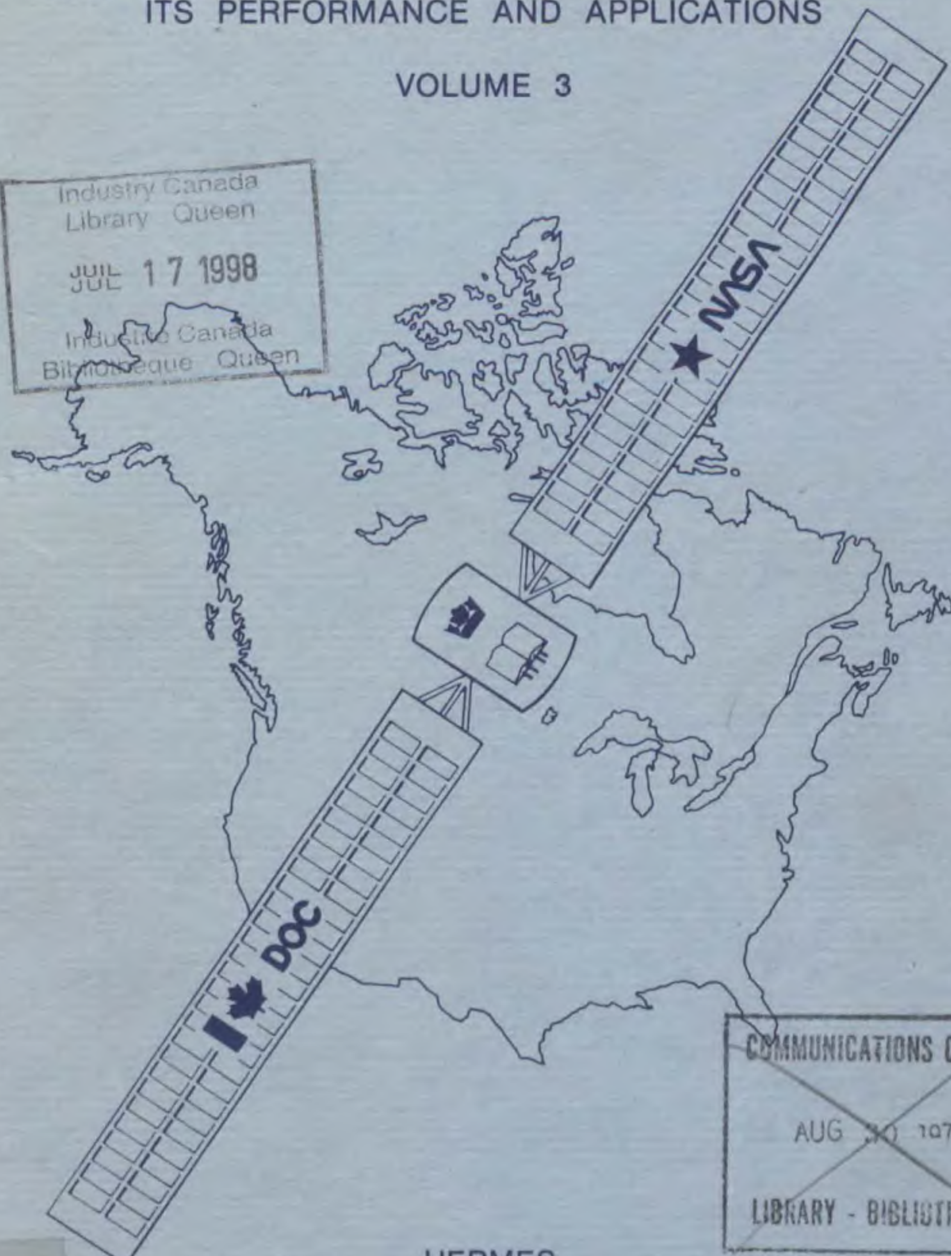
HERMES
(THE COMMUNICATIONS TECHNOLOGY SATELLITE)
ITS PERFORMANCE AND APPLICATIONS

VOLUME 3



HERMES
(LE SATELLITE TECHNOLOGIQUE DE TELECOMMUNICATIONS)
SON FONCTIONNEMENT ET SES APPLICATIONS

TOME 3

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HERMES

(THE COMMUNICATIONS TECHNOLOGY SATELLITE):

ITS PERFORMANCE AND APPLICATIONS

HERMES

(LE SATELLITE TECHNOLOGIQUE DE TELECOMMUNICATIONS):

SON FONCTIONNEMENT ET SES APPLICATIONS

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HERMES SERVITEUR DES CITOYENS

L'honorable Jeanne Sauvé

Ministre des Communications

Gouvernement du Canada

Ottawa, Canada

J'ai de la nuit du lancement d'Hermès, il y a maintenant presque deux ans, un souvenir inoubliable. Tous ceux d'entre nous qui étaient là, particulièrement ceux qui avaient travaillé au projet pendant quatre ans, mesuraient toute l'importance de cet événement. Je me rendais compte que je n'étais pas seule à serrer les dents pendant le compte à rebours.

Nous avions invité les directeurs des projets expérimentaux lesquels devaient être effectués par le truchement d'Hermès. Plusieurs d'entre eux étaient présents, et il était très intéressant d'observer la différence d'attitude entre les chercheurs et les ingénieurs qui avaient créé le satellite et celle de ses utilisateurs éventuels.

Pour les chercheurs et les ingénieurs, Hermès était un chef-d'oeuvre de la technologie moderne, le satellite de télécommunications le plus puissant au monde. Mais les expérimentateurs eux, devaient le mater, apprendre à s'en servir et à le mettre au service de la population.

Aujourd'hui, l'expérience acquise, nous permet de dire qu'Hermès a largement dépassé nos attentes, et affirmé sa vocation de serviteur des citoyens.

Les Canadiens savent depuis longtemps que le satellite de télécommunications est le seul moyen pratique d'apporter les services de télécommunications à une population disséminée sur un vaste territoire. C'est en 1968 que le gouvernement a publié le Livre Blanc intitulé *Un système domestique de télécommunications par satellite pour le Canada.* Neuf ans plus tard, environ 84 collectivités bénéficient des services du téléphone, de la radio et de la télévision grâce aux satellites Anik-A de Télésat Canada.

Cette réussite même incite certains à se demander pourquoi il était nécessaire de mettre au point un satellite du genre d'Hermès. C'est tout simplement parce que les techniques employées et les services fournis par les satellites Anik-A constituent dans le domaine des communications un service de base. Au début de la présente décennie, le gouvernement canadien a toutefois décidé qu'il faudrait mettre au point de *nouvelles* techniques afin de pouvoir offrir dans l'avenir les meilleurs services de télécommunications. Hermès est à cet égard un exemple de technologie avancée, un modèle de ce qu'on peut souhaiter pour l'avenir.

Il n'est pas nécessaire d'être un expert pour saisir le raffinement technologique d'Hermès. Ce satellite est beaucoup plus puissant et fonctionne sur une fréquence beaucoup plus élevée que les satellites traditionnels. Ces deux facteurs, à savoir: une plus grande puissance et un potentiel de fréquences plus élevé font que les stations terrestres qui s'y trouvent reliées peuvent être plus petites et même transportables.

Il saute aux yeux que ce système offre de multiples possibilités.

C'est ainsi qu'un petit hôpital perdu du Nord peut être relié à un centre hospitalier universitaire dans le Sud et fournir des services médicaux spécialisés, grâce à un réseau de communications sonores et visuelles. Les succès obtenus jusqu'à présent sont étonnants et indiscutables.

Des étudiants, vivant à des centaines de milles de l'université la plus proche, peuvent assister à des cours tout comme s'ils se trouvaient sur le campus. Cela aussi est déjà une réalité.

De petites collectivités, auparavant isolées l'une de l'autre, peuvent maintenant échanger des renseignements et des idées. On le doit encore au programme expérimental qui a suivi le lancement d'Hermès.

A ceux qui croient que les télécommunications se limitent à des échanges de potins, aux bulletins de nouvelles ou à la transmission des téléromans, Hermès manifeste la dimension nouvelle qu'ont prise avec lui les télécommunications. Et pourtant, le début de ce programme expérimental ne remonte qu'à un an et demi.

Au cours du présent congrès, nous entendrons des rapports sur des projets canadiens et américains dans le domaine des soins de la santé, de l'enseignement, des rapports intercommunautaires et de l'administration, ainsi que de la recherche technologique.

Nombre de ces projets n'auraient pas été possibles sans l'enthousiasme et le dévouement des participants, aussi bien aux Etats-Unis qu'au Canada. Ce sont eux les vrais pionniers des télécommunications par satellite.

Ils ont d'abord conçu et planifié les expériences pour ensuite faire avec d'autres personnes l'essai de leurs expériences collectives.

L'esprit d'équipe et le dévouement expliquent cette réussite. Et les obstacles et les frustrations qui accompagnent d'ordinaire ce genre d'entreprise n'en ont que stimulé davantage les initiateurs.

On pourrait aligner une série d'exemples:

- le coordonnateur qui grimpe un ou deux escaliers, vérifie une antenne et revient à la salle de contrôle en dix secondes;

- l'anesthésiste qui se mue en expert pour déglacer une antenne avec une solution alcoolisée et un balai;

- les chercheurs en équilibre sur des tables pendant un congrès de chirurgiens afin de régler les commandes de caméras montées au plafond;

- les directeurs de projets qui rédigent pour la centième fois une demande.

Pourtant, ils ont tenu le coup, convaincus que les innovations envisagées annonçaient une ère où le satellite de télécommunications aiderait à réaliser les ambitions de Monsieur Tout-le-monde, qu'il veuille parfaire son éducation, avoir rapidement accès aux services médicaux d'un spécialiste ou discuter avec les planificateurs gouvernementaux de questions relatives à son milieu.

Le programme Hermès démontre que les télécommunications par satellite peuvent contribuer à la mise en place de la structure canadienne et que ce travail de
a une grande influence sur la solidité et la qu
social. C'est essentiellement, en fait, un projet de participation. Dans bien des cas, le satellite a servi de catalyseur, car l'essai de méthodes nouvelles entraînait des découvertes qui, à leur tour, en entraînaient d'autres à la façon des réactions en chaîne.

Des gens du monde de l'enseignement, de la santé, de la radiodiffusion et de l'administration publique, des associations professionnelles ont appris comment utiliser les télécommunications par satellite. On a ainsi démythifié la technologie. On ne s'est pas cantonné dans le rôle de spectateur; on a tiré parti des possibilités d'aller et de retour du dispositif Hermès pour poser des questions et indiquer aux planificateurs du programme ce qui plaisait ou déplaisait en demandant, le cas échéant, des modifications.

If faut voir de quelle façon on utilise le satellite dans le domaine des relations intercommunautaires et dans celui de l'administration des soins de la santé. Par exemple, les habitants de localités du nord de l'Alberta savent chaque semaine s'il y a des emplois vacants dans leur région. Ils peuvent de plus discuter entre eux ou avec des experts, de projets d'embellissement de leurs maisons, et si les matériaux ou les outils manquent chez eux, ils peuvent examiner d'autres solutions. Ainsi, au cours d'une séance d'information sur l'isolation des maisons, on suggérait que les matériaux soient fixés les uns aux autres à l'aide de crampons. Les participants ont alors demandé s'ils pouvaient se servir de clous puisqu'il était difficile de se procurer les crampons suggérés.

En Colombie-Britannique, les retraités aident à concevoir des programmes conformes à l'âge d'or. Les habitants de deux localités du Québec ont parlé de leur participation à l'activité sociale de leur milieu tandis que des jeunes discutaient de hockey, et des adultes de développement urbain. Les sujets traités allaient de l'artisanat local aux recettes préférées.

Dans une localité du nord de l'Ontario, les autorités ont pu éviter de faire évacuer la population dès les premiers signes de crue de la rivière avoisinante, car une liaison efficace a permis de demander de l'aide seulement lorsque l'évacuation est devenue vraiment nécessaire. Un jeune dentiste a pu, grâce à la télévision, montrer à son professeur un cas qu'il n'avait jamais vu auparavant. Un spécialiste situé à des centaines de milles d'une salle d'opération a pu surveiller les appareils de survie pendant une césarienne. Il s'agissait là du premier accouchement effectué par l'intermédiaire d'un satellite.

Au cours de la "visite télévisée" d'un hôpital dans le nord de l'Ontario, un spécialiste a remarqué qu'une de ses patientes, qui s'était fracturé un fémur, se déplaçait encore avec des béquilles. Un examen a démontré qu'elle devait suivre un traitement de physiothérapie. Comme ce service n'était pas offert dans la localité, cela s'est fait par satellite sous la direction d'un centre hospitalier universitaire. La simulation du transfert d'urgence d'un patient d'un endroit éloigné vers un hôpital de l'Ontario a par ailleurs montré comment on peut améliorer les services de secours en cas d'urgence ou de désastre à l'aide des communications par satellite. A l'occasion, des patients ont pu, de l'hôpital, à leur grand plaisir, visiter des parents et des amis grâce au satellite. Un vieil indigène hospitalisé quelque part en Ontario et qui ne parlait pas l'anglais a eu la joie de pouvoir s'entretenir, par l'intermédiaire d'Hermès, avec des amis qui se trouvaient à l'hôpital central. Il avait enfin trouvé quelqu'un qui pouvait interpréter pour lui et informer qui de droit qu'il n'avait plus de papier-mouchoirs.

Hermès a aussi facilité un programme de santé publique à Terre-Neuve. Au cours de séances sur le diabète, un jeune de St. Anthony a dit hésiter à quitter sa ville pour entrer au collège technique à Saint-Jean, car il craignait de ne plus recevoir les soins que lui prodiguaient les travailleurs des services de santé de sa localité. Grâce à Hermès, on a pu le rassurer en lui faisant rencontrer à distance les personnes qui le suivraient pendant son séjour à Saint-Jean.

Hermès a aussi fait ses preuves dans le domaine de l'enseignement et de la recherche. Des chercheurs d'Ottawa ont eu l'occasion unique de participer à l'Université Carleton à un cours que donnait, en Californie, l'un des praticiens les plus renommés du domaine, le directeur du centre de recherches au NASA/AMES Research Center.

Des biologistes de Montréal, de Québec et de Trois-Rivières ont entrepris une série de discussions sur des virus et des bactéries présentés à l'aide d'un microscope électronique par l'intermédiaire du satellite. Les chercheurs ont agi comme s'ils se trouvaient dans la même pièce.

Des médecins et des pharmaciens, postés dans des hôpitaux de Terre-Neuve et du Labrador, ont pour leur part fait des exposés et participé activement par l'intermédiaire d'Hermès, à deux congrès tenus à Saint-Jean.

Grâce à leur facilité de transport et d'installation, les petites stations terrestres utilisées avec le satellite Hermès donnent au réseau une souplesse inégalée. Des essais menés par les gouvernements de l'Ontario et du Québec, démontrent par exemple que les systèmes de télécommunications par satellite du genre d'Hermès pourraient être utiles pour le contrôle et la direction des activités dans les cas d'urgence, comme les incendies de forêts ou l'écrasement d'un avion. Ils appuieraient et faciliteraient le travail de l'équipe de sapeurs ou de sauveteurs évoluant dans une région isolée. Les possibilités de ce genre sont innombrables.

Voilà seulement quelques exemples de ce qui peut se faire et se fait déjà grâce au satellite Hermès, ainsi que de la façon dont la population a bénéficié de ses services. Il y a d'ailleurs encore bien d'autres projets en voie d'exécution ou de préparation.

Il faut noter que la technologie des télécommunications par satellite ne s'adresse pas seulement aux régions éloignées même si c'est là que les exemples paraissent plus spectaculaires.

Elle offre autant de possibilités pour les habitants du Sud. Un fait me vient immédiatement à l'esprit: la télédiffusion en direct des débats de la Chambre des communes à l'intention des Canadiens vivant à l'extérieur d'Ottawa. Comme vous le savez sans doute, depuis que la télévision est entrée au Parlement, les cablodistributeurs d'Ottawa présentent en direct la période quotidienne de questions. Bien des citoyens espèrent jouir de cet avantage où qu'ils se trouvent au Canada.

Il faudra auparavant résoudre bien des problèmes mais les satellites contribueront sûrement au reportage en direct des débats parlementaires dans tout le pays.

Outre que l'utilisation du satellite facilite une meilleure connaissance de l'institution démocratique qu'est le Parlement, il arrive que la période de questions est l'émission qui provoque le plus l'intérêt des téléspectateurs. Qu'advient-il après Hermès?

A mon avis, les Canadiens peuvent être fiers du rôle que joue leur pays dans les domaines de la mise au point et de l'application de techniques nouvelles de télécommunication par satellite. Mais nous ne pouvons en rester là. Nous préparons déjà une série de programmes complémentaires qui utiliseront le prochain satellite de Télésat Canada, Anik-B, dont le lancement aura lieu bientôt. Après cela, nous reprendrons plusieurs des techniques mises au point au cours des expériences Anik-B dans une troisième série de satellites de Télésat, la série Anik-C. Hermès est un satellite expérimental seulement. Les projets Anik-B visent par contre à examiner comment nous pouvons passer du stade expérimental à la prestation d'un service continu.

C'est déjà beaucoup de participer au perfectionnement de nouvelles techniques de télécommunication, mais c'est encore plus satisfaisant d'appliquer les techniques perfectionnées à des services destinés à tous les Canadiens. L'emploi maximal des communications par satellite exige cependant bien plus que des techniques. Il faut encore un cadre institutionnel et ce cadre a fait l'objet des manchettes dernièrement, en raison de la demande de Télésat Canada de se joindre au Réseau téléphonique transcanadien (R.T.T.).

Comme vous le savez, le gouvernement estimait que l'adhésion de Télésat au R.T.T. aurait des effets favorables pour la mise au point, l'intégration et l'emploi des installations de télécommunications par satellite au Canada. Cette attitude n'a pas fait l'unanimité, la critique vient particulièrement de ceux qui favorisent le modèle américain. Je me dois toutefois de signaler qu'il y a des différences importantes entre le monde des télécommunicateurs du Canada et celui des Etats-Unis.

Notre gouvernement a dû en tenir compte et adopter une structure différente pour les télécommunications par satellite. On ne s'étonnera pas qu'une ressource aussi coûteuse et aussi importante soit considérée comme un complément des autres systèmes de télécommunications au Canada, car les toutes premières déclarations du ministre des Communications, lorsqu'il a présenté la Loi de la Télésat Canada au Parlement en 1969, faisaient état de ce fait. Cette loi prévoit que les entreprises d'exploitation de télécommunications existantes doivent posséder chacune une part de Télésat et siéger à son conseil d'administration. De toute évidence, on n'aurait jamais institué ce genre de propriété s'il avait été question de concurrence libre. La participation de Télésat Canada au conseil de direction du Réseau téléphonique transcanadien n'est qu'un prolongement de ce principe. Elle assurera à mon avis l'objectivité et l'équilibre, lorsque les activités du R.T.T. toucheront les plans de Télésat ou, à l'inverse, lorsque celles de Télésat influenceront les projets du R.T.T.

Il est essentiel, pour que tous les utilisateurs du système puissent bénéficier de la réduction du coût des voies de communication offertes par les nouveaux satellites, que les systèmes par satellites soient utilisés au maximum, ce qui n'est possible que par leur raccordement aux installations de Terre. Le R.T.T. représente 95% de l'industrie qui peut garantir cet emploi des satellites. Vous m'excuserez si je compare encore la situation canadienne à celle des Etats-Unis, mais un certain nombre de fournisseurs de services par satellite aux Etats-Unis sont eux-mêmes les exploitants de systèmes de télécommunications importants auxquels ils intègrent leurs installations par satellite, et ces dernières ne sont pas des concurrentes, mais des compléments des autres services de télécommunications.

Néanmoins, plusieurs craignent qu'une plus grande intégration des systèmes ne réduise les avantages éventuels d'une concurrence hypothétique des divers modes de communications. C'est pourquoi la demande de Télésat en vue de se joindre au R.T.T. est matière à controverse au Canada.

Il serait utile à mon avis de s'arrêter quelques minutes sur la situation concurrentielle du marché des services de télécommunications au Canada. Tout le monde le sait, il s'est créé au cours des années une forme de concurrence entre les deux principaux groupes de télécommunicateurs, à savoir le Réseau téléphonique transcanadien et les Télécommunications du CNCP. Je ne crois pas que nous puissions nous permettre le luxe de posséder trois ou quatre télécommunicateurs en situation de conflit sur le marché national au Canada. Toutefois, le gouvernement persiste à croire qu'il est dans l'intérêt public de garder un certain élément de concurrence dans la prestation des services et installations de télécommunications d'affaires qui, de toute évidence, ne sont pas sujets au monopole des services téléphoniques. C'est dans ce but qu'il appuie le rôle des Télécommunications du CNCP, en tant que second fournisseur dans tout le pays, sous réserve d'un cadre réglementaire qui protège l'intérêt public général. Pour ce qui est de la concurrence entre d'autres télécommunicateurs que ces deux groupes, j'incline à croire que des considérations d'ordre régional peuvent justifier des différences de même nature.

La controverse suscitée par la demande de Télésat Canada, a obligé le gouvernement à conclure, à la suite d'un examen de la décision rendue par le C.R.T.C., qu'il serait opportun de réviser toute sa politique de propriété des stations terrestres de télécommunications par satellite. A l'heure actuelle, Télésat Canada possède en effet toutes les stations terrestres reliées à son système. Il est peut-être temps, dans l'intérêt public, de peser à nouveau les avantages et les inconvénients d'une telle situation.

Le gouvernement estime en outre que l'opinion selon laquelle Télésat ne doit louer que des voies entières devrait être remise en question. En effet, il pourrait être à l'avantage du public que des télécommunicateurs réglementés puissent louer des portions de voies s'ils le désirent et si le C.R.T.C. les appuie.

Mais permettez-moi de signaler d'autres facteurs qui ont joué un rôle important dans la décision du gouvernement d'appuyer l'accord entre Télésat et le R.T.T. L'exploitation des satellites Anik en orbite à l'heure actuelle prendra fin au début des années'1980. L'acquisition de nouveaux satellites est donc d'importance capitale. De plus, l'acquisition au moment opportun du système satellite Anik-C constitue un facteur décisif de la sauvegarde et de l'expansion de l'industrie spatiale canadienne. L'annulation de cet achat, ou même son report d'un an seulement, aurait des conséquences graves.

Une telle mesure dérangerait l'enchaînement des programmes visés par les politiques du gouvernement fédéral en vue du développement de compétences industrielles et technologiques au Canada. Un délai dans l'acquisition des satellites Anik-C signifierait une diminution de quelque 75 millions de dollars des revenus prévus par l'industrie spatiale canadienne au cours des trois ou quatre prochaines années, ainsi qu'une diminution proportionnelle du taux d'emploi dans ce secteur; en d'autres termes, une perte d'environ 300 emplois à compter de 1978.

A longue échéance, le poste d'avant-garde que détient le Canada grâce à la conception des satellites Alouette, ISIS et Hermès et aux travaux relatifs aux satellites Anik-A et Anik-B, se trouverait menacé. Les avantages que l'industrie canadienne a su tirer dans plusieurs domaines de la conception et de la fabrication de satellites seraient fortement ébranlés, et même après un délai très court, il lui serait difficile et coûteux, pour ne pas dire impossible, de rétablir sa position actuelle. Le gouvernement ne tient pas à risquer de perdre les avantages de l'expérience acquise jusqu'à maintenant, ni la main-d'oeuvre spécialisée employée à l'heure actuelle, en laissant Télésat, la société canadienne de télécommunications par satellite, à la merci du marché concurrentiel national, comme certains l'ont suggéré.

Lorsqu'il a décidé de modifier la décision du C.R.T.C., le gouvernement a examiné les pouvoirs statuaires dont jouissait le Conseil pour trancher la question de réglementation que suscitait l'association projetée. Bien qu'il admit la possibilité de certaines difficultés de réglementation, le gouvernement croyait que les pouvoirs de réglementation nécessaires pour aplanir ces difficultés existaient déjà et qu'on pouvait en user efficacement. Il reconnaissait cependant qu'il faudrait peut-être trouver de nouvelles techniques d'application pour faire face aux difficultés qu'entraîne l'association. Il était d'avis que, de toute façon, même si l'accord entre Télésat et le R.T.T. ne se concrétisait pas, le Conseil se verrait obligé de trancher des questions de plus en plus complexes, à mesure que les satellites s'intégreraient aux systèmes de télécommunications de Terre. En approuvant l'accord, le gouvernement a, à mon sens, renouvelé sa confiance dans la capacité et la compétence du Conseil pour trancher les questions réglementaires relevant de son domaine.

Mais, pour en revenir à l'objet de mon allocution, j'aimerais souligner que l'accord entre Télésat Canada et le R.T.T. aidera à créer au Canada une structure économique qui permettra au secteur des services publics d'envisager sérieusement l'emploi de systèmes par satellite aux fins d'exploitation. Je sais que des discussions semblables se tiennent aux Etats-Unis et j'ai bon espoir que les planificateurs du gouvernement, les utilisateurs et les télécommunicateurs canadiens et américains parviendront à établir des structures susceptibles de couvrir l'ensemble du système.

Quoi qu'il en soit, les satellites font déjà partie du système canadien de télécommunication. Avec les expériences et les travaux de perfectionnement du programme Hermès et les programmes prévus pour l'exploitation d'Anik-B, nous préparons déjà la voie pour les services de télécommunications par satellite de l'avenir.

Le caractère même des programmes expérimentaux fait que nous préparons actuellement, avec l'aide des personnes qui les utiliseront, les services de télécommunications de demain.

En fin de compte, c'est là l'objectif le plus important des programmes expérimentaux d'Hermès qui consiste à faire des satellites les serviteurs de la population canadienne.

SATELLITES ARE FOR PEOPLE

The Honourable Jeanne Sauvé

Minister of Communications

Government of Canada

Ottawa, Canada

I can vividly recall the night, almost two years ago now, when Hermes was launched. All of us who were there, but especially those who had lived with the project for the previous four years, were struck by the immensity of the event. And I know I was not the only one with white knuckles as the countdown ended.

We had invited to the launch the leaders of experimental projects that would soon be taking place, through Hermes. Many of them attended, and it was interesting to see the difference in attitudes between the scientists and engineers who had created the satellite, and those who would be using it.

For the scientists and engineers, Hermes represents a masterpiece of modern technology -- the most powerful communications satellite in the world. But it was up to the experimenters to tame it, to work with it, and to learn how to put it to the service of people.

Now, with the lessons of many experiments behind us, Hermes has more than fulfilled its promise as a satellite for people.

We Canadians recognized early in the game that satellite communications offered the only practical way to extend communications services to our far-flung and scattered population. It was in 1968, that the Government published its White Paper on *A Domestic Satellite System for Canada*. Now, nine years later, about 84 distant communities enjoy telephone, radio or television service, thanks to Telesat Canada's Anik-A series of satellites.

With the success of the Aniks, there are those who have asked why the development of a satellite such as Hermes has been considered necessary. The answer lies in the fact that the technology used and services provided by the Anik-A series of satellites extend basic communications services. But in the early 1970's, the Canadian government decided that *new* technology would be required in the future to make available the best possible communications services. Hermes is an example of such technological development.

One does not have to be an expert to appreciate the technological beauty of Hermes. The satellite is much more powerful and operates at a higher frequency than conventional satellites. Those two factors -- higher power and higher operating frequency -- mean that the earth stations can be made smaller and even portable.

Now, see the kind of services that suddenly become possible.

A small isolated hospital in the north can be linked by voice and television with a large southern university hospital, to provide extended medical services. This has already taken place, with dramatic results.

Students, hundreds of miles from the nearest university, can participate in long-distance courses as if they were there on campus - and already have done so.

Small communities, previously isolated from each other, can benefit from exchanging information and ideas. And this, too, has occurred thanks to the experimental program made possible through Hermes.

For those who tend to think of communications in terms of telephoning your Aunt Martha, listening to the six o'clock news, or watching King of Kensington, Hermes represents a whole new dimension in communications.

It has now been a year and a half since the experimental program began.

During this Symposium we will hear reports on Canadian and United States projects in the areas of health-care delivery, education, community interaction and administration as well as technological explorations.

Many of the projects would not have been possible without the dedication and enthusiasm of those involved - both in the United States and in Canada. These are the true pioneers in this venture.

They made the projects possible initially by conceiving and planning the experiments and others readily participated in the testing of satellite services which were delivered to them or by them.

Team spirit and dedication describe well what made the projects work.

And although any new venture has its share of frustration, obstacles were not a deterrent.

There are many stories of:

- the coordinator who became known for his skills in rushing up two flights of stairs in 10 seconds to check the antenna and then back to the control room;

- the anesthetist who became a pro at wiping ice and snow off the antenna with an alcohol solution and a barn broom;

- the researcher who balanced on top of tables during a surgeon's congress in order to adjust the controls on ceiling-mounted television sets;

- the experiment leader who re-wrote his request for funding for about the 100th time.

Despite these frustrations, people stuck with the project. The guiding principle behind the projects which inspired the participants is the conviction that the innovations will bring about an era in which satellite communications can help fulfill people's aspirations; to upgrade one's education; to have immediate access to specialist medical care; or to discuss with government planners matters which are of concern at the community level.

The Hermes program is showing that satellite communications can be a factor in the social fabric of our country. Hermes has particularly demonstrated the role of *tion* in the building and reinforcement of this social fabric. It is a participatory project. In many instances, the satellite served as a catalyst -- as new approaches were tried, more would be discovered, as in a chain reaction.

People in education, health and broadcasting, in government, and professional associations have learned to apply satellite communications. The technology has been demystified. Far from being passive, participants used the interactive Hermes system to ask questions and to tell program planners when they liked a program or to complain when they wanted changes.

Consider some of the ways the satellite is being used in the field of community interaction and health-care delivery.

People in Northern Alberta communities have weekly access to up-to-date announcements regarding employment opportunities in their areas. They can discuss with experts and among themselves plans for home improvement. When materials or equipments are not locally available, they can explore other solutions. For example, during a session on home insulation the instruction suggested materials should be stapled together. The communities came back with the question "would nails do?", since staples are hard to find.

In British Columbia retired people are engaged in developing programs relevant to their age group. Two communities in Quebec discussed via Hermes their community life, and things that concerned them. Youngsters got together to talk about hockey and adults discussed urban development. Other topics ranged from local handicrafts to favorite recipes.

A community in Northern Ontario did not have to evacuate prematurely when the nearby river flooded, because the reliable telecommunications link would have allowed a call for help when evacuation was really needed.

A young dentist could show via TV directly to his professor a disease which he had never before encountered.

A specialist hundreds of miles away could 'see' right into an operating room and watch various life-supporting mechanisms while a baby was being delivered by caesarean operation, the first baby to be born with the help of a satellite.

During a 'television visit' to a Northern Ontario hospital, a specialist noticed that a former patient who had suffered a broken thigh was still walking with crutches. A check-up showed that it was necessary for her to undergo physiotherapy. As none was available locally, it was done by satellite under supervision from a university hospital.

The simulation of a medical emergency evacuation from a remote site to a hospital in Ontario had demonstrated how emergency and disaster relief efforts can be enhanced by satellite communications.

On occasion, hospitalized patients could visit, via satellite, with family and friends, much to their pleasure. An elderly native patient at an Ontario Hospital who did not speak English, was relieved when he talked via Hermes to friends at the base hospital. Finally, he had someone who could translate that he had run out of facial tissues.

Hermes facilitated public health programming in Newfoundland. In the course of a series on diabetics, a youngster in St. Anthony's revealed his reluctance to attend a trade college in St. John's because he was worried he would lose the personal support he had received from the health-care workers in his community. Via Hermes he was reassured when he was introduced remotely to the people with whom he would deal in St. John's.

In the fields of education and research, Hermes has also shown its potential. Research managers in Ottawa had the unique opportunity at Carleton University to participate in a course given in California by one of the most eminent practitioners in the field, the head of the NASA-Ames Research Center.

Biologists in Montreal, Quebec and Trois-Rivières undertook a series of research discussions on viruses and bacteria which were displayed from an electronic microscope via the satellite to the three sites. Researchers acted as if they were in the same room.

Via Hermes, physicians and pharmacists at hospitals in Newfoundland and Labrador gave presentations and actively participated in two symposia which were held in St. John's.

The small, portable and easy to install earth stations used with Hermes, are providing a flexibility never before possible. In tests conducted by the Ontario Government and in Quebec, for example, it appears that satellite communications systems of the Hermes type could be useful in the control and management of emergencies such as forest fires or a plane crash. They could support a work crew or a research team while operating in a remote area. The possibilities are limitless.

These are just a small sample of what has already taken place through Hermes and how people have been affected. Many more exciting projects are underway or being planned.

Satellite technology not only benefits those in remote areas, although perhaps the benefits are more dramatic where satellite service replaces no service at all.

But consider the potential for us in the south, as well. One possibility that immediately comes to mind is that of providing live coverage of the House of Commons debates to Canadians outside of Ottawa. As you may know, since TV came to Parliament, Ottawa cablevision companies have been carrying the daily question period live. Many Canadians hope that live coverage could soon be extended across Canada.

There are many questions that would have to be resolved before this could happen. But satellites would almost certainly have to be involved in extending live Parliamentary coverage across the country.

Beyond the fact that Parliament via satellite would dramatically bring people closer to the democratic process, we also have to admit that the daily question period has become the hottest show in town.

I believe all Canadians can be proud of the role our country has played and will continue to play in the development and application of new satellite communications technology. But we cannot rest on this success. We are already planning a follow-on series of programs, using Telesat Canada's soon-to-be-launched Anik-B satellite. Beyond that, we will see much of the technology that has evolved from these experiments being brought into use in Telesat's Anik-C series of satellites. Hermes is entirely experimental. The programs on Anik-B are being designed to explore how we can move from experiment to the provision of continuing service.

It is one thing to participate in the development of new communications technology. It is even more satisfying when the technology can be of direct benefit to all Canadians. But the full use of satellite communications involves more than technology; an institutional framework is also required. The institutional framework for satellite communications in Canada has been in the news lately, as a result of the Telesat Canada application for membership in the Trans-Canada Telephone System (TCTS).

As you know, the Government considered that Telesat's membership in TCTS would have a number of positive results for the development, integration and use of satellite facilities in Canada. There are, of course, critics of the Canadian approach who favour the U.S. model. I must, however, emphasize that there are significant differences between the regulatory and telecommunications carrier environment of our two countries.

The Government of Canada has had to recognize these factors by adopting different institutional arrangements for satellite communications than those in the United States. It should be no surprise that such an important and expensive resource must be viewed as complementary to other systems of telecommunications in Canada.

The complementary role for Telesat was recognized in the early statements of the Minister of Communications who presented the Telesat Canada Act to Parliament in 1969. The statutory structure of the corporation provides for major equity interest by the existing telecommunications companies and for their membership on the Board of Directors. Obviously, this ownership structure would never have been implemented if free competition were envisaged. The membership of Telesat Canada on the Board of Management of the Trans-Canada Telephone System is a further evolution of this principle. I believe it will provide a positive, balancing viewpoint when TCTS matters impact on Telesat planning, and vice-versa.

Extensive utilization through integration with terrestrial facilities is a prerequisite to realizing the benefit of the lower channel cost of the new satellites for all users of the system. The members of TCTS represent 95 percent of the industry which can provide that basic utilization of the satellites. If again I may draw a comparison, a number of the providers of satellite service in the United States are themselves the operators of major telecommunications systems with which they are integrating their satellite facilities. In this respect their satellites are not competitors, but are complementary to other communications services of those companies.

Nevertheless, increased system integration has been seen by some as reducing the potential advantages which might result from eventual competition between the various modes. Therefore, the Telesat proposal to join TCTS created a divergence of opinion in Canada.

I think it would be useful to pause for a moment to say a few words concerning competition in the provision of telecommunications services to Canadians. As everyone knows, over the years there has developed a degree of competition between two major carrier groups, the Trans-Canada Telephone System and CNCP Telecommunications. I do not believe that we as Canadians can afford the luxury of three or four telecommunications carriers competing on a national basis. Nevertheless, the Government continues to hold the view that the public interest is well served by an element of competition in the provision of certain business telecommunications facilities and services that clearly fall outside the family of monopoly telephone services. It is to this end that it supports the role of CNCP Telecommunications as an alternative supplier across Canada within a regulatory framework designed to protect the overall public interest. Insofar as additional competition involving more than these two carrier groups is concerned, I am inclined to accept the proposition that regional considerations may favour regional differences.

Because of the debate surrounding the Telesat proposal to join TCTS, the Government concluded, as a result of its review of the CRTC Decision, that it would be appropriate and timely to undertake a full review of its policy on ownership of satellite earth stations. At present, Telesat Canada directly owns all earth stations in its system. The time may have come for reconsideration of the advantages and disadvantages of this situation, from a public interest point of view.

In addition, the Government considers that the approach that Telesat should lease only complete channels on satellites should now be reconsidered. It has concluded it could be to the benefit of the public that regulated Canadian telecommunications carriers should be able to lease less than complete channels, if they wish, and if the CRTC decides that it would be in the public interest.

Let me now turn to some of the other considerations that also featured prominently in the Government's decision that the Telesat/TCTS Agreement was in the public interest. The effective life of the current generation of Anik satellites will end in the early 1980's. Therefore, the timing of the procurement of the next satellite series is critical from an operational viewpoint. Furthermore, the timing of the procurement of the Anik-C satellite system is a critical component in sustaining and developing the Canadian space industry. The cancellation of procurement or even postponement for one year would have serious effects.

Such action would disrupt the continuity of programs fostered by Government policies for ongoing industrial and technological competence in Canada. The consequent impact of a suspension of the Anik-C procurement would have been a reduction of approximately $75 million of work over the next three or four years, now planned in the Canadian space industry and a corresponding reduction of Canadian industry employment of about 300 positions beginning in 1978.

In the longer term, the advanced position of Canadian technology through the design of Alouette, ISIS, Hermes and work associated with the Anik-A and B satellite series would have been eroded. The advantages that our industry has gained in several fields of satellite design and production would have been seriously impaired. Regaining the technological advantage, even after a short interval, would have been difficult and costly, if not impossible. The Government was not prepared to jeopardize the accomplishment to date and the related skilled employment by leaving the Canadian satellite carrier, Telesat, to the vicissitudes of the competitive domestic environment which some suggested.

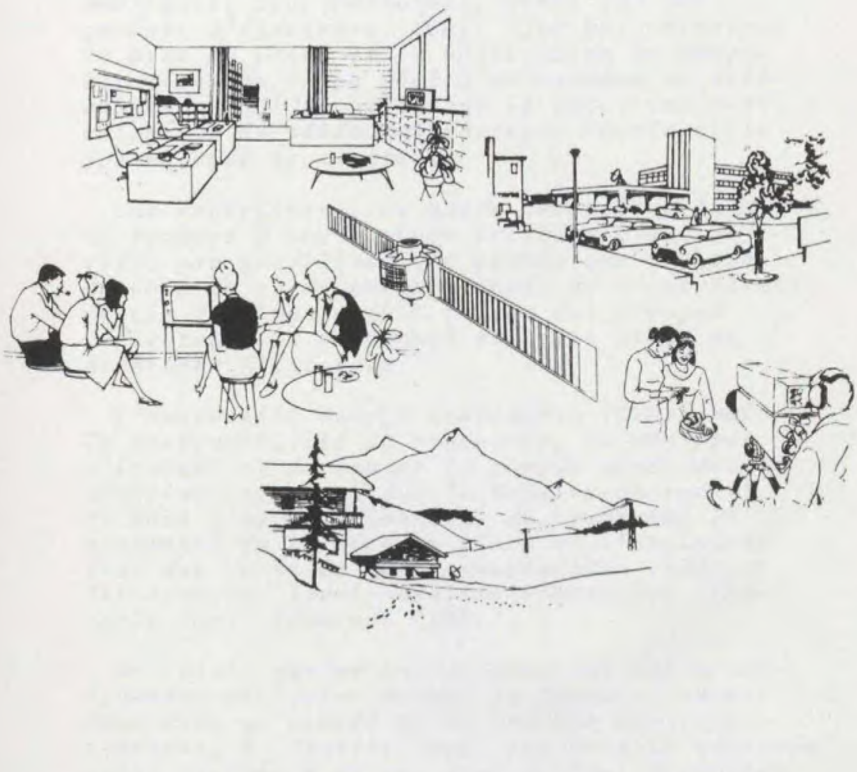
May I emphasize that in deciding to vary the CRTC Decision, the Government reviewed the statutory powers of the Commission to deal with the regulatory situation it perceived as arising from the proposed association. While recognizing some potential regulatory difficulties, the Government was of the view that the necessary regulatory powers exist and can be used effectively, although it might be necessary to devise new regulatory techniques to meet the complexities introduced by the association. In any event, even in the absence of the Telesat/TCTS Agreement, the Commission would be faced with some additional complexities, as satellites become more integrated with terrestrial facilities in Canadian telecommunications systems. By approving the Agreement, I believe that the Government has reaffirmed its confidence in the professional skill and in the competence of the Commission and its staff to deal with the regulatory matters, within its jurisdiction.

Coming back to a main theme of my discussion, I wish to stress that the Agreement will help to bring about an institutional framework in Canada which will provide the economic basis for the public services sector to seriously assess - and hopefully implement - the utilization of operational satellite systems. I understand that in the United States, similar discussions are going on. I am confident that in both countries Government planners, users and carriers together will arrive at structures which are most suitable in the overall system development.

Satellites are already an integral part of the Canadian communications system. With the experimental and development work of Hermes, and the programs planned for Anik-B, we are already pioneering the future development of satellite services.

By the very nature of these experimental programs, the communication services of tomorrow are being designed with the help of the very people who will be using them. And this, in the final analysis, is the greatest achievement of experimental programs, such as those being undertaken through Hermes -- to ensure that satellites are for people.

COMMUNITY AND SPECIAL SERVICES



LA COMMUNAUTE ET LES SERVICES SPECIAUX

VIDEOCONFERENCING VIA SATELLITE:

OPENING CONGRESS TO THE PEOPLE*

Fred B. Wood, Vary T. Coates, Richard F. Ericson

The George Washington University, Washington, D.C.

and Robert L. Chartrand

U.S. Library of Congress, Washington, D.C.

Cette série d'expériences, à laquelle ont participé des membres choisis du Congrès américain, leur personnel, ainsi que des groupes d'électeurs, avait pour but principal la mise au point et la réalisation de démonstrations en temps réel d'un système de télé-conférence vidéo utilisant le satellite technologique de télécommunications Hermès et la technologie apparentée.

Les expériences, au cours desquelles on a eu recours à une liaison bilatérale audio-vidéo par satellite, ont permis aux membres du Congrès et à leur personnel de s'entretenir depuis Washington (D.C.) avec des groupes d'électeurs ou personnel de leurs états ou districts électoraux.

L'Université George Washington (GWU) avait la responsabilité de concevoir, de réaliser, d'évaluer et de donner le compte rendu des expériences, alors que la NASA se chargeait de tout l'aspect technique du programme et notamment de la mise en place et l'exploitation des voies de télécommunication vidéo et des stations terriennes transportables (Portable Earth Terminal (PET)).

Au total, quatre expériences ont été effectivement réalisées durant la première année: deux avec un membre de la Chambre des représentants, M. Charlie Rose, une avec le sénateur Adlai Stevenson et une avec M. Paul McCloskey également membre de la Chambre des représentants. Trois autres expériences ont dû être annulées pour des raisons d'ordre technique ou administratif.

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*This paper was prepared to accompany a videotape presentation at the Hermes (CTS) Symposium on December 1, 1977, in Ottawa, Canada. The entire paper will appear as part of a full-length report to be published in April 1978 under the same title by the George Washington University.

Utilisant Hermes MM. Rose et McCloskey ont pu s'entretenir depuis Washington, le premier avec des étudiants d'une école secondaire et des personnalités officielles locales de Raeford, Caroline du Nord et le second avec un groupe de psychologues et d'employés du Congrès à Palo Alto, en Californie. Le sénateur Stevenson, quant à lui, a pu, au cours d'une audience de son sous-comité de la science, de la technologie et de l'espace, recueillir par le biais du satellite les dépositions de témoins qui se trouvaient à Springfield dans l'Illinois.

Il ressort clairement de cette série d'expériences que la technique des téléconférences vidéo pourrait permettre aux membres du Congrès d'établir des rapports plus étroits avec l'électorat, aux électeurs de prendre une part plus active au processus démocratique et au public et à ses représentants élus d'économiser du temps et de l'argent. Toutefois, avant d'envisager une utilisation à grande échelle de ce système, il faut régler un certain nombre de problèmes, notamment les modalités d'exploitations, les risques d'abus politiques ou autres, et évidemment son coût.

Dans l'ensemble, l'emploi des téléconférences vidéo par le Congrès s'est avéré techniquement réalisable et utile.

Si on arrivait, avec la mise en place d'un système opérationnel, à maintenir les frais d'exploitation dans des limites raisonnables et à régler les difficultés relatives aux principes et modalités d'utilisation, la technique des téléconférences vidéo pourrait devenir un autre moyen pour assurer les échanges entre groupes d'électeurs et membres du Congrès.

Par dessus tout, cette technique nouvelle permettrait au Congrès de se rapprocher de la population qui n'a pas normalement la possibilité de se rendre à Washington ou d'avoir des contacts directs et personnels avec ses sénateurs et ses représentants.

FIRST-YEAR RESULTS

Constituent Communication and Field Testimony

A. INTRODUCTION

1. Purpose of Research

Close to the heart of the American political system is the process of communication between citizens and their elected representatives. At the congressional level, telecommunications technologies, like the telephone and broadcast television, already play a significant role. But the job of the congressman continues to get harder. And citizen demands for participation in the legislative process get stronger.

The purpose of this research is to evaluate, through actual demonstrations, whether satellite videoconferencing, one particularly important new technology, can help or hinder the political and legislative process.

In order to develop an answer, we designed and implemented several real-time demonstrations of congressional videoconferencing via satellite, with the direct participation of Members of Congress and their staffs and constituents.

2. History of Research

Constituent communication is essential to the job of the Congressman in his role as: a public official working to carry out important legislative and representative responsibilities, an ombudsman for constituents who need help, and an overseer of federal programs and monitor of their effects on citizens. Indeed, the system of communication between Congressmen and citizens is perhaps one of the most important in our society.

Recent studies have confirmed that telecommunications technologies--in the form of the telephone, audio and videotapes, telefacsimile, and the like--already play an important role in constituent communication (Wood, 1974 and 1975a). But these studies have also documented signs of stress. Congressmen complain, for example, that effective communication with constituents is becoming more difficult due to: longer House sessions and heavier Washington workloads, increasing demands on personal time and energy, and greater complexity in issues and legislation. And as revealed in a comprehensive Lou Harris survey, (1973), more citizens perhaps now have a desire to participate in the legislative process but find it difficult to do so, due in part to the inadequacy of current communication channels.

At the same time, American society is well into the so-called "Communications Revolution", (Wood, 1971), a period when many of the major new tools of society are communications technologies like the computer or satellite. Can emergent communication channels, such as the videoconference, play a role in resolving these problems and offer significant improvement over existing modes of constituent communication?

Until 1973, answers to this question with respect to Congressional use were based largely on "intelligent speculation" or "reasoned conjecture" (Goldhamer, 1970; Sackman, 1971; Parker and Dunn, 1972; Chartrand, 1972). However, in 1973-1974 a major study on the potential of emergent telecommunications for Congressional use arrived at more definitive answers based on the attitudes and perceptions of Congressmen themselves (Wood, 1975b,c). The potential and limitations of several emergent channels were identified through interviews with a stratified judgment sample of U.S. Representatives and senior staff from the 93rd Congress. Three channels, cable television, information retrieval, and the videoconference, were perceived by more than half of the Congressmen and staff as being potentially useful for constituent communication.

The results of the landmark study cited above, however convincing, were based on perceptions of future use, not on actual "hands-on" experience. The study concluded that additional research, and especially demonstrations such as the ones reported here, would be necessary to arrive at the more authoritative answers required by policymakers and the general public.

Given further research along these lines, the study suggested that the public benefits and risks could be identified and thus serve as a basis for appropriate policy decisions. In this way, the study concluded, the potential of emergent telecommunications for serving the public interest and strengthening democratic governmental processes would hopefully be realized.

Satellite systems first developed by the National Aeronautics and Space Administration (NASA) are providing new capacity for meeting many human needs, including those of the political and legislative process. The Communications Technology Satellite (CTS or Hermes) used in these demonstrations incorporates the latest satellite technology. In general, Hermes is being used to probe the social, cultural, and economic impacts of this technology and to help identify new applications and provide better data for planners and makers of public policy (NASA, 1976).

To generate this new knowledge, experiments using Hermes are being carried out by a wide spectrum of user groups in four categories: education, health care, community and special services, and technology extension.

The congressional videoconferencing project, described in detail in the following pages, is a logical extension of NASA experiments in the area of government communication in general and legislative branch communication in particular. The congressional videoconferencing project falls within the community and special services category of NASA-sponsored experimental activity.

B. EXPERIMENTAL DEMONSTRATIONS

1. Congressional Constituent Meeting: Large Group, Rural Area

Many congressmen use mobile offices (which move around the district) and multiple district offices in an effort to keep in better touch with their constituents. Still, all the demands on the congressman's time cannot be met. This is especially true for congressmen from rural districts where the population is distributed over a wide geographic area.

Congressman Charlie Rose comes from such a rural district where there are many individuals and groups who would like to meet with him but who cannot afford the time or money to come to Washington. Congressman Rose gets back to his district as often as he can, but there is no way he can find the time to meet with everybody.

Charlie Rose is always looking for ways to communicate more effectively with his constituents.

The first videoconference took place with Rose in Washington, D.C. at the NASA-HQ studio at 600 Independence Avenue, N.W., just 7 or 8 blocks down the street from his Capitol Hill office. Rose talked for about 1½ hours over Hermes with high school students and faculty from Hoke County High School in Raeford, North Carolina, a town with a population of about 3,000.

The students--about 150 strong--sat in the school library with a panel of 5 students designated to ask questions of Congressman Rose. NASA's Portable Earth Terminal (PET) a complete earth station inside a bus, including TV camera, monitors, etc., was parked outside next to the library. A portable TV camera and four monitors were set up inside the library and connected to the bus via cable.

(Excerpts from this videoconference were presented on a videocassette recording.)

2. Congressional-Constituent Meeting: Small Group, Rural Area

In addition to regular contact with the general public, congressmen have to keep in frequent touch with local officials and representatives of local business and government in the district. Unlike the major corporations or high officials in state government or national lobby groups, local public officials can rarely afford the time or money to come to Washington to meet with their congressmen. They do try to make the most of their congressman's trips home. But many issues and problems come up on short notice while Congress is in session and require immediate discussion, if inputs are to be timely.

This problem is particularly severe for congressmen like Charlie Rose who come from a predominantly rural district with many small towns, and thus many local public officials to keep in touch with. To test the potential of satellite videoconferencing for meeting this need, a second videoconference was scheduled to follow the meeting with high school students.

This second videoconference took place with Rose at the Washington NASA-HQ studio as before. He talked for about one hour over the satellite with the Hoke County Commissioners, the Mayor of Raeford, and other local public officials. The seven or eight officials sat in the school library, as did the students earlier, and conducted their meeting with the Congressman, as excerpted on the videocassette recording.

3. <u>Congressional Subcommittee Hearing: Field Testimony</u>

Much of the time of many Senators and Representatives in Washington is spent in committee and subcommittee hearings. Indeed, such hearings are at the heart of the legislative process. On any given day when Congress is in session, several dozen subcommittee hearings may be in progress simultaneously.

Tight scheduling of subcommittee hearings and the overwhelming workload of most congressmen means that people must come to Washington to testify or depend on lobbyists to represent them. Congressmen rarely have time to conduct hearings out in the field around the country, except during recess periods. As a result, the large majority of Americans who have neither the time or money to fly to Washington are effectively excluded from the hearing process.

The major purpose of the third videoconference was to test the potential of satellite communications for use in a congressional hearing. This videoconference took place between Senator Adlai E. Stevenson and the Subcommittee on Science, Technology and Space convened in Washington, D.C., with testimony via satellite from public witnesses in Springfield, Illinois.

The Senators were in Room 5110 of the Dirksen Senate Office Building, the Subcommittee hearing room, with cameras, lights, and related equipment brought in from NASA's Goddard Space Flight Center. The cameras in Room 5110 were connected via a microwave link to the satellite earth terminal at Goddard. The hearing lasted about 3½ hours.

The public witnesses - a total of ten divided into three panels - sat in a courtroom on the second floor of the

Federal Building in Springfield, Illinois. Witnesses were from state agencies, universities, and private firms. The PET was parked nearby. A portable TV camera and four TV monitors were set up inside the courtroom and connected to the PET via cable.

(Excerpts from this videoconference were presented on a videocassette recording.)

4. Congressional-Constituent Meeting: Small Group, Urban Area

While congressmen from rural districts have difficulty finding the time to stay in touch with people from remote areas, many urban congressmen find that they could spend 24 hours a day talking with people from the densely populated, politically-active constituencies in the major metropolitan areas. Urban (and suburban) congressmen don't have as much geographic area to cover, but many times their constituents place greater emphasis on talking with them in person.

Congressman Paul "Pete" McCloskey comes from this kind of urban-suburban district in the San Francisco Bay Area, California. This district includes parts of San Mateo and Santa Clara counties and both Stanford and Santa Clara Universities. McCloskey gives a high priority to constituent communication and has as good a record as anyone with respect to visits to the district. He has conscientiously held many "town meetings" with constituents from all over his district.

But despite this excellent record, McCloskey has still not been able to satisfy all the needs of his constituents to consult with him in person. This, of course, is partly due to the nature of his district, which is highly educated and politically active. But part of the problem is his ever-increasing workload in Washington which makes it almost impossible for him to spend as much time in the district as he might like.

The fourth videoconference was unique in that it provided perhaps the optimal test of satellite videoconferencing, for these reasons. First, there were constituent communication needs that could not be met through existing means. Second, McCloskey's district is sufficiently far from Washington that travel time and expense become very significant. Third, the time-zone difference between the East and West coasts means that McCloskey could use his evening time (when his Washington schedule is less hectic) while it was still late afternoon (and part of the regular business day) in California. Fourth, the NASA-Ames Research Center located in McCloskey's district has a satellite earth station complete with studio. Constituents can reach the NASA studio with only a 20-30 minute drive.

Congressman McCloskey used the NASA-HQ studio in

Washington, D.C., while a group of constituents - in this case professional clinical psychologists - used the NASA-Ames studio near Palo Alto, California. McCloskey talked for about one hour with the psychologists on the subject of whether or not clinical psychologists should be included as primary health-care providers under federal health programs.

(Excerpts from this videoconference were presented on videocassette recordings.)

C. CONCEPTUAL DEMONSTRATIONS

In addition to the four congressional videoconferences which were demonstrated experimentally, three other videoconferences were demonstrated on a conceptual level. That is, planning and advance work were completed, thus demonstrating the conceptual feasibility of each videoconference, but technical or scheduling problems precluded an actual experimental demonstration.

1. Congressional-Constituent Conference: Large Group, Rural Area

Congressmen receive invitations to numerous conferences, seminars, symposia, and other public events where their participation is desired. As a practical matter, most invitations have to be declined because of the tight congressional schedule. Invitations from the home state or district, and invitations relevant to the congressman's committee activities, receive the most serious consideration. But even here, it is frequently impossible for congressmen to accept, especially if Congress is in session and substantial travel time is involved.

To test the potential value of satellite videoconferencing in this context, Congressman Jim Weaver (and tentatively Senator Mark Hatfield) of Oregon accepted an invitation to participate via satellite in a conference at Oregon State University, Corvallis.

The plan was for Weaver and perhaps Hatfield to address the April 27, 1977, conference from the NASA-HQ studio in Washington, D.C. The audience of 400-500 junior-high and high school students would be in an auditorium at Oregon State equipped with a large video screen. As was the case with the Raeford demonstrations, NASA's PET was to be used.

The conference program called for an introduction by the Oregon State President followed by opening remarks of Congressman Weaver. A panel of students from the audience would then participate in a question-and-answer session with Weaver.

Congressman Weaver viewed this as an opportunity to do something he can rarely accommodate to his schedule, namely, participate in a mid-week conference in Oregon while Congress is in session. He planned to talk about solar energy and future job opportunities in this field.

Unfortunately, although the conference planning was essentially complete, mechanical failure of the PET vehicle (front-end problems) required cancellation of its scheduled trip to Oregon. Without the PET, the satellite could not be accessed and the videoconference had to be cancelled.

2. Congressional Press Conference: Small Group, Urban Area

The local press is important to almost all congressmen, as a means by which the public learns about congressional activities. However, in many congressional districts, the newspapers and radio/TV stations do not have Washington correspondents and must depend on the wire and news services. In effect, they do not have first-hand news sources.

Congressman John Brademas comes from such a district. As a leader in the use of new technology to improve communication between the public and Congress, Brademas was interested in the possible use of satellite videoconferencing, to conduct press conferences in his district, as well as in its use to conduct meetings with constituents and others.

Brademas represents an urbanized area, Southbend, Indiana, with five daily newspapers and three TV stations; none of them have Washington correspondents. When Brademas is in the district, he holds regular press conferences. This, of course, is not possible when he is in Washington.

The plan was for Congressman Brademas to use the NASA-HQ studio in Washington, D.C. to talk with Southbend reporters using a studio in his district office in downtown Southbend. The PET would provide all necessary terminal facilities at Southbend.

Unfortunately, before the press conference could be officially called, the exigencies of the Congressman's scheduling priorities, amplified by his heavy House-leadership responsibilities, precluded his participation on June 20, 1977, the day the PET was scheduled to be set up in Southbend.

3. Congressional Public Affairs Conference: State-wide, Public TV Interconnect

Perhaps even more important than meeting with news reporters is the need for many congressmen to somehow participate in a broader dialogue on public issues and concerns. The limitations on newspapers and broadcast TV make this dialogue a difficult thing to achieve. And particularly for Senators, the feasibility of holding face-to-face town meetings all over the state is severely constrained.

Fortunately, the combination of satellite videoconferencing with the more advanced public television systems opens up a wide range of new possibilities. The State of Ohio offers a unique opportunity to test this potential in that (a) the Ohio Educational TV Network has a full duplex (two-way audio-video) microwave link between its major public TV stations, (b) NASA has a satellite earth terminal and related facilities at the Lewis Research Center in Cleveland, and (c) the Cleveland public TV station, WVIZ-TV, is only a couple of blocks down the road from NASA-Lewis, which makes it relatively easy to interconnect the public TV and Hermes systems with a short microwave link leased from the phone company.

With the cooperation of Ohio ETV, NASA, and Senator Howard Metzenbaum (who had previously participated in Ohio ETV public affairs programs), a demonstration was planned for July 21, 1977. Senator Metzenbaum would be in Washington, D.C. at the NASA-HQ studio to be interviewed live for one hour by the public affairs directors at eight different Ohio public TV stations. By using the Ohio ETV capability to switch between stations, a state-wide public affairs discussion (or conference) with Metzenbaum would then be possible.

The plan was to tape the one hour conference for broadcast over the entire 12-station Ohio ETV network the following evening, July 22, 1977. Unfortunately, while the basic concept proved to be sound, a successful final checkout could not be achieved, due largely to technical problems with the AT&T landline interconnect between the NASA-HQ studio in Washington, D.C. and the satellite earth terminal at NASA-Goddard in Greenbelt, Md. As a result of this relatively minor but yet critical technical difficulty, the demonstration had to be cancelled.

D. EVALUATION OF CONGRESSIONAL VIDEOCONFERENCING

One important purpose of the congressional videoconference demonstrations - and a major basis for evaluation - is to compare the results of demonstrations against the results of an interview survey conducted in 1973-1974. In effect, if properly evaluated, the demonstrations can test the hypotheses and conclusions of the interview survey.

The complete survey results have been published elsewhere (Wood, 1975a,b,c). By way of review, the initial sample size was 10% of the House (43 offices), with only three of the 43 declining to participate. Out of the 40 offices in the final sample, a total of 31 congressmen (also referred to as members of Congress or MCs) and 39 senior staff persons (primarily administrative assistants, known as AAs) were interviewed. The sample survey used a set of sketches as the primary research instrument.

The congressional interviews yielded a fairly specific identification of the possible advantages and disadvantages for each emergent channel.

The results of the actual demonstrations will be compared here with the inverview results.

1. Reach More People More Effectively.

By far, the advantage cited most frequently in the 1973 interviews was the ability of videoconferences to help congressmen reach more people more effectively. This interview finding was borne out by the 1977 demonstration results. In all four videoconferences, the congressmen had an opportunity to meet with constituents who would not otherwise have been able to fit into their congressional schedule. This is certainly true for the high school students and local officials from Raeford, the psychologists from California, and most, but not all, of the public witnesses from Illinois. In all cases, the communication between the congressmen and constituents was felt to be just as effective as meeting face-to-face.

2. Significant Improvement Over Current System.

The demonstration results here again confirmed the interview results in that participants found the videoconference to be clearly more effective than letters or telephone calls or not communicating at all, the major options under the current system other than flying out in person.

3. Increase Citizen Participation and Feedback

The most significant finding (again demonstration and interview results are quite consistent) may be that videoconferences encourage meaningful dialogue between citizens and their elected representatives. The two-way interactive nature of the medium facilitates an open exchange of views and an honest, forthright approach to questions and answers, for both congressmen and constituents. It can be fairly said that, in these four demonstrations, citizen participation was meaningful and not a put-on.

4. Save Time and Energy

As predicted in the interviews, telecommunication is energy-conserving when compared to travel. The demonstrations provided evidence that videoconferencing can save the time of the participants, both through the reduction or elimination of travel and by the reduction of meeting time due to more-focused and better-prepared participation. The same holds true for the personal energy (fatigue factor) of participants and the physical energy that would have been expended in travel.

5. Potential Abuse and Overuse

Some congressmen and staff in the interview survey expressed concern that videoconferencing might be used by congressmen to manipulate or stage-manage discussions with constituents, or to otherwise abuse the notion of an honest, open dialogue. Based on the three demonstrations, this concern seems unfounded. In all cases, citizens with little or no media experience (expecially the students and psychologists) were able to adapt quickly to the videoconference and stood their ground quite well against the congressmen, two of whom (Rose and McCloskey) are well-known for their media skills. For other participants, the results of course might be different.

There is some basis for concern that the use of videoconferencing could contribute to an unfair political advantage for incumbents. Lou Harris and others have found that one of the most useful things a congressman can do is come home to the district and talk with his constituents. All four of the videoconferences were clearly advantageous to the congressional participants from a political perspective, not just in terms of the favorable impression left on the constituents but with respect to the good press generated via newspaper and TV coverage (in the case of Rose and Stevenson) and professional newsletters (in the case of McCloskey). This phenomena might be expected to wear off if videoconferences were more commonplace, but presumably some political advantage would still accrue to the incumbent congressman unless fair use and access can be ensured.

6. <u>People Problems; Inadequate Interest and Understanding</u>

In the 1973 interview survey, many congressmen and staff were concerned that most constituents would not be interested in participating in videoconferences with their congressman and would have inadequate understanding of the issues to engage in a meaningful conversation. The results of the demonstrations do not support this concern. If anything, the constituents were eager to meet with their elected congressmen and had at least enough understanding of current affairs to hold their own. The events of the last 3-4 years may have had a profound effect on the American people, perhaps increasing their awareness of politics and decreasing their respect for politicians to at least a healthy skepticism. To many, this is a good sign for democracy and may mean that new forms of communication, like videoconferencing, are less amenable to control by political elites.

People problems are another story. People problems refers primarily - and perhaps is better referred to as - scheduling problems involved in setting up a videoconference. A regular constituent meeting or town forum on the congressman's next trip home is difficult enough to arrange. The same goes for congressional hearings. The experimental videoconferencing system adds several more variables and complicates the entire process. Scheduling constraints were perhaps the major barrier to setting up the videoconference demonstrations. This is a real problem, but it is one which should be overcome in an operational system.

7. Reduction in Person-to-Person Contact

There are two concerns here; one, that videoconferencing will somehow be artificial and devoid of human contact, and, two, that videoconferencing will induce congressmen to reduce their trips back to the district and substitute media contact for personal contact. While both of these concerns seemed quite realistic back in 1973, the evidence from the demonstrations is that videoconferencing is very much a humanized use of communications technology. Two-way, face-to-face, real-time, interactive discussion over a videoconference is exactly what happens when people meet in person. Apart from a few minor technical imperfections (e.g., in audio reproduction), the participants without exception adjusted to the videoconference format within minutes (or sooner) and felt almost as if they were in the same room with each other.

With respect to the possible substitution of videoconferencing for trips back home, none of the congressional participants - however enthusiastic about the videoconference itself - expected to reduce his district visits as a result. Videoconferencing is viewed as a complement, not as a substitute, intended to meet their ever-increasing communications needs which can no longer be accommodated through traditional means alone. Videoconferencing is especially geared to helping congressmen use their time and energy in Washington more effectively, while still being responsive to growing demands of citizens for the discussion of an ever-rising agenda of pressing public issues.

8. Cost

One concern expressed in 1973 which is just as valid in 1977 is the question of financial cost. Whatever the benefits of videoconferencing may be, they have to be weighed against the financial costs of using the system. Cost was not an immediate factor in the four demonstrations since there was no direct cost to the congressional or public participants, and all of the technical-support costs were absorbed as part of NASA's ongoing satellite communications research program. Since for the most part existing NASA personnel and equipment were adequate, the actual direct costs to NASA were also relatively modest. In any event, the purpose of the experiment was to demonstrate or evaluate the utility and feasibility of congressional videoconferencing, not the cost-effectiveness. The actual cost will, of course, be a factor in the future use of videoconferencing, and will depend largely on the type of operational system which evolves in the U.S. and the terms and conditions of its use.

E. CONCLUSIONS

Congressmen are interested in videoconferencing and many would like to participate. Of the twenty Representatives and Senators approached in this experiment, sixteen expressed an interest in the concept and fourteen actually wanted to participate. The fact that demonstrations could be set-up for only seven of these congressmen reflected the tight constraints on Hermes and PET time, constraints which were unavoidable in this experimental system. In the end, three demonstrations were successfully conducted (including a two-part videoconference with Charlie Rose, one with Pete McCloskey, and one with Senators Stevenson, Schmitt, Pearson, and Goldwater). Three demonstrations had to be cancelled due to a last-minute scheduling problem involving a busy congressman and two minor technical problems, one involving a mechanical failure of the PET vehicle and the other an unreliable AT&T landline interconnect, neither of which had anything to do with the basic Hermes technology.

In sum, evaluation of these three successful demonstrations indicates that congressional videoconferencing can help congressmen reach more people more effectively, increase citizen participation and feedback, and save time and energy of both congressmen and constituents. On the other hand, congressional videoconferencing, to be effective on a widespread basis, will have to overcome some possible disadvantages like scheduling difficulties, the danger of unfair political use or abuse, and cost.

Overall, congressional videoconferencing was demonstrated to be technically feasible and useful to the participants. Assuming that cost and scheduling procedures would be reasonable with an operational system and that fair use and access can be insured, videoconferencing appears to be a viable new alternative for the exchange of views between congressmen and groups of constituents.

Perhaps most important, the effect might well be to open up Congress to the many people who cannot afford to fly to Washington, D.C., and who do not otherwise have direct and personal access to their elected Representatives and Senators in the U.S. Congress.

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PROJECT IRON STAR

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Lorsqu'on l'a invitée à participer au programme du satellite Hermès, l'Alberta Native Communications Society (ANCS) s'est empressée d'accepter. Cinq ans se sont écoulés depuis et plusieurs facteurs ont nécessité des révisions majeures au concept et au plan de notre expérience intitulée Projet Iron Star. Toutefois, l'essentiel est que nous ayions maintenu nos principaux objectifs en ce qui concerne l'utilisation du satellite dans nos communications avec les communautés autochtones isolées et que nous ayions, par le fait même, élaboré et mis à l'épreuve de nouvelles techniques de télécommunication. Ces objectifs impliquaient notamment que le projet soit innovateur, exploite pleinement les possibilités d'échanges et d'interaction offertes par le satellite, répondre aux besoins, préoccupations et intérêts particuliers de la population concernée, et soit évolutif, c'est-à-dire assez souple pour qu'on puisse le modifier constamment en fonction des données et connaissances acquises durant l'expérience elle-même.

Les problèmes rencontrés pendant le déroulement du projet nous ont obligé à y apporter de nombreuses modifications, parfois majeures. Ainsi, on a dû consacrer beaucoup de temps et d'énergie à l'obtention des crédits nécessaires, et les sommes finalement consenties nous ont forcé à limiter strictement le nombre de communautés pouvant participer de façon active au projet.

Au début, on prévoyait aborder la programmation sous un angle nouveau en faisant appel à des techniques et structures de radiodiffusion différentes. On comptait faire participer les communautés isolées à la programmation, ce qui garantirait le respect de leurs besoins, de leurs préoccupations et de leurs intérêts. Toutefois, les problèmes inhérents à la formation rapide d'autochtones aux responsabilités complexes de la programmation d'émissions de télévision nous ont obligé à nous rabattre plus que nous ne l'aurions voulu sur les méthodes traditionnelles. La partici-

pation interactive des communautés à la programmation a également été plus limitée que prévu pour plusieurs raisons, toutes reliées aux contraintes budgétaires.

Le projet a eu plusieurs effets positifs. Il a capté l'imagination du personnel de l'"ANCS" et a suscité beaucoup d'intérêt chez les autochtones qui ont été instruits du projet. Il a permis la création d'une équipe technique efficace parmi les autochtones, eux qui avaient peu ou pas d'expérience ou de formation touchant le fonctionnement d'une station de télévision et qui en assument maintenant la responsabilité. Enfin, et ce qui est plus important, le projet permet à tous d'apprendre sur le tas et d'actualiser leurs connaissances. On peut donc suivre l'évolution de toute l'expérience et lui imprimer l'orientation nécessaire pour atteindre progressivement les objectifs globaux qu'on s'était fixés initialement. La réserve de connaissances et d'expériences accumulée sera inestimable pour toutes initiatives futures des autochtones dans le domaine des télécommunications.

When the Alberta Native Communications Society (ANCS) was first invited nearly five years ago to participate in what was to become the Hermes Satellite program, we had no idea that we were undertaking a project which would dominate our attention and resources for half a decade and repeatedly threaten to overwhelm us completely.

We only knew that we were being offered an opportunity to become pioneers for our people as the first Native organization to undertake a satellite experiment, and to pursue the exploration of innovative communications techniques far beyond the limited capabilities available to us at that time.

In a far more than poetic sense, we were being offered an opportunity to take our people across the vast communications gap from smoke signals to satellites. But first we had to make that journey ourselves.

Five years ago, our organization had already made considerable progress in its half dozen years of existence, developing increasingly sophisticated communications facilities and activities to meet the special needs of our people.

The Society had begun with one man and a tape recorder, collecting interviews in Cree for a 15-minute-a-week program on a local radio station. Response was so great that the Society was formed, funding was obtained from the federal and provincial governments and development begun on a multi-media program that was to become the model for Native communications in Canada - a fact frequently stated by the Department of the Secretary of State, which administers federal funding to Native communications programs.

An important difference between this an other Native organizations was that it served all Native people in Alberta without distinction between Treaty and non-Treaty, Cree or Chipewyan, urban or rural, and it was administered by an elected board of directors composed of six Treaty Indians and six non-Treaty or Metis.

ANCS produces Canada's first weekly Native newspaper, The Native People. It produces several hours of radio programming each week in its own modern studios, in English and Native languages, for radio stations across Alberta - including the CBC. It has been producing television programming in its own studios, and in co-operation with Edmonton television stations, for a number of years. It has its own film production department, and has produced numerous training, educational and short feature films, including several under contract to the Department of Indian Affairs. It has successfully developed a Native Communications Training Program to enable young Native people to acquire the skills they need to carry out the Society's various responsibilities. It is actively involved in the work of the Atchemowin Native Theatre group, to ensure that Native performers will be available for television, radio and film projects.

The training program and theatre group at least partially owe their existence to the Society's involvement in the satellite project, which we call Project Iron Star.

I tell you all of this by way of background, so that you may better understand where we were when we became involved in satellite experimentation - a young organization staffed by Native people with little experience or training already heavily committed to responsibilities which strained our financial, manpower and physical resources.

Yet, despite our already over-extended situation we did not feel we could let this opportunity pass, and we were confident that if we put together the right kind of project, we would be able to find the financing, the people and the equipment needed to make it work.

In the years from presentation of our initial proposal to the actual utilization of the satellite to transmit programs to isolated Native communities, the experiment design underwent numerous transformations due to financial and technical restraints, continuous fluctuation of human and other resources and, most significantly, the evolutionary effects inherent in the step-by-step development of our program.

Despite the vast difference between the initial concept of the experiment and what it became, however, it is satisfying to be able to report that the basic concepts initially considered essential to the experiment have been retained - albeit sometimes in a different form - and the success of the experiment has been enhanced by unexpected benefits.

The key aspects of the initial proposal which have been maintained throughout the development of the experiment were that it be *innovative*, that it utilize the *interactive* potential of the satellite as fully as possible, that it be *relevant* to the unique needs, concerns and interests of the people it would serve, and that it be *evolutionary*, changing to accomodate the new information and insight gained by day-by-day through the actual progression of the experiment.

Many times it seemed these goals, if not the experiment itself, would be buried by the essential realities of obtaining financing, solving technical difficulties, establishing physical facilities, and recruiting, training and organizing personnel.

Initial plans to involve as many as 20 communities through terrestrial extension of satellite terminals had to be eliminated, and eventually even the number of communities with terminals was reduced.

We had to choose communities which were reasonably accessible, with larger populations - and thus better services - to reach a significant number of people.

Innovative approaches to programming were initially planned as distinctly different from normal broadcasting techniques and formats, with interactive involvement of the isolated communities as an integral part of the programming, ensuring that it was relevant to their needs, concerns and interests.

There are indeed innovative aspects to the programming, but the realities of quickly training inexperienced Native people to undertake the complex responsibilities of television programming has necessitated a greater dependence on traditional modes of operation. The bonus is the speed and facility with which they have been able to assume these new and complex tasks.

The interactive aspect of programming has been more limited than originally intended for a number of reasons.

We had hoped to prepare the communities prior to the experiment by undertaking a fairly extensive preparatory stage, beginning with a demystification process in which equipment such as video portapacks and tape recorders would be taken into the communities where the people could see and touch them, learn how they operate and participate in their use. This process would also have provided an opportunity to gather essential data on the target communities in an unobtrusive fashion, and to amass programming material for use during the experiment.

Intensive involvement of facilitators in the target communities was also planned, with a substantial pre-experiment preparatory phase in which they would be able to integrate themselves into target communities, familiarize themselves with the existing social structure and become aware of community needs, concerns and functional manners.

Again, the aim was to have the facilitator integrated into the community by the time the actual experiment started so that the facilitator could realize maximum participation in an unobtrusive fashion, and maintain the integrity of that participation by ensuring that it reflected the true interests and concerns of the community.

Again, we were forced to settle for an alteration to the original plan.

Instead of being able to prepare a considerable amount of program material in advance, and to test it under simulated conditions, we had to delay any substantial efforts toward program development until we were virtually into the experiment. This delay created considerable production pressure and reduced the time and effort which could be devoted to assessing the experiment as it progressed, and to implementing the evolutionary process as intensively as we considered desirable.

Our evaluation team, too, could not be hired until the experiment was virtually in progress, reducing the availability of pre-experiment data to enable comparative measurement. Plans for monitoring similar communities not involved in the experiment as a control group had to be scrapped completely.

And finally, we had to obtain necessary staff on short notice and had to thrust them into positions of responsibility with less advance preparation than was considered desirable. Often, because of the delay we had to settle for less-experienced people because the people we had already identified as best qualified had gone on to other challenges.

Now all this sounds extremely negative - and it is - but the strength of our people lies in their patience, adaptability and toughness.

The first phase of the experiment - the audio phase - though plagued with problems, provided invaluable experience in the special problems of trying to superimpose sophisticated technology on a primitive society.

There was the problem of isolation, and the limited transportation and communications alternatives available. There was the problem of finding personnel in the communities with the technical aptitude to operate the equipment interfaced with the satellite terminal. There was the problem of weather and wilderness, and their inherent complications.

The result was an excessive amount of system downtime, unfulfilled audience expectations, and loss of control of critical factors essential to valid evaluation.

But we learned, and our second phase - the video phase - is a totally different story, and although that phase is still in progress and evaluation is not yet complete, we feel it is a success. That we cannot yet measure that success accurately should in no way invalidate this assessment.

We are not dealing here with something that can be easily measured or controlled, there seems to be just too much going on - both in the studio and the communities. We do have a situation in which significant changes are obvious and surely support can be given to the notion that by just being there we helped.

While Project Iron Star cannot be credited directly, for example, for the alleviation of a housing crisis in Fort Chipewyan, the Project did provide a direct link between people in need of emergency housing and officials in Edmonton, and as a result the solution to the problem was realized more rapidly than might otherwise have been the case.

In Assumption, too, unnecessary concern over housing development delays due to flooding were greatly reduced through a regular flow of information to keep all parties involved informed of progress being made. In retrospect, Ironstar could have been used even more effectively here had it been utilized for such things as expediting delivery of materials.

In Wabasca-Desmarais, where Native people are virtually considered squatters on land they've inhabited for generations, we were able through Iron Star to facilitate an interactive information flow which helped immeasurably in creating a greater understanding of the legal ramifications of securing land tenure. While the issue is as yet unresolved, we are convinced that whatever decisions are made will be made with a better understanding by the people involved.

So, even at this incomplete stage, there is considerable evidence of the experiment's success, and long-range influences can be predicted, even, we suspect, into future generations if some form of program delivery can be maintained.

The impact of Project Iron Star is most intense among ANCS staff, where it has not only become the consuming interest of the senior staff, but a focal point even among those who, to their consternation and regret, are not directly involved. While this interest has had a unifying and motivating effect on staff, it at times has so possessed their attention that other, more mundane responsibilities have suffered.

The impact of Project Iron Star has been most noticeable on staff directly involved with the project's programming and technical services, motivating them to hitherto unachieved levels of performance and responsibility. Unfortunately, the short time we had to prepare them for their tasks has forced selection of traditional broadcasting techniques at the expense of the innovative approaches originally considered vital.

This tendency toward "professional" broadcasting approaches has sometimes resulted in "success" being judged on that basis in the studio rather than on the project's impact in the target communities.

That in itself must be considered a "success", however, since it is developing the skills of Native young people and it is stimulating their adherence to a set of standards to a hitherto unachieved degree.

Further, we anticipated that as studio functions became increasingly familiar and routine, we would become more effective in dealing with community development needs. This has happened and the pace and style of broadcasting is changing with a shift in emphasis from "presenting issues" to discussing various ideas. As immediate needs are met, the selection of topics changes, as does the selection of resource people and how they might be used during the broadcast. As they become more comfortable, the broadcasters themselves will be encouraged to use new ideas so as to better utilize the system's interactive capabilities.

Another disadvantage of the "professional" format has been the small degree of interaction between the target communities and their continuing reliance on being cued by the moderator in the main studio in Edmonton. Again, familiarity with the system makes it easier to shift from the initial formality, although occasionally the result is that everyone is talking at once, making it necessary to re-establish order and deal with the communities one at a time.

More community influence on programming content is being encouraged by offering numerous alternative topics and resource people, from which they can select those most relevant to their interests, needs and concerns.

To date, most participants have been Native, either representing Native organizations or participating as individuals. Some of them are city dwellers from the target communities who still have friends and relatives there and who are uniquely able to explain the vast difference between their old and new lives in terms their people left behind will understand - not just in language but in common terms of reference.

Participants from government departments and agencies have gained a deeper awareness of the need for re-defining programs and delivery mechanisms. As one such guest put it: "I gained as much from what was *not* said as from what *was* said." We have every reason to believe that, in this case at least, a renewed and revised approach to problem solving will be taken, due to the influence of Project Iron Star.

A considerable amount of development is still possible in motivating participants in the isolated communities to assess their own situation, identify their information needs and relay those needs to Edmonton for response through Project Ironstar programming.

It is unfortunate that we were not able to use communities that are even more isolated, where the need is even greater, for we are sure the greater need would have motivated greater response.

Until we manage to extend this interactive communications facility to the most isolated communities, the project will continue to be viewed more as a novelty than as a tool which they can use to achieve their own objectives.

The extent of participation in the isolated communities is also hampered by a number of factors peculiar to the communities themselves, ranging from the suitability of the location for viewing the programs and participating in them, to poor weather and roads, fishing, hunting and trapping responsibilities, and competing activities such as ball games or bingos in the communities.

Maybe we are like the Native people in a northern parish who kept their priest in a state of suspense by turning out in full force for mass only every third or fourth Sunday. Finally, one of the Native leaders explained it was because they came to express their needs to the Lord, then returned after their needs were fulfilled to thank Him. There seemed to be little sense in bothering Him all the time.

We have learned that we are growing away from our isolated people, living and working as we do in an urban environment where the pace of life and the rate of progress is greatly accelerated. This we are changing.

Because of the renewed, regular contact through Ironstar, we realize that we must maintain closer awareness of where our isolated people are in their social evolution if we are to provide services relevant to their needs.

But we can influence their progress, too.

In Assumption, for example, Grades 4 to 6 saw a film on Edible Plants of the Wild, and were motivated to undertake a field trip on which they gathered plants and used them not just as the film had shown, but as their people had done in generations past.

From their birch bark soup, and other ventures, they not only rediscovered their environment, but gained a new and lasting awareness of their heritage.

It is impossible to measure the future influence of such experiences, but we are certain they will occur.

Although we are not yet able to make a final assessment of the impact of Project Iron Star, we are able to note a number of positive results of our involvement in it.

First, we have learned a great deal about our hitherto unrealized capabilities through the long process of project development and negotiations. Had we known from the beginning the trials and tribulations that lay ahead, we might have been discouraged from even trying. But having progressed this far, we can look to our accomplishments with pride.

Second, all of us involved in this project have advanced our communications skills far more rapidly than we might have without the incentive of this project, enabling us to undertake all of our activities far more professionally and effectively.

Third, through our achievements on Project Iron Star, all Native people can point out with pride to one more example of what we are able to achieve in this complex society in which we live.

Both through what we have learned in making this project a reality, and in the actual experimentation within the project itself, we have gained valuable experience and knowledge which will help us to more effectively serve the communications needs of our people.

We are grateful to all of the many agencies which made this opportunity possible, and who have helped us to take advantage of it.

We look forward to more such challenges in the future. Our increasing awareness of the needs of our people, provides us with motivation to continue our endeavours, but we are motivated most by the Native boy who didn't know what he wanted to be when he grew up because, as he said, "I didn't even expect to get this far."

We have come this far and we intend to continue.

THE WESTINGHOUSE HERMES TELECONFERENCING EXPERIMENT

Herb Nunnally

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L'"Aerospace Electrical Division" (AED), située à Lima (Ohio), et l'administration centrale, à Baltimore, ont été reliées par le satellite technologique de télécommunication (STT-CTS) Hermès lors d'une expérience de téléconférence. Ces deux divisions de la Westinghouse relèvent du "Baltimore Defence and Electronics Systems Center" et il est donc essentiel qu'il y ait entre elles un échange continuel d'informations sur la plupart de leurs opérations. Notre expérience a porté essentiellement sur la communication vidéo en duplex, c'est-à-dire un mode de communication bilatéral en direct (vidéo/audio interactive) par opposition à la communication en différé ou à la transmission vidéo simplex en direct.

Le rapport qui suit se limite à étudier l'aménagement expérimental et l'évaluation faite par les usagers des salles de téléconférence utilisées pour l'expérience effectuée chez Westinghouse.

La première phase de l'expérience, qui a précédé le lancement du satellite Hermès, a duré six mois et s'est déroulé dans deux salles de téléconférence adjacentes. L'analyse des résultats de cette première phase permet d'avancer les conclusions suivantes:

1. *Un système de conception analogue réduirait efficacement le nombre de voyages d'affaires.*

2. *Une meilleure préparation et organisation des réunions par les usagers augmenterait l'efficacité du système.*

3. *L'aménagement des deux salles utilisées n'a aucunement influé sur la direction de la réunion.*

4. *Les deux salles ont reçu une évaluation relativement identique. C'est donc dire que l'aménagement de chacune*

d'elles n'a pas réellement joué sur leur évaluation.

5. *Les personnes qui ont participé à l'étude étaient relativement détendues au cours de chaque téléconférence.*

La deuxième phase s'est déroulée entre mai 1976 et août 1977, et a fait appel au satellite Hermès. Une station de téléconférence était située à Baltimore, Maryland et une autre à Lima, Ohio. La majorité des usagers du système a convenu que:

a) *L'aménagement des locaux était satisfaisant.*

b) *Cette façon de se rencontrer a permis d'atteindre les objectifs fixés pour les réunions.*

c) *Le matériel (caméras, microphones, etc.) ne cause pas de distraction.*

d) *Le système de commande automatique de la caméra par la voix s'est avéré très satisfaisant.*

Un point semble se dégager très clairement de ces observations, à savoir que les salles de téléconférence conçues par la Westinghouse créent une atmosphère propice aux conférences "électroniques". Un vaste groupe-type de professionnels, des directeurs d'entreprise aux ingénieurs subalternes, ont eu recours au système à mesure qu'il devenait disponible.

Les recherches de la Westinghouse sur les téléconférences confirment les résultats d'autres travaux effectués aux Etats-Unis et à l'étranger, ce qui montre que les téléconférences peuvent efficacement remplacer les voyages d'affaires courants.

Commencée en octobre 1977, la troisième phase démontrera les avantages de la transmission de l'image en simplex et du son en duplex. De plus, elle permettra d'évaluer dans l'environnement des téléconférences la qualité des démodulateurs audio mis au point par la Westinghouse.

Il semble donc que le système de téléconférence de la Westinghouse ait de très bonnes caractéristiques au niveau des voies, c'est-à-dire de la fidélité des transmissions audio et

vidéo, et des servitudes connexes, mais de moins bonnes caractéristiques au niveau du système, à savoir l'accès aux installations (en termes de temps de satellite disponible), au stade expérimental du moins. Le passage au stade opérationnel et la création d'un réseau de stations de téléconférence remédieraient fort probablement aux difficultés d'accès du système et feraient des téléconférences un substitut populaire aux voyages d'affaires.

INTRODUCTION

The Aerospace Electrical Division (AED) located at Lima, Ohio comprises one end of the experiment link through Hermes (The Communications Technology Satellite) with headquarters facilities in Baltimore providing the other point for teleconferences. Both of these divisions report organizationally to the Baltimore Defense and Electronics Systems Center and there is a continuous need for sharing information relative to most facets of conducting business. The distance between Baltimore and Lima (500 miles) results in significant travel time with high associated manpower costs.

The Westinghouse Electric Corporation and other similar organizations in the private and public sector have a continual requirement to identify and evaluate means to minimize the cost of information and data exchange. In this experiment the nature of duplex video information exchange is emphasized, that is relating to the conversational (interactive video/audio) mode as opposed to taped video monologues. However, simplex video and duplex audio will be evaluated in 1978.

This experiment is being conducted in three phases which began in mid-1975. Phase 1 reflected a configuring of initial experiment support facilities into an environment *simulating* actual satellite teleconferencing. The objective of this phase was to establish baseline data relative to the effectiveness and acceptance of teleconferencing within the functional areas of marketing, manufacturing, management, and engineering. It was accomplished in a Westinghouse facility located in the Baltimore area (Hunt Valley, Maryland).

Phase 2, a post-launch phase from May 1976 to August 1977, involved utilizing the techniques and baseline data developed in Phase 1 to conduct actual teleconferencing between Baltimore and Lima via Hermes. It involved the evaluation of the effectiveness of satellite teleconferencing by concentrating on the users' acceptance and on identifiable variables in the teleconference environment. Phase 2 conferences were usually held during normal working hours of both locations.

Phase 3, which began in October 1977, will concentrate on the use of simplex television transmissions with duplex audio. In addition, evaluation of Westinghouse-developed audio scramblers will be accomplished in an actual teleconferencing environment.

This paper concentrates on the experimental design and user evaluation of the teleconference rooms utilized in Phases 1 and 2. The author does not wish to imply, by omission in this paper, that the technical factors associated with the design, integration/test, and evaluation of the satellite ground terminals were insignificant. Many heretofore unknowns, relative to 14/12 GHz operations with Hermes, had to be taken into consideration prior to launch. Suffice to say in this paper, that the Westinghouse-designed ground terminals performed with excellent results and in a most reliable manner. The preliminary results of Phase 2 have in no way been impaired by the RF terminals' performance. Detailed analysis of the ground terminals can be found in G. Kuegler and Motz, 1977.

This paper is divided into two major parts. The first part portrays Phase 1 design, data analysis and final conclusions. The second part describes Phase 2 and provides insight into the results of the experiment. The detailed planning on the work reported herein can be found in Nunnally and Kahn, 1975.

OBJECTIVES

The prime objective of Phases 1 and 2 of the Westinghouse experiment via the Hermes satellite was:

- To test the hypothesis that a large geographically-dispersed industrial organization can economically utilize a geosynchronous high-power communications satellite to effectively exchange information necessary to conduct business, in lieu of transportation of the individuals involved, in a significant percentage of cases. The system would use low-cost satellite earth terminals capable of handling a wide range of audio-video media.

- This hypothesis will be tested under defined criteria, methodology and environmental conditions, such that individual acceptance and effectiveness can be evaluated and documented.

To satisfy this objective, a means has been provided for accomplishing management meetings and conferences, technical or engineering meetings and consultations, and sales and marketing meetings between personnel situated at geographically scattered locations, without the need for travel.

As an integral part of the above, numerous sub-objectives which either support or contribute to the satisfying of the prime objective were investigated during Phase 1, and are being refined during Phase 2. Namely,

- To contribute to the base of knowledge relative to the amount of "third-party" assistance necessary for business-oriented meetings. (Third parties are individuals in the teleconference room who operate equipment such as cameras, etc., but do *not* participate in the teleconference exchange.)

- To ascertain the most desirable form of graphics for business-oriented teleconferences. For example, to evaluate large easel drawings with explaining participant in camera view as opposed to full screen (monitor) drawings.

- To document the users' (by functional group and by individual participant) perceived value of color transmissions versus black/white.

- To estimate the operational (as opposed to experimental) cost of satellite teleconferencing for two-party meetings and the number of conferences/conferees necessary to make such a system economically viable in lieu of transportation.

- To provide a means for various levels of Westinghouse management/professionals to gain direct experience in video teleconferencing.

If such a system is widely used, it must be assumed that information of value to an industrial competitor will be discussed. If such information is transmitted via a high-powered satellite, it can be received by anyone who sets up an inexpensive ground station. In the case of a competitor already using the same satellite for similar purposes, the cost would be minimal because he would already have access to a ground station. In order, therefore, that companies could use such a telecommunications system with confidence, the system should be relatively secure from eavesdroppers. Westinghouse has evaluated a patented technique in an attempt to achieve a secure link in a relatively inexpensive manner.

It should be pointed out that the experiment uses only National Television Standards Committee (NTSC) video images during Phases 1 and 2. Video equipment will provide full bandwidth (4.2 MHz, 525 line) with the 3/4 height/

width ratio of conventional television. All equipment, with the exception of the video scramblers/descramblers, is of commercially available nature.

PHASE 1

From the very outset, the Westinghouse designers felt that experience with a simulated teleconferencing environment was essential if the experiment was to obtain meaningful and productive utilization of the limited Hermes time. Therefore a so-called Phase 1 activity was conceived that would last approximately 6 months and immediately precede the January 1976 launch of CTS. The designers felt that as Phase 1 progressed, a definite insight would be gained into the best teleconference room design for implementation at Baltimore and Lima for Phase 2. With these thoughts and objectives in mind, Phase 1 began early in 1975.

The two teleconference rooms that were designed and utilized in Phase 1 were referred to as Conference Room A and B. An attempt was made to maximize the types of variables under analysis, by providing quite different facilities in the two Conference Rooms, for example color TV in A and black/white in B. The essential purpose of the plan was to obtain data useful for establishing the configurations of the Phase 2 facilities.

In establishing the initial teleconference room design(s), several fundamental criteria were used. Personnel conducting basic research at Bell Laboratories in Holmdel, New Jersey (Duncanson and Williams, 1973) utilized the following guidelines which were also applied in the Westinghouse Phase 1 experiments:

- Each conference room facility should serve groups of people as opposed to individuals.

- Video equipment in the conference rooms should provide coverage for not more than two or three people on camera at one time.

- The facility should permit "hand-free" operation without the use of a third party.

In addition to the above, the following criteria were established by Westinghouse designers:

- The perceived values of black/white and color video should be evaluated and compared by the participants.

- Large screen projection (approximately 5 feet by 4 feet) should be evaluated and compared with smaller strategically-placed commercially-available monitors.

- Provision should be made for transmitting "participant" explained graphical material located on an easel.

- Provision should be made to maintain "eye contact" between participants in the two teleconference rooms.

- Lighting in the conference facility should resemble a normal conference room without the annoyance of bright studio-type lights.

The majority of the above considerations dealt with the transmitting/reception of video images. The audio facilities had been given due consideration and great benefit had been derived from the results of research by the Australian Post Office (Segler et al, 1973). Basically, the authors of this reference insisted on a "board room" atmosphere such that the equipment did not impose constraints on the participants. Westinghouse designers of this experiment and facilities concurred with the Australian requirements and adopted most of them as initial audio-design criteria for Phase 1:

- The audio channels were continuously open both ways with no form of manual or voice switching.

- The microphones were placed so as not to impede the participants' view of the display screens, nor hide their faces from cameras.

- The participants did not have to wear, hold or sit close to the microphones. The quality and loudness of the received sound was natural.

With the above video and audio configuration criteria in mind, the two teleconference rooms (A and B) were prepared for Phase 1 activities. Each room was designed to accommodate 6 conferees and they were co-located in a Westinghouse building at Hunt Valley, Maryland. They were isolated from each other and were connected for experimental purposes via electronic video/audio techniques.

Teleconference Room A

Teleconference Room A is shown in figures 1 and 2. Incoming video from Conference Room B was projected on a large screen, the "Advent" system. The screen size is 69 x 52 inches and the top and bottom of the screen are 84 and 32 inches respectively from the floor. Sound is beamed through the air, from the projector to the screen, so that it appears to originate from the screen. The screen must be exactly 8 feet from the projector. Obviously, use

Figure 1. Westinghouse CTS Teleconferencing, Room A, Phase 1

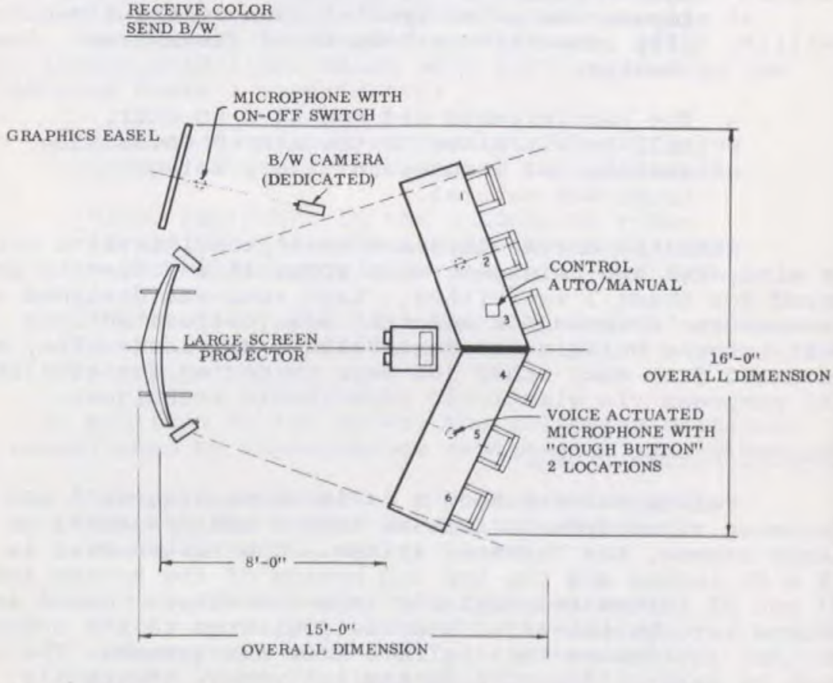

Figure 2. Phase 1 Conference Room A

of this large screen introduced major constraints in other facets of the room design. However, the viewing advantage (up to 24 feet distance and 20 feet breadth) of a large screen were considered sufficiently important to accept the associated constraints.

Due to the further necessity of placing the mid-point of the screen exactly in line with the projector lenses, Room A utilized two adjacent black/white cameras, each viewing 3 of the 6 possible participants. Each camera was approximately 104 inches from the edge of the table for the 3 participants in view and the width of the field of view was approximately 79 inches. These cameras were voice-selected by either of two microphones placed on the table about two feet in front of each group of 3 participants. Each microphone had a "cough" button to deactivate the microphone for private discussion.

The graphics had a dedicated black/white camera which was voice-selected by speaking into a microphone above the easel.

Teleconference Room B

Teleconference Room B is shown in figures 3 and 4. This teleconference room initially had one color camera mounted in such a manner that 4 positions were possible. Three of the positions viewed two participants each, and one position viewed the graphics easel. Incoming video was displayed on two 25-inch monitors about 6 feet in front of the participants (Fig. 4). A feedback monitor (12 inch) was placed over the color camera for viewing the out-going video. This feedback feature was unique to Teleconference Room B. The camera positions were selected by voice-activated microphones located equally between positions 1 and 2, 3 and 4, and 5 and 6. These microphones had "cough" buttons to permit private conversations without drawing the attention of the transmitting camera.

Phase 1 Data Collection

The Westinghouse Phase 1 experiments involved management (middle-upper) of engineering, marketing, and manufacturing. This was done to obtain some idea of the acceptability of the media by several homogeneous teleconferencing groups.

The data collection techniques had the following objectives:

- Ascertain if the nature of a conference held by a homogeneous group was influenced by the room configuration.

- Determine the influence of time limitation on the nature of the conference.

Figure 3. Westinghouse CTS Teleconferencing Room B, Phase 1

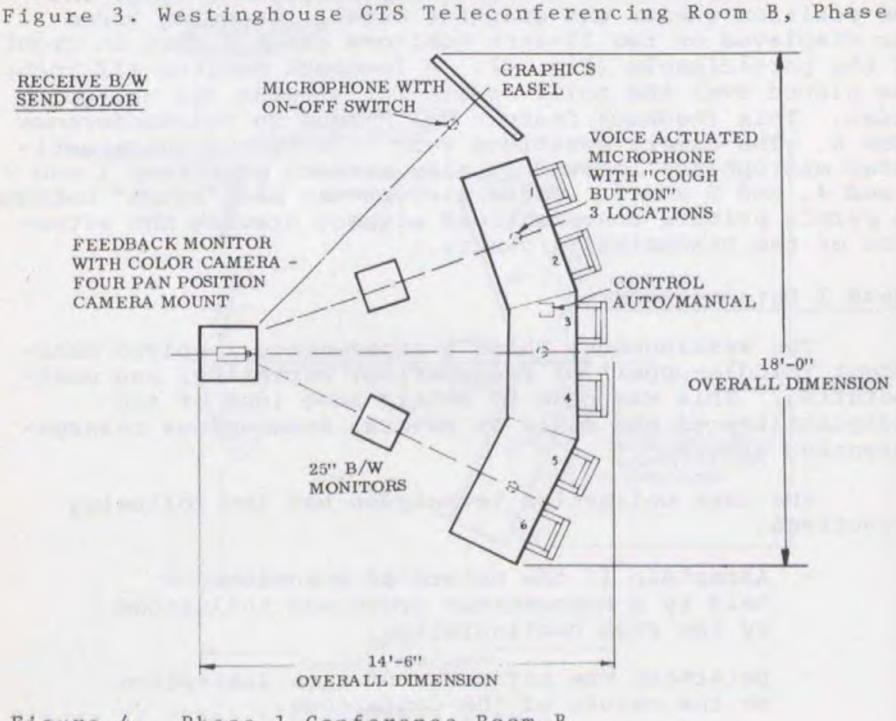

Figure 4. Phase 1 Conference Room B

- Ascertain whether the use of TV was acceptable to non-technical participants.

The primary data source for this experiment were responses by participants to questionnaires. Since it had been suggested that prior opinions could influence the evaluation of television utilization, a pre-conference questionnaire was used to determine these preconceived opinions (if any).

Before beginning each session, the experimenter read an introductory set of instructions. He then distributed questionnaires to the individuals in both rooms and told the organizer of the meeting, usually the chairman, that he was free to start the meeting as soon as the pre-conference questionnaires were completed. The chairman had been previously told the amount of time he had to conduct his meeting. (The meetings were time limited in Phase 1 to simulate actual future Hermes time constraints.) A second "post-conference" questionnaire was distributed at the end of each conference.

The subjects expressed their opinions in two different ways on the questionnaires by putting a mark on a line. All lines were the same length and were not sub-divided in any way. The line was either between two words, or next to a single word. In the first case the words were chosen to resemble the semantic differential technique, and the distance of the mark from either word conveyed the subject's opinion. In the second case, the nearer the mark was to the word, the higher the rating.

Numeric values were assigned to the points marked on the lines and this data was processed by computer to obtain mean value, standard deviation, and certain other pertinent parameters.

Phase 1 Data Analysis

An important aspect of the use of teleconferencing equipment is the participants' estimation of the approximation of the arrangement to a face-to-face meeting. Williams, 1976, has analyzed data where the following question was asked: "If the same meeting had been held face-to-face, would it have been much less successful or much more successful?" He reports that a mean rating of 3.8, using a scale of 1.0 to 7.0, was obtained. In Phase 1, a mean rating of 4.1 was obtained for equivalence to a face-to-face meeting. Even though the questions were not the same, the results are remarkably similar for both experiments.

A major emphasis of Phase 1 effort was the evaluation of the different features of the man-machine interface. For example, how does the user relate to the voice-activation of the video cameras? The occupants of Room A rated the technique lower than the occupants of Room B. This difference may have been due to the fact that the occupants of Room A observed a screen that had as its input a camera that was "panning" from one speaker to another. The delayed response of the camera to quick changes from one speaker to another evidently cause a great deal of annoyance to the occupants of Room A. These derogatory ratings may also have been due to the fact that in the beginning of the experiment, the audio system was extremely sensitive to random noise triggering the switching mechanism in Room A. This situation was later rectified by the use of lavalier microphones and acoustic covering of the walls to minimize reflection of the sound into the microphones. The overall results showed that neither room configuration was rated significantly better than the other.

From a behavioral point of view, it is evident, that the participants looked upon the simulation as a real conference and made no attempt to reverse decisions made during the conference after they came out of the rooms and returned to their activities.

Analysis of the results of Phase 1 suggests the following conclusions:

- A similar system design would be effective in reducing the amount of travel needed to conduct business.

- The effectiveness of the system could be improved by better preparation and organization of the meeting by the users.

- Neither room design provided any detriment to the exercise of leadership of the meeting.

- Neither room was rated significantly better than the other. This statement implied that individual room configurations did not greatly influence the ratings.

- The individuals who participated in this study were reasonably relaxed during each teleconference.

With Phase 1 data analysis available plus observations and personal evaluations of the experimenters, the Phase 2 teleconference room design plans were formulated.

These final designs and plans employed large screen projection systems for both Baltimore and Lima and color transmission/displays. Even though data analysis indicated no significant difference in user acceptance between black/white versus color and large screen versus 25 inch monitors, it was felt by the experimenters that near life-size projections and color would add an intangible value to the experiment evaluations.

PHASE 2

The Phase 2 teleconference room designs were finalized in late 1975 and constructed in Baltimore and Lima in early 1976. The Hermes spacecraft was launched on January 17, 1976 and Westinghouse established a duplex audio-video link between Baltimore and Lima satellite earth stations on February 17, 1976. Earth stations were located on the roofs of the plants in Baltimore and Lima. For Phase 2 operations the teleconference room and the earth station were established at a Westinghouse plant adjacent to the Baltimore-Washington Airport.

The Phase 2 teleconference rooms in Baltimore, Maryland, (Fig. 5) and Lima, Ohio, are basically indentical to and most nearly resemble the Phase 1 conference room A. Each handles up to 6 active participants per meeting. The system includes a large-screen projector and convenient visual-aid capabilities which permit participants to display 8½ x 11 inch printed pages. Microphones are clipped onto the participants, and through voice-activation, cameras automatically switch to the table where the individual is speaking. No camera "panning" is employed in Phase 2. Participants are able to disengage their microphones to cough or discuss matters privately with others at the table. Male engineers and administrators, 31 to 50 years old, were the predominant users of the facility. No difference between observers and users of the facility was found, suggesting that attitudes toward the usefulness, convenience, and effectiveness of the media are relatively fixed.

The results shown in Table I have been selected from a number of questions which were presented to the users after each satellite teleconference. The respondent marked one out of a possible 7 positions of a broken-line segment representing his reaction to the question asked. All answers were then averaged for each question individually and the average placed on a continuous line as shown in Table I. Figures 6 and 7 give a profile of the users by organizational function/age and the various purposes of the sessions.

Phase 2 Data Analysis

Table I shows the mean values of ratings supplied by 139 Westinghouse employees who utilized the facilities in Baltimore and Lima. Numerous additional people have used the facilities; however, since their usage was oriented to one-time demonstrations, their ratings are excluded from Table I. However, when their ratings are processed separately from the normal Westinghouse user opinions, remarkably similar attitudes are revealed.

Figure 5. Westinghouse CTS Teleconferencing Room, Phase 2, Baltimore, Maryland

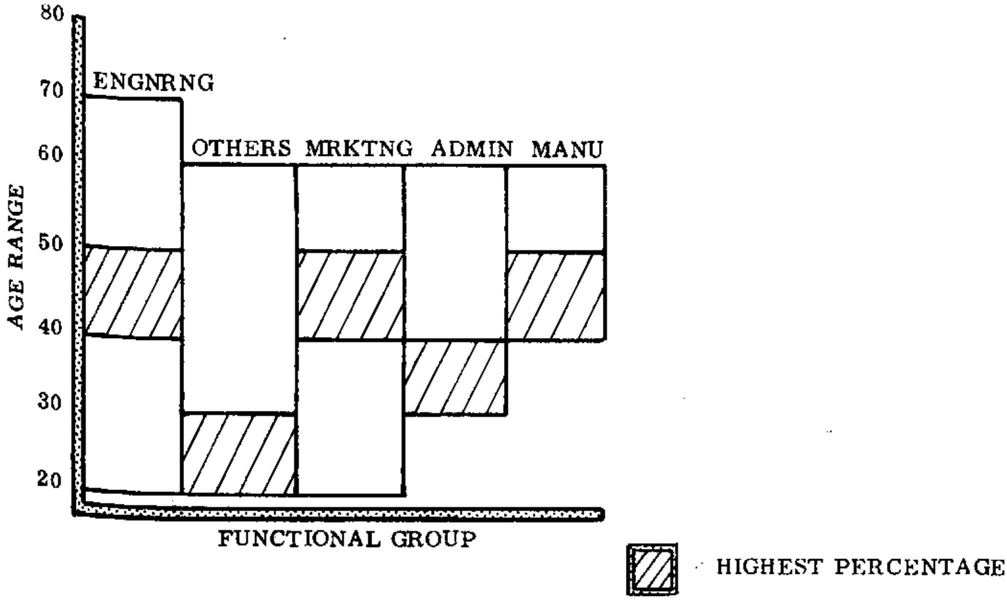

Figure 6. Age Range Per Functional Group

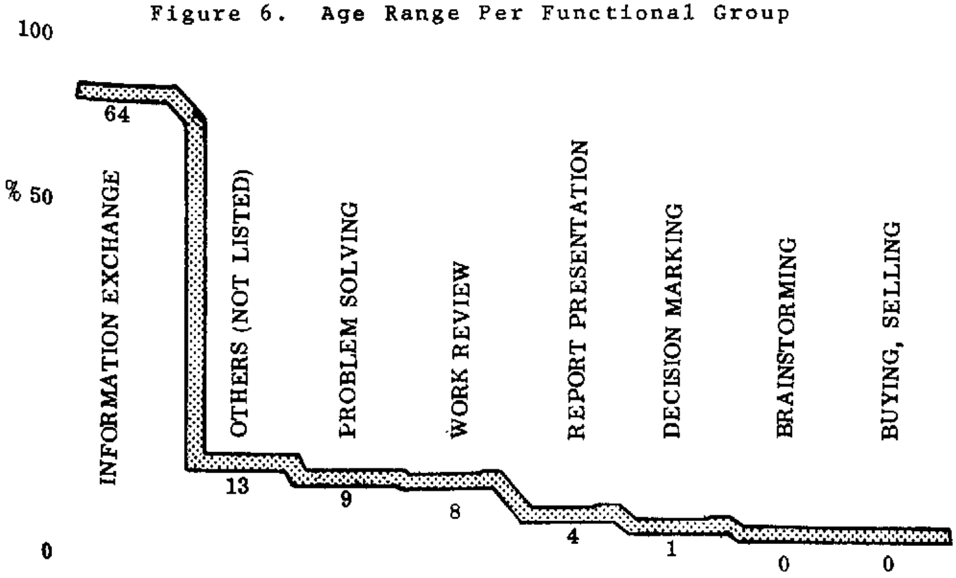

Figure 7. Reflects Primary Purpose Responses

TABLE I

WESTINGHOUSE CTS TELECONFERENCE QUESTIONNAIRE RESULTS

USER POPULATION PROFILE

Sex	%
Male	- 94.2
Female	- 5.8

Age	%
21-30	16.5
31-40	27.3
41-50	37.4
51-60	17.3
61-70	1.4

Functional Groups	%
Administration	-20.9
Engineering	-33.8
Marketing	- 7.2
Manufacturing	- 4.3
Other (Training, Financial, Plant engineering, Public relations, etc.)	-33.8

HOW MUCH DID YOU LIKE THE SYSTEM

VERY MUCH 1 ▼ 7 NOT AT ALL

Semantic Scale 1
Mean 1.94
N=138.00
Standard Deviation 1.03

WOULD A FACE TO FACE MEETING HAVE BEEN

MORE SUCCESSFUL 1 ▼ 7 LESS SUCCESSFUL

Semantic Scale 2
Mean 3.66
N=136.00
Standard Deviation 1.05

WOULD YOU HAVE FELT

MORE RELAXED 1 ▼ 7 LESS RELAXED

Semantic Scale 3
Mean 3.80
N=137.00
Standard Deviation .91

YOUR GOALS WERE MET

FULLY 1▼ 7 NOT AT ALL

Semantic Scale 4
Mean 1.86
N=138.00
Standard Deviation .84

TIME CONSTRAINTS

CONSPICUOUS 1 ▼ 7 INCONSPICUOUS

Semantic Scale 5
Mean 5.14
N=121.00
Standard Deviation 2.64

STUDIO DISTANCE

CONSPICUOUS 1 ▼ 7 INCONSPICUOUS

Semantic Scale 6
Mean 5.69
N=119.00
Standard Deviation 2.79

MEDIA DEVICES

DISTRACTING 1 ▼ 7 NOT DISTRACTING

Semantic Scale 7
Mean 4.84
N=122.00
Standard Deviation 2.47

Analysis can be basically self-evident from Table I. It seems that a significant majority of users found that:

- They liked the facility design.
- Their meetings' goals were met by holding their meeting in this fashion.
- The devices (cameras, microphones, etc.,) were not distracting.
- The automatic control via voice-activation of the cameras was quite satisfactory.

It would appear that a clear point is evident from the data. Namely, that the Westinghouse-designed teleconference rooms provide an atmosphere that facilitates acceptable "electronic" meetings. A vast cross-section of professionals from high-level executives to junior engineers used the system during Phase 2 on an "as available" basis.

The Westinghouse teleconferencing research seems to substantiate other research in this country and abroad which indicates that teleconferencing can be a viable alternative to normal business travel.

Summary of Phase 1 and Phase 2 Results

The results of Phase 1 data collection indicated that different room configurations and combinations of function, environment, and time had little impact on the rating of selected aspects of the teleconferencing experience. The ratings reflected a satisfactory or excellent opinion of the system. Only in expressing their opinion of whether the system was equivalent to face-to-face did the users feel that the environment was something less than an actual person-to-person exchange.

The results of Phase 2 data, as noted earlier, came from several sources. Evaluation of post-teleconference questionnaires found the collective opinion of participants towards facility components and environment to be very positive. Evaluation of a questionnaire designed to determine causes of non-use found lack of pertinent business between counterparts in Baltimore and Lima was the most frequently-cited reason. Further, *all* respondents of the "non-use" questionnaire felt that the facility components or environment did not affect the outcome of meetings. A small percentage of respondents preferred face-to-face meetings. The final questionnaire sent to the managers of two Westinghouse divisions received a modest but representative response. Middle-ranked management expressed the most interest in the system, while upper and lower segments exhibited less enthusiasm. In general, comments made by all participants were extremely positive.

All questionnaires used in Phase 2 were conceived and refined on the basis of previous teleconference research and questionnaire experiments conducted by Westinghouse personnel. Therefore, assuming that measurement methodology did not in some way skew the results, a paradox of sorts seems to exist within the Westinghouse organizational setting. Results from participants were extremely positive and yet participation dwindled as time passed. Efforts to increase visibility of the service had little discernable effect. Phase 1 data portrayed near independence in choice of configurations for the Phase 2 facility, and Phase 2 data indicated abundant acceptance of the chosen configuration. Nonetheless, participation diminished and remained low despite efforts by investigators to stimulate greater use. Perhaps limited access to the satellite was a contributing cause to the diminishing use of the facilities.

It appears, then, that the Westinghouse teleconferencing experiment was a design high in *channel* characteristics, that is audio and video fidelity, and basic environments, but low in *system* characteristics, that is poor facility access (in terms of available satellite time) *in the experimental mode*. A full service mode, and a network of teleconferencing terminals could very well offset this poor access; possibly making teleconferencing a widely accepted alternate to travel.

ACKNOWLEDGEMENTS

The experiment design, hardware integration/test, and preliminary evaluations were accomplished by the author with the able assistance and suggestions of numerous people within Westinghouse. Of special note were Dr. Arthur Kahn, Experiment Co-Investigator; Mr. George Kuegler, Experiment Technical Manager and Mr. Bob Motz, Project Engineer. The author would also like to thank various Hermes experimenters in the United States and Canada who have provided valuable teleconferencing research material.

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SASKEBEC

OU LA TELECONFERENCE DEMYSTIFIEE

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Il peut vous sembler étrange de trouver, inclus dans votre programme, un rapport sur SASKEBEC, sachant que cette expérimentation ne débutera qu'au mois de février 1978. Le même programme, cependant, indique que le but de ce symposium est non seulement de présenter des résultats d'expérimentations, mais aussi de: "promouvoir la discussion sur les aspects sociaux, techniques et économiques de communications par satellites".

Nous croyons que l'expérience que nous avons accumulée, de même que les problèmes que nous avons rencontrés en essayant d'atteindre les buts de notre expérimentation au cours des quatre années écoulées, sont en mesure d'apporter une contribution valable à cette assemblée. En retour, nous espérons pouvoir bénéficier de vos commentaires et de vos idées au moment même où se rapproche le début de notre utilisation du satellite.

Permettez-nous d'expliquer brièvement en quoi consiste l'expérience SASKEBEC, et d'indiquer de quelle façon elle s'insère dans les objectifs généraux fixés par la Section des programmes sociaux du Ministère des Communications Canada. SASKEBEC est un projet socio-culturel qui permettra à deux communautés situées à 3,000 km de distance l'une de l'autre de se rencontrer et de communiquer par l'entremise du satellite Hermès. Les communautés, toutes deux francophones, présentent des similarités, mais en même temps des différences assez importantes. Toutes deux ont des problèmes économiques locaux à résoudre, et subissent les conséquences sociales et démographiques de l'exode vers les villes. Toutes deux enfin sont isolées, mais la qualité de cet isolement est différente dans chaque cas. Zénon Park, un village situé au nord de la Saskatchewan, est un îlot francophone perdu au milieu d'un océan anglophone; Baie St. Paul, située sur la rive nord du St. Laurent, à 80 km environ en aval de la ville de Québec était, jusqu'à très récemment, située en dehors des grands axes de communication. Le français, contrairement à celui parlé à Zénon Park, n'y est par contre nullement menacé. Ajoutons en passant que plusieurs pionniers de Zénon Park étaient originaires de la région de Baie St. Paul. L'objectif premier de SASKEBEC, en conséquence, est d'établir un lien entre deux groupes francophones qui, sans l'intervention du satellite, ne seraient jamais entrés en contact. C'est une téléconférence, mais une téléconférence d'un type différent.

(The English text follows the French text.)

Dès les débuts, SASKEBEC a été planifié afin de répondre au voeu exprimé par le Ministère des Communications Canada disant: "afin que des utilisateurs en puissance puissent s'initier au développement et à l'évaluation de la technologie" (Casey-Stahmer, 1975). Bien que les expérimentateurs de la Saskatchewan du projet SASKEBEC s'intéressent particulièrement aux objectifs liés à Zénon Park, ils considèrent l'expérience dans sa totalité comme devant être une contribution valable au dessein général de l'étude des communications, et un essai de recherches nouvelles utilisant la technologie des satellites de communication en matière socio-culturelle, dans un cadre plus spécifiquement canadien. L'accent a été placé constamment sur la participation communautaire; ainsi qu'il sera mentionné plus loin, les comités locaux de citoyens ont joué un rôle déterminant lors de toutes les étapes de la préparation du projet, lors de la définition des programmes lors de la création de documents audio-visuels, et lors de l'organisation du projet au niveau local. Cet aspect est très important, car Zénon Park est situé à 380 km de Régina, lieu où se trouve le Centre d'Etudes bilingues de l'université.

La Téléconférence...

L'Institut international de communication de l'Université de Montréal, dans un travail intitulé "La communication par satellites, perspectives pour l'usager" consacre un chapitre aux téléconférences (Université du Québec, 1977), 1977a), dans lequel ses auteurs évaluent les résultats obtenus par les échanges bi-directionnels du type: échanges entre deux groupes restreints de spécialistes (généralement de 2 à 9 personnes) placés dans deux salles équipées en conséquence. Pour que la téléconférence soit efficace, les personnes utilisant le système doivent bien se connaître, ce qui nécessite souvent une recontre physique entre ces dernières, avant la téléconférence proprement dite. Certaines expériences de télémédecine entre deux continents, préparées par des rencontres à Paris ou à Montréal, sont devenues ainsi, pour les besoins de l'expérimentation de l'utilisation d'un satellite, une répétition factice d'une rencontre réelle parfaitement satisfaisante. Le luxe de moyens utilisés pour les téléconférences et les sommes engagées n'ont cependant pas encore résolu certaines questions, telles que celle de prouver l'avantage de téléconférances audio-vidéo sur un système audio, ou d'éliminer la lassitude provoquée par le manque de flexibilité des systèmes vidéo utilisés, quand il ne s'agit pas de la qualité même de l'image ou du son.

Les auteurs du rapport concluent en disant: "Habitués que nous sommes à la sollicitation excessive des mass-media, harcelés par la publicité, de moins en moins étonnés par la richesse des stimuli audio-visuels, placés le plus souvent dans des situations de sur-information, nous avons peine à définir les conditions nécessaires à la communication dite "utilitaire" (pour la distinguer de la communication du type 'spectaculaire'). Même si l'on prétend vivre une civilisation de l'image, peu de gens, sauf les spécialistes, sont capables de produire, de manipuler et de transmettre des messages audio-visuels" (Ibid).

Un des buts principaux de l'expérimentation intitulée SASKEBEC est précisément de prouver qu'en ôtant des mains des experts la téléconférence, et en la plaçant dans celles de fermiers, de ménagères, d'instituteurs et d'étudiants, une dimension nouvelle surgira qui permettra précisément d'éliminer certains faux problèmes posés à l'heure actuelle par les téléconférences.

...Démystifiée

Par "démystifier", nous entendons, selon la définition du Robert: "faire cesser le caractère mystérieux, ésotérique de quelque chose". En d'autres mots, nous voulons expérimenter la téléconférence descendue du piédestal des experts, des organismes à ressources financières importantes et des grandes entreprises, pour l'amener au niveau de la rue et du commun des mortels.

Réexamen des objectifs

Un réexamen récent des objectifs fixés au projet SASKEBEC nous a amenés à relire l'excellent article du Finlandais Kaarle Nordenstreng publié en 1975.

Cet article traite des nouvelles tendances de la théorie de la communication, et établit une différence marquée entre l'école anglo-saxonne et l'école scandinave, la première menant à une attitude pragmatique limitant souvent les recherches sur la communication à l'étude des media, la seconde concluant à la nécessité d'une théorie générale de la communication incluant des options socio-politiques bien déterminées.

Kaarle Nordenstreng établit une différence essentielle entre besoins objectifs et subjectifs en information. Il s'agit, écrit-il, "de considérer le comportement informationnel d'un individu (besoins subjectifs) comme inhérent à l'ensemble de ses conditions de vie et de son environnement social (besoins objectifs)." Et d'ajouter plus loin: "on (l'école scandinave) veut éviter d'adopter un strict point de vue de spécialiste de la communication et choisir au contraire une perspective très large, avec une gamme étendue de facteurs socio-économiques (objectifs) interférant avec des phénomènes de communication (subjectifs)."

Placés dans la situation du personnage célèbre de Molière qui faisait de la prose sans le savoir, nous nous sommes rendus compte petit à petit que notre expérimentation se présentait sous les couleurs de l'actuelle réorientation de la recherche en communication, virant du positivisme-behavioriste vers un antipositivisme reflétant un désir de modifier une situation socio-culturelle établie.

Le Centre d'Etudes bilingues de l'Université de Régina avait, durant plusieurs années, effectué des recherches linguistiques, historiques et socio-culturelles au sein de communautés francophones de la Saskatchewan, et avait dûment enregistré l'assimilation linguistique galopante à laquelle les conditions de vie nouvelles, le dépeuplement rural, les concentrations scolaires et les media les soumettaient. Tout d'abord il vit dans la possibilité qui leur était offerte d'utiliser le nouveau satellite technologique de télécommunications un outil leur permettant, dans un espace et un temps délimités, d'amener de la région francophone la plus proche - le Québec - un apport culturel massif susceptible de freiner, voire d'arrêter une dégradation linguistique suscitant les plus grandes inquiétudes. Nous considérons alors le processus de communication par satellite comme une source d'information et d'enseignement à distance largement unidirectionnelle transformant, selon Nordenstreng, "la communication en un phénomène magique, aisément susceptible d'occuper une position dominante dans de nombreux domaines de l'art et de la science".

Les contacts en profondeur que nous eûmes ensuite avec les habitants du village-cible: Zénon Park, avec nos partenaires québécois du Service Général des Moyens d'Enseignement du Ministère de l'Education, puis enfin avec le second interlocuteur; la population de Baie St. Paul, au Québec, nous convainquirent rapidement que seule une expérimentation bidirectionnelle à partenaires égaux devait être envisagée.

Micheline Tremblay, l'un des responsables québécois de SASKEBEC, décrit les nouveaux objectifs de la façon suivante: "Dans l'expérience SASKEBEC, la télévision devient un véritable moyen de communication, un outil, et non un simple moyen de diffusion de masse, un produit à consommer. En effet, SASKEBEC met de l'avant une conception de la télévision-outil où il n'y a pas d'une part le producteur et d'autre part le consommateur d'un produit fini. Chacun est engagé dans l'expérience du 'faire', du 'communiquer'. Dans cette perspective de télévision-communication, s'opère une démystification du médium, car l'objectif n'est pas de réaliser la meilleure production technique, mais bien de réussir la meilleure documentation. Ceux qui profiteront de l'expérience, ce sont surtout ceux qui la feront et non ceux qui la regarderont." (Tremblay, 1976)

Les étapes

Revenons aux différentes étapes du projet qui s'étendent, rappelons-le, sur une période de quatre ans. Sa longueur même, qui nous fut imposée par le calendrier des expérimentations, notre expérience ayant été placée en fin de programme, nous sembla être tout d'abord contraignante, car elle nous imposait l'obligation de maintenir un intérêt soutenu envers le projet auprès de deux populations, durant ce qui nous semblait à l'époque être une éternité. Bientôt cependant, nous nous rendîmes compte que nous aurions besoin de chaque minute du temps de préparation qui nous avait été accordé.

La recherche d'un partenaire du côté québécois, l'approfondissement du travail, et le choix des deux localités-cibles prirent une année. Le financement du projet fut ébauché également durant cette période. Que d'illusions rapidement perdues: agences, fondations et organismes jouant avec brio le jeu connu du: "Renvoyez l'ascenseur"!

L'année suivante vit se former à Zénon Park et à Baie St. Paul les comités de citoyens responsables du projet. L'idée de ce dernier ayant été "vendue" de part et d'autre, et l'assurance ayant été fournie que chaque comité représentait réellement la communauté, le travail put enfin débuter au véritable niveau recherché par le projet, soit au niveau communautaire. Une étude monographique (Zénon Park, 1976), la première jamais effectuée à Zénon Park, fut publiée, et des cours d'introduction au médium de la télévision furent enseignés dans les deux localités par les collèges communautaires.

L'année 1976 vit se former les équipes locales bénévoles de recherches, de production et de réalisation, armées d'un matériel de télévision portatif minimum, et encadrées par des spécialistes fournis par les expérimentateurs. Cette époque héroïque se concrétisa par la fabrication des premiers produits finis, comme par exemple un document de trente minutes sur la luzerne, qui demande mille heures d'efforts conjugés. Ce fut aussi l'époque où toutes les prévisions financières savamment échafaudées furent bousculées par les hausses sur le coût de la vie, ou par le retrait de l'appui promis par certaines agences. Cette situation, dont nous n'avons, j'en suis certain, pas été les seuls à souffrir, nous fit passer de très mauvais moments.

Vint 1977, et la remise à chacun des comités d'un matériel de télévision plus important, et mieux adapté aux besoins. Vint aussi la construction de deux studios dans une salle de classe et dans une boucherie désaffectée, ainsi que la conclusion d'accords finaux sur la redistribution des programmes par émetteur à courte distance à Zénon Park et par câble à Baie St. Paul.

L'harmonisation des documents pré-enregistrés, et l'établissement du contenu final des communications, a été réalisé il y a quelques jours lors d'une séance conjointe des deux comités. Un total de 75 émissions en matinées et en soirées a été programmé, ce qui représente pour les deux communautés, et spécialement pour les 350 habitants de Zénon Park, un effort colossal. Le contenu des émissions dites culturelles va de l'échange d'informations entre familles portant le même nom - les Poulin de Zénon Park et les Poulin de Baie St. Paul - à une messe concélébrée à distance, à l'échange de recettes de cuisine, et à des émissions-réflexions sur la langue, le chômage et sur les mouvements coopératifs. Les émissions prévues dans le secteur de l'éducation réuniront de part et d'autre les professeurs, les comités de parents et les commissions scolaires, ainsi que des classes du primaire et du secondaire. Il a même été prévu une soirée dite: "officielle" réservée aux députés locaux, aux ministres de l'Education et d'autres dignitaires qui voudront ce soir-là parler d'unité canadienne et de générosité de leurs gouvernements respectifs.

Une grande variété de formats d'émissions a été retenue. Parmi ceux-ci, celui du document pré-enregistré suivi de dialogue est le plus fréquent. D'autres formats prévoient des émissions à réaction différée, des émissions évaluation, des émissions suivies de lignes ouvertes téléphoniques, des émissions audio suivies de contrôle vidéo, des émissions avec support visuel sur dialogue (diapositive, photo) et même des communications spontanées. Une évaluation partielle au milieu de la période des communications permettra de faire le point, et d'abandonner les formats n'ayant pas donné satisfaction.

Coût de SASKEBEC

Bien qu'il soit difficile, dans l'état actuel du projet SASKEBEC, d'évaluer son coût total, nous sommes cependant à même de vous indiquer en gros les chiffres suivants:

Du côté de la Saskatchewan, $14,000 ont été dépensés en recherches et évaluations préliminaires, $10,000 en frais de voyage aux fins de coordination avec les expérimentateurs québécois et avec les participants de Zénon Park, $25,000 en support technique pour la formation audio visuelle, $70,000 pour le montage du studio de télévision de Zénon Park. Le prêt de matériel technique supplémentaire est évalué à $35,000. $6,000 seront dépensés en frais de transport et de logement durant l'expérimentation, et une somme égale est prévue pour les évaluations et pour le rapport final. Ceci nous donne un total très conservateur de $160,000. A ce chiffre s'ajoute un montant égal, sinon légèrement supérieur, dépensé par nos partenaires québécois.

Il va sans dire que la somme incroyable d'efforts dépensée par tous les participants au projet SASKEBEC n'est pas comptabilisée, étant entièrement bénévole.

Conclusions

A deux mois du début des échanges par satellite, et malgré les problèmes - principalement d'ordre politique et financier - rencontrés durant une période de quatre ans, les expérimentateurs de SASKEBEC sont d'ores et déjà en mesure d'affirmer qu'un certain nombre des objectifs assignés a été atteint. La petite communauté de Zénon Park, grâce à la participation extrêmement active de son comité, a été en mesure de s'organiser, d'entrer en contact avec Baie St. Paul, et de produire des documents audio visuels avec un minimum d'aide et d'appuis financiers venant de l'extérieur. Elle sera en mesure, tout comme Baie St. Paul, de conserver une partie de l'équipement mis à sa disposition, après que le projet SASKEBEC sera terminé, ce qui lui permettra de poursuivre la production de programmes d'intérêt communautaire.

Si rien de plus ne devait être achevé, l'expérimentation serait déjà considérée comme étant valable. Nous sommes cependant convaincus que l'échange prévu entre les deux communautés durant la période s'étendant de février à mai 1978 - la téléconférence démystifiée - sera tout autant fructueuse.

A vrai dire, nous sommes impatients de la voir débuter.

(La bibliographie est à la fin du texte anglais qui suit.)

SASKEBEC

OR THE DEMYSTIFIED TELECONFERENCE

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It may seem a little strange to you to find a report on SASKEBEC on your program, when the experiment is not due to begin until next February. However, the same program states that the purpose of the symposium is not only to present results, but also to "promote discussion on the social, technical and economic aspects of communications using satellites".

We believe that the experience which we had and the problems encountered in attempting to ensure the success of our experiment during the four years of preparation, can provide a useful contribution to this forum. In return we hope to benefit from your comments and ideas as the time of satellite use draws near.

First, what sort of experiment is SASKEBEC and how does it fit into the general objectives fixed by the Social Policy and Programs Branch of the Department of Communications (DOC), Canada. SASKEBEC is a socio-cultural project which will enable two communities over 3,000 kms apart to meet and to interact by means of the Hermes satellite. The two communities, both francophone, have similarities but also important differences. Both communities are characterized by difficulties in the local economy leading to a population drift towards larger centres and consequent loss of identity. Both are rather isolated but the quality of the isolation is different in each case. Zenon Park, a village in northern Saskatchewan is a small island of francophones in the middle of an ocean of anglophones; Baie St. Paul, on the north shore of the St. Lawrence, some 80 kms east of Québec City, was until recently, at least, geographically off the beaten track, but its "francophonie" is secure. We might add that some of the pioneers of Zenon Park came from the Baie St. Paul region. Thus the first broad objective of SASKEBEC is to join two francophone groups which, without the help of satellite communications, would not come into contact. It is a teleconference, but a teleconference with a difference.

From the outset, SASKEBEC has been planned to respond to the desire of DOC "to involve potential users themselves in the development and assessment of the technology" (Casey-Stahmer, 1975). While the Saskatchewan directors of SASKEBEC

(Le texte français précède ce texte.)

have particular objectives with respect to the community of Zenon Park, they regard the entire experiment as a valuable contribution to the attempt to study general communications policies and to help to discover techniques for making use of satellite communications technology in social and cultural fields, with special reference to the Canadian context. The emphasis has always been placed on community participation, and, as will be seen, residents played the key role at all stages of the preparation of the project, in the definition of programming, the development of audio and visual materials and in organizing the project at the local level. This is all-important, for Zenon Park is 380 kms from the Bilingual Centre of the University, in Regina.

The Teleconference...

In a study entitled: "Satellite communications, user perspectives", the Institut international de communication of the University of Montreal devotes a chapter to teleconferences (Université du Québec, 1977a), in which the authors evaluate the results of two-way exchanges between small groups of specialists (generally from 2 to 9 in number) in two specially equipped rooms. The persons involved should know each other well if the teleconference is to function properly. This fact often demands a physical meeting before the teleconference itself. For example, certain telemedicine experiments bridging two continents were prepared by meetings in Paris or Montreal and, as far as experimentation in the use of satellites is concerned, were merely an artificial repetition of a perfectly adequate meeting.

Despite the sophisticated material and the amount of money expended on teleconferences, many questions still remain unanswered. Are audio-visual conferences necessarily better than purely audio ones? How does one eliminate the boredom arising from the lack of flexibility of the video systems in use? And will the sound and picture quality be satisfactory?

The authors of the report conclude: "Accustomed as we are to the excessive pressure of the mass media, harassed by commercials, less and less impressed by the proliferation of audio-visual stimuli, usually over-informed, we find it difficult to distinguish between the necessary conditions for 'practical' communications and those for the 'entertainment' type. Even if we claim to live in a civilization built around the televised image, few people other than specialists are able to produce, manipulate and transmit audio-visual messages" (Ibid).

One of the main aims of SASKEBEC is to prove that by taking the teleconference out of the hands of the experts and putting it into those of farmers, homemakers, teachers and students a new dimension will emerge which will bring about the elimination of some of the spurious problems which are now associated with the holding of teleconferences.

...Demystified

By "demystify" we mean, following the definition of the Robert dictionary: "to eliminate the mysterious, esoteric character of something". In other words, we wish to try out a teleconference brought down from the pedestal of the experts, of organizations with the massive funding capabilities of big business, but at the level of the ordinary man in the street.

Re-evaluation of the objectives

A recent re-evaluation of the objectives of the SASKEBEC project led us to read the excellent article published in 1975 by the Finn, Kaarle Nordenstreng.

This article deals with new trends in communications theory and identifies a clear distinction between the Anglo-Saxon and Scandinavian schools. The first leads to a pragmatic attitude which often limits communications research to the study of the media, the second establishes the need for a general communications theory which will take into account well-defined socio-political options.

Kaarle Nordenstreng postulates an essential difference between objective and subjective needs in the field of information. "The informational behavior of an individual (subjective needs)", he writes, "is inherent to the totality of his living conditions and his social environment (objective needs)." And he adds: "We (the Scandinavian school) do not want to adopt a strictly specialist view of communications but rather to select a broad perspective with a whole range of socio-economic (objective) factors interacting with the communications phenomena (subjective)."

We are somewhat in the situation of Molière's character who wrote prose without knowing it, inasmuch as we have gradually realized that our experiment was within the broad lines of the present re-orientation of communications research, moving from a positivist-behaviorist position towards an anti-positivist one, and so reflecting a desire to modify an established socio-cultural situation.

The Bilingual Centre of the University of Regina had carried out linguistic, historical and socio-cultural research in francophone communities in Saskatchewan for several years, and had noted the rapid linguistic assimilation imposed upon them by new social conditions, rural depopulation, school centralization and the media. At first, we saw Hermes as a way of obtaining a massive cultural injection from the nearest francophone region, Quebec. This might help to slow down, if not to stop, the erosion of the French language which was causing so much anxiety. Thus we initially considered the satellite communication process as being essentially one-way, providing a source of information and education which could transform, as Nordenstreng has it, "communication into a magic phenomenon which might easily occupy a dominant position in various areas of art and science".

The in-depth contacts which we subsequently had with the population of the target-village, Zenon Park, with our Quebec counterparts in the Service Général des Moyens d'Enseignement of the Department of Education and with the other partner in the exchange, the population of Baie St. Paul, in Quebec, soon convinced us that a two-way communication experiment between equal partners was the only type that should be considered.

Micheline Tremblay, one of the members of the Quebec team of SASKEBEC, describes the new objectives in the following way: "In the SASKEBEC experiment, television becomes a real means of communication, a tool, and not simply a means of mass broadcasting, a consumer product. SASKEBEC, then, opens up the concept of television as a tool in which there is no distinction between the producer and the consumer of the finished product. Everyone is involved in the active experience, in 'communicating'. In this concept of television as communication, the medium is demystified, for the aim is not to achieve the best technical production, but to produce the best exchange of information. Those who carry out the experiment, rather than those who simply watch it, will benefit most" (Tremblay, 1976).

The stages

Let us return to the various stages of the project which stretch, as you will recall, over a period of four years. Its very length, dictated by the time scheduling of the experiments, ours being set at the end of the program, seemed at first to impose particular difficulties on us, since we were obliged to maintain interest in the two populations for what seemed to us to be an eternity. We soon realized, however, that we would need every minute of our preparation time.

Finding a Quebec partner, the thorough development of the project, and the choice of the two target-centres took a year, during which time we started to look for financial support. Many illusions were swiftly dispelled, as we bounced back and forth between various agencies, foundations, and other bodies.

The following year saw the establishment at Zenon Park and Baie St. Paul of citizens' committees. The project had been "sold", and once we were sure that the committees really represented the communities, the work could finally begin at the appropriate level -- that of the community. A monograph was published (Zenon Park, 1976) the first ever of Zenon Park, and an introduction to television was given by personnel from community colleges.

In 1976, local volunteer research and production teams, equipped with basic portable equipment, went into action. These were helped by specialists provided by the SASKEBEC directors. The end result of this period was the first finished film products, for example a 30-minute documentary on alfalfa, the result of 1,000 man-hours of work. At this time too, we found all our financial estimates upset either by rising costs or by the withdrawal of some promised funding. We are undoubtedly not the only ones to have suffered from such a situation, but it certainly caused us many anxious moments.

Each of the committees obtained more sophisticated equipment in 1977. Studios were set up, in Zenon Park in a classroom and in Baie St. Paul in a vacant meat market. Agreement was reached on the terrestrial distribution of the programs, by cable in Baie St. Paul and by low-power transmitter in Zenon Park.

The coordination of filmed material and the setting up of the program schedule took place a few days ago, at a meeting of the two committees. A total of 75 afternoon and evening programs were scheduled. This represents a remarkable achievement for both communities, especially for the 350 inhabitants of Zenon Park. The cultural programs range from meetings between two families of the same name - the Poulins of Zenon Park and those of Baie St. Paul - to the concelebrated mass, an exchange of recipes and discussions on the French language, unemployment and cooperative movements. In the field of education, teachers will meet, as will committees of parents and school boards; so too will students at both elementary and high school levels. One "official" evening has been planned, when local MP's, Ministers of Education and other dignitaries will no doubt speak of Canadian unity and the magnanimity of their respective governments.

Many different program formats have been planned, a documentary film followed by dialogue being the most common. There will also be phone-in programs, evaluations, audio programs with visual back-up, documentary films which will be the subject of later discussion and spontaneous exchanges. At the half-way stage there will be an initial evaluation which will enable us to drop formats which are clearly unsatisfactory.

Costs

It is difficult at this point to estimate the total costs of SASKEBEC but we can give the following rough figures.

On the Saskatchewan side, $14,000 went into preliminary research and evaluation, $10,000 for travel to allow coordination between Quebec and Zenon Park, $25,000 for audio-visual training and equipment and $70,000 for the television studio at Zenon Park. Additional technical material will be leased at a cost of $35,000. $6,000 will be needed for transportation and living costs during the experiment and an equivalent sum for evaluation and the final report. This gives a conservative total of $160,000. Our Quebec counterparts will have spent an equal, if not slightly greater amount.

We must underline that the remarkable efforts put into SASKEBEC by all its participants were on a strictly voluntary basis, and are therefore not included in this budget.

Conclusion

With two months still to go before the first satellite exchanges take place, and despite the problems - mostly political and financial - encountered over a period of four years, the directors of SASKEBEC can already say that some of their objectives have been achieved. The small community of Zenon Park, thanks to its extremely active committee, has been able to organize itself to enter into contact with Baie St. Paul, and to produce interesting programming with a minimum of outside help and finance. It will be able - as will Baie St. Paul - to use part of the equipment left at its disposal, after SASKEBEC, for the production of programs of community interest. If this were the only achievement, the experiment would be worthwhile. We are convinced, however, that the exchange between the two communities from February until May, 1978 - the demystified teleconference - will be equally fruitful, and we are impatient to see it begin.

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PSSC: ALTERNATIVES ON HERMES

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Le "Public Service Satellite Consortium" (PSSC) a été créé en 1975 afin d'informer les usagers potentiels du secteur public des possibilités offertes par la technologie des satellites. Le rôle du PSSC est de recenser les besoins et exigences des organismes publics en matière de télécommunications, de fournir une aide technique à ces mêmes organismes et d'élaborer des programmes d'application de la technologie des télécommunications qui soient efficaces et économiques.

Le PSSC réunit actuellement 80 organismes publics oeuvrant dans les domaines de l'éducation, de la santé, de la bibliothéconomie, de la radioffusion publique, et autres secteurs connexes. Tous les Etats américains y sont représentés, y compris l'Alaska et Hawaii.

Les expériences de brève durée constituent l'un des aspects des opérations du PSSC facilitant la diffusion et encourageant l'utilisation de cette nouvelle technologie. Le PSSC est un participant officiel aux expériences réalisées avec le satellite d'application technologique ATS-6 et le satellite Hermès.

Au nom des organismes publiques qu'il représente, et aidé de satellites expérimentaux de la NASA, le PSSC a pris part à la planification, la coordination et la réalisation de nombreuses démonstrations visant à étudier différents modes de prestation de services.

Le PSSC et plusieurs organismes similaires poursuivent le même objectif: améliorer les services aux abonnés et voir si les télécommunications pourraient remplacer les services déjà établis. Ces expériences n'ont réglé aucun problème (à notre avis, seules des applications à long terme de la technologie des satellites pourraient y parvenir), mais chacune d'entre elles a été extrêmement riche en enseignements de tout ordre. En principe, la technologie des télécommunications par satellite est très souple et se

prête merveilleusement bien aux divers besoins de la société. Cependant, les usagers éventuels doivent être adéquatement informés de façon à pouvoir en saisir toutes les possibilités et les implications.

Les expériences effectuées jusqu'ici ont eu un effet positif. Elles nous ont appris que des milliers de personnes sont maintenant au courant de cette innovation scientifique et y portent un intérêt spécial. Elles nous ont également appris qu'il était possible de répondre aux besoins particuliers de chaque groupe social.

En plus, les démonstrations échelonnées sur de courtes périodes de temps ont permis aux représentants et dirigeants de ces différents organismes publics d'élaborer, de tester et d'évaluer certains concepts. Cela leur a donné l'occasion, d'abord, d'acquérir une connaissance pratique du processus d'application technique et, ensuite, de mettre à l'essai divers systèmes de communication, deux étapes essentielles à la planification et à la prise de décision.

De l'avis du PSSC, 1977, l'année des expériences limitées dans le temps a été particulièrement productive. Nous continuerons d'en réaliser d'autres et prévoyons faire passer les services prometteurs du stade expérimental au stade opérationnel.

As it comes of age, the communications satellite will make it possible, practical, and cost-effective to provide a number of services which in the past existed only in the pages of science fiction. The National Aeronautics and Space Administration (NASA) series of Applied Technology Satellites (ATS) and the joint USA/Canada Communications Technology Satellite (CTS) or Hermes are showing the way.

The 1980s will usher in a new era of low-cost satellite earth stations which tie in with comprehensive local distribution facilities. The crucial next step for the public sector is to plan to take advantage of it. Public service organizations will need to adapt their planning, budgeting, and operating practices to accommodate an alternative communications delivery system. New approaches are necessary, and present barriers to innovation must be overcome. Public service organizations must work together to define their practical service requirements and the means of best fulfilling those requirements.

The Public Service Satellite Consortium (PSSC) was created in 1975 as a mechanism to educate and aggregate the public service community in the use of this new technology. It is an outgrowth of the first year of health-care and education experiments which were conducted with the use of ATS-6. When the satellite was dispatched to India for its second year of service, those domestic users who had been experimenting with this remarkable spacecraft were left with no way to apply what they had learned. With the encouragement of the Department of Health, Education and Welfare, the White House Office of Telecommunications Policy, and NASA, the PSSC was formed. Its role is to identify communication needs and requirements of public-service organizations, provide technical assistance to meet them, and develop plans for the effective, economical application of telecommunications technology. The original membership of 23 organizations has grown to over 80. The constituency is diverse, covering the areas of health, education, religion, voluntary citizens organizations, and non-federal government services.

One of the PSSC functions which has facilitated awareness and utilization of satellite communications is the short-term demonstration. As an approved experimenter on ATS-6 and Hermes, the PSSC has assisted a number of organizations who wanted to try a short-term demonstration to see how the new technology could meet their needs.

Figure 1 shows PSSC-supported demonstrations that have been completed. The following discussion will focus on the nature of the organizations, the purposes, scope, and results of their demonstrations, and the implications for ongoing operational services.

Municipal Requirements

The California Innovations Group (CIG) is a non-profit corporation concerned with the growth and development of California cities. The organization is comprised of a team from local governments, high-technology firms, universities, and the League of California Cities. Current projects include urban services delivery scheduling, growth management, energy management, solar-energy demonstrations, and data-processing facilities management.

The CIG is a member of the PSSC and is seriously interested in satellite technology. Why? Where is there a commonality between other organizations and an organization requiring solutions to problems unique to the municipalities of California? The CIG seeks to link problems with alternatives, and it intends to do this by applying scientific methodology and utilizing human resources.

With PSSC assistance, on March 1 of this year, during the "United States National Conference of Mayors", the CIG arranged a teleconference via Hermes between newly-elected mayors attending the conference at Menlo Park, California, and Mrs. Patricia Harris, the Secretary of the United States Department of Housing and Urban Development in Washington,

Figure 1

PSSC CTS EXPERIMENT 21

DEMONSTRATIONS COMPLETED

			T-Transmit, R-Receive
March 1, 1977	CALIFORNIA INNOVATIONS GROUP	Washington, D.C.	T/R video/audio
		Ames Research Center	T/R video/audio
April 13, 1977	COUNCIL FOR EXCEPTIONAL CHILDREN	Atlanta, Georgia	T video/audio
		Baltimore, Maryland	R video/audio
		Harrisonburg, Virginia	R video/audio
		Columbia, So. Carolina	R video/audio
May 23, 1977	INDIANA UNIVERSITY SCHOOL OF MEDICINE/MARYLAND CENTER FOR PUBLIC BROADCASTING	Bethesda, Maryland	T/R video/audio
		Baltimore, Maryland	T/R video/audio
		Indianapolis, Indiana	R video, T/R audio
June 1, 1977	UNIVERSITY OF KENTUCKY	Ames Research Center	T video/audio
		Lexington, Kentucky	R video/audio
June 17, 1977	PSSC WORKSHOP	Goddard Space Flight Center	T video/audio
		Vail, Colorado	R video/audio
July, 7-19, 1977	UNIVERSITY OF ALABAMA IN BIRMINGHAM	Birmingham, Alabama	T video/audio
		Dothan, Alabama	R video/audio
July 21, 1977	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	Bethesda, Maryland	T/R video/audio
		Denver, Colorado	T/R video/audio
		Seattle, Washington	T/R video/audio

Figure 1 - continued

T-Transmit, R-Receive

July 30 - August 1, 1977	AMERICAN HOSPITAL ASSOCIATION	Atlanta, Georgia	T video, T/R audio
		Indianapolis, Indiana	R video, T/R audio
		Dallas, Texas	R video, T/R audio
		Cleveland, Ohio	R video, T/R audio
		Anchorage, Alaska	R video, T/R audio
		Fairbanks, Alaska	R video, T/R audio
September 10-11 1977	SEND/RECEIVE SATELLITE NETWORK	New York City, New York	T/R video/audio
		Ames Research Center	T/R video/audio
September 27 1977	REHABILITATION SERVICES ADMINISTRATION/DHEW	Fisherville, Virginia	T video/audio
		Madison, Wisconsin	R video/audio
October 14, 1977	AMERICAN DIETETIC ASSOCIATION	Bethesda, Maryland	T video/audio
		Los Angeles, California	R video/audio
October 28, 1977	BUREAU OF RECLAMATION	Edna, Texas	T video/audio
		Denver, Colorado	R video/audio

D.C. The purpose of the teleconference was to demonstrate the feasibility of satellite technology and the utility of its applications.

The technical configuration called for two-way interaction -- both video and voice. Through the cooperation of Project Interchange in California, and NASA's Lewis and Ames Research Centers, arrangements were made for use of Hermes, a portable earth station at Washington, D.C., and a fixed earth station at Ames, connected to studio facilities at Menlo Park, by a terrestrial microwave link.

According to the CIG, the 3 hour satellite teleconference proved effective in a number of respects. It provided a positive experience with satellite technology. It initiated an open line of communications between local and federal officials. It illustrated the practicality of an alternative to transportation. And it stimulated an interest in future satellite applications.

Service to the Handicapped

The Council for Exceptional Children is an organization of 75,000 professionals interested in advancing the education of exceptional children. Its activities focus heavily on stimulating research and improving teaching quality and professional growth through the dissemination of information. Conventions, conferences, and instructional institutes are, therefore, major requirements.

The Special Education Satellite Project is a group within the University of Kentucky also concerned with the handicapped -- specifically, with the 28 million handicapped persons in the United States who are not adequately provided with educational services. The Project's goal is to examine alternatives and determine applications of communications satellites that would effectively deliver educational services to the handicapped.

The Rehabilitation Services Administration (RSA) is a federal agency within the Department of Health, Education and Welfare. Currently, a major RSA effort involves present and future telecommunication options. RSA's aim: to consolidate available information and make recommendations to top agency administrators and planners so that policy can be directed toward best servicing the needs of the handicapped.

Earlier this year each of these groups received PSSC support for a short-term demonstration using Hermes. In April, during the Council for Exceptional Children's 55th Annual International Convention in Atlanta, Georgia, Hermes was utilized to explore satellite technology as an informational and instructional delivery mechanism. Conference participants included special and regular educators, teachers, administrators, college and university faculty, handicapped persons, and parents of handicapped children. Through the cooperation of the Southern Educational Communications Association (SECA) and the Westinghouse Corporation, receive-video earth stations were utilized at Harrisonburg, Virginia; Columbia, South Carolina; and Baltimore, Maryland. The Baltimore location also utilized voice-talkback capabilities. The NASA Portable Earth Terminal (PET), transmitted video and voice from the Convention Center in Atlanta via Hermes to the receiving sites in Virginia, South Carolina, and Maryland.

In June, at the Special Education Satellite Project's Users' Conference for Special Educators, a three-hour satellite conference/seminar took place between participants at the conference in Lexington, Kentucky and teachers of the handicapped at Project Interchange studios in Menlo Park, California. The idea was that the experience gained in the logistics of satellite usage would be valuable in understanding various alternatives. The technical link was achieved through use of Hermes and a fixed earth station at Ames connected to studio facilities at Menlo Park by a terrestrial microwave link.

In September, the RSA held a 1½ hour satellite demonstration during its first Telecommunications in Vocational Rehabilitation Conference. The short-term demonstration was intended to raise the level of awareness as to how telecommunications can be used for client services and training and for future RSA meetings and conferences. Over 100 persons, both federal staff and Vocational Rehabilitation administrators, attended the conference at the University of Wisconsin in Madison. The equipment for the satellite demonstration consisted of NASA's Portable Earth Terminal at the Wisconsin location and a newly-constructed Class I Terminal for the Woodrow Wilson Rehabilitation Center in Fisherville, Virginia. The Class I is being made available to societal users by NASA's Goddard Space Flight Center and is on loan to the PSSC for this purpose. This terminal is a portable station similar to the PET, with transmit video and voice-talkback capabilities.

Each of these users, the Council for Exceptional Children, the Special Education Satellite Project, and the RSA, had a brief but nevertheless positive experience utilizing Hermes. In the case of the Council for Exceptional Children, if a greater number of earth stations had been available, they would have been used. As it was, CEC officials and convention participants were enormously impressed. Technically, the delivery system performed well. Programmatically, a sizeable audience otherwise unable to attend the convention received access to current CEC information and activities.

At the University of Kentucky's Users' Conference for Special Educators, although audio problems occurred during the pre-program checkout period, the program went well and served to stimulate a high level of enthusiasm and interest in future options.

The RSA's demonstration evoked similar results. Besides a high level of interest, the conference also stimulated a critical concern for the resolution of a number of issues -- particularly costs and technical considerations involved in the usage of satellite technology.

These three satellite communication demonstrations in related areas of handicapped services were conducted by people who all wanted greater access to the technology. Their combined list of requirements is long. It includes: continuing education for special educators; health services for the handicapped; diagnostic services for the handicapped; access to information; access to professional expertise in handicapped services; administrative interconnects among service agencies; conferencing; conventions; and instructional institutes. These needs involve a huge and geographically dispersed population. The brief interlude with Hermes for a short demonstration was just one small element in the exploration process. It did not solve any problems, but it did help by exposing the constituency of these groups to current information, and it made many people sufficiently interested to want involvement with this new avenue to solutions.

Physicians and Nurses

The Medical Educational Resources Program (MERP) is a special division of the Indiana University School of Medicine with extensive facilities for medical program development, including a production center which distributes world-wide more than 2,000 hours of videotapes and films each year and a closed-circuit medical television network for continuing medical-education programs at teaching hospitals throughout the State of Indiana.

In May, 1977, the organization hosted the Nineteenth Annual Meeting of the Health Sciences Communications Association (HeSCA) during which a Hermes 3 hour demonstration was arranged. The demonstration's purpose was two-fold. First, the presentation was to show the distance-insensitive attributes of satellites for people-to-people interaction, specifically through a demonstration to improve communications and understanding between staff at the Lister Hill National Center for Biomedical Communications in Bethesda, Maryland and constituents of Health Science Education at the conference in Indianapolis, Indiana. Secondly, the aim was to demonstrate medical-education interaction through interchange between two medical institutions. For this concept, a clinical patient was examined using fiber-optic color television technology that was transmitted from Maryland to Indiana. The technical configuration called for live transmissions from Lister Hill in Bethesda, Maryland (which has a fixed terminal) and from Johns Hopkins in Baltimore. The Maryland Center for Public Broadcasting helped in arranging use of the COMSAT portable earth terminal. The NASA Transportable Earth Terminal (TET) was used for Indianapolis where conference participants could see and exchange dialogue with staff at Lister Hill and Johns Hopkins.

As would be expected, this was an impressive and dramatic demonstration in satellite applications. Over 400 persons attended the conference. Governor Otis R. Bowen, himself a physician, proclaimed Health Services Communications Week in Indiana to coincide with the meeting. And through an extensive public-relations effort by the respective staffs of the cooperating institutions, the demonstration was informative and educational for the general public as well.

The University of Alabama is another institution actively engaged in communications, education, and health care for the public. Seriously interested in satellite technology, the University already has a Telecommunications Center, six separate production facilities within the various schools on campus, and an Instructional Television Field Service system that serves the Birmingham metropolitan area.

In July of this year, the University's Telecommunication Center in Birmingham, along with the School of Medicine and the School of Nursing, conducted two 5-day demonstrations. These projects involved the experimental use of Hermes as a means of providing a series of continuing-education opportunities to practicing physicians and nurses in the rural area of Dotham, Alabama, which is approximately 200 miles from Birmingham. The program for physicians focused on "Current Thought and Trends in Endocrinology and Metabolic Disorders with Emphasis on the Diabetic Patient". Nurses participated in a course on "Current Issues in Nursing Education and Nursing Services". NASA's PET and TET were used at Birmingham, so that video transmissions were from Birmingham with voice exchange between the two locations.

Technically and programmatically, the University of Alabama was pleased with these short-term continuing-education experiments. They found the audience of physicians and nurses appreciative and helpful in their post-evaluation comments. A frequently-cited benefit by both groups was the ability to obtain access to information without extensive travel. Physicians also felt that American Medical Association Category I credit was a significant positive factor influencing their attendance. Most physicians commented that the voice-interaction aspect was an excellent approach. The University of Alabama wants to do it again and, with PSSC's assistance, are planning another short-term demonstration for 1978.

The American Hospital Association

Approximately 7,000 hospitals are members of the American Hospital Association (AHA). Seventy percent of these hospitals have less than 200 beds, and fify percent are located in rural areas. This brief summary of AHA membership not only describes a group, it describes a problem

- a problem for a widely-dispersed group needing to communicate for a multitude of reasons. According to AHA administrators, conventional alternatives have been both inefficient and insufficient. For these reasons, and with administrative, educational, and informational applications in mind, the AHA is seriously involved in the determination of opportunities with satellite technology.

At their Annual Convention in Atlanta, Georgia, from August 29 through September 1 of this year, the AHA conducted a demonstration using both Hermes and ATS-6. Through interconnects at earth station downlinks, over 60 hospitals in the midwest and Alaska viewed the program. Its purpose was to present the potential of satellite communications for reaching distant individual hospitals for educational purposes and to show the viability of using satellite communications as an alternative to traditional conference participation.

Technically the configuration was more complex than other demonstrations. NASA's Class I Terminal, located at the Georgia World Congress Center in Atlanta, was used to transmit video and voice. Goddard Space Flight Center received the Atlanta signal and "looped" it back through CTS reception by Dallas, Texas and Indianapolis, Indiana. Dallas and Indianapolis used Class II transportable terminals which are similar to the TET. Cleveland, Ohio, used the TET. The received signal was further extended into existing terrestrial systems for distribution into area hospitals. Additionally, NASA's Rosman earth station received and relayed the signal from Hermes to the ATS-6 so that hospital administrators in Fairbanks and Anchorage could receive the program. Participation through voice-feedback was arranged using direct telephone lines into the conference.

The AHA demonstration is a case where audience reaction must be separated from technical appraisal. The demonstration involved a $2\frac{1}{4}$ hour transmission on the last Tuesday in August, and a $3\frac{1}{4}$ hour transmission on the following Thursday. Although the demonstration time was utilized, the Tuesday event was totally unacceptable. The technical problem was not one of feasibility, but rather a problem of inadequate testing before use of some newly constructed equipment. Prior to the Thursday demonstration, the equipment problems were corrected. We are really not sure if the dramatic success that occurred on Thursday, the final day of the convention, was due to the unexpected display of what the system could do, or to the impact of a live teleconference with the President of the AHA, Mr. Alex McMahon. We do know that AHA administrators and conference participants are interested in telecommunications, they want telecommunications, and they were excited about the demonstration.

The American Dietetic Association

The American Dietetic Association (ADA) is comprised of over 32,000 dietitians, all of whom meet the ADA membership requirement of a baccalaureate degree from an accredited college or university. The ADA purposes are (1) to improve the nutrition of human beings, (2) to advance the science of dietetics and nutrition, and (3) to promote education in these and allied areas.

The ADA satellite communication demonstration took place in October. The mode was one-way video from Bethesda, Maryland, to Los Angeles, California with return audio. Two congressmen on the east coast gave the presentation from the Lister Hill facility in Maryland. Due to time constraints of their positions, these gentlemen would otherwise have been unable to participate in the Los Angeles meeting. The presentation focused on "Nutrition Education: Where Do We Go From Here?" At the Los Angeles Convention Center, where a Class II portable unit was used, an estimated 1,600 health practitioners had an opportunity to experience the use of a communications satellite firsthand.

The ADA demonstration was an outstanding success. It provided an introductory experience to the potential of communications satellites, and it allowed interaction with two nationally recognized presenters who were otherwise unable to attend the meeting.

Social Action and Public Interests

The Send/Receive Satellite Network is an organization whose concerns focus on non-profit social and public-action interests. The organization is particularly interested in learning how the telecommunications potential of communications satellites and related new technologies can be applied to meet the needs of these groups. The Send/Receive Satellite Network, therefore, had a satellite demonstration in September to assist them in developing a well-informed user community better able to formulate its requirements for satellite usage.

Participants were from the performing arts, media productions, and legal fields. An interconnect was arranged via Hermes between Ames Research Center in California, and a New York City location. The signal was further distributed, through terrestrial links, to the audiences of two New York cable companies.

There were some technical problems on the first day of their two-day demonstration. These were a combination of satellite and ground equipment malfunctions. The second day of the demonstration was technically acceptable. The Send/Receive Satellite Network considered their demonstration effective and helpful in meeting its purpose.

Environmental Research

Another user of the demonstration opportunity was the *National Oceanic and Atmospheric Administration (NOAA)* of the U.S. Department of Commerce. As NOAA organizations are scattered throughout the United States, there is concern with improving the efficiency of their information dissemination process. Prior to instituting a major effort in satellite communications, NOAA requested a short experience with satellite technology. Their demonstration occurred in July.

The topic selected was Equal Employment Opportunity (EEO) which is of interest to most organizations in the United States, since EEO is a declared national policy. The format was that of a structured meeting. The NOAA administrator and other high officials were at Bethesda. Full duplex video and audio were configured between Denver, Colorado; Bethesda, Maryland; and Seattle, Washington. These facilities were made available through the cooperation of the Lister Hill National Center for Biomedical Communications.

All aspects of the 4½ hour demonstration were considered highly successful. It was the first time many of the persons from NOAA's distant locations had met "face-to-face". But no travel funds were spent. NOAA officials were impressed with both the convenience and utility of such an alternative and are enthusiastic about its long-term possibilities.

Multipurpose Water Development

The Bureau of Reclamation, U.S. Department of Interior, is currently involved with the development of over 400 dams in scattered locations throughout the United States. Large teams and departments involving many personnel, are responsible for the development and direction of construction activities. Consequently, central offices require constant feedback to determine what is happening at the construction sites. The Bureau of Reclamation wants to find out what cost savings could be effected by employing satellite technology.

In September, the Bureau of Reclamation conducted a two-hour experiment between Edna, Texas and Denver, Colorado. The purpose was to experience satellite usage, particularly as a first step in the process whereby designers, administrators, and engineers will determine what cost savings could be gained. A GSFC Class I portable terminal was used for Edna, Texas; a Class II was used for the Federal Center at Denver. Construction engineers at the Palmetto Bend Dam construction site in Edna pointed out and explained the status of the construction activity and problems encountered. Planners and designers in Denver learned of problems needing resolution and answered those immediately solvable.

Technically, the video was excellent. The audio was readable but noisy. In all, Bureau of Reclamation officials were interested in and receptive to the demonstration. It was a first experience for many and will certainly require further discussion and many answers before a serious determination of cost benefits can be made. As with all interested users, the PSSC plans further dialogue with the Bureau of Reclamation and in-depth discussions about their requirements.

The Role of the Public Service Satellite Consortium

The PSSC held its own Hermes demonstration in June during a workshop in Vail, Colorado. On the last day of the workshop, a teleconference was held so that participants at Vail could exchange ideas and questions with NASA and NIE officials in Washington, D.C. Through the PSSC workshop and satellite teleconference, a number of participants learned of the Hermes opportunity and subsequently received PSSC support in arranging a demonstration for their constituency.

The role of the PSSC in all these short-term demonstration activities has been to help create an awareness and generate an interest in potential users by supporting the opportunity to observe the manner in which satellite communications function. The PSSC wants to assure that the public-service community learns as much as possible from the Hermes opportunity. For this reason, the Consortium encourages optimum usage of Hermes, fills available time gaps, helps assure a full range of satellite applications, and offers technical planning and implementation support to the demonstrator. Further, through the cooperation of the Canadian Department of Communication, the National Aeronautics and Space Administration, and a number of long-term societal experimenters, the Hermes satellite and earth station equipment have been made available to short-term demonstrators so that they may have firsthand experience without an extensive investment in time, money, or facilities.

The PSSC coordinates the various possibilities and helps to ensure the operational readiness of a demonstration by performing a host of activities which, in themselves, have proved informative to many planners. These activities include such logistics as securing satellite time, arranging facility linkages to portable earth terminals, determining compatibility of the demonstration sites with the satellite antenna footprint, coordinating frequencies for uplinks and downlinks, arranging a full-systems checkout prior to scheduled events, and operating portable earth station equipment. To old hands in the business of satellite technology, "test-conductors", "real-time coordination", "simulation events", "satellite interface", "frequency coordination", and so on, are commonplace elements in the implementation process. But to many who seek to use satellite technology, much of this is new. The PSSC has made it a point to keep short-term demonstrators abreast of the overall activities performed on their behalf. As a result, many have commented that the experience was enlightening and that because of it they now feel better prepared to plan, as they look into long-term options.

FIGURE 2

PSSC EXPERIMENT 21

PENDING DEMONSTRATIONS

1977	LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS
	APPALACHIAN REGIONAL COMMISSION
1978	MEDICAL UNIVERSITY OF SOUTH CAROLINA
	UNIVERSITY OF ALABAMA IN BIRMINGHAM
	INDIANA HIGHER EDUCATION TELECOMMUNICATION SYSTEM
	UNIVERSITY OF CALIFORNIA, SAN DIEGO
	JOINT COUNCIL ON EDUCATIONAL TELECOMMUNICATIONS
	FORUM FOR THE ADVANCEMENT OF STUDENTS IN SCIENCE AND TECHNOLOGY, INC.
	NATIONAL EDUCATION ASSOCIATION
	AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS
	NORTHWEST MINNESOTA TELECOMMUNICATIONS, INC.
	ILLINOIS BOARD OF EDUCATION
	AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS
	AMERICAN COLLEGE OF PHYSICIANS

Implications and Summary

Figure 2 shows organizations currently receiving PSSC support for short-term demonstrations being planned in 1978. These and other diverse organizations have one thing in common: a need to improve services and an interest in telecommunications as one alternative to their existing system of service delivery. These demonstrations haven't solved any problems - we think only long-term satellite arrangements can do that - but each demonstration has been worth a thousand words of explanation. Basically, satellite communications technology is an adaptive mechanism, amazingly suited to meet many societal needs. However, potential users must be educated to grasp the opportunity of using this advanced technological mechanism.

From those demonstrations already completed, we know that a positive point is being made. We know that because of them thousands of people are aware of and are interested in this current and innovative scientific approach. We also know that each demonstration has illustrated the feasibility of meeting the needs of each respective societal group.

At the same time, the short-term satellite demonstration has allowed the officials and decision makers of these diverse public-service groups to set up, test, and appraise specific concepts. It has allowed them to gain experience of the technical implementation process and has provided a practice opportunity for trying out various media techniques, both valuable for planning and decision making.

The PSSC thinks that 1977, the year of the short-term satellite demonstration, was a good one. We plan to continue in our provisions for support to the short-term demonstrator. We also plan to move promising services from experimental status to regular operations.

ONTARIO GOVERNMENT MULTI-MINISTRY ADMINISTRATIVE/OPERATIONAL EXPERIMENTS USING HERMES

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Le rapport qui suit couvre les phases de planification, d'élaboration, d'exploitation et d'évaluation du programme expérimental de télécommunications du gouvernement de l'Ontario à l'aide du satellite Hermès. Il s'agit d'un programme multi-ministériel dans le cadre duquel les ministères de l'Environnement, de la Santé, des Richesses naturelles, du Solliciteur général (Police Pronvinciale (OPP)), des Transports et des Communications ont participé avec le ministère des Services gouvernementaux à la mise au point d'une gamme d'expériences permettant d'évaluer les applications de Hermès dans les domaines administratif et opérationnel.

L'objectif global du programme était de déterminer jusqu'à quel point les divers ministères de la province pourraient bénéficier, dans leurs activités courantes, de systèmes de télécommunication par satellite comme le Hermès. Les objectifs précis étaient les suivants:

1. *l'évaluation du rendement technique et opérationnel de la station terrienne dotée d'une antenne de 1m de diamètre, y compris les conditions d'installation, d'exploitation et d'entretien;*
2. *la mise au point et l'essai, dans des conditions opérationnelles, d'un certain nombre de prototypes de systèmes de télécommunication par satellite, surtout dans des régions isolées;*
3. *la démonstration des possibilités de tels systèmes de télécommunication pour la haute direction et le personnel des bureaux régionaux;*
4. *l'étude de rentabilité de ces systèmes.*

De façon générale, le déroulement des phases de planification, d'élaboration, d'exploitation et d'évaluation a été satisfaisant. La majorité des participants, y compris les planificateurs et les directeurs de programme, ont reconnu que les télécommunications peuvent

apporter de nouvelles solutions à de vieux problèmes et qu'un réseau simple de télécommunications par satellite et par stations terrestres permettrait d'offrir une nouvelle batterie de services.

Il faut cependant admettre que devant les servitudes du programme, il n'a été possible de démontrer que de façon limitée l'application des télécommunications par satellite aux besoins administratifs et opérationnels des ministères ontariens. Il sera nécessaire de procéder à une étude beaucoup plus poussée de la rentabilité, de l'efficacité et des applications des systèmes mis à l'essai avant d'apporter des conclusions définitives sur leurs possibilités dans un contexte opérationnel.

INTRODUCTION

The Government of Ontario is responsible for delivering a wide variety of management and professional services throughout the 900,000 km^2 of the province. These services include regular health-care delivery, emergency medical services, air and road transportation, education, educational broadcasting, forest-fire control and management, environmental protection and electrical and communication services. In recent years the requirements for services in remote areas, particularly in Northern Ontario, have increased, but the rate and extent to which such government programs can be implemented and improved is determined by the effective utilization of limited financial and human resources. It is in this area of effective utilization of resources that improvements in communication services could play a major role.

The lack of reliable, economical and flexible telecommunication services has placed a severe constraint upon the Government's efforts to improve services in remote areas. This constraint manifests itself in several forms, including:

- difficulty in attracting adequate specialist and managerial skills to remote areas
- high cost and inefficient use of specialist staff from Southern Ontario who, as a consequence, are required to visit these areas periodically
- undesirably long delays in dealing with potential hazards and emergency situations, e.g. air/water pollution, forest-fire control, emergency medical evacuations

- difficulty in arranging the coordinated use of limited manpower and equipment (e.g. air transport)

- difficulty for remote-area personnel making use, on a consultative basis, of Southern Ontario expertise

- feeling of isolation felt by remote-area personnel

- difficulty in providing adequate training programs to remote-area staff.

The Federal Government's invitation in 1972 and the subsequent approval of the Ontario Government's multi-ministry program proposal for inclusion in the joint Canada/U.S.A. Hermes experimental project presented a timely opportunity for a number of ministries to investigate the feasibility of several telecommunication system concepts, utilizing the unique capabilities of Hermes, which might be applied in the operation of many ministries throughout the Province where telecommunication services are either non-existent, unreliable, or too expensive.

The overall goal of the Ontario Government's Multi-Ministry Hermes Program was to determine the extent to which satellite telecommunication systems such as Hermes could assist in the operation of Ontario Government Ministries.

Specific Program objectives were to:

- evaluate the technical and operational performance of the 1m antenna diameter Hermes earth station

- develop and test under field conditions, particularly in remote areas, a number of prototype, satellite-based telecommunication systems

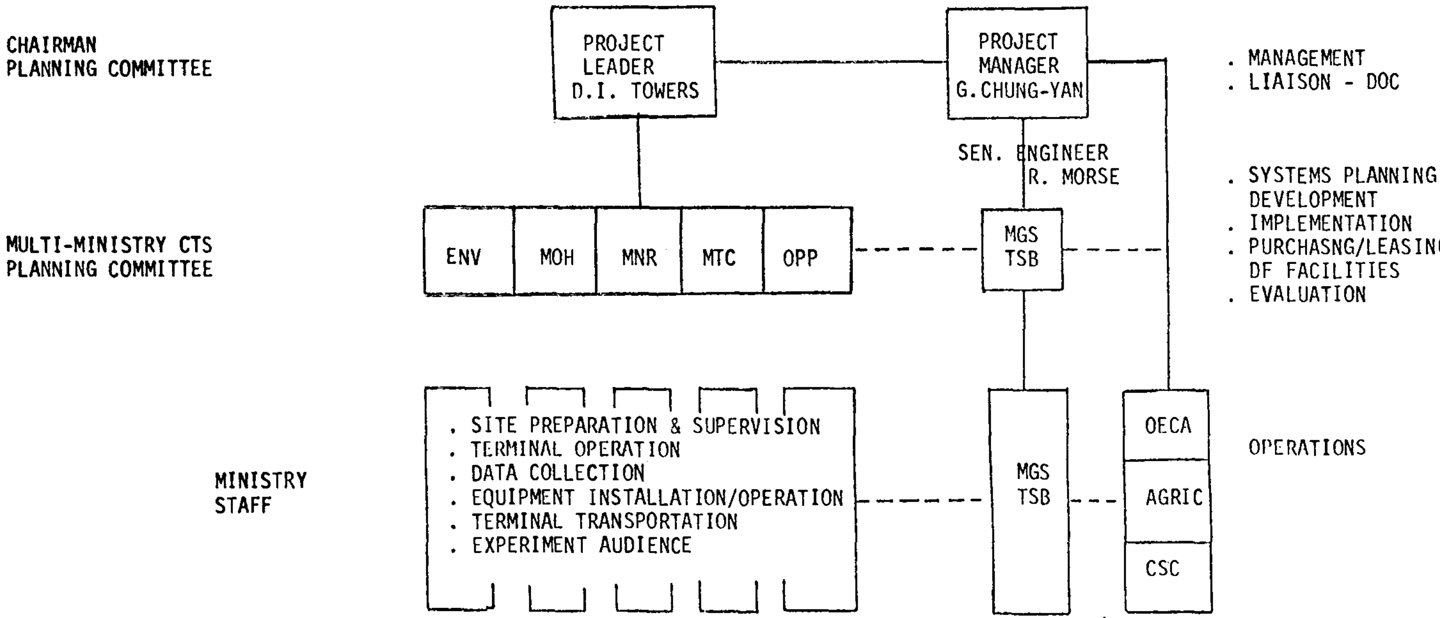
- demonstrate the potential of these prototype telecommunication system models to higher management, as well as to field personnel

- study the cost-effectiveness of such telecommunication systems.

PROGRAM MANAGEMENT AND ORGANIZATION

The organizational arrangement shown in figure 1 was adopted to facilitate execution of the following activities:

- Program development, coordination and management, including development of experiment



MGS - MINISTRY OF GOVERNMENT SERVICES
TSB - TELECOMMUNICATION SERVICES BRANCH
ENV - MINISTRY OF THE ENVIRONMENT
MOH - MINISTRY OF HEALTH
MNR - MINISTRY OF NATURAL RESOURCES
MTC - MINISTRY OF TRANSPORTATION & COMMUNICATIONS
OPP - ONTARIO PROVINCIAL POLICE
CSC - CIVIL SERVICE COMMISSION

Fig. 1. Ontario Government Multi-Ministry CTS Experiments Organization Chart.

proposal for submission to Department of Communications (DOC); development of Cabinet and Management Board submissions for policy and funding approval; development of an experiment plan; representation at Experimenters' Meetings; and interaction with personnel representing and associated with the participating ministries, the DOC, other experimenters and equipment and service suppliers.

- Program execution, including acquisition and allocation of resources, implementation of system, and operation of experiments.

- Program evaluation, including ongoing evaluation, debriefing, assimilation of data and extraction of conclusions.

- Reports documentation; reviewing participating ministry submissions and preparation of final reports.

The Planning Committee was comprised of representatives from the Ministries of Environment, Government Services, Natural Resources, Solicitor General (Ontario Provincial Police, OPP) and Transportation and Communications.

Other organizations involved in the program to a lesser extent, but not represented on the Committee, were the Ministry of Agriculture, Civil Service Commission and the Ontario Education Communications Authority (OECA).

Functionally, overall management and coordination of the experimental program was assigned to the Telecommunication Services Branch (TSB) of the Ministry of Government Services (MGS). This Branch was responsible for developing the overall multi-ministry experiment program in consultation and cooperation with the participating ministries, and for providing technical advice and assistance.

Participating ministries developed their own program material, provided (over and above those provided by TSB), specialized manpower and equipment resources required for their part of the experiment and documented the results of their experiments.

Over 200 personnel from, or associated with, Ontario Government ministries and agencies (Agriculture & Food, Environment, Government Services, Health, OPP, Natural Resources and Ministry of Transportation and Communications) participated in the Program.

EXPERIMENT AND EVALUATION PLAN

The experiment plan involved testing of the earth-terminal hardware and field trials and demonstrations of the following satellite-based telecommunication systems:

- a general purpose system for administrative applications
- a remote-sensing system for monitoring and collection of environmental data
- a satellite/terrestrial repeater system for mobile services in remote areas
- a transportable system for emergency operations
- a system for medical-support services in remote areas.

The experiments were conducted in two phases: Phase I, from 2 May to 22 August, 1976, was limited to narrow band transmissions; Phase II, from 15 May to 31 August, 1977, included narrow-band and broad-band experiments. During the scheduled periods 2½ to 3 hours of Hermes time was allocated on alternate days in the mid-afternoon.

The facilities allocated for Phase I included four 1m ground terminals, a telephone interface unit (TIU) with access to the 9m earth station in Ottawa via a 4-wire dedicated terrestrial line, and access to the 9m terminal via the regular telephone switched network. Additional facilities allocated for Phase II included one 3m terminal (August 1 - August 31, 1977), and one TVRO (Television Receive Only).

Experiment locations were chosen to conform to the following objectives:

- to test performance in built-up city areas as well as in rural environments
- to expose the experimental telecommunication systems to as wide as possible a spectrum of participants, with diverse backgrounds and experience
- to make maximum use of the limited available satellite resources.

As a consequence the following locations were chosen for the ground terminals: Toronto, Pickle Lake, Thunder Bay, Sioux Lookout, Dryden, Winisk, Red Lake, and base camp locations in N.W. Ontario.

The following transmission modes were used: narrow-band voice transmission, broad-band video transmissions, facsimile transmissions, slow speed data transmission including teletypewriter transmissions, and physiological data transmission.

Figure 2 summarizes the operational modes used at each location.

The evaluation plan is detailed in Towers and Chung-Yan, 1978. The following procedures were adopted: a running log was maintained on the operation of all major system components; a variety of ministry personnel were invited to utilize and experience the system on a field trial basis; written questionnaires and interviews were utilized to collect data from experiment participants; evaluation reports were collected from and interviews were held with agencies responsible for sub-experiments within the Multi-Ministry Program; and information collected was analyzed to determine overall performance of the systems tested and costs and benefits of such systems.

EXPERIMENTAL PROGRAM

The Hermes Multi-Ministry program included demonstrations of general administrative applications and tests of selected operational services, as outlined below.

General Applications

To demonstrate the potential of "telecommunications power" a multi-mode (voice, video, facsimile and TTY) multi-purpose system was designed and implemented for general administrative applications such as: information transfer between regional centres and remote locations; "remote" ad hoc and planned meetings between management groups; technical discussions between professional and para-professional groups in such areas as engineering, agriculture and law enforcement; and civil service training.

For these demonstrations terminal facilities were located in Ontario Government offices to permit maximum exposure of the experimental systems to personnel from all the participating ministries. One-metre earth stations were installed in both city (Toronto and Thunder Bay) and remote locations (Winisk, Pickle Lake, Sioux Lookout and Dryden). The stations were transported via pick-up truck and Twin Otter, and installed on various rooftop and ground locations. Information was collected on the operational reliability and the resource requirements for installing, disassembling, operating and maintaining the system.

The Phase I experiment used narrow-band voice, facsimile, data and TTY transmission modes on a point-to-point and multi-point basis. In Phase II these transmission modes were augmented by audio and black-and-white video

EXPERIMENT LOCATIONS	OPERATIONAL MODES												
	VOICE		TELECONFERENCE			FACSIMILE		DATA		OTHER			
	point-to point	multi-point *	two-way audio **	2w Audio + 1w video	2w audio + 2w video	point-to point	broadcast	tty	computer access	vital signs trans.	remote sensing	mobile radio	NOTES
A. Toronto - 22 College	X	X	X	X		X	X	X	X		X	X	. OPP - Ontario Provincial Police
- OPP HQ	X	X				X			X			X	
- Sunnybrook Medical Centre	X	X								X		X	. OECA-Ontario Educational Authority
- OECA Studio					X								. 2w - Two Way
B. Thunder Bay - Govn't Consolidated Bldg	X	X	X	X	X	X	X	X	X			X	. 1w - One Way . tty-tele-typewriter
C. Dryden - MNR Fire Centre	X	X				X	X	X				X	
- Public School Bldgs	X								X				* involves one party at each point
D. Red Lake- MNR Bldg	X	X				X	X				X		**can involve more than one person at each point
- Balmertown											X		
E. Sioux Lookout - DPP Bldg	X	X				X	X	X				X	
- General Hosp.	X	X								X		X	

Fig. 2. Operational Modes and Experiment Locations.

EXPERIMENT LOCATIONS	OPERATIONAL MODES: VOICE		TELECONFERENCE			FACSIMILE		DATA		OTHER			NOTES
	point-to point	multi-point *	two-way audio **	2w Audio + 1w video	2w audio + 2w video	point-to point	broadcast	tty	computer access	vital signs trans.	remote sensing	mobile radio	
F. Pickle Lake	X	X								X		X	
G. Winisk	X	X										X	
H. Carleton University	X								X				NWO - North Western Ontario
I. Land Vehicle	X	X								X		X	
J. Aircraft	X	X								X		X	
K. NWO - Base Camp	X	X										X	

Fig. 2. (Continued)

teleconferencing facilities between Toronto and Thunder Bay, to enable conferencing in the following modes; two-way audio, two-way audio plus one-way video, and two-way audio and two-way video. Figure 3 shows the experimental configuration for narrow-band transmissions and figure 4 the configuration for a full-duplex audio-video teleconference.

Remote Sensing

The Ministries of The Environment and of Natural Resources were both interested in investigating the applicability of a Hermes-type satellite for their environmental and forest fire control programs.

An experimental network (Fig. 5) was designed to investigate the feasibility of monitoring and storing meteorological and environmental data at remote locations, and of retrieval of such data, on a demand or automatic basis, at a distant "central location". This Phase I experiment used 30 hours of Hermes time. The telemetering master station was installed in Red Lake, the remote sensors in Balmertown, and the retrieval system in Toronto. (Jain, 1976).

The system capabilities included: monitoring of sulphur dioxide (SO_2), wind speed, wind direction and rainfall at Balmertown (Red Lake); automatic collection and storage of monitored data at Balmertown, at telemetering master station located in Red Lake; and retrieval of stored data from master station by a terminal located in Toronto.

Mobile Communication Services

Field personnel involved in land mobile operations of the Ambulance Services Branch (MOH), the OPP, and the Ministry of Natural Resources need reliable communication with their operations base. However, because of the great distances, rugged terrain and potential man-made and natural disasters associated with remote areas of Northern Ontario, provision of the necessary mobile coverage and control capability, by means of presently available services and facilities is prohibitively expensive and/or inflexible and/or unreliable.

Accordingly, experimental networks were designed to meet this mobile communication service requirement. The basic system used a back-to-back satellite - VHF mobile terrestrial repeater, with representative configuration as in figure 6. Field trials and demonstrations of this system were conducted during Phases I and II for Toronto, Ottawa, Thunder Bay, Dryden, Pickle Lake, Sioux Lookout and Winisk. (See Towers and Chung-Yan, 1978, for details.)

Emergency Communications

In a disaster situation or in regular operations such as forest-fire fighting and OPP patrols in Northern

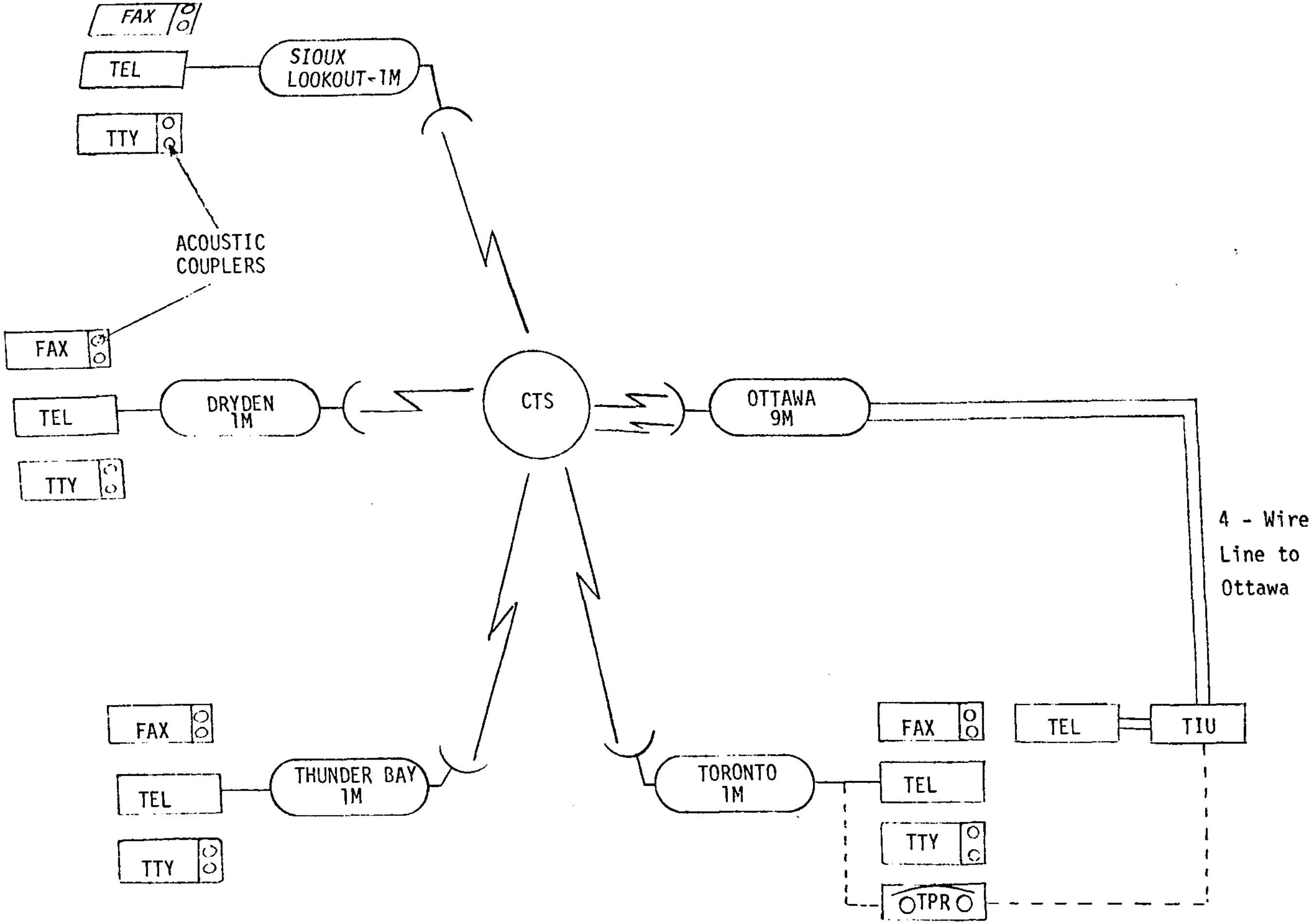


Fig. 3. Administrative Narrowband Network for Voice, Facsimile and Teletypewriter Transmission.

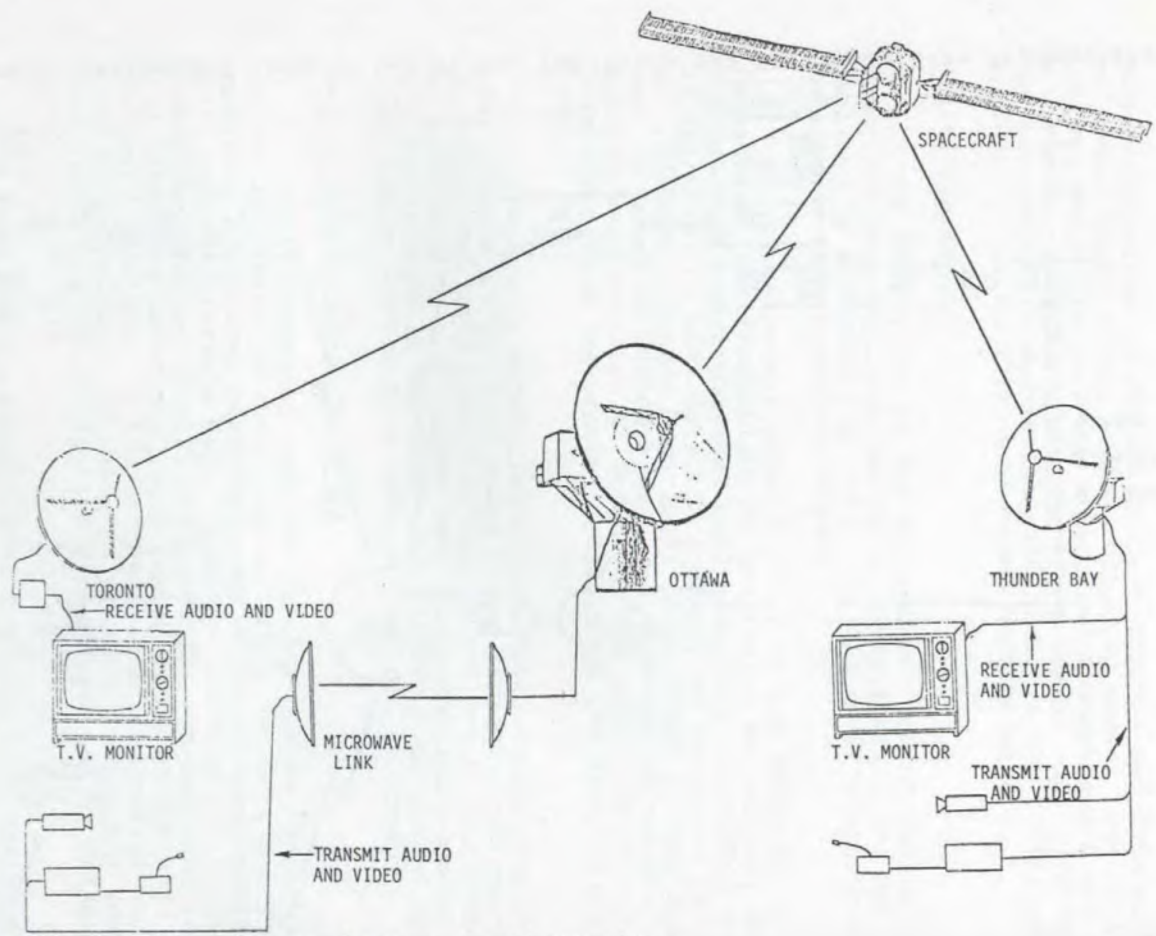


Fig. 4. Two-way Audio and Video Teleconference Configuration.

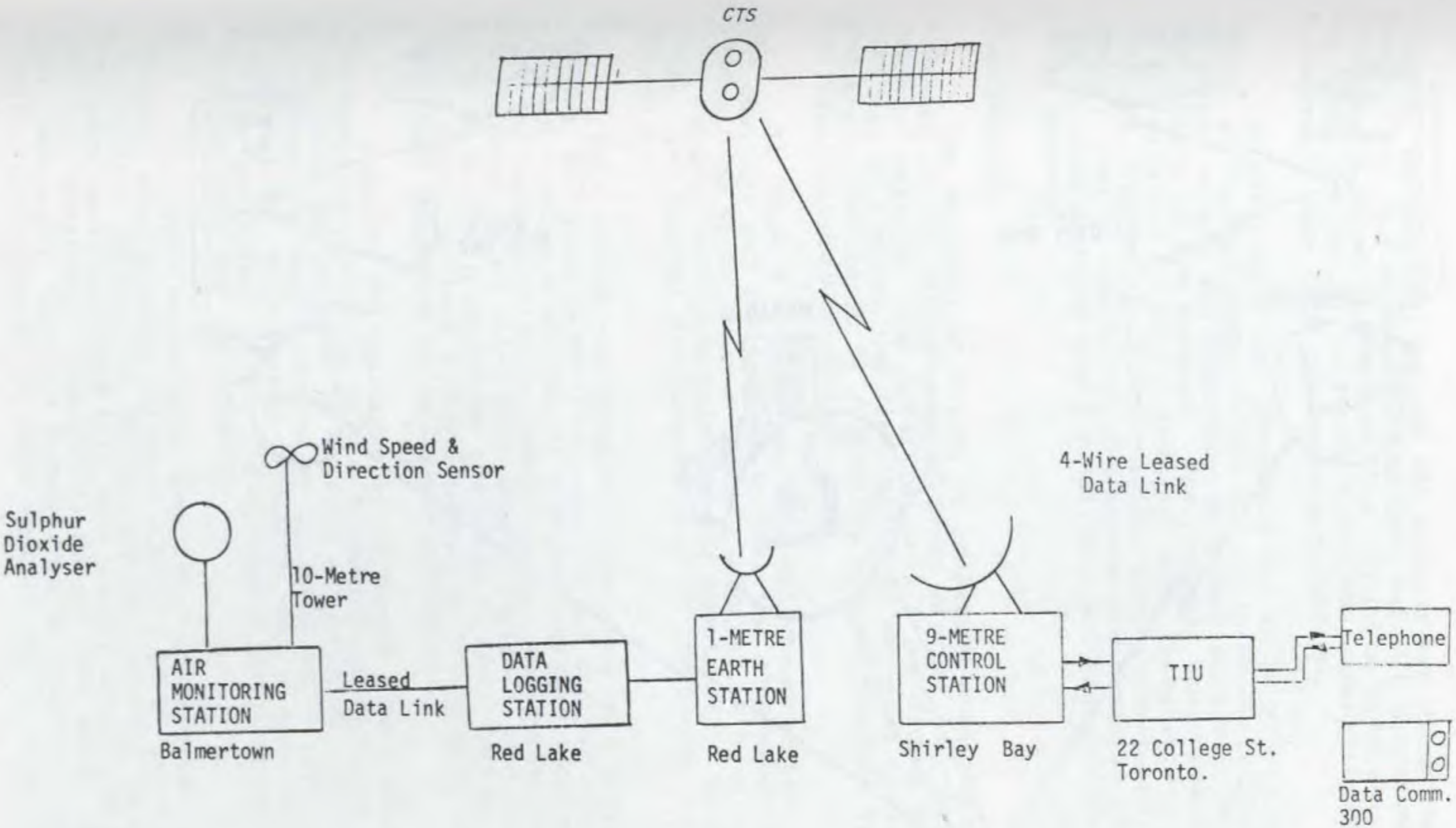


Fig. 5. Remote-sensing Network Configuration.

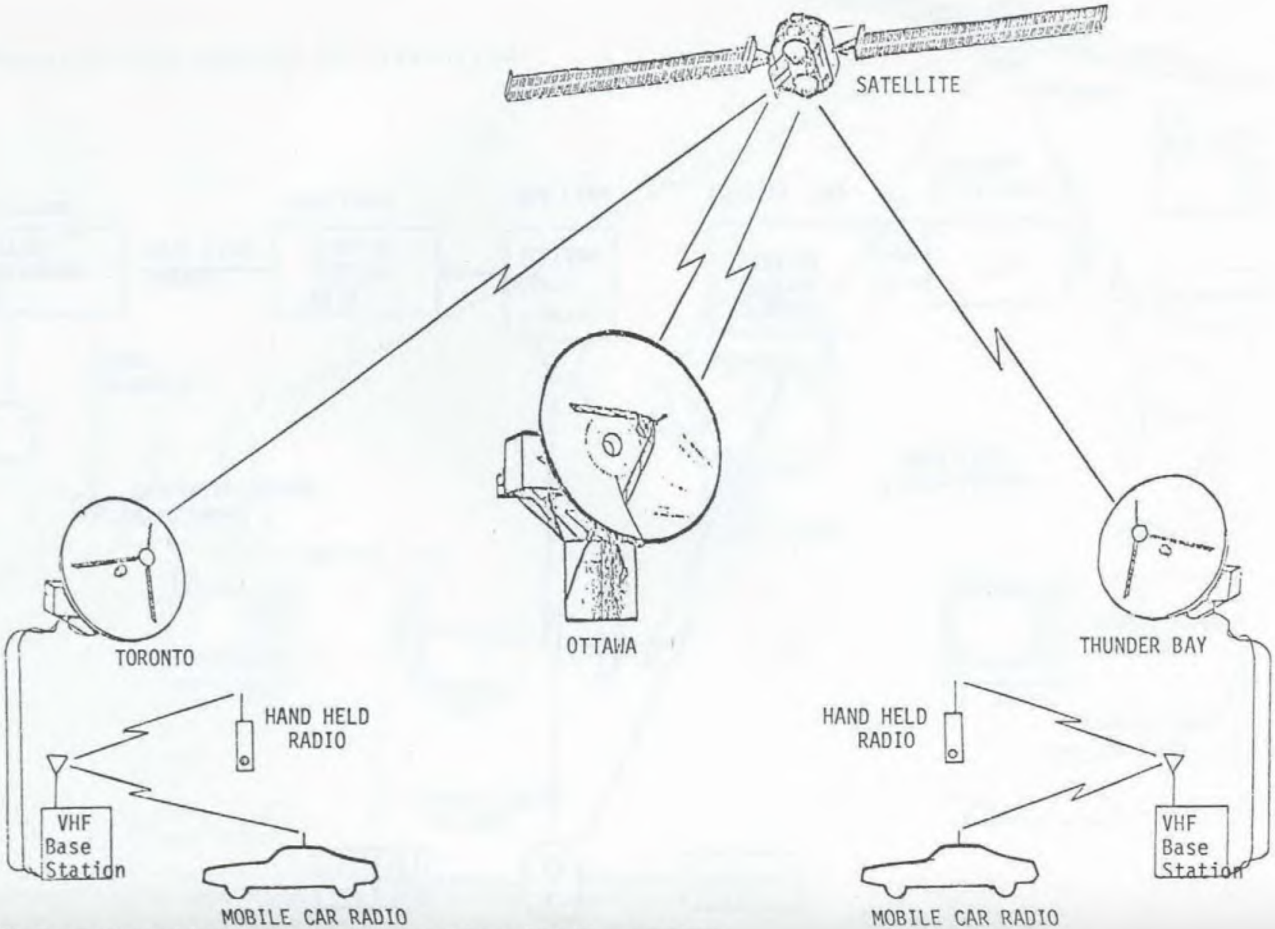


Fig. 6. VHF Base/Satellite Repeater Station Configuration.

Ontario, conventional HF and VHF systems are often inadequate. For such operations the OPP, Natural Resources and Transportation and Communications require a flexible, reliable, easily-transportable communications capability between a temporary base camp and a district office.

Accordingly, test locations for lm terminals were chosen at various sites within N.W. Ontario including Winisk, and field trials and demonstrations were conducted during both phases of the Program. The physical and operational characteristics of the lm terminal were investigated, with emphasis on ease of transportation, installation and disassembly, ease of operation, and system and hardware reliability under varying field conditions and using different power sources.

Telemedicine

The Ministry of Health is concerned with the effectiveness of the health-care delivery service in remote areas of Ontario. The intent of this telemedicine experiment was to explore the feasibility of reducing travel time and associated costs by delivering medical-support services via satellite telecommunications.

In Phase I a voice and data telecommunication system was designed amd implemented to link the Sunnybrook Medical Centre, the Sioux Lookout General Hospital, a nursing station located in Pickle Lake, an air ambulance, a land ambulance, and general practioners located in Thunder Bay and Dryden.

This system was intended to be used as a support service for general medical consultation and for remotely-located nursing stations, to provide emergency medical support services, including remote cardiac monitoring and interpretation of vital sign (physiological) data by a medical centre (Sunnybrook and Sioux Lookout General Hospital), from a patient located either at the nursing station, in a land ambulance or in an air ambulance.

Phase II of the Ministry of Health experiment plan was severely curtailed due to financial constraints. This experiment on the "Remote Testing of Children with Learning Disabilities" was conducted by Carleton University with support from the Ministry of Health, and is described in Knights and Adler, 1977. Their summary and conclusions are repeated here for convenience.

"In 1970 the Canadian Commission on Emotional and Learning Disorders in Children (CELDIC, 1970) reported that one million children in Canada required special psychoeducational assistance and that this number constituted a national emergency. Typically, if and when these children are recognized, they are referred to an educator, psychologist, pediatrician or other specialist for diagnosis and recommendations for treatment. Often they are not recognized at all before serious secondary problems begin to develop. Unfortunately, waiting lists for assessment are long especially in the important psychoeducational area and sophisticated services are available only in the larger centres of Ontario. Many of our rural and remote communities are lacking these services. There is a definite need in these isolated areas for the provision of a link to psychologists, pediatricians and educational consultants who can diagnose existing problems, prescribe appropriate remedial procedures and make general recommendations. The purpose of this study was to determine the feasibility of providing this link via a computer terminal and long distance transmission of computer-administered assessment data between the northern Ontario town of Dryden and the appropriate specialists at Carleton University and the Children's Hospital of Eastern Ontario in Ottawa.

The automated assessment procedures were found to be a useful means of collecting data, and enjoyable to both parents and children. Problem areas that appeared in the assessment summaries were followed up by the specialist in Ottawa via long distance telephone discussions with parents in Dryden. In terms of the people involved, long distance computer-administered assessment is clearly a useful and feasible tool.

In terms of the reliability of long distance transmission, it is more feasible to make the long distance link between a computer terminal in a remote area and the central computer via satellite rather than via regular long distance telephone. In terms of cost, it is more difficult to assess the feasibility due to the experimental nature of the satellite."

FINDINGS

This section provides an overall evaluation of the Ontario Government Multi-Ministry Experimental Program.

GENERAL FINDINGS

From an analysis of the data obtained from over 200 Ontario Government personnel (professional, administrative, technical and clerical) our evaluation of the general technical and operational characteristics of this Hermes satellite-communication system are as follows:

Transmission Quality

Transmissions of voice, slow speed facsimile (3-6 minutes machines) and slow-speed teletypewriter signals (up to 300 baud) using the 1m terminal were comparable to high-quality telephone lines.

Switching Characteristics

The switching feature of the satellite system, which enabled communications to be established either on a point-to-point or a multi-point basis was considered very useful for a number of administrative and operational applications, such as point-to-point and multi-point voice conferencing, facsimile point-to-point and broadcast transmission, and teletypewriter point-to-point and broadcast transmission. However, during the early phase of the experiments, there was a tendency for one or more of the earth stations involved in a previously established link, to become "disconnected". While it was easy to detect when such "dropouts" occurred on a point-to-point voice link, the same cannot be said when communicating on a multi-point voice or facsimile configuration. Design improvements to eliminate this problem seem to be appropriate.

System Reliability (Satellite Components Only)

The reliability of the satellite system was affected by:

- line dropouts during conversation without disconnect tones (i.e. the line appeared "live" but no voice contact was possible)
- loss of dial tone on the satellite terminal phone
- loud slow intermittent busy tone received when a satellite link was established
- failure on the lm earth station uplink
- loss of spacecraft signals.

The outage time was approximately 10% of the available satellite time, and a significant portion of the failures occurring during Phase I. Such outages were consistent with the experimental nature of the Hermes project, and did not adversely affect the successful completion of the Ontario Government Multi-Ministry Program.

Transmission Delay

The inherent transmission delay of ½ sec. characteristic of geosynchronous communication satellite systems had no significant impact on the effectiveness of voice interaction over the various systems tested. However, the transmission delay did influence the manner in which the interaction took place. The need to hear the talking party through, with less interjection by the other party, quickly became apparent. Also this requirement became progressively more important the greater the number of nodes involved in the conference network. In some respects it was advantageous to have one party control the conversation flow during a conference. Generally, those not familiar with talking over the Hermes system needed an initial adjustment period of ½ to 1 minute, to reach a comfortable level of verbal interaction. For slow-speed facsimile and teletypewriter systems, no operational problems could be attributed to the transmission delay of the satellite.

INSTALLATION, DISASSEMBLY AND TRANSPORTATION OF ONE-METRE EARTH STATION

A total of 12 installations and subsequent disassemblies of the 1m earth station were made during this program, with the following results:

- In good weather, two trained persons can assemble or disassemble the 1m terminal in 3 to 4 hours. This includes the time needed to set the antenna dish at the correct elevation and azimuth.

- Flexible waveguides were provided to allow the antenna to be adjusted over a range of angles. However, this flexibility, coupled with the weakness and weight of the assembly, makes the waveguides very difficult to handle during installation and disassembly.

- Due to the weight of some of the equipment components and the packages, and the characteristics of the waveguide assembly, installation or disassembly by one person is not recommended.

- If, as was the case for most installations, a wooden base has to be constructed for the earth-station, then additional time must be allowed for this task. Depending on where the installation is to be made (rooftop, elevated platform, ground installation, etc.) the assembly time required can vary from 4 to 24 hours.

- While computer readouts of look angles were provided to facilitate successful installation at a number of locations, no difficulty was encountered when such tasks were undertaken at other locations without the benefit of a precise computer readout. A simple interpolation of previous look angles provided enough information to complete the task.

- The training involved for installation and disassembly of the 1m earth station can be easily administered and completed. After one day's practical experience, technicians had no difficulty in completing these activities.

- The earth station was shipped over 4,000 miles by road and 1,000 miles by air from one experiment location to another. Transporting the terminal via road using pick-up or van, or via air using a Twin Otter, was not too difficult. For air-transport in particular, shipping would be facilitated if the weight and volume of some of the larger crates (e.g. the antenna assembly), could be reduced.

STATION OPERATION, MAINTENANCE AND RELIABILITY - ONE-METRE EARTH STATION

Findings regarding the operation, maintenance and reliability of the lm earth station are as follows:

- Operation of the terminal is very simple once a few procedures are learned. Establishing and terminating a call over the satellite system is as simple as using a touch-tone phone.

- Provided there is back-up equipment, the training necessary for a technician/operator to keep the system in good working order is simple and straightforward - one day's training should suffice. However, if no such equipment redundancy exists, then more extensive training would be necessary to allow the operator/technician to "trouble shoot" the terminal unassisted. This is very important for terminals which may be operated in remote areas where regular communication services are unavailable.

- Subjectively, no difference in operational performance of the earth station was observed in city (Toronto, Thunder Bay) or remote (Pickle Lake, Winisk, Dryden, Sioux Lookout) locations, during rainy or dry conditions, or when powered from standard mains supply or from a gasoline generator.

- Equipment reliability was affected by a number of problems in the electronic packages (both indoors and outdoors). While considered not up-to-standard for operational services, the reliability was nevertheless rated acceptable for experimental services.

- In spite of the operational flexibility of the 1m earth station the high transmitter energy, which could be hazardous to the human body under certain circumstances, is considered the most critical factor in determining where and under what conditions the terminals could be used for providing service.

MULTI-MINISTRY APPLICATIONS

The following sections highlight the results achieved with these experimental Hermes systems, with particular reference to technical and operational aspects and to the reaction of those who participated in demonstrations or trials of the system.

Administrative

Significant findings in the area of administrative applications were as follows:

- A very high level of success with voice interaction was achieved with 3 basic network configurations: point-to-point, multi-point and teleconference. (Note: A distinction is made between multi-point conference and teleconference. The former involves one active party at each point while the latter can involve more than one active participant at each point.)

- A hybrid satellite-switched network configuration was also tried in the experiment but this was rated only fairly successful for voice interaction. Our conclusions are that the switching characteristics of the echo suppressors did not permit effective interaction.

- Facsimile transmission on both point-to-point and "broadcast" (multi-point) modes proved very successful with good quality copies received at 3, 4 and 6 minute speeds.

- A variety of documents were transmitted (i.e. photographs, weather maps, typed and handwritten documents, finger prints, etc.) with the limit on quality depending more upon the resolution capabilities of the facsimile machines than the quality of the Hermes network. This latter comment is particularly relevant to specialized application areas where high resolution is required. The facsimile was of unacceptable quality for fingerprint transmissions, insofar as the resolution requirements for identification purposes was concerned.

- Point-to-point, interactive communication between teletypewriter devices (maximum speed 300 baud) and between computer and teletypewriter worked well, provided the network was a 4-wire configuration. Attempts to use a hybrid satellite/switched network configuration for Canadian Police Information Centre transactions did not prove very successful.

- In the area of teleconferencing, three basic system configurations were tested; two-way audio only, two-way audio and one-way video, and two-way audio and two-way video. A high level of satisfaction was achieved both in terms of system performance and user reaction to the potential capabilities of the Hermes system in general, and teleconferencing in particular.

- Except for problems of echo, which occurred in some instances when the microphones at both nodes were open, the audio quality was considered satisfactory by the majority of the participants.

- In many instances, in spite of the echo, which was considered more of a nuisance than a problem, participants preferred the open-microphone arrangement rather than the press-to-talk one, because the interaction appeared more natural.

- Participants were also pleased with the quality of the picture (black and white).

- For many, the ability to hold discussions with groups of people separated by long distances, was a new experience. It demonstrated to them that teleconference systems can actually work, that it is not as mystifying as originally thought, and that it is easy to become familiar with the system.

- The general feeling was that teleconference systems can play a significant role for activities such as group discussions and meetings, seminars and training sessions, by bringing these about more economically and perhaps on a more timely and frequent basis, where groups of people are separated by large distances. The important requirement now is to plan and organize more effective ways to making use of such systems.

- While time and resources did not permit a full range of teleconference systems and terminals to be investigated, many felt that two-way audio along with facsimile would meet the majority of potential Ontario Government ministry administrative teleconference applications. However, in situations where the subject discussed involved the presentation of visuals, sketches, drawings, etc. - such as a training session or seminars, at least a one-way video capability seemed to be particularly desirable.

- For teleconference activities envisaged by an organization such as OECA, it appears, however, that a two-way audio, two-way video capability is a requirement. (See Towers and Chung-Yan, 1978).

Remote Sensing

In the area of remote sensing, the technical feasibility of monitoring remote air pollution and meteorological data and collecting this data on a real time or demand basis at a central location thousands of miles away, was successfully demonstrated. However, to be effective for applications such as environmental and natural resource protection programs, a highly portable, light-weight ground terminal, capable of operating from a low-power primary-power source (e.g. batteries) is required. Accordingly, although a satellite solution seems to be a logical approach for remote sensing over an area the size of Ontario, the 1m terminal is not judged suitable for this application because of its weight and primary-power requirements.

Mobile Communication Services

While time did not permit exhaustive testing of the back-to-back satellite/VHF mobile repeater system on an operational basis, a number of test trials were successfully performed by technical and operating personnel from the Ministries of Solicitor General (OPP), Health, (Ambulance Services Branch), and Natural Resources (Forest Fire Protection Branch).

A senior OPP official with a portable VHF radio in Toronto, for example, was able to communicate via the satellite-based repeater system, with a VHF base station and a mobile unit in the Thunder Bay area.

With the Ministry of Natural Resources repeater system located in Toronto, very acceptable transmissions were made between mobile units in Toronto and a base station in Thunder Bay. On another occasion, with the Satellite Repeater at a Fire Base Camp (simulated), communication between portable radios in the vicinity of the Camp and the Fire Centre, 100 miles away, was facilitated.

In the case of the Ambulance Services Branch, the extended mobile coverage provided by the satellite mobile repeater at Pickle Lake, enabled effective communications between a land ambulance, and then subsequently an air ambulance, and the Sioux Lookout General Hospital and the Sunnybrook Medical Centre in Toronto.

Emergency Communications

The Hermes experiments demonstrated that the 1m earth station: was relatively simple to install, operate and dismantle; was not too difficult to transport either by land or air using, for example a pick-up or Twin-Otter respectively; and can provide good long haul communication services in the field, even when powered by a small gasoline generator.

While not as portable as standard mobile VHF & HF radio equipment, nevertheless, the flexibility, operating characteristics and long range point-to-point and broadcast services that are possible with these terminals make them very useful candidates for the provision of emergency communication services in disaster or emergency situations; given improvements in equipment reliability, waveguide design, assembly and shipping weight.

Telemedicine

The telemedicine experiments demonstrated that it is technically feasible to transmit both high quality voice and a patient's vital sign signals (only heart beats were transmitted) from the scene of an accident in a remote area (outside the village of Pickle Lake) or from a land or air ambulance, for interpretation by specialists located at a distant medical centre (both the Sunnybrook Medical Centre and the Sioux Lookout General Hospitals were involved).

With suitable refinements and augmentation, a telecommunication network can be developed to link medical outposts with better equipped and staffed centres, to conduct both routine and special activities such as medical consultation, continuing medical education, and administrative or medical conferences.

CONCLUSIONS AND RECOMMENDATIONS

The Ontario Government's involvement in the joint Canada/U.S.A. Hermes Project has been a valuable and rewarding experience. The Multi-Ministry Program has demonstrated that the power of this new type of communication satellite and its flexible earth stations can be utilized to provide new alternatives to solving old problems.

The ability of the satellite system to effectively manage voice, video, facsimile and various forms of data, makes it an ideal general-purpose communication system that can be integrated with existing telecommunication facilities such as landline, microwave and mobile radio systems, to provide a wide range of communication services to meet public service requirements in areas such as administration, education and training, health, environmental and natural resources protection, disaster operations, ambulance and law enforcement services.

It must be recognized however, that within the constraints of the Program, it was possible to demonstrate on a limited basis only, how telecommunications via satellite can be applied in meeting many of the administrative and operational needs of Ontario Government Ministries. An in-depth study of the cost and effectiveness of systems and applications is essential before any final decisions can be reached regarding the systems' feasibility in a fully-operational environment.

In summary, it is recommended that:

- further exploration and study of the cost effectiveness of a multi-purpose satellite-based network, designed to provide a range of services including teleconferencing, tele-education, telemedical and extended mobile radio dispatching, be undertaken

- in order to achieve any meaningful results in the above endeavour, access to satellite services should be available on continuous basis

- particular attention be paid to maintaining and further improving, to the extent possible, the size, portability and flexibility characteristics of the Hermes satellite ground stations

- in exploring the social and economic benefits of satellites in general, and 12/14 GHz satellites in particular, the spirit of cooperation between the Federal Government Department of Communications and the Ontario Government be recognized and maintained.

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SATELLITE DISTRIBUTION EXPERIMENT: SOUTHERN EDUCATIONAL COMMUNICATIONS ASSOCIATION (SECA)

N.W. Willett

Southwest Texas Public Broadcasting Council

Austin, U.S.A.

La Southern Educational Communications Association (SECA) est un organisme de services et une maison de production du sud-est des Etats-Unis. Réunissant des sociétés de radiodiffusion à but non lucratif, la SECA dispose du plus important des cinq réseaux régionaux de stations publiques de télévision aux Etats-Unis. Dans le cadre du programme Hermès, elle se proposait de distribuer par satellite, à un certain nombre de stations dispersées sur un vaste territoire, des programmes de télévision selon un horaire pré-établi. Ses expériences doivent débuter le 6 décembre 1977 et elle transmet actuellement en direction de 10 stations terminales desservant 44 stations de télévision. La SECA diffuse normalement 12 heures d'émission par semaine réparties également entre des programmes éducatifs et des programmes pour adultes. L'expérience a connu beaucoup de succès jusqu'à maintenant, malgré diverses contraintes au plan de l'équipement terrestre, et a permis aux stations de télévision participantes de présenter à leur auditoire des programmes qu'elles n'auraient pu obtenir autrement.

EXPERIMENT SUMMARY

Before describing the television distribution experiment being conducted by SECA, the Southern Educational Communications Association, perhaps it would be well to first describe SECA and how it relates to broadcasting in the United States. SECA is a service and production organization of non-commercial broadcasters in the southeastern United States (Fig. 1). The membership area includes Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Oklahoma, and Missouri. The members are engaged within this area in public broadcasting, instructional broadcasting, closed-circuit or

Figure 1

limited-access distribution, and studio production in support of these activities. Founded in 1967, it is the largest of the five regional networks of U.S. public-television stations, in terms of both geographical area and viewer population. The 65 million people within the area are served by 98 public-television stations. This does not include translators or Instructional Television Fixed Service (ITFS) stations. These stations are operated by 26 licensees. (Several of the licensees are state networks that operate more than one station.) The 26 members cover every field from community-supported public-television stations to a medical college, from state networks to a public-school instructional channel.

One of the major services offered by SECA is the acquisition or production of program material, and its distribution to member stations for broadcast. Historically, this distribution has been accomplished by use of a small block of time available for this purpose on the Public Broadcasting Service (PBS) terrestrial network. The PBS network is configured so that it may be divided into 5 smaller networks with simultaneous origination from each of the 5 regional centers.

A few years back SECA found itself in a dilemma. SECA stations were quite active in their production efforts, so there were more programs to distribute. At the same time the PBS was increasing its own distribution, leaving less open time for use by the regional networks. Several alternative solutions were investigated. Tape would not permit live distribution, and would present duplication problems. Also, erratic parcel-delivery service made that prospect less than inviting. Linking of existing state-operated terrestrial systems was deemed to be costly, erratic in its operation, and would serve a disappointingly small percentage of affiliated stations. Leased common-carrier services over such large geographic area were out of reach financially.

The SECA engineering committee suggested satellite distribution as being cost effective as well as providing an extremely high quality end product. An experiment was proposed using the high-power transponder in the Hermes satellite to study several parameters. Satellites were not new to broadcasting, they have been used in television since the orbiting of Telstar in 1962. However, their use had been limited to occasional special programs, on a point-to-point basis. The satellite relayed the program from its point of origination to network headquarters, where distribution to stations was accomplished by conventional terrestrial systems. SECA proposed to deliver programs via satellite on a pre-scheduled basis to multiple addresses over a wide geographic area (Fig. 2). The Hermes satellite offered an excellent vehicle for the SECA experiment. The antennas could be oriented to provide almost perfect coverage of the SECA region. All stations desiring to participate could be nicely fitted into the -3dB coverage curve. This, along with the high IERP produced by the 200w transponder, would allow the experiment to be conducted with relatively low-cost ground equipment without sacrifice of quality.

After acceptance of the SECA proposal by NASA, equipment procurement and installation occupied the time until December 6, 1977 when experimentation was to begin. The SECA transmissions are currently received at 10 terminals that service 44 television stations. A typical week has a schedule of 12 hours, divided equally between instructional programs and those aimed at an adult audience.

The original plan was to transmit all material from network headquarters in Columbia, South Carolina; other stations would be converted to also provide uplinks at a later time. Actually, problems arose in the procurement of the transmitting equipment for Columbia, and a temporary arrangement was made whereby SECA would install a 3-hop terrestrial microwave link from Columbia to a NASA installation in Rosman, North Carolina, so that Rosman could provide interim uplink service. Manufacturing problems delayed delivery of the Rosman transmitter well over a year, so yet other uplink arrangements had to be made. Virtually all SECA programs to date have originated from tapes shipped to Cleveland and fed to the satellite by the NASA staff at the Lewis Research Center.

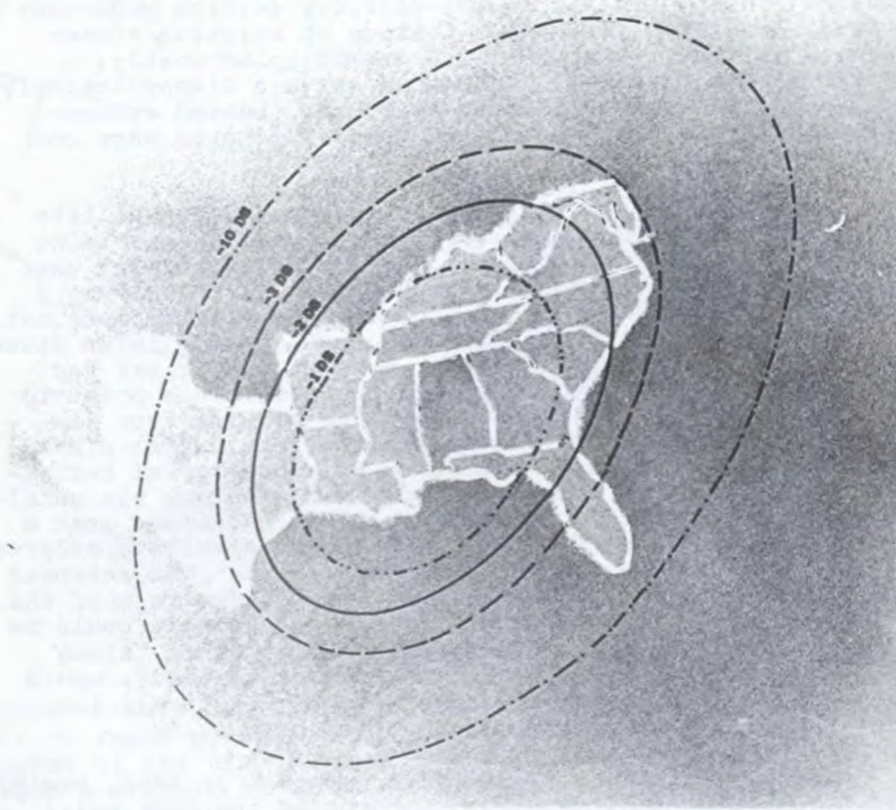

Figure 2

The Rosman transmitter is now in place, but has not yet proven stable. Service to the SECA stations will likely be provided by a combination of Cleveland and Rosman until April or May 1978, when the SECA station in Columbia is expected to provide the uplink service.

In spite of limitations imposed by the uplink situation, the experiment has been quite successful, utilization has been high and the system has allowed distribution of programs that otherwise would not have been available to the stations. Of particular interest to the stations has been the use of the system to send preview or pilot programs for screening and balloting by the programming staff of the stations prior to scheduling.

The only real disappointment has been the decision of the instructional group to discontinue the morning feed destined for classroom use. This decision is in no way a damnation of satellite distribution. It is totally the result of the specific Hermes time-division schedule. The classroom teachers objected strongly to the alternate-day schedule, particularly when the days were to be switched on a quarterly basis. Instructional programs will continue to be scheduled, but as enrichment material only. These will be delivered during evening hours and will be recorded by the stations for re-play at the convenience of the class-room teachers.

The hardware used in the SECA locations may be somewhat larger than those used by many U.S. experimenters. The goals of the experiment demanded that the system deliver extremely high quality video and audio, with very high reliability. The SECA engineering committee, with considerable assistance from NASA, developed a specification to be used in the purchase procedure. Bids were taken on a mass purchase, although payment was from the individual stations as the equipment is all locally owned. Some stations use 3 metre diameter antennas, others use 4.5 metre units, depending on their distance from beam center. Also, any station considered for conversion to uplink was initially equipped with a 4.5 metre antenna in order that spacecraft transponder saturation might be achieved with lower-power transmitters. Consideration was also given to future use with other satellites.

To achieve optimum results from the 4.5 metre antennas (which have a rather narrow angle of signal acceptance) they are equipped with an automatic centering system which senses received-signal strength and aligns the antenna in azimuth and elevation for maximum signal. The 3 metre antenna systems are also equipped with electric motor drive, but these antennas are aligned manually, using a signal-strength meter. The receivers are tuned to the high-power transponder only, and require a signal from this transponder for antenna alignment.

The receiver electronic systems were manufactured by Farinon Electric Corporation of California and are modified from a standard fixed-tuned terrestrial microwave receiver. The modifications include the addition of a low-noise amplifier to achieve maximum signal-to-noise ratio. The receiver noise figure is 4.5dB. The electronics is in two portions with the preamplifier, oscillator, mixer, and some IF amplification in a weather-tight housing affixed directly to the antenna. A 70 MHz cable connects to the second portion of the electronics which contains all output sections including video clamping, provisions for video polarity reversal, and two audio subcarriers. The audio subcarriers were chosen at higher frequencies than most Hermes experimenters in order to ensure less interference with the video signal. The two audio channels may either be two discreet channels for two separate languages, or alternatively they may be used as left and right channels for stereophonic broadcasting.

The technical performance of the system meets or exceeds objectives. Video signal-to-noise is approximately 50dB. The audio signal-to noise ratio is 55dB or better. The numbers given here are the results of rather crude measurements and are conservative. Definitive point-to-point signal analysis has not been possible to date due to the uplink arrangements. We do feel that what small signal degradation we see is the product of the ground equipment; the space segment appears to be essentially transparent. Reliability has been quite good. Initially we were concerned over atmospheric disturbances at the high operating frequencies. Because of this we added several extra dB margin in our link calculations. To date two of our stations have reported deep fades of short duration during heavy local storms. On two other occasions we have had deep fades that we could not explain. This is during 11 months of operation at approximately 12 hours per week.

I do not mean to imply we have a perfect record of program delivery. We have had our share of equipment failures, lost tapes, and poor antenna orientation, but those cannot be blamed on the system. Suffice it to say that the results thus far are quite satisfactory for the intended purpose, indeed they are superior to any that could be obtained from common carrier terrestrial services, regardless of cost.

SECA looks to the future with optimism. The original experiment time is almost over, however we are making application for a follow-on project to allow completion of some phases, and to investigate new areas. Funding arrangements are being negotiated this week to complete the funding for a new project which will include the Columbia uplink, a portable uplink, and six additional receiver locations.

Thus far all the SECA activities have been in television. Two months ago a radio division was formed. One of the factors in the decision to form this group was the possibility of experimental distribution of stereophonic program material with transmission quality not attainable from common carriers. Now being planned is a series of live musical events, not only by television, but with stereo sound carried by companion FM stations. During the second phase of experimentation a strong emphasis will be placed on live pick-up of events at their point of origination, either as complete programs, or for inclusion into those and larger programs.

During 1978 the PBS Network will begin converting its entire distribution to satellite. Service will be provided in the 4 GHz band using the Westar satellites. All SECA stations are PBS members, and as such will have access to a multi-channel receiver. Also, an uplink for this service will be installed at our network headquarters in Columbia. This will add greatly to transmission flexibility, and should make more time available for regional use from PBS. The arrival of this service is not expected to lessen our interest in high-frequency, high-power satellites; on the contrary we expect the current experiments to point up the need for such service to increase, particularly for field pick-up work where small easily-portable equipment is a must. Our only hope is that the Public Service Satellite Consortium and other like agencies will have operational class hardware available by the time SECA is ready to move out of the experimental category.

HERMES: A SATELLITE DELIVERY SYSTEM FOR DISTANCE EDUCATION: NOTES ON WORK IN PROGRESS

Patricia Carney and Gene Lawrence

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La Colombie-Britannique est parmi les derniers participants à se joindre au programme d'expériences réalisées avec le satellite Hermès. Notre principal objectif es d'utiliser les maisons d'enseignement existantes comme principaux foyers de diffusion d'enseignement à distance. Ainsi, le premier but recherché etait d'étudier l'utilité d'une agence centralisée de télé-enseignement en Colombie-Britannique qui coordonnerait les activités basées sur un groupe coopératif. Le groupement qui devait parrainer l'expérience, le Distance Education Planning Group (DEPG), n'a été constitué qu'en mai 1977 et il n'a été possible d'avoir accès au satellite Hermès que vers la fin juin. Pourtant, trois mois et deux jours après ses démarches initiales auprès du Ministère des Communications (MDC), la Colombie-Britannique (C.-B.) lançait une expérience de télé-enseignement comportant 64 heures d'émissions en couleur diffusées vers 6 stations à travers la C.-B. sur une période de 8 semaines se terminant vers la mi-décembre 1977.

Le projet réunit une variété de participants, de programmes et de systèmes de diffusion. On compte des universités, un institut de technologie, des collèges communautaires, un camp de bûcherons éloigné, des organismes de santé publique et un hôpital, un centre culturel autochtone, des associations de bibliothèques, ainsi que l'Office national du film du Canada. Divers modes de télécommunication terrestre et par satellite sont utilisés pour transmettre une gamme étendue de programmes.

Nos conclusions, jusqu'à maintenant, sont essentiellement positives. Le télé-enseignement par satellite devrait se faire sélectivement et s'inscrire dans le cadre d'un

système intégré de télécommunications. La possibilité d'interaction semble être la caractéristique la plus importante de cette technologie. Elle ressort, paradoxalement, comme l'élément le plus satisfaisant et le plus frustrant. Le rôle d'animateur/tuteur au point de réception est peut-être le plus important facteur de succès ou d'échec du programme.

INTRODUCTION

British Columbia was a late entry among Hermes experimenters. The experiment sponsor, the Distance Education Planning Group (DEPG) was not organized until May 1977 and the opportunity to access the Hermes Satellite program did not arise until late June. Yet, three months and two days following the initial contact with the federal Department of Communications (DOC), British Columbia (BC) launched a tele-education experiment involving 64 hours of color programming at 6 sites throughout BC, over an 8-week period ending in mid-December 1977.

The BC tele-education experiment involves several features of interest to other Hermes experimenters. They include:

1. The range of participating agencies, which number more than 20 at mid-point in the experiment. All 3 provincial universities, the major provincial technical institute, a remote logging camp, several community colleges, BC's largest hospital, several public-health associations, a native Indian cultural centre, several library associations, the National Film Board of Canada, and others were among the participants.

2. The range of programming, which includes workshops on family law and social services delivery, public-health forums, a medical "grand rounds" format, worker training and production processes in the forest industry, a forest fire-fighting simulation exercise, on-line searching of computer data banks for librarians and others.

3. The range of deleviry systems, which includes, the Hermes satellite, 3 community cable systems, 4 community colleges, a radio-telephone system and terrestrial telephone systems.

Given the time and cost constraints, such a comprehensive program required intensive co-operation among all participating agencies. The incentive was the unique opportunity to gain "hands on" experience in an exciting new technology. Our hope was that this technology might help to deliver education at a distance to British Columbia residents who are spatially or socially isolated from traditional institutions of learning.

These notes, prepared at mid-point in the experiment, outline the program's objectives, the methodology involved in mounting the program, and some observations pending final evaluation.

OBJECTIVES

The Satellite Tele-education Program (STEP) was initiated as a demonstration project by the DEPG to explore the possibility of using existing educational institutions as the prime delivery system for distance education. Thus the first objective was to test the utility of a centralized distance education agency in BC to co-ordinate activities on a consortium basis.

This objective was achieved by networking the province's major educational institutions and systems as participants in the Hermes experiment under the aegis of the DEPG. Specific programs were developed by the three universities, (The University of British Columbia, University of Victoria and Simon Fraser University), the British Columbia Institute of Technology and Fraser Valley College. Northern Lights College at Dawson Creek, North Island College at Campbell River, Okanagan College at Kelowna and Fraser Valley College at Chilliwack, all served as delivery agents in their own communities. Other colleges, such as Douglas College in New Westminster, Malaspina College at Nanaimo and the College of New Caledonia at Prince George contributed services, program materials and research assistance.

A second major objective of STEP was to test the feasibility of using satellites as a distance education mode, both technically and from an instructional perspective. This objective was partially met, since the technical delivery of educational programming has proved to be entirely possible via satellites. However, the severe time constraints did not permit us to develop educational programming which could be offered for credit and tested for instructional validity We hope to meet this challenge when the Anik B experimental satellite becomes available.

Given the technical orientation of the Hermes experiment, a third major objective was to test the various configurations of satellite-based distance-education systems, including hardware aspects (cable television systems, telephone links, classrooms, etc.) and audience aspects (size and spatial distribution of groups). This particular objective was achieved through a variety of methods, including:

1. Use of radio telephone for interactive communications from a remote logging camp, accessible only by airplane and water taxi.

2. The linking of community cable-television studios and systems and college classrooms.

3. The use of a cable-television system accessed through an educational resources centre.

4. The use of telephone systems to link the cable-television audience with the satellite-based systems.

5. The linking, via satellite, of computer terminals located at several test communities with centralized computer at the University of British Columbia, which in turn was linked with computer systems elsewhere in North America.

In general, all the configurations examined proved to be technically feasible, although areas for improvement were quickly identified. These include the need for more easily operated hand microphones as well as more efficient methods of linking cable-television audiences with programmers located in our central studio. Given the range of networked modes, one of the unresolved technical problems was the inability of programmers in the central studio to ascertain easily the number of people at each site seeking to "talk back" via the interactive communications system.

A fourth major objective was to raise the level of awareness about distance education (what it is), distance education techniques (how it may be achieved), and the nature of the demand for distance education (the target audience) on a province-wide basis.

Due to the high profile of the STEP experiment in the test communities this objective was clearly reached. The adventure was accompanied by wide-spread publicity in the media. Some of the local community animators wrote regular reports in their community newspapers and the views of participants on the performance of the system were disseminated, often with unnerving candor, throughout the community cable systems. Politicians at all levels of government participated in the experiment at most sites and on several occasions.

These major objectives were augmented by various auxiliary goals, mainly related to the technical aspects of satellite delivery. The experience gained with Hermes will enable us to tackle the prime objective of our proposed

Anik B tele-education program, which is to design interactive educational programming for satellite delivery as part of a comprehensive distance-education system in BC.

METHODOLOGY

Although the members of DEPG had a broad background in communications, no member of the group had had access to satellite-based tele-education technology prior to Hermes, nor was there time to benefit from the recent experience of other experimenters. However, the group was networked into various educational committees and institutions within the province. In addition, BC experimenters received unstinting support and encouragement from members of DOC's space systems directorate in Ottawa. Through the directorate, we were also able to obtain the assistance of Murray Richmond, a member of DOC's national evaluation team for the Hermes program, who helped to ensure that the BC evaluation model was compatible with the model developed for the national evaluation.

Utilizing the concept of "planovation" or planning for innovation developed by Kalba, 1974, the BC experimenters developed an organization chart and a time line, as in figures 1, 2 and 3.

Within this framework, the following methodology was developed.

A. SITE SELECTION

BC has no provincially operated microwave system for over-the-air broadcasting, but the province has an extensive network of community cablevision systems, particularly in the heavily-populated regions. Four test communities spatially distributed throughout the province, were selected. Three have a community cablevision system; one does not. Later it became feasible to add an industrial site, a remote logging camp with extremely limited communications links. Selection in each case was with the prior approval of the local regional college, which as the delivery agent would have to bear the brunt of the workload at the delivery end of the system.

B. PARTICIPANT SELECTION

The experimenters' objective of testing consortium delivery systems required the largest possible range and number of participating educational institutions. Therefore all major institutions were invited to participate and other agencies became involved as interest in satellite

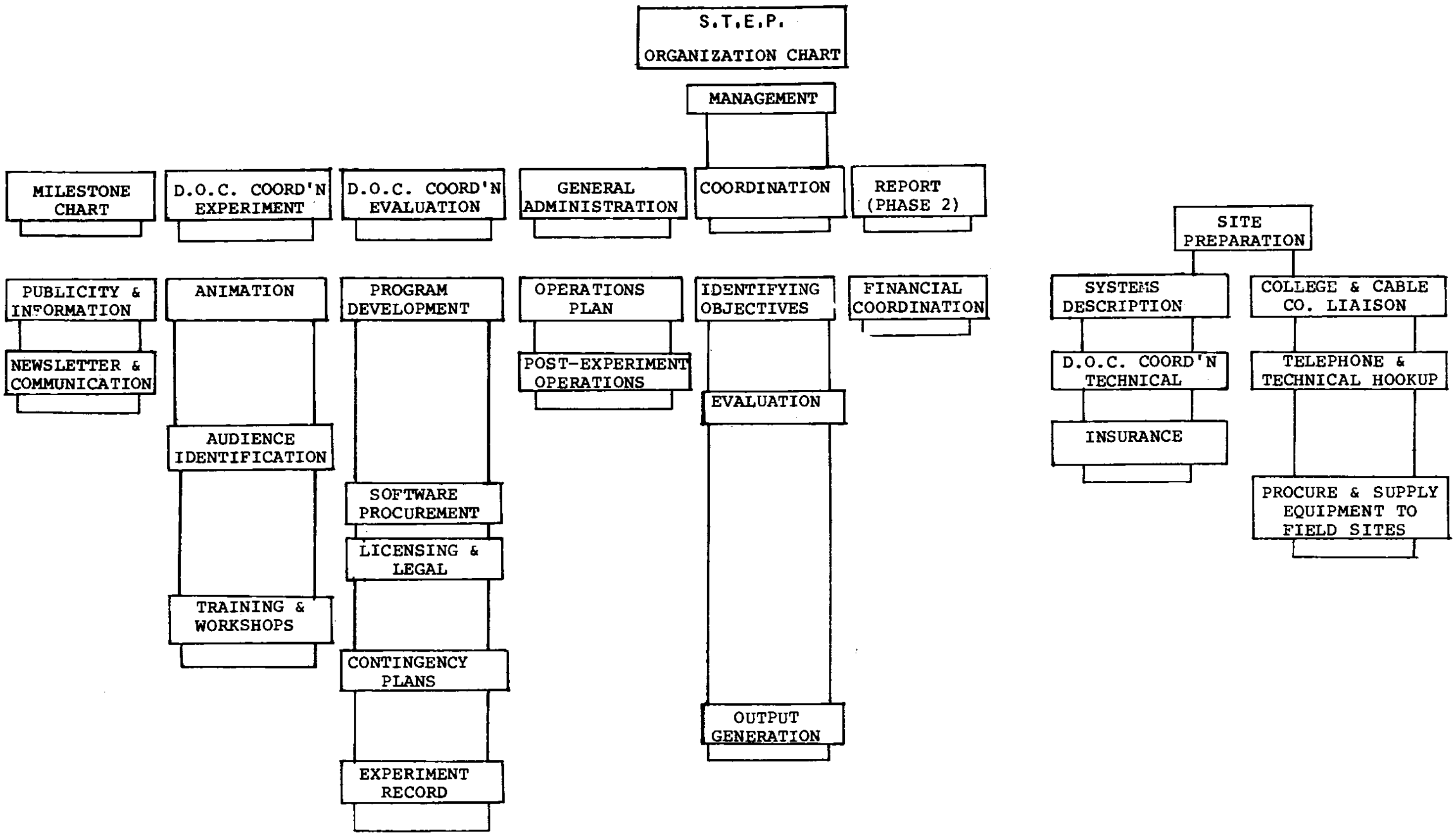
S.T.E.P.
ORGANIZATION CHART
MANAGEMENT
MILESTONE CHART
D.O.C. COORD'N EXPERIMENT
D.O.C. COORD'N EVALUATION
GENERAL ADMINISTRATION
COORDINATION
REPORT (PHASE 2)
SITE PREPARATION
PUBLICITY & INFORMATION
NEWSLETTER & COMMUNICATION
ANIMATION
AUDIENCE IDENTIFICATION
TRAINING & WORKSHOPS
PROGRAM DEVELOPMENT
SOFTWARE PROCUREMENT
LICENSING & LEGAL
CONTINGENCY PLANS
EXPERIMENT RECORD
OPERATIONS PLAN
POST-EXPERIMENT OPERATIONS
IDENTIFYING OBJECTIVES
EVALUATION
OUTPUT GENERATION
FINANCIAL COORDINATION
SYSTEMS DESCRIPTION
D.O.C. COORD'N TECHNICAL
INSURANCE
COLLEGE & CABLE CO. LIAISON
TELEPHONE & TECHNICAL HOOKUP
PROCURE & SUPPLY EQUIPMENT TO FIELD SITES

Figure 1

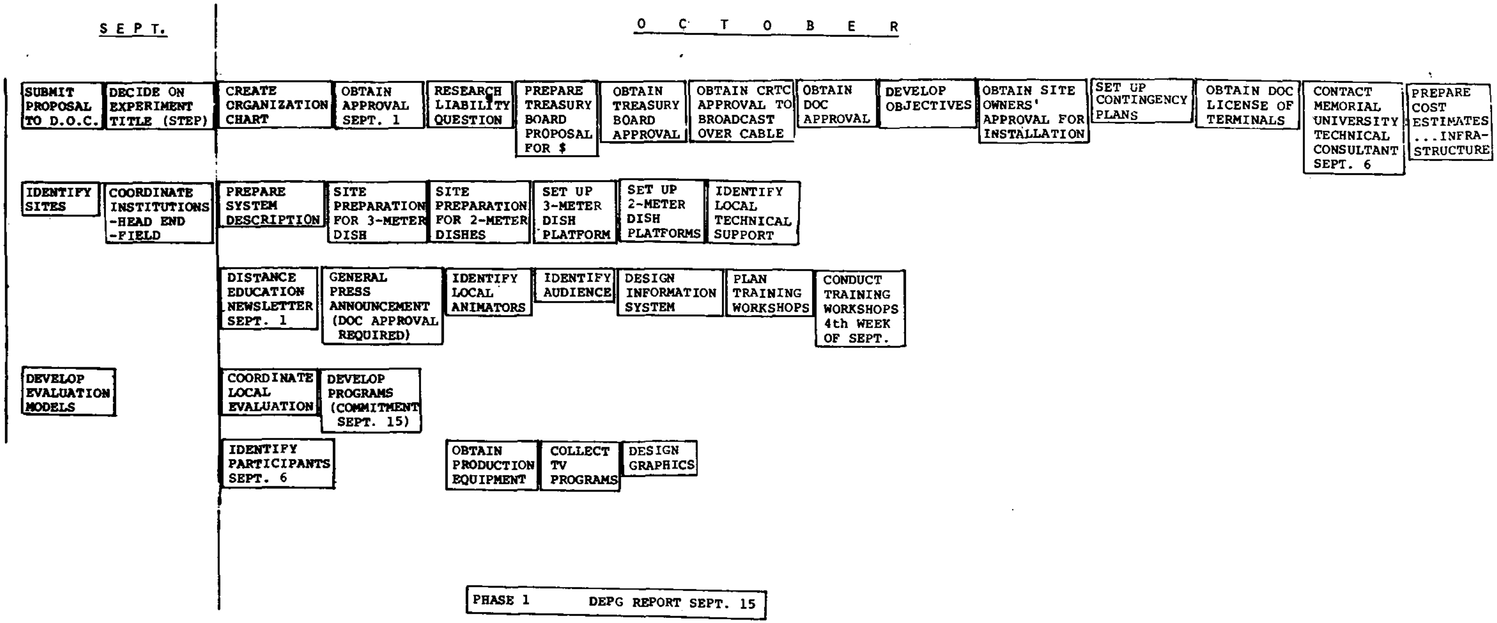
SEPT.
OCTOBER
SUBMIT PROPOSAL TO D.O.C.
DECIDE ON EXPERIMENT TITLE (STEP)
CREATE ORGANIZATION CHART
OBTAIN APPROVAL SEPT. 1
RESEARCH LIABILITY QUESTION
PREPARE TREASURY BOARD PROPOSAL FOR $
OBTAIN TREASURY BOARD APPROVAL
OBTAIN CRTC APPROVAL TO BROADCAST OVER CABLE
OBTAIN DOC APPROVAL
DEVELOP OBJECTIVES
OBTAIN SITE OWNERS' APPROVAL FOR INSTALLATION
SET UP CONTINGENCY PLANS
OBTAIN DOC LICENSE OF TERMINALS
CONTACT MEMORIAL UNIVERSITY TECHNICAL CONSULTANT SEPT. 6
PREPARE COST ESTIMATES ...INFRA-STRUCTURE
IDENTIFY SITES
COORDINATE INSTITUTIONS -HEAD END -FIELD
PREPARE SYSTEM DESCRIPTION
SITE PREPARATION FOR 3-METER DISH
SITE PREPARATION FOR 2-METER DISHES
SET UP 3-METER DISH PLATFORM
SET UP 2-METER DISH PLATFORMS
IDENTIFY LOCAL TECHNICAL SUPPORT
DISTANCE EDUCATION NEWSLETTER SEPT. 1
GENERAL PRESS ANNOUNCEMENT (DOC APPROVAL REQUIRED)
IDENTIFY LOCAL ANIMATORS
IDENTIFY AUDIENCE
DESIGN INFORMATION SYSTEM
PLAN TRAINING WORKSHOPS
CONDUCT TRAINING WORKSHOPS 4th WEEK OF SEPT.
DEVELOP EVALUATION MODELS
COORDINATE LOCAL EVALUATION
DEVELOP PROGRAMS (COMMITMENT SEPT. 15)
IDENTIFY PARTICIPANTS SEPT. 6
OBTAIN PRODUCTION EQUIPMENT
COLLECT TV PROGRAMS
DESIGN GRAPHICS
PHASE 1 DEPG REPORT SEPT. 15

Figure 2

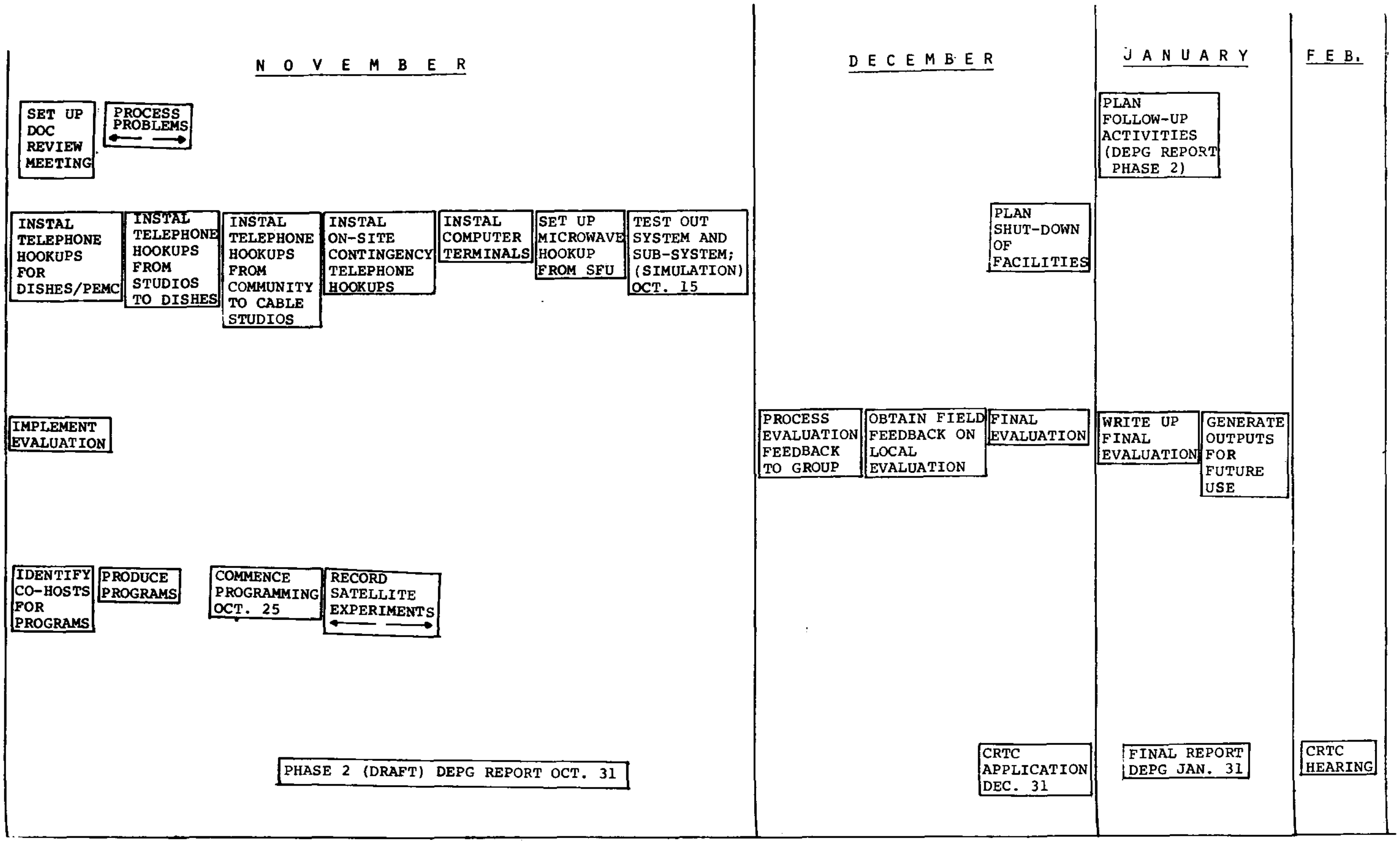
NOVEMBER
DECEMBER
JANUARY
FEB.
SET UP DOC REVIEW MEETING
PROCESS PROBLEMS
INSTAL TELEPHONE HOOKUPS FOR DISHES/PEMC
INSTAL TELEPHONE HOOKUPS FROM STUDIOS TO DISHES
INSTAL TELEPHONE HOOKUPS FROM COMMUNITY TO CABLE STUDIOS
INSTAL ON-SITE CONTINGENCY TELEPHONE HOOKUPS
INSTAL COMPUTER TERMINALS
SET UP MICROWAVE HOOKUP FROM SFU
TEST OUT SYSTEM AND SUB-SYSTEM; (SIMULATION) OCT. 15
IMPLEMENT EVALUATION
IDENTIFY CO-HOSTS FOR PROGRAMS
PRODUCE PROGRAMS
COMMENCE PROGRAMMING OCT. 25
RECORD SATELLITE EXPERIMENTS
PHASE 2 (DRAFT) DEPG REPORT OCT. 31
PLAN SHUT-DOWN OF FACILITIES
PROCESS EVALUATION FEEDBACK TO GROUP
OBTAIN FIELD FEEDBACK ON LOCAL EVALUATION
FINAL EVALUATION
CRTC APPLICATION DEC. 31
PLAN FOLLOW-UP ACTIVITIES (DEPG REPORT PHASE 2)
WRITE UP FINAL EVALUATION
GENERATE OUTPUTS FOR FUTURE USE
FINAL REPORT DEPG JAN. 31
CRTC HEARING

Figure 3

communications technology grew. Very few agencies failed to respond to our invitation.

C. PROGRAM SELECTION

The potentially thorny issue of control over program selection was avoided in this case by the experimental nature of the project. Participants were asked to develop programming based on their particular needs and goals.

The British Columbia Institute of Technology wanted to experiment with delivery of vocational training at a distance, and produced 8 programs dealing with forestry, BC's largest industry. Fraser Valley Community College was interested in producing programming which might be used in other college regions, and developed a series for senior citizens. The college's senior citizen advisory committee rejected the programmer's proposal to build the series around such traditional senior-citizens concern as health care and pensions, and substituted a series which dealt with native land claims, women's rights, agribusiness and other current issues. The University of Victoria, which is interested in the distant delivery of education in the social services field, developed a series which experimented with a number of delivery techniques, such as workshops, off-air group discussions, and "soap opera" presentation of material. The various library associations explored a number of relevant themes including old-book collections, term-paper clinics and on-line computer searching. The University of British Columbia, in conjunction with local arthritis, heart, and diabetes associations, developed public forums on health care.

Few program ideas were repeated, and the programming format was constantly reviewed and revised in response to the suggestions of viewing audiences.

D. AUDIENCE SELECTION

The task of identifying the local target audience for each program was primarily the responsibility of animators retained by DEPG through the regional college. The animators also handled local publicity, operated the equipment, and encouraged the audiences to interact with the group presenting a program. They proved to be a vital force in identifying problems and developing new program formats, since their audience "voted with their feet" if they did not like a certain method of presentation. The animators, who were part of the DEPG delivery system, also were responsible for local evaluation. Naturally they were overworked.

E. EVALUATION

The DEPG evaluation model dealt with the interactive component and technical aspects of the experiment, such as audio quality and clarity of picture. Individual programmers were responsible for evaluating program content. The evaluation process was set in place at the beginning of program, which permitted early results to be recycled into the programming formats. Not surprisingly, audience satisfaction appeared to increase as we were able to design programs more suited to an interactive communications mode. Ironically, this process was most useful to late-entry participants to the satellite program, since the initial programmers were often committed to the videotaped material utilizing traditional educational television formats. The late entries were able to design their programs to fit the emerging requirements of the audiences. No attempt was made to measure "success" or "failure"; if a format or technique did not work, others were tried instead to push the technology to its limits.

F. TRAINING

The whole experiment was perceived as "hands on" training in satellite technology. A workshop was held for all participants, including the community animators and the cable-television system operators, to acquaint us all with the program goals. The two-week period prior to the start of the satellite delivery programming was used for dry runs of the whole system, to acquaint ourselves with the necessary on-air techniques. A post-experiment workshop is planned to review the evaluation results and develop some program and delivery parameters for the next satellite programming.

During the initial teleconferences, the concept of vocational education at a distance received some unexpected support when the animator at Chilliwack reported that the only operator who knew how to shut off the equipment was out of town. The Provincial Educational Media Centre technical supervisor rolled similar equipment on to the studio floor, and illustrated the shut-down procedure to the Chilliwack animator via the satellite.

G. FINANCING

Since it was set up primarily as a research group, DEPG did not have project funds of its own to commit to the experiment. Supportive Ministry of Education personnel received a provincial grant of $50,000 for installation of telephone lines to the earth stations, the workshops and the community animators. The participating institutions had to fund all other costs from their own resources. Most kept careful records of the amounts of money, time and effort expended so that it will be possible to cost another satellite experiment. The total amount is expected to range between $150,000 and $200,000.

INITIAL CONCLUSIONS

It would be inappropriate to make firm conclusions at mid-point in the experiment pending final evaluation results. However, certain observations can be made.

1. The technology exceeded our expectations in terms of program delivery via Hermes. An echo suppressor developed by PEMC effectively eliminated audio problems, and the quality of the color exceeds that of broadcast television in the lower BC mainland.

2. Satellite delivery of education at a distance should be selectively used and should be part of a multi-modal communications system. Audiences were critical of programs which could be transmitted as effectively by video cassette, telex or other modes.

3. Satellite delivery seems to work best when it is part of a multi-modal system, utilizing tutors at the receiving ends,

workshops or discussions, print materials, etc. The cost of this innovative mode demands that it be used as efficiently as possible.

4. The interactive component appears to be the most significant factor in the use of the technology. It appears to be the element which, paradoxically, most satisfies and frustrates the participants. Those who have the opportunity for effective dialogue appear to be highly pleased. On the other hand, the technology can be extremely counterproductive; people who cannot "get into the act" tend to be dissatisfied and negative, and may even be hostile to the active participants at the other sites. The role of animator/tutor at the receiving end appears to be a critical factor in determining the success or failure of the system. The lack of an animator seems to inhibit people from accessing the system.

5. Programming is a two-way business. The expert, or program originator, requires sufficient time to present the material or else the system becomes merely a video "hot line" for the exchange of personal comments and opinions.

6. Programming for an interactive mode, such as the satellite, requires different formats than those used in traditional "one-way" educational television programming. While a variety of formats from soap opera to simulation were used, the best rule of thumb is to confine video-taped material to a series of brief messages, interspersed with periods of animated interaction. Even simple, "talking head" telelecturers, normally dismal on one-way systems, can be effective on two-way systems.

7. The quality of production and the type of service provided are important. Viewers who are accustomed to programs in color were negative about black and white programs. The use of professional media personnel is as important as the use of qualified academics.

8. The satellite technology appears to have the potential for reducing the sense of isolation often experienced in remote areas. There is equity in the interaction; every site is as accessible as any other. In some programs, the "expert" was located in a test community, instead of at the central studio. He ran the program using the audio-channel only, to the delight of participants who resent centralized transmission of programs from institutions located in the lower mainland area.

One unresolved issue that merits further study is the question of audience size. There may be numerical limits to the number of people who can effectively access the system at each site, and to the number of sites themselves. Of course, these two limits are interdependent. Some programs attracted several hundred people in the studios or classrooms at the community test sites, plus an unknown number of cable television viewers. Only a few people could participate in the interaction.

In future experiments, the BC consortium may attempt to develop regional systems. This would include a central transmitting and receiving station located in a regional centre and linked to a network of receive-only sites at isolated communities within the particular college region. The possibilities are exciting. The hundreds of people in the BC educational system who have been directly involved in the Hermes project are our best guarantee that future opportunities in satellite tele-education will be carefully explored.

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EVALUATION

EVALUATION

A GUIDE TO THE EVALUATION OF THE CANADIAN PUBLIC SERVICE EXPERIMENTS

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Dès le lancement du projet de télécommunication Hermès, l'évaluation de ce dernier revêtait un caractère important aux yeux du ministère des Communications (MDC). Chaque expérience tentée dans le cadre du programme devait comporter une évaluation, soit interne soit externe. Le nombre et la diversité des projets n'ont pas facilité le choix des critères d'évaluation et il a donc été décidé de s'arrêter aux expériences du secteur public. Aux fins de l'évaluation, plusieurs projets ne constituaient pas une expérience, mais plutôt une démonstration. Les résultats recueillis décrivent subjectivement et objectivement les expériences effectuées et serviront pour toute planification et évaluation futures.

Introduction

Project evaluation was recognized as an important factor by the Canadian Department of Communications (DOC) from the beginning of the Hermes communications project. The DOC concern was twofold: major project activities and their effects should be identified and the role of the Hermes experiments should be established in regard to future related developments in the telecommunications and in the public services sectors. Although the evaluation of most of the experiments would not be complete by the time of this symposium, the Program Committee considered it worthwhile to solicit and publish interim evaluations.

The large number of projects and their diversity created a difficult choice for the evaluation. It became clear that the evaluation would have to be selective and that not all project aspects could be evaluated in as great depth as might have been desirable. Discussions within DOC, the project teams and outside agencies resulted in a decision to focus the evaluations on the public service sector experiments, including health care, education, administration and community development, rather than on the technical or technological experiments. It was felt that for these latter experiments, tested scientific methods existed which were being applied by the experiment leaders. *The* *evaluations presented in these proceedings focus on the public service projects.* The reader will not find in this section an assessment of the potential long-range social effects of the technical experiments.

In the case of the public service experiments no established methodologies appeared to lend themselves to their evaluation. A first and important step was therefore to build bridges between the diverse disciplines and interests represented, including engineering, psychology, sociology, anthropology, epidemiology, health and medicine, education, community development, and administration. The Hermes communications projects, by focusing on this not always successful bridge-building activity have brought us a long way in developing the essential knowledge, as well as in developing a corps of evaluators (and project leaders) experienced in this interdisciplinary endeavour.

Many different avenues could have been taken in evaluating the public service projects. For example, the management structures of the experiments and of the DOC Hermes communications project could have been explored, or experimental costs could have been made the main focus. The avenues that were selected are largely a result of a reiterative process of discussions between evaluators, experiment leaders, DOC staff and representatives from other interested agencies. The following discussion outlines the approach taken by the DOC in its efforts to coordinate the Hermes project evaluation and draws several tentative conclusions. Specific recommendations on areas to pursue or evaluations to be undertaken can be found in the evaluator's reports in this section of the proceedings and in other documents (Phillips et al, 1977; Phillips and Skene 1977; Casey-Stahmer, 1977; Bell Northern Research, 1977; Stufflebeam, 1971).

The Context

In Canada, the Hermes projects are a first step in a process designed to test the application of telecommunications technology in general and communications satellite technology in particular in support of public services, such as health, education, administration and community development. Aside from the technological and industrial project objectives that were defined for the spacecraft, evaluation of the applications program pursued the following objectives which reflect the exploratory and catalytic nature of the project. They are (in order of priority):

- to create awareness of the potential utility of telecommunications, its problems and advantages among service agencies and institutions,
- to identify applications of Hermes technology in a variety of projects and user environments,

- to develop strategies leading to the planning of operational communication systems in the public services sectors,
- to analyse and develop policies which will facilitate the application of telecommunications to public services.

These objectives are being further refined and explored in the Anik-B satellite communications program, scheduled to begin in the spring of 1979. It is hoped that the third step in this sequence will be a critical assessment by user agencies of the utility and value of operational telecommunication-based delivery systems for public services (Chapman, 1977).

This context explains much about the nature of the individual Hermes experiments and their evaluations. In evaluative terms many of the projects are not experiments, but demonstrations. The relatively short duration of the experiments, the sharing arrangements with the U.S.A., the experimental nature of the Hermes technology itself, the relative novelty for user agencies of working with satellite technology are the main constraints and conditions which suggested to many evaluators that it would not be useful to apply experimental research designs or summative evaluation techniques. Thus, in general the Hermes experiment evaluations are formative in nature and lay the foundation for the research directions that may be explored in future programs, such as Anik-B. As formative evaluations they provide a substantial subjective and objective experiment description which will be the basis for future planning and evaluation.

Some observers, and indeed some evaluators, may have expected the experiment evaluations to yield definitive results. However, in the planning phases it became clear that this expectation was not realistic given the fact that the projects were often not designed to provide an information base substantive enough for summative evaluations on long-range effects and implications.

To reiterate, the experiments were mainly designed to demonstrate the feasibility of bringing together satellite technology and public services. Within the constraints of merging an experimental technology with hitherto novel applications in non-technical areas, the Hermes experiments were very successful. Without the Hermes experiments many exciting new applications would not have been explored.

The Evaluation Structure and Its Implications

Each Canadian Hermes experiment was required by the Department of Communications (DOC) to have an evaluative component. The leaders of most public service experiments acquired evaluative expertise by adding an evaluator to the project. In some cases the evaluators were from within the agency or institution which developed the experiment (in the case of the Public Service Commission, Memorial University, Carleton University, the University of Quebec, the British Columbia Ministry of Education). In other cases the evaluator was from a different institution (in the case of the University of Western Ontario and the Alberta Native Communications Society). In-house evaluators had the advantage of being closely in-tune with everyday events of the experiment and had fewer differences of opinion with the experiment staff. External evaluators could maintain a more objective view. Although one might suggest that in-house evaluations are better for the largely descriptive evaluations of the Hermes experiments, the following evaluators reports show the strengths and weaknesses of both approaches.

In most projects structured feedback encouraged a formative evaluation to take place; the main feedback occurred at meetings and review of reports of evaluators and experiment leaders prior to and during the project. The shortness of the projects themselves appears generally to have had a positive effect on the willingness of the project leaders to change formats, techniques and other facets of their operations in order to overcome problems or to incorporate suggestions resulting from evaluative findings. Where limitations of this feedback became apparent, they can be attributed to some relatively-fixed project goals and operating procedures which could not be changed appreciably during the project. The general spirit was that of exploration and demonstration where new ideas could be tried out relatively easily. At times this spirit, however, constituted problems for the evaluators, when new ideas were tested and demonstrated on short notice and with little consultation, thus endangering the research methods.

In addition to the evaluations related to individual experiments, the DOC initiated two evaluations designed to explore areas of commonality across groups of experiments. The Man-Machine Interactions team of the Research Branch of the DOC explored behavioural and human-factors type issues across several experiments (Phillips et al, 1977; Daniel et al, 1976). A team of educational planners from outside the government, representing a broad range of educational interests, was given the task of evaluating aspects of all tele-education experiments (Daniel et al, 1976; Daniel et al, 1977). This latter team adapted an existing evaluation model (Stufflebeam, 1971; Daniel et al, 1976) to the conditions of the Hermes experiments. This evaluation model conceptually was used by all individual education experiments, thus providing a certain consistency in the evaluation approaches. This makes the bases for assumptions, findings, and recommendations comparable across these experiments.

As part of their evaluative effort, these two teams prepared sets of 'common' data collection instruments which could be applied to most experiments under consideration. These instruments were limited to technical performance of the equipment, to the interactive aspects of communications, to participant attitudes and to attitudes of experimenters and their personnel. Content-related issues resulting from experiment objectives, such as learning outcomes, were the tasks of the individual experiment evaluator. It was planned to integrate the common instruments into the designs of the individual projects. The evaluators of these projects administered these common instruments in order to prevent a duplication of effort. This division did not always work. However, the evaluators of all education experiments used several components of these common instruments. They selected components that were most directly related to their projects or they modified components to better reflect the project objectives. Not every common instrument was used or modified for all experiments. This was true for cases where experimenters and evaluators felt that the common instruments would detract from their own evaluation goals. Of all common instruments, the examination of participant attitudes seems to have withstood changes and challenges most effectively.

More communications and discussions between the groups or different administrative procedures would have been required to make this effort more effective. A more rigorous application of the common instruments would have yielded a more substantial data base, particularly in regard to technical performance and interactive aspects. However, this could have been obtained only with additional major administrative efforts, which in the practical circumstances did not seem warranted or desirable.

The development of common instruments covers only one aspect of the activities of the team of the tele-education evaluators. They will also provide an assessment concerned with the ifs, and the conditions under which satellite communications systems could become a reality in the Canadian educational environment. To this end, various educators and educational authorities across the country participated in a user needs survey which assessed the utility and feasibility of satellite-based systems for distance education. Such an overall assessment is a particularly necessary step in regard to long-term development, which will be largely determined by economies of scale, user aggregates and by institutional cooperation (Daniel et al, 1977).

Research and evaluation in tele-education is much more developed than in telehealth care. In tele-education, the question "does the medium teach effectively", has been largely answered with "it depends on how you use it". Questions regarding issues such as knowledge gain of students, are being replaced by issues related for example, to the effective introduction of technology into educational institutions, to issues of experiment implementation or to the development and implementation of educational policies which would support tele-education systems. In the latter area, the viability of educational consortia, and the practicality of curriculum-sharing arrangements are among the questions being asked.

The state of a much more recent art is reflected in the questions which are still being explored in telehealth care. They include the identification of technical requirements for medical tasks, including image resolution and channel bandwidth as well as systems acceptance by care providers and consumers. Institutional and administrative arrangements facilitating the effective use of telehealth care systems, the effects of such systems on the quality of health care, and ultimately their desirability in different areas of health-care delivery systems are among the evaluative questions of the future (Phillips et al, 1977; Casey-Stahmer, 1977; Koba, 1977; Bell Northern Research, 1977).

Conclusions

The Hermes evaluations are formative in nature and will provide a good basis for future planning. They will show areas where experimental laboratory research is preferable to field trials, as may be the case for establishing technical standards for clinical-medical-tasks. They will show areas where long-term field trials are desirable as may be the case in the development and implementation of organizational arrangements and administrative procedures designed to accommodate communications technologies as an integral part of public service delivery systems.

The Hermes experiments were essentially catalytical in nature that is to say, they created awareness of new applications of communications technology. This goal was successfully achieved. However, follow-on projects, such as Anik-B, go a step beyond this goal. They should be designed to lend themselves to summative evaluation, upon which a decision for future operational services can be made. This project orientation should reflect itself in pre-implementation research and planning activities, in which operational requirements are identified and priorities established. One may find that many of the requirements identified in these activities have been addressed to varying degrees in the Hermes projects. On the other hand, the Hermes experiments do not tell the full story. For example, in the area of telehealth care, the Hermes projects did not explore interurban or computer applications. It should be established if such applications are required or if they address health-care priorities, present or future. It appears that future developments will benefit from coupling the lessons learned in the Hermes demonstrations with a comprehensive assessment of areas that were not explored.

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THE EVALUATION OF U.S. EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE

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Aux Etats-Unis, les expérimentateurs utilisant le satellite technologique de télécommunications (STT) Hermès doivent, dans l'exécution de leurs tâches respecter les directives et méthodes de travail établies par la National Aeronautics and Space Administration (NASA) dans le cadre de son programme de satellites d'application technologique (SAT) (Application Technology Satellites(ATS)). Conformément au mandat qu'elle détient du Congrès, la NASA fournit aux expérimentateurs les moyens logistiques et techniques nécessaires à leurs expériences. Chaque expérimentateur est cependant responsable de la mise au point et du déroulement de son ou de ses expériences, ainsi que de l'évaluation et de la diffusion des résultats.

Ces conditions entraînent une foule d'expériences interdépendantes de programmes d'évaluation et de diffusion des résultats qui, bien que loin d'être homogènes, dénotent quand même une communauté d'intérêts. Le groupe d'évaluation du programme STT (présidé par l'auteur) est le principal mécanisme permettant aux expérimentateurs de comparer leurs points de vue respectifs et de déterminer de quelle façon les résultats obtenus pourraient être clarifiés, complétés ou validés grâce à une coordination plus étroite des efforts de tous les participants.

In the United States, experimenters on the Communications Technology Satellite (CTS), or Hermes, operate under conditions of use which have their roots in a 1969 decision by the National Aeronautics and Space Administration (NASA). In the summer of that year, NASA announced that it would make its then-existing communications satellites in the Application Technology series, ATS-1, 3, and -5, available for new experiments once those for which the satellites were originally designed were completed. Experiment proposals were invited from interested universities, agencies, corporations and other organizations at home and abroad. NASA's offer included both the use of the satellite without charge and such support services as free access via existing NASA earth stations. Experimenters, however, had to accept responsibility for the design, operation, and funding of their own projects. Because NASA considers the "social worth" of proposed experiments an important criterion, accepted experimenters were responsible for proposing and executing appropriate evaluation schemes, and for disseminating the results to professional colleagues within their own communities of interest.

The same conditions were later applied to users (in NASA parlance, an experimenter whose proposal gains final acceptance becomes a "user") of ATS-6 - including the Federation of Rocky Mountain States, the State of Alaska, the Appalachian Regional Commission and the Indian Space Research Organization - and now to U.S. users of CTS.

As one might expect, such conditions of use result in a family of experiments and of evaluation and dissemination plans characterized by diversity, rather than by homogeneity. The goals and purposes of the experiments vary widely, as do the measures by which those who seek them evaluate their success. Many of the CTS users are from groups and disciplines usually far removed from experimentation with communications systems either space or terrestrial. But one may argue that as communications satellites develop from being the special interest of a chosen few to become the common tool of the many, the experience gained from experiments in the *application* of communications satellite technology is no less valuable, no less rewarding, than that gained from experiments which are more strictly scientific or technical.

In point of fact, the varied programs of the U.S. users present a spectrum of experiments and interests which encompass both the scientific and the social. Nonetheless, even though the U.S. CTS experiments are independently conceived and executed, there emerge identifiable clusters of common interest.

Some of the experimenters are primarily interested in the collection of technical data. NASA's Goddard Space Flight Center (GSFC) is conducting an experiment to measure and characterize the CTS radio frequency communication links, including the degradation caused by terrestrial man-made noise as well as by precipitation. NASA's Lewis Research Center (LeRC)'s TEP/SHF Technology Experiment provides an assessment of the performance in space of the CTS' super efficient 200w Transmitter Experiment Package (TEP).

The U.S.-Canadian college curriculum-sharing experiment in which Stanford University in Palo Alto and Carleton University in Ottawa use the satellite to share faculty and courses also investigates the application of digital television for possible savings in bandwidth. The so-called

"DICE" experiment which involves LeRC and the COMSAT Laboratories, is also developing data on the performance of digitized wideband communication systems.

COMSAT Labs' Transportable Emergency Earth Terminal program looks primarily at the potential use of highly-mobile terrestrial gear for the establishment of disaster communications, but its activities also provide data on CTS communications in a wide variety of locations and circumstances. AGREE, the Advanced Ground Receiving Equipment Experiment in which the principal investigators are NASA Goddard and Nippon Hoso Kyokai (NHK), is also gaining experience in CTS communications in a variety of locations, using the 1.6m diameter receive-only earth stations built by Japanese manufacturers for the planned Japanese Experimental Broadcasting Satellite.

The potential use of teleconferencing as a substitute for and/or extension of transportation is a common theme found in many of the experiments. Westinghouse's experiment is specifically labelled, "Communications in Lieu of Transportation", and attempts to assess the utility of two-way television by satellite as a direct substitute for staff travel between Lima, Ohio, and Baltimore, Maryland. While this experiment deals with teleconferencing in a business environment, two NASA Centers, Goddard and Ames, are exploring Interactive Techniques for Intra-NASA Applications, a similar experiment within a government agency. In the field of education, the more limited Project Interchange has used one-way video via CTS plus conventional telephone circuits to provide teachers at the elementary school level with opportunities to share information and ideas regarding individualizing and personalizing instruction. In yet another milieu, the George Washington University experiment, "Videoconferencing for Congress", is looking at the use of satellite communications for direct dialogue between Representatives and Senators or their staffs and constituents at home.

Finally, Project Adjunct, an experiment being conducted by Satellite Business Systems, the joint venture of IBM, COMSAT General, and the Aetna Casualty and Surety Co., also explored a panoply of teleconferencing services for business and industry. Via CTS, the company is testing the waters for the wide range of communication services it plans to offer when its own satellites are in operation.

In health services, teleconferencing and a number of related satellite services are being explored by several major U.S. CTS experimenters. The Washington-Alaska-Montana-Idaho (WAMI) medical education consortium, is using CTS for curriculum-sharing in which the University of Washington School of Medicine shares its resources with out-of-state students. In addition, interactive teleconferencing activities in continuing education for physician-practitioners, nurses and "medex-practitioners" and for undergraduate and graduate education are being explored. The Veterans

Administration, the largest unitary health-care system in the world, is using CTS for a variety of experimental programs including one-to-one teleconsultations, a "national medical satellite journal", management teleconferences, continuing professional education, allied health programming and patient education and information exchange.

Other experiments being conducted under the aegis of the Lister Hill Center for Biomedical Communication, National Library of Medicine and the National Institutes of Health (NIH) of the U.S. Public Health Service include teleconferencing for the Western Regional Meeting of the Association of American Medical Colleges, for the National Institute on Drug Abuse, for WAMI on the Legislative Process, and for NIH on Research Dissemination. Other activities include interactive instruction in a number of health areas as well as admissions counseling designed to promote recruitment of minorities for the health professions.

The Southern Educational Communications Association (SECA) is the largest of the regional networks in public television in the United States. The national interconnection, the Public Broadcasting Service, plans to move from conventional terrestrial interconnection of stations to interconnection via Westar II, a commercial domestic satellite. SECA is utilizing CTS to gain pre-operational experience in television station interconnection by satellite, and has directed its attention specifically at the potential flexibility offered by the new technology and the opportunities for program sharing.

The Public Service Satellite Consortium (PSSC) is a non-governmental council of more than eighty organizations interested in the potential which high power satellite technology appears to offer for more effective and lower cost communications for the full spectrum of public service purposes. PSSC's participation as a U.S. CTS experimenter has been as a facilitator of the efforts of those who wish to gain first-hand experience with satellite communications on a basis less formal and less stringent than that of "CTS user". In consequence, PSSC has assisted a growing number of institutions and associations to engage in "demonstrations" (essentially "one-shots") and "events" (short term activities) which have allowed participant groups to discover for themselves what role satellite communications, particularly powerful satellite-small terminal communications, might play in their own future development.

An examination of the principal U.S. experiments on CTS reveals that, although the experimenters are independent and free to seek their own goals, there is, in fact, substantial evidence of congruity. By the similarity of most experimenters' goals with those of at least some of their colleagues, a first order community of interest is established within the family of experimenters.

Each experimenter is required to have an Evaluation

Coordinator to oversee the experiment's assessment of its own goals, and to plan the measures of its success and the dissemination of results to all interested parties.

A CTS Evaluation Working Group is the principal means by which each experimenter can match his interests with those of his colleagues and determine the ways in which his own findings might be illuminated, enhanced, or validated by closer coordination with other users who have similar interests. The regularly scheduled CTS Users' Meetings provide additional opportunities for formal and informal discussions, the exchange of views and techniques, and the sharing of preliminary or final results, opportunities and problems.

Such cross-fertilization of ideas has been healthy and useful. Often problems are solved by help which cuts across the lines of discipline or experiment goals. The members of the Evaluation Working Group become, in essence, a pool of expertise and experience which is available to all. The benefits of efficiency and tight coordination which might result from a single centralized evaluation effort may be lost, but what is gained is a rich mixture of ideas and approaches from a much larger group whose most experienced members have impressive professional and experimental credentials and whose junior partners benefit greatly from intellectual resources which would not otherwise be available to them.

In the final analysis, the role of the Evaluation Working Group and the independent evaluation of each U.S. experiment on CTS stem directly from those user policies first established by NASA in 1969. In accord with its Congressional mandate, the National Aeronautics and Space Administration is envisioned as a provider of experiment opportunities and of technical support for experiments. Even when NASA research centers are accepted as experimenters, they, not NASA headquarters, have responsibility for the design and implementation of the experiment and its evaluation and the dissemination of results. They, too, become members of the community of users who value the assistance and advice of their colleagues, but are happy to maintain their individuality and their independence.

AN EVALUATOR'S PARADOX: DEMONSTRATIONS IN THE ABSENCE OF DEMONSTRATED NEED

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On ne peut présenter une évaluation probante de la valeur éducative des expériences dans l'enseignement, faites au moyen du satellite technologique de télécommunications (STT-CTS), ou Hermès, parce qu'aucune des expériences ou des démonstrations n'était fondée sur un besoin exprimé et défini par les personnes pour lesquelles le projet avait été destiné. La communication ci-dessous étudie la question des besoins d'une évaluation et ses conséquences pour l'obtention d'une interprétation valable des résultats d'expériences faites au moyen de Hermès.

What is a Need?

Need is both a noun and a verb. As a quality it refers to the lack of something useful or desired. As a state it suggests a pressing want. Need implies deprivation and usually refers to things required for the welfare or success of a person. Stufflebeam (1977) proposes a working definition for educators:

"A need is something that can be shown to be necessary or useful for the fulfillment of some defensible purpose.

- A defensible purpose is one that meets certain ethical and utility criteria or at least is not counter productive in relation to these criteria.

- A necessary thing is one that is required to achieve a particular purpose.

- Something that is useful helps but may not be essential in fulfilling a purpose".

Evaluation has been defined as "the process of delineating, obtaining, and providing useful information for judging decision alternatives" (Stufflebeam et al, 1971). According to these authors, the decision-making model of evaluation implies three possibilities for educational improvement. These are:

"(1) some unmet need exists, (2) some barrier impeding the fulfillment of a need exists (such barriers will arbitrarily be referred to as problems), or (3) some opportunity which ought to be exploited exists" (Ibid, p.40). In other words the most important criterion for assessing the educational worth of a project must be the degree to which it succeeds in addressing and responding to needs.

The Relationship Between Needs and Objectives

An assumption with respect to the Hermes educational experiments appears to have been that needs are defined by objectives. For example, the Carleton-Stanford curriculum-sharing experiment proposal lists the following educational objectives:

> "(a) Demonstrate the ability to expand the scope of instruction by sharing classes between universities that have different emphasis and orientations.
>
> (b) Devise and evaluate a variety of techniques for the presentation of remote instruction, feedback of student response, and evaluation of student interaction for the user aspect of the curriculum-sharing experiment.
>
> (c) Experiment with diverse techniques and styles of programming to determine cost-beneficial methods of using a satellite link for curriculum sharing.
>
> (d) Develop strategies for resolving administrative and class management problems created by curriculum sharing between diverse universities. Problem areas that have been identified include course accreditation, non-concurrent class terms, scheduling across time zones, and classes with different time durations" (George, 1977, Appendix 11, p.1).

Then in discussing 'need for the experiment' the following assertion is made:

> "The use of satellites for relaying television signals to multiple remote locations is attracting enthusiastic attention in the area of teleconferencing. One promising teleconferencing application is in college curriculum sharing, enabling courses in a specialty area of one college to be offered to students of another college at a remote location" (Ibid, p.2).

The implication is that the need grows out of the definition of the objectives. And, as we noted elsewhere, "Since objectives became an obsession in the world of education there has grown a tendency for the writing of them to become an art form divorced from real life." (Daniel et al, 1977, p.15) To be able to meaningfully and validly interpret the results of the projects, the relationship between needs and objectives must be reversed.

Needs evaluation supplies the basic information for problem analysis and systems design. Without this information in hand the best response an institution can make is likely to be an approximation of the service required. At worst, it will be totally inappropriate.

Similar orientations and statements of objectives are presented for both the Newfoundland and University of Quebec experiments (Roberts, 1975; Université du Québec, 1975). There is no instance of the rationale for an experiment being based on a carefully-documented case of need by the ultimate consumers of the service.

<u>Whose Need?</u>

Needs evaluation raises an important problem of perspective. Definitions of need all beg the question of whose need. In the case of the Hermes demonstration projects, the focus is almost exclusively on the needs of the institution. Particular emphasis is given to stating the objectives in terms of the teaching and research mandates of each institution. The following objectives are illustrative:

Carleton - Stanford

"(b) Devise and evaluate a variety of techniques for the presentation of remote instruction, feedback of student response, and evaluation of student interaction for the user aspect of the curriculum-sharing experiment.

(e) Develop and demonstrate a cost-effective video compression system in conjunction with efficient channel coding and modulation" (George, 1977, Appendix 11, pps.1,2).

Université du Québec

"1. Favoriser l'innovation en matière d'enseignement, de recherche et de gestion, afin de répondre à des besoins nouveaux (décentralisation des ressources universitaires, individualisation de l'enseignement supérieur) et à des contraintes nouvelles (limitation des ressources financières, physiques et humaines; développement du savoir; création de nouveaux programmes, etc.)

4. Stimuler le développement des ressources techniques et le perfectionnement des ressources humaines du secteur communications de l'Université du Québec" (Université du Québec, 1976, p.11).

Newfoundland

> "P-1-2: (ii) To provide community health-education programs in order to study the reaction from, and effect on, a community of a real-time interaction system, compared to more traditional approaches" (Roberts, 1975, p.2).

The University of Quebec (undated working paper) is very explicit about its orientation:

> "Le comité a d'abord déterminé des critères d'évaluation en fonction des besoins particuliers de l'Université du Québec en matière de télécommunications, des objectifs de recherche en communications de l'Université et de ses unités constituantes, des conditions expérimentales essentielles à la réalisation du projet-cadre Réseau Omnibus et, enfin, des exigences du programme STT" (p.3).

Given the demonstration nature of the Hermes projects, their institutional focus is a defensible (and very practical) approach. However, it raises serious problems for interpreting the results of these projects. For example, a particular demonstration may meet its objectives as defined by the experimenter. But what is the relative significance of this achievement in terms of educational worth? This is the nub of the evaluator's paradox.

To attempt to assess the relative value of a project requires information from a different referent group, the consumers or users of the service. At a basic level, this requires finding answers to questions like the following:

1. What are the educational needs of the user group?
2. What educational needs does this experimental service address?
3. How important are the needs addressed by this service relative to any other needs which the group may have?
4. What alternatives to this service are already available or desirable?
5. How much is the group willing to pay for continuation of this service?

A needs survey (Daniel, 1977) conducted among government agencies and educational institutions in association with the Hermes evaluation, drew largely predictable responses. Respondents generally expressed mild interest and/or skepticism with respect to the usefulness and feasibility of two hypothetical satellite-based networks. A small minority raised concerns about the design and operation of the system from a consumer/user perspective.

Why Evaluate Needs?

Costs for the hardware, software, and manpower required to provide educational services via satellite are high. Experiments, demonstrations and operational projects using satellites demand a serious resource commitment from participating institutions and their funding agencies. Needs evaluation data is necessary to ensure that the services provided address genuine educational problems. To proceed without such information is to risk the accusation of simply 'playing' with a new technology.

From an educational decision-making perspective, needs evaluation provides basic information required to analyze the educational problem(s) of users. Crucial information about the user population, their demographic characteristics and their educational goals and needs can be obtained. Data about the range of instructional methods, techniques, and delivery modes acceptable to particular user groups can also be collected. The compiled information can then be used to design educational programs and instructional materials, and to determine the nature of the delivery system and any ancillary services required. The needs evaluation process provides a legitimate mechanism for involving users in the planning, development, and delivery of the proposed educational services. This involvement may be a crucial factor in the transition from experimental to operational projects.

Finally, and most importantly from an evaluator's perspective, needs evaluation indicates the appropriate criteria for assessing the educational value of services provided. Such criteria are essential if evaluators are to address issues beyond whether or not a project has met its institutionally-defined objectives.

An evaluation report about the Appalachian and Rocky Mountains Educational Satellite Communications Demonstration (ESCD) makes the following comment: "The ESCD was well received by almost all participants, but one must keep in mind that it replaced nothing, threatened nothing, and usually cost its user very little" (Syracuse University Research Corporation, 1975, p.1-4). This type of outcome may be avoided if all future satellite demonstration and pilot projects are preceded by a needs evaluation.

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L'EVALUATION DE L'UTILISATION DU SATELLITE HERMES DANS LE CADRE DU RESEAU OMNIBUS DE L'UNIVERSITE DU QUEBEC

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"Les faits ne parlent pas", disait Henri Poincaré, "c'est nous qui les faisont parler."

Our evaluation of the University of Quebec communications experiments using the Hermes Satellite, within our "réseau Omnibus" network, considered two distinct levels:

(1) The usefulness and cost of applying satellite communications to meet specific objectives.

(2) The social and cultural changes that would result from the introduction of satellite communications in a well-defined context.

Twelve experiments were conducted between October 1976 and February 1977, for a total of about 300 satellite hours, and seven experiments were selected for detailed evaluation. The present paper concentrates on responses of users of the experimental services to a questionnaire. (See the Annexe). In general, these responses were positive. However, the evaluation is still incomplete, and it would be premature to draw firm conclusions.

The opportunity to participate in the Hermes experiments stimulated a review of our overall communication system concept. In retrospect, we realized that the value of satellite communications for relatively short distances is uncertain, and that we might have carried out essentially the same experiments using entirely terrestrial networks, possibly at lower cost. It is far from certain, however, that we would have taken such an initiative without the stimulus of a satellite project.

I. PREAMBULE

Jean-Paul Lafrance et Gaëtan Tremblay

On peut envisager l'expérience avec le Satellite technologique de télécommunications (STT) ou Hermès et son évaluation sous deux angles différents, également valables. D'un premier point de vue, celui des objectifs de chaque expérience particulière et des objectifs généraux du réseau Omnibus de l'Université du Québec (UQ), Hermès fournit l'occasion d'explorer l'utilité et les conditions d'utilisation d'un outil nouveau, le satellite de communication, à des fins précises: éducation, médecine, documentation, etc. Il s'agit d'évaluer l'efficacité et l'économie relatives d'un outil parmi d'autres à l'intérieur d'un processus spécifique, comme le processus de traitement médical par exemple, ou encore celui de l'enseignement à distance.

D'un autre point de vue, l'expérience Hermès, de façon globale, constitue une sorte de laboratoire d'exploration de l'influence d'une nouvelle technologie de communication sur un ensemble de processus - éducation, administration, médecine, etc. - et sur la vie sociale et culturelle d'une collectivité. Dans le premier cas, l'évaluation sera centrée davantage sur l'utilité et l'économie d'un outil, dans le second sur l'influence socioculturelle d'une technologie.

Ainsi, on pourra évaluer l'efficacité du satellite dans la distribution de services médicaux sur un vaste territoire. On pourra également, à un autre niveau, analyser l'influence de cette technologie dans l'exercice de la médecine (rapports médecins-patients, médecins-infirmières, etc.).

On peut donc distinguer globalement deux niveaux d'évaluation de l'expérience Hermès:

1. celui de l'utilité et du coût de la communication par satellite dans la poursuite de fins spécifiques à l'intérieur de divers processus

2. celui des transformations sociales et culturelles qu'entraîne l'introduction du satellite de communication dans un système déterminé.

L'évaluation de *premier niveau* exige une claire précision des objectifs poursuivis par chaque expérience et une définition d'instruments permettant de mesurer le degré d'atteinte de ces objectifs. Cette évaluation revêtira forcément des aspects différents, sinon pour chaque expérience, du moins pour chaque catégorie d'expériences (médecine, administration, éducation, etc.).

L'évaluation de *second niveau* présuppose la mise au point d'un cadre de référence général pour l'ensemble des expériences. L'influence du satellite se fera sentir de façon particulière, bien sûr, dans chacun des domaines concernés, mais on peut supposer que certaines caractéristiques de la technologie agiront dans le même sens autant en médecine qu'en éducation. Ce type d'évaluation est plus ambitieux et plus difficile à réaliser que le premier. Mais il est fondamental et malgré la courte durée de l'expérience Hermès, il faut profiter du "laboratoire" qu'elle constitue pour relever des tendances, affiner des hypothèses, explorer des possibilités pouvant conduire à une prospective sérieuse. L'ambition de la science n'est-elle pas de prévoir?

Bref, au premier niveau, on se demande "ce qu'on peut faire avec le satellite" et au second, "ce que le satellite nous fait (ou fait dans un système donné)".

Alors qu'ici je ne parlerai pas tellement de l'évaluation ponctuelle des expériences faites sur satellite dans le cadre du réseau Omnibus (voir chapitre II l'opinion des usagers), je voudrais surtout vous entretenir de l'influence qu'a exercé sur nous, chercheurs en communication, le concept même du satellite! En d'autres mots, la venue du satellite nous a permis de repenser les modèles d'utilisation des systèmes de communication, non plus en fonction d'un routage terrestre, mais en regard de la suppression de la distance. Etant donné la gratuité et la disponibilité d'Hermès, le satellite a constitué pour nous un facteur d'innovation et curieusement un *prétexte* à l'analyse des systèmes de communication.

En effet pour nous qui n'étions ni des techniciens, ni des ingénieurs, le satellite nous a été présenté - du moins c'est ainsi que nous l'avons compris, et c'est ce qui est important - comme une sorte d'OVNI (Objet Volant Non Identifié) situé à quelque part au-dessus de nos têtes, un "super CB" selon l'expression enjouée des pêcheurs des Iles de la Madeleine avec qui nous avons réalisé l'expérience de *Radiorbital*. Nous étions tous situés à la même distance de ce puissant émetteur-récepteur, que nous pouvions atteindre à l'aide d'antennes simples, légères, mobiles - l'expérience a cependant montré que les antennes étaient plus difficilement transportables qu'on ne le disait!

Nous pouvions alors poser un certain nombre d'hypothèses qui différenciaient un réseau satellite d'un réseau terrestre de micro-ondes et des câbles coaxiaux.

(a) Le réseau satellite serait un réseau universel, indépendant de la distance, des accidents topographiques, des conditions météorologiques, des difficultés de réception des zones difficilement accessibles ou densément peuplées.

(b) Ce serait un réseau universel de communication, et non plus seulement de diffusion ou de transmission.
Au point de vue systémique, la diffusion est une communication de *point à zone* et la retransmission, du *point à point;* avec le satellite, on pouvait donc espérer réaliser le *multi-point.*

(c) Nous pouvions donc espérer utiliser cet outil (le satellite) comme un instrument privilégié de *communication de groupe* (à mi-chemin entre la communication inter-individuelle de type téléphonique et la diffusion de masse).

En fait, la plupart des expériences via satellite tentées dans le cadre du réseau *Omnibus* de l'UQ furent des téléconférences pour des fins d'enseignement, de consultation, d'administration pédagogique ou de recherche scientifique qui s'inspiraient du modèle de la *communication multidirectionnelle,* c'est-à-dire de "l'interaction à plusieurs".

Par le réseau *Omnibus,* nous avons imaginé créer un système, ouvert, flexibles - outil de communication souple, non programmé, moins axé sur le contenu que sur le processus de communication, plus utilitaire que spectaculaire (au sens des mass-média). Et l'analyse systémique nous apparaîtrait plus une formule d'évaluation de l'expérience Hermès (avec l'analyse de l'effet "réseau") que la classique analyse de contenu.

<u>En conclusion</u>

Avons-nous assister à un *détournement* de la finalité du satellite*!
Je ne le sais pas.

Le satellite nous a-t-il permis de réfléchir sur la configuration des systèmes de communication? Ne fut-il qu'un prétexte à une réflexion.

Ce qui est frappant, c'est que nous avons ensuite réalisé que nous pouvions peut-être faire la même chose avec les systèmes terrestres! Peut-être même à de moindres coûts.

Mais cette réflexion, l'aurions-nous fait sans le satellite?
Qui sait?

Selon Mumford, l'horloge mécanique a été inventée par les moines du Moyen Age pour bien marquer le temps des prières. Pourtant l'horloge, instrument de la fragmentation du temps, a eu un tout autre usage à une époque subséquente - à l'ère de la société industrielle!

** Postface:*

A la suite des questions de la part de participants à ce symposium, il m'a semblé nécessaire de préciser ma penseée à ce sujet.

Jusqu'à présent, les satellites de télécommunications ont surtout été utilisés pour la transmission de conversations téléphoniques ou d'émissions de télévision *point à point* sur de très longues distances (plus de 3000 km) ou dans des zones d'accès difficile. On prévoit bientôt son utilisation pour la diffusion de masse, *point à zone*. Dans l'expérience de l'UQ, nous avons tenté de créer, à l'aide d'Hermès, un réseau *multipoint, multifonctions et multimedia*. Est-ce là une caractéristique nouvelle et propre aux satellites? Nous aurions pu le croire à l'époque, puisque les réseaux de télécommunication terrestres à large bande n'avaient pas la flexibilité du satellite relié à des antennes légères et transportables.

Cependant, on peut prévoir, dans le futur immédiat, un développement important des infrastructures terrestres de télécommunication, même dans les zones semi-urbaines, par l'utilisation des câbles coaxiaux, de la fibre optique ou des micro-ondes à grande capacité, à mesure que vont se mettre en place les réseaux institutionnels de téléconférence, de télétravail, de télé-éducation ou de télétransmission de données.

En conséquence, l'utilisation du satellite sur de courtes distances demeure encore problématique. Il est un maillon de la chaîne de diffusion mondiale, en interconnexion avec les micro-ondes et les câbles coaxiaux - pas nécessairement destiné à les remplacer, même en partie. Loin de moi l'idée d'être un "détracteur" ni d'ailleurs un "ami" des satellites!

II. RAPPORT PRELIMINAIRE: OPINION DES USAGERS

Gaétan Tremblay

Les diverses constituantes de l'UQ ont réalisé, d'octobre 76 à février 77, un ensemble d'expériences de communication par satellite, dans le cadre de ce qui se voulait un "réseau Omnibus". Douze expériences différentes ont été menées à bien dans des domaines aussi variés que le télé-enseignement, la transmission de données, la télé-documentation, et les téléconférences de type scientifique, administratif ou socioculturel, pour un total de près de 300 heures. De ces expériences, sept ont été retenues à des fins d'évaluation. Après une brève description de ces expériences et une esquisse de la démarche générale d'évaluation, la présente communication sera centrée sur un aspect particulier de cette démarche, les résultats d'un questionnaire auquel ont répondu les usagers du Réseau Omnibus.

1. Description des expériences

1.1 Microscopie électronique

Télétravail de type scientifique entre des chercheurs de l'Institut Armand Frappier à Montréal, de l'Institut national de la recherche scientifique (INRS) Océanographie à Rimouski, de l'Université Laval à Québec et de l'Université du Québec à Trois-Rivières (UQTR). Liaison unidirectionnelle vidéo et bidirectionnelle audio, du 21 octobre 1976 au 9 novembre 1976. Discussion sur des analyses au microscope électronique diffusées à partir de l'Institut Armand Frappier.

1.2 AMICIS (analyse des modalités de l'interaction en situation de communication instantanée par satellite)

Expérience d'encadrement éducatif d'enseignants en exercice organisée par le Centre de Développement en Environnement Scolaire (CDES) de Trois-Rivières en collaboration avec des enseignants de l'Ile d'Orléans, près de Québec. Du 26 octobre 1976 au 30 novembre 1976. Une partie de l'expérience a été réalisée en audio bidirectionnel et l'autre avec en plus une liaison uni-directionnelle vidéo. Cette activité de formation portait sur le rôle de l'enseignant et de l'environnement à l'occasion d'un projet pédagogique impliquant la participation active des élèves.

1.3 Téléréférence Trois-Rivières —— Rimouski

Expérience de documentation à distance impliquant des bibliothécaires de Trois-Rivières et des clients de l'UQ à Rimouski (UQAR). Du 28 octobre 1976 au 2 décembre 1976. Entrevues de documentation. Une partie de l'expérience a été réalisée en audio bidirectionnel et l'autre avec en plus une liaison vidéo unidirectionnelle.

1.4 Télé-documentation

Expérience de documentation à distance, similaire à la précédente à la différence que la recherche documentaire ne se faisait pas en présence du client. Liaison bidirectionnelle audio entre des bibliothécaires de Rimouski et des clients du Bas du fleuve et de la Gaspésie. Du 27 octobre 1976 au 25 novembre 1976.

1.5 Maîtrise en administration publique

Expérience de télé-enseignement organisée par des professeurs de l'Ecole Nationale d'Administration Publique (ENAP). Cours en analyse de système donné à Québec à un groupe d'étudiants et retransmis par satellite à des étudiants de Hull et à un groupe témoin de Québec. Du 9 décembre 1976 au 16 décembre 1976. Liaison unidirectionnelle vidéo et bidirectionnelle audio.

1.6 Le Centre d'Etudes universitaires dans l'Ouest québécois (CEUOQ)

Le CEUOQ a été à lui seul le lieu d'une série d'expériences en télé-enseignement et en téléconférence entre les villes de Rouyn, Hull, Val d'Or, Chibougamau et La Sarre. Les deux plus importantes ont été un cours sur l'histoire du syndicalisme et une télé-conférence entre des agents de liaison dans plusieurs sous-centres du CEUOQ. La liaison entre Hull et Rouyn était bidirectionnelle vidéo. Les autres villes disposaient d'antennes de 2m (Chibougamau et Val d'Or) ou de 1m (La Sarre). Du 2 février 1977 au 25 février 1977.

1.7 Intercom

Expérience organisée par le Département des Communications de l'Université du Québec à Montréal (UQAM) avec la collaboration des services audio-visuels du CEUOQ impliquant les télévisions communautaires de deux petites villes, Buckingham et St-Raymond de Portneuf. Les citoyens des deux villes ont échangé sur une foule de sujets. Liaison bidirectionnelle vidéo. Du 14 février 1977 au 23 février 1977.

Plusieurs expériences originellement prévues dans le cadre du Réseau Omnibus n'ont pu avoir lieu, les unes pour des raisons techniques (Radio-Orbital), d'autres par manque de ressources humaines disponibles (Télé-animation) d'autres à cause d'un conflit de travail entre la direction de l'UQAM et ses professeurs (télé-visite au musée, MIREC), et une (PLATON) à cause de contretemps dans la livraison et l'installation des terminaux.

2. L'évaluation du Réseau Omnibus

Dans l'évaluation de l'ensemble des expériences du Réseau Omnibus, nous avons distingué deux angles d'approches, différents mais complémentaires des phénomènes de communication par satellite:

(a) celui de l'utilité et du coût de la communication par satellite dans la poursuite et l'atteinte d'objectifs spécifiques;

(b) celui des transformations sociales et culturelles qu'entraîne l'introduction d'une technologie de communication par satellite dans un système donné.

Au premier niveau, on se demande "ce qu'on peut faire avec le satellite" et au second, "ce que le satellite nous fait (ou fait dans un système donné)." En conséquence, le cadre théorique d'analyse du réseau Omnibus comprend à la fois un modèle d'évaluation des expériences et une grille d'analyse de l'influence de la communication par satellite. Pour mener à bien cette recherche, divers instruments de cueillette de données ont été utilisés: plusieurs types de questionnaires, l'enregistrement des émissions et l'observation systématique (Tremblay et Demers, 1977).

Dans la présente communication, il ne sera pas question de l'ensemble du schéma d'évaluation - la recherche n'étant pas encore terminée - mais uniquement de l'une de ses composantes: les opinions, réactions et commentaires des utilisateurs. Les données présentées ici ont été recueillies par questionnaire auprès des usagers des diverses expériences du Réseau Omnibus. Chacune des expériences ayant sa spécificité propre, les questionnaires utilisés étaient différents dans chaque cas; mais ils comprenaient un certain nombre de questions identiques pour permettre une compilation et une analyse d'ensemble (cf. annexe). Le tableau I, à la page suivante, donne la répartition du nombre de réponses par expérience.

3. L'opinion des usagers - Présentation des résultats

La lettre Q suivie d'un chiffre en marge du texte renvoie à un numéro de question en annexe.

3.1 Les aspects techniques

Selon la très grande majorité des usagers du Réseau Omnibus, l'équipement utilisé dans les diverses expériences pouvait permettre une participation satisfaisante; cette satisfaction est presque unanime en ce
Q.2 qui concerne le nombre de récepteurs TV (90.5%) et le
Q.3 nombre de haut-parleurs (86.9%); elle diminue un peu, tout en demeurant assez forte, en ce qui concerne le
Q.4 nombre de microphones (74.4%), appareils pouvant permettre une participation plus active de chacun dans la discussion.

La satisfaction est beaucoup moins évidente en ce qui a trait à l'aménagement général et au confort des

TABLEAU I

Répartition du nombre de réponses par expérience

	Nombre de réponses	Pourcentage
CDES - AMICIS	9	1.1
CEUOQ	551	67.6
Télédocumentation Rimouski	14	1.7
Intercom	107	13.1
Maîtrise en administration publique	105	12.9
Microscopie électronique	7	.9
Téléréférence UQTR-UQAR	22	2.7
Total	815	100.0

Q.1 salles utilisées. Si 47.2% des répondants s'en sont déclarés satisfaits, 30% ont émis un jugement négatif et 22.8% ont refusé de se prononcer clairement. Il semble que les locaux, sauf quelques rares exceptions telle que la salle vidéo de l'UQ à Québec, se soient avérés trop petits, mal aérés, et de façon générale peu appropriés pour ce genre d'expériences.

La qualité de l'image télévisuelle a comblé les
Q.5 voeux de la très grande majorité des usagers (88.2%).
Q.6 Cette appréciation se fait encore plus positive (91.5%)
en égard aux objectifs de la séance. La qualité du son
Q.7 fait un peu moins l'unanimité mais 72.7% s'en sont tout
Q.8 de même dits satisfaits et 81.2% l'ont jugée suffisante
pour atteindre les objectifs de la séance. Le volume
Q.9 du son, par ailleurs, n'a pas posé de problèmes majeurs.

Q.10 Dans la majorité des cas, les gens se sont montrés satisfaits (79.7%) des explications données avant
la séance quant à l'utilisation de l'équipement, lequel
Q.11 a été d'ailleurs perçu comme facile à manier (87.5%).

Il semble cependant que les responsables locaux aient eu passablement de difficultés avec l'équipement durant
Q.12 les séances. En effet seulement 51.4% des répondants n'ont constaté aucun problème de cet ordre durant leur séance, alors que 13.1% considèrent qu'il y en a eu beaucoup. D'autres répondants relèvent le problème avec un jugement plus nuancé quant à sa fréquence.

On observe sensiblement le même phénomène en ce
Q.13 qui concerne l'écho de leurs interventions dû au délai de la transmission par satellite. 42.1% des usagers affirment catégoriquement ne l'avoir jamais entendu; 15.4% au contraire disent l'avoir toujours perçu; alors que les autres répondants ne l'ont observé que dans une fréquence moins élevée. Une interprétation plus poussée de ces résultats devra cependant tenir compte des différentes configurations d'équipement utilisées.

Amenés à évaluer globalement la qualité technique du système de communication utilisé, la grande majorité des répondants (81.2%) la jugent suffisante
Q.14 compte tenu des buts poursuivis dans leur expérience. La proportion de ceux qui seraient intéressés à uti-
Q.15 liser régulièrement ce système de communication pour les mêmes fins est cependant moins grande (65%).

Bref, en ce qui concerne les aspects techniques, on peut résumer l'opinion de "l'usager moyen" de la façon suivante: chaque site était équipé de manière satisfaisante; la qualité de l'image était excellente, celle du son un peu moins mais tout de même assez bonne. Les locaux n'étaient cependant pas tellement convenables. Il y avait un peu trop souvent des problèmes d'écho. Et le responsable semble avoir eu pas mal de difficultés avec l'équipement en cours de séance. Globalement, c'est un bon système de communication. Quant à l'utiliser régulièrement pour les mêmes fins... euh! oui, peut-être.

3.2 Le déroulement et le contenu des séances

Q.16 Dans les expériences du Réseau Omnibus, la plupart des répondants (58.6%) ont eu l'impression que seulement quelques personnes avaient activement parti-
Q.24 cipé à la discussion. (Les diverses expériences du Réseau furent fort différentes l'une de l'autre de ce point de vue. Une analyse statistique plus poussée permettra de savoir si ces différences se reflètent dans l'opinion des usagers.) A peine plus de la moitié (51.6%) des participants se sont d'ailleurs sentis encouragés à s'exprimer. Cette situation explique sans doute l'absence de problème d'identification: à tout
Q.17 moment, la plupart des usagers (82.8%) savaient qui parlait. A ce niveau, les possibilités interactives de la communication par satellite n'ont sans doute pas été exploitées à leur maximum.

Q.20 La majorité des répondants (61.3%) ont qualifié le déroulement de la séance de prédéterminé: près de la
Q.21 moitié (47.8%) ont eu l'impression que questions et commentaires n'influençaient guère ce déroulement.

S'il y a eu des silences en cours de séances,
Q.22 ils n'ont incommodé que peu de gens (10.8%). Et peu de participants ont craint, lors de ces silences, que la
Q.23 communication par satellite n'ait été rompue (12.0%). Ces silences, ou mieux leur possibilité, ont, selon notre expérience, beaucoup plus traumatisé les organisateurs que les usagers!

Au niveau du contenu, les interventions concer-
Q.29 nant la direction et l'animation de la séance n'ont pas, aux dires des participants, trop pris d'importance. Les formes d'échange les plus fréquentes ont été, dans un ordre décroissant, les présentations d'information (38.6%), les manifestations d'accord avec les autres
Q.30 participants (36.6%) les demandes d'information (28.9%), les demandes d'explications supplémentaires (26.5%) et les présentations d'explications supplémentaires (24.7%). A ce sujet, les résultats font ressortir un certain nombre de phénomènes intéressants:

(a) la grande importance des interventions visant à fournir de l'information mais aussi de celles visant à manifester sa solidarité avec les autres participants;

(b) les présentations d'informations ont été plus fréquentes que les demandes; par contre les réponses en termes d'explications supplémentaires ont été moins fréquentes que les demandes; il y a eu un certain décalage entre l'offre et la demande, entre ce qu'ont prévu les organisateurs et les aspirations des participants;

(c) si les échanges exprimant un désaccord et les interventions sans rapport les unes avec les autres ont été presque inexistants (respectivement 0.0% et 2.1%), les véritables discussions ne semblent guère avoir été plus fréquentes (11.9%).

Au niveau de la présentation, les répondants ont qualifié la communication de spontanée (47.9%), d'inté-
Q.32 ressante (65.2%), d'utile (63.3%) et de claire (65.0%).

Ces majorités relativement faibles laissent sous-entendre qu'on est loin de l'unanimité.

Les opinions sur la durée de la séance sont
Q.31 nuancées. Pour la moitié des répondants (52.3%), elle
a paru correcte; mais pour les autres, elle a été soit
trop courte (22.0%), soit trop longue (25.6%).

De l'opinion des usagers, la technique n'a pas
Q.18 négativement interféré sur le déroulement de la séance.
La disposition de l'équipement ne semble pas avoir
entravé la discussion (73.9%), pas plus d'ailleurs que
Q.19 la qualité technique des liaisons (71.1%). Peu de
Q.26 personnes (19.3%) ont été distraites par l'encadrement
Q.28 technique. Et les ajustements nécessaires à l'établissement de communications satisfaisantes n'ont paru
longs qu'à une minorité de gens (17.5%).

Amenés à comparer la communication par satellite
à la communication face à face, les répondants ont
exprimé des avis partagés. Un peu moins de la moitié
Q.25 des participants (47.9%) ont répondu que le contenu
de la séance et des échanges est aussi facile à saisir
lors d'une communication par satellite que lors d'une
Q.27 rencontre en personne. Et seulement un peu plus de la
moitié (59.8%) ont clairement affirmé que, malgré les
distances physiques, les groupes sont en fait rapprochés grâce au système de communication par satellite.

4. <u>Analyse des résultats</u>

A ce stade-ci de la recherche, l'analyse ne peut être que partielle, l'exploitation statistique restant encore incomplète.

Les résultats précédemment présentés ne peuvent être interprétés correctement sans une référence explicite au contexte expérimental des projets réalisés dans le cadre du Réseau Omnibus. Pour tirer des conclusions des expériences sur Hermès et amorcer une certaine réflexion prospective, il faut être en mesure de départager le mieux possible ce qui résulte de la situation expérimentale comme telle de ce qui tient à l'utilisation d'un médium comme le satellite. (L'expression situation expérimentale est utilisée ici dans un sens différent, bien entendu, de celui qu'il revêt en sciences exactes. Il signifie ici "expérience-pilote", "à titre d'expérience", etc.). Cette opération ne pourra être faite convenablement qu'à la toute fin de la recherche, lorsqu'il sera possible de mettre en rapport les résultats du questionnaire avec ceux de l'observation systématique. Quelques remarques s'imposent cependant immédiatement.

On peut raisonnablement faire l'hypothèse que les réponses des usagers du Réseau Omnibus ont été influencées par une prédisposition favorable, positive, à l'égard de l'expérience à laquelle ils ont participé; et ce pour deux raisons qui tiennent essentiellement au caractère "expérimental" de la situation. Premièrement, toute référence à une première tentative, bien intentionnée, provoque habituellement l'indulgence face aux erreurs éventuelles. Sur certains points, le jugement des usagers du Réseau s'est montré beaucoup moins sévère qu'il ne le serait en situation d'utilisation régulière. Deuxièmement, les participants aux expériences du Réseau étaient tous volontaires et, de ce fait peut-on supposer, passablement motivés. Certaines personnes détestent passer pour des cobayes, surtout à leur insu; par contre, plusieurs trouvent une importante valorisation dans la participation volontaire à des expériences nouvelles. Dans ce contexte, il apparaît plus plausible de faire l'hypothèse que les résultats ont été influencés par une attitude favorable et bienveillante de la part de la majorité des répondants que de considérer ces mêmes résultats comme le reflet exact d'un jugement "neutre et objectif" des participants.

On peut trouver, non pas une preuve mais un indice, de cette survalorisation positive des réponses dûe à la situation expérimentale, dans l'écart qui sépare le jugement sur la qualité globale du système de communication, compte tenu des buts poursuivis, (Q.14) des intentions d'utilisation régulière de ce système pour les mêmes fins (Q.15).

Compte tenu de ces réserves et de la prudence qu'elles impliquent, on peut tirer de ces premiers résultats les constatations suivantes: les usagers du Réseau se sont montrés satisfaits de la quantité d'appareils de réception et d'émission mis à leur disposition ainsi que la qualité visuelle et sonore des transmissions. Ils ont par contre noté les difficultés auxquelles ont eu à faire face les responsables locaux. Et ils signalent des problèmes d'echo et de locaux.

Quant au déroulement de la séance, ils ont eu l'impression qu'il suivait son cours selon un plan déterminé à l'avance et peu modifiable en cours de route. Proportionnellement peu de gens ont eu une participation active au cours des séances, dont le contenu consistait surtout en transmission d'informations et d'explications. La technique n'a pas été perçue comme une interférence dans les discussions, mais la majorité reste sceptique quant à l'efficacité de la communication par satellite comparée à celle du face à face.

Le style de la communication a beaucoup varié d'une expérience à l'autre (cf. description ci-haut) et les résultats globaux sont davantage influencés par celles où les participants étaient nombreux (CEUQ, MAP, INTERCOM). L'analyse statistique ultérieure permettra de faire les raffinements qui s'imposent. A ce stade-ci, on reste avec la forte impression que les possibilités d'interaction multidirectionnelle du satellite ont été relativement peu exploitées.

Une dernière remarque avant de mettre un point final à cette analyse préliminaire: le questionnaire ne fournit pas des données épistémologiquement plus "objectives" que d'autres instruments de mesure, comme l'observation systématique ou l'entrevue par exemple. Il procure des données comparables et compilables d'un certain type: ce que les gens veulent bien nous dire de la perception qu'ils ont de leur vécu par rapport à certaines questions précises pour lesquelles on leur fournit l'inventaire des réponses acceptables. Trop de gens acceptent trop souvent le postulat douteux d'une adéquation parfaite entre l'expression, la perception et le vécu lui-même.

Pour la cueillette d'un certain type de données, le questionnaire s'avère d'ailleurs un instrument inadéquat. La question 30, par exemple, porte sur la fréquence de différents types d'intervention. Si c'est la perception des usagers qui nous intéresse, pas de problème. Si c'est la fréquence réelle, l'enregistrement des séances et le dépouillement de ces enregistrements à l'aide d'une grille fourniront des résultats beaucoup plus fiables. Autre exemple: la question de l'interférence de la technique sur la discussion ne saurait être limitée à la perception des usagers. L'observation qualitative systématique peut sur ce sujet être tout autant utile, sinon plus.

Ces quelques remarques n'ont pas pour but d'amorcer une "défense et illustration du questionnaire et autres instruments de mesure en sciences humaines". Elles visent seulement à interroger une préférence marquée, dans le domaine de l'évaluation, pour le questionnaire et les résultats quantitatifs. Compte tenu des remarques précédentes sur les caractéristiques de la situation expérimentale on comprendra qu'une démarche fondée exclusivement sur le questionnaire risque de passer subrepticement de l'évaluation à la justification.

REFERENCE

Tremblay, Gaétan et Demers, André
1977 *Rapport d'étape*, avril, pp. 18-24.

ANNEXE

		+ +	+	0	-	- -	Total
1.	Comment trouviez-vous l'aménagement général et le confort de la salle utilisée pour cette séance?.	125 17.8	207 29.4	160 22.8	121 17.2	90 12.8	703 100%
2.	Y avait-il assez de récepteurs TV pour permettre une participation satisfaisante?	399 64.5	161 26.0	40 6.5	18 2.9	1 0.2	619 100%
3.	Y avait-il assez de naut parleurs pour permettre une participation satisfaisante?	354 67.6	101 19.3	45 8.6	19 3.6	5 1.0	524 100%
4.	Y avait-il assez de microphones pour permettre une participation satisfaisante?	355 56.3	114 18.1	87 13.8	52 8.3	22 3.5	630 100%
5.	S'il y avait réception télévisuelle durant cette séance, quelle fut la qualité de l'image?	411 56.9	226 31.3	49 6.8	27 3.7	9 1.2	722 100%
6.	La qualité de l'image était-elle suffisante pour atteindre les objectifs de la séance?	484 67.4	173 24.1	29 4.0	22 3.1	9 1.3	717 100%
7.	Quelle était la qualité du son?	314 41.9	231 30.8	101 13.5	71 9.5	33 4.4	750 100%
8.	La qualité du son était-elle suffisante pour atteindre les objectifs de la séance?	399 53.2	210 28.0	85 11.3	33 4.4	23 3.1	750 100%
9.	Comment était le volume du son?	64 9.2	146 21.0	416 59.8	56 8.0	14 2.0	696 100%
10.	Avant la séance, vous a-t-on clairement expliqué comment utiliser l'équipement?	427 65.9	90 13.9	39 6.0	35 5.4	57 8.8	648 100%
11.	L'équipement était-il facile à manier?	457 71.8	100 15.7	43 6.8	12 1.9	24 3.8	636 100%
12.	Le responsable a-t-il eu des problèmes avec l'équipement durant la séance?	83 13.1	94 14.8	62 9.7	70 11.0	327 51.4	636 100%
13.	Entendiez-vous aux autres localités l'écho des interventions faites à votre localité?	96 15.4	95 15.2	84 13.5	86 13.8	262 42.1	623 100%
14.	Compte tenu des buts poursuivis, la qualité technique globale du système de communication était-elle suffisante pendant cette séance?	397 52.0	223 29.2	78 10.2	42 5.5	23 3.0	763 100%

		+ +	+	0	-	- -	Total
15.	Seriez-vous intéressé à utiliser régulièrement ce système de communication pour les mêmes fins?	336 44.4	156 20.6	158 20.9	106 14.0	0 0	756 100%
		Tous	Plupart	QQ pers	1 pers	Autre	Total
16.	Quelle proportion des gens présents à votre localité ont parlé aux autres localités durant la séance?	65 10.3	132 21.0	369 58.6	47 7.5	17 2.7	630 100%
17.	A tout moment, saviez-vous qui parlait?	344 63.0	108 19.8	48 8.8	35 6.4	11 2.0	546 100%
18.	La disposition de l'équipement vous a-t-elle empêché de discuter librement?	43 5.7	62 8.2	92 12.2	82 10.9	476 63.0	755 100%
19.	La qualité technique des liaisons a-t-elle entravé la discussion?	68 9.1	72 9.6	76 10.2	127 17.0	405 54.1	748 100%
20.	Aviez-vous l'impression que cette séance suivait fidèlement un déroulement prédéterminé?	292 39.1	166 22.2	142 19.0	59 7.9	88 11.8	747 100%
21.	Le déroulement de la séance a-t-il été modifié à la lumière des questions et commentaires des participants?	84 11.4	121 16.4	181 24.5	115 15.5	239 32.3	740 100%
22.	Y avait-il des silences gênants au cours de la séance?	32 4.6	43 6.2	80 11.6	117 17.0	418 60.6	690 100%
23.	S'il y avait de tels silences, vous faisaient-ils craindre que la communication par satellite avait été coupée?	43 7.2	29 4.8	42 7.0	47 7.9	437 73.1	598 100%
24.	Etiez-vous encouragé à vous exprimer durant la séance?	234 31.8	146 19.8	198 26.9	85 11.5	74 10.0	737 100%
25.	Trouviez-vous que le contenu de la séance et des échanges est plus difficile à saisir lors d'une communication par satellite que lors d'une rencontre en personne?	87 12.0	131 18.1	159 22.0	128 17.7	219 30.2	724 100%
26.	L'encadrement technique utilisé lors de la séance était-il une source de distraction?	51 6.9	92 12.4	104 14.0	150 20.2	346 46.6	743 100%
27.	Croyez-vous que, malgré les distances physiques, les groupes sont, en fait, rapprochés, grâce au système de communication par satellite?	297 39.7	150 20.1	161 21.5	72 9.6	68 9.1	748 100%

		+ +	+	0	-	- -	Total
28.	Les ajustements nécessaires à l'établissement de communications satisfaisantes vous ont-ils paru longs?	72 9.7	58 7.8	77 10.4	127 17.1	409 55.0	743 100%
29.	Les interventions concernant la direction et l'animation de la réunion ont-elles pris trop d'importance par rapport au contenu même de la séance?	16 2.2	38 5.1	111 15.0	147 19.8	429 57.9	741 100%
30.	Lors de communications bidirectionnelles, les formes d'échange suivantes étaient-elles fréquentes ou non?						
30.1	- demander de l'information	59 8.6	139 20.3	226 33.0	134 19.6	127 18.5	685 100%
30.2	- fournir de l'information	92 13.9	165 24.9	212 31.9	106 15.9	89 13.4	664 100%
30.3	- demander des explications supplémentaires	43 6.4	135 20.1	206 30.6	152 22.6	137 20.4	673 100%
30.4	- fournir des explications supplémentaires	45 6.8	118 17.9	219 33.1	156 23.6	123 18.6	661 100%
30.5	- des manifestations d'accord avec les autres participants	16 17.2	18 19.4	31 33.3	11 11.8	17 18.3	93 100%
30.6	- des interventions sans rapport les unes avec les autres	0 0	2 2.1	8 8.3	12 12.5	74 77.0	96 100%
30.7	- Discussion	5 5.4	6 6.5	25 26.9	12 12.9	45 48.4	93 100%
30.8	- Dispute	0 0	0 0	2 2.2	3 3.3	87 94.6	92 100%
		T.long				T.court	
31.	Quelle est votre opinion quant à la durée de cette séance?	74 9.6	123 16.0	402 52.3	67 8.7	102 13.3	768 100%
32.	Comment évaluez-vous la communication lors de cette séance par rapport aux échelles suivantes:						
32.1	- Spontanée	131 19.4	193 28.5	192 28.4	97 14.3	64 9.5	677 100%
32.2	- Intéressante	197 29.1	245 36.1	158 23.3	59 8.7	19 2.8	678 100%
32.3	- Utile	198 29.6	225 33.7	177 26.5	49 7.3	19 2.8	668 100%
33.3	- Confuse	17 2.6	62 9.4	151 23.0	220 33.5	207 31.5	657 100%

AN EVALUATION OF PERSONNEL DEVELOPMENT BY SATELLITE

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L'article qui suit fait état d'une expérience de formation télédiffusée par l'intermédiaire du satellite technologique de télécommunications (STT-CTS), Hermès. Vingt-cinq cadres intermédiaires réunis en deux groupes et divisés en cinq sous-groupes (4 à Saint-Jean, Terre-Neuve et 1 à Ottawa) ont suivi un cours de planification à long terme diffusé grâce à un système audio-visuel interactif. On a comparé les résultats de l'apprentissage par satellite obtenus chez ces deux groupes à ceux obtenus chez un autre groupe où la formation a été dispensée par des enseignants sur place et ayant les mêmes méthodes d'enseignement. Une partie de l'expérience consistait à mettre au point une méthode d'enseignement non dirigée, c'est-à-dire par et pour les élèves eux-mêmes, répondant aux besoins d'élèves adultes et compatible avec un système de télécommunication interactif.

Trois groupes d'hypothèses ont été formulés sur:

1. *l'apprentissage et la personnalité de l'élève, les préférences de celui-ci pour un certain style d'apprentissage et pour un mode de communication donné;*

2. *les conséquences de préférences de l'élève pour un style d'apprentissage donné sur la participation interactive, sa satisfaction et son attitude vis-à-vis le mode de communication choisi;*

3. *les conséquences du mode de communication sur l'évaluation de la méthode non dirigée, sur la satisfaction des élèves et leur comportement interactif.*

Les résultats provisoires du premier groupe d'hypothèses ne révèlent aucune différence statistique importante, au niveau de l'apprentissage, entre les introvertis et les extravertis, ou entre les tenants de la méthode non

dirigée et ceux de la méthode dirigée. Toutefois, la tendance est à un meilleur apprentissage chez les introvertis.

Pour ce qui est du deuxième groupe d'hypothèses, la préférence pour un style d'apprentissage particulier semble n'avoir qu'un effet négligeable sur le comportement des participants et leur attitude vis-à-vis le mode de communication emprunté.

Quant au troisième groupe, le degré de satisfaction et le comportement des participants étaient plus le résultat de différences au niveau du cours dispensé à chaque groupe que celui du mode de communication utilisé. Toutefois, on a noté une différence sensible entre l'attitude du groupe d'Ottawa et celle du groupe de Saint-Jean vis-à-vis du mode de communication; l'attitude du groupe d'Ottawa était plus positive.

Les résultats semblent donc indiquer que le style d'enseignement/apprentissage emprunté convenait très bien aux élèves et au mode de communication, et se prêtait bien à la méthode d'enseignement. On note également que les résultats de l'enseignement dispensé par satellite étaient aussi satisfaisants que ceux de l'enseignement dispensé par un professeur en présence de ses élèves.

INTRODUCTION

In the spring of 1977, as part of the Hermes tele-education program, the Public Service Commission (PSC) conducted a field experiment to determine the effectiveness of an audio-video interactive system for providing training to middle managers in both regional and central areas in Canada. Effectiveness was measured by comparing the reactions of learners attending a long-range planning course offered via satellite with learners attending the same content course in a face-to-face situation; reactive questionnaires, a content test and observation log were used. The experiment also explored the use of a student-centered learning approach and the effects of personality on participants' learning. Complete details are available in the Evaluators' Report (Mendenhall et al, 1977).

REVIEW OF LITERATURE

Teaching Approach Studies

Most studies on the effect of teacher-centered vs student-centered teaching methods on learning acquisition have indicated little difference between the two approaches, but some authors have suggested that this may be due to a "failure to articulate teaching technique and student needs" (Gage, 1963). Conflicting findings have been reported in terms of satisfaction with student-centered classes. For example Bills (1952), Flanders (1951), Lewin et al, (1939) and Deignan (1955) showed that students expressed positive attitudes; while Wispé (1951) and Weider (1955) reported student dissatisfaction with student-centered classes. These conflicting results may be due to the fact that attitudes toward student-centered instruction seem to be largely related to personality characteristics. Wispé (1951) used the Thematic Apperception Test to classify his students into three groups: "insecure", "satisfied" and "independent". The "independent" group had the highest number of interventions and the most positive attitude towards the permissive method, their fellow students and the instructors. Stern (1956) also reported that student-centered instruction was preferred by "students who reject traditional sources of authority, have strong needs for demonstrating their personal independence, and are characterized by a high drive for academic achievement". Similarly, Haythorn et al (1956) reported a positive relationship between learning outcome and teaching approach when the approach applied corresponded to student preferences.

Extroversion-introversion has also been linked with learning. According to Eysenck (1968), extroverts are less affected than introverts by conditioning. Since conditioning is an important factor in learning, he suggests that introverts will learn better than extroverts and cites a number of studies supporting his theory.

If, therefore, using a student-centered teaching approach, the teaching technique and student needs could be carefully articulated, one might predict that learning would be greater for students who preferred a student-centered approach and who had an extroverted personality pattern.

Media Comparison Studies

Studies carried out on mediated education systems have shown that one should not simply transfer face-to-face teaching methods to a mediated teaching situation (Baird, 1976; Wedemeyer, 1977). The educational method has to take into account the medium to be used.

It was therefore predicted that if a training method were designed specifically for a mediated situation, its use in a face-to-face condition would be less satisfactory and it therefore would be rated more critically.

In recent years, both interactive and broadcast communication media were studied to determine their effects on learning (Bramble, 1975; McNamara, 1977; Puzzuoli, 1970; Chu and Schramm, 1967). The transmission link and technical configuration varied from telephone, closed-circuit television, micro-wave to satellite; from one-way audio to two-way video; from two locations to multi-locations. The effects on learning, however, were consistent. They appear to indicate that all three media, face-to-face, video and audio, are equally effective as modes of communication for learning. It could be predicted therefore, that no significant differences would be found in learning between satellite course participants and face-to-face course participants.

According to Argyle (1969), visual signals have two major functions in social interaction. First, visual signals provide emotional and cognitive feedback to the speaker. Second, visual cues play the role of gatekeepers in conversation by establishing when it is appropriate to speak or be silent. If so, a reduction in visibility may affect communication behaviour, particularly the ease of interaction and speech patterns.

This theory has not been uniformly upheld. Several laboratory studies investigated the effect of lack of vision (back-to-back vs face-to-face) on speech patterns (Cook, 1969), and the effect of varying the degree of visibility (masks, dark glasses, opaque screens) on ease of interaction (Argyle et al, 1968). The results of these studies showed no major differences in social interaction between conditions, although the back-to-back condition produced fewer interruptions in speech patterns and shorter utterances. An experiment by Williams (1974) on the effect of the medium (face-to-face, audio and video) on the generation of ideas also showed no significant differences between the medium used and the number of ideas generated.

Contrary findings were reported by Ocksman and Chapanis (1974), Weeks and Chapanis (1976), and Weston et al, (1975). They found that more messages were exchanged in face-to-face than via video, and via video than via audio, in a given amount of time. These results suggest that in some cases, the mode of communication does have an effect on the amount of interaction. It was therefore predicted that:

i) face-to-face participants, having full opportunity for visual cues, would make more interventions than participants in mediated sessions, and

ii) participants in the multiplexing condition (that is, with limited visibility) would have more negative attitudes toward the medium and be less satisfied with the course than those experiencing the better visibility of high-quality video.

Zinzer (1975) reported that although the profile of communication via satellite was similar to face-to-face, a slightly higher proportion of questions to total interventions occurred. She attributed this to the need for reassurance to reduce the strain caused by an unfamiliar medium.

The use of a non-directive, student-centered approach, implying a lack of formal structure, would probably reinforce the needs postulated by Zinser leading to greater uncertainty among participants in the mediated courses. This led to the prediction that such participants would ask a higher proportion of questions than would their colleagues on the face-to-face course.

Statement of Hypotheses

The following hypotheses were based on the theoretical considerations and literature survey outlined above.

Three groups of hypotheses were distinguished. The first group was related to participants' learning: three hypotheses were formulated, namely that:

1. There will be no statistically significant learning differences between participants attending the experimental (satellite) courses and participants attending the control (face-to-face) course.

2. There will be no statistically significant differences in learning between extroverted and introverted participants.

3. The learning of participants who prefer a student-centered learning style will be greater than that of participants who prefer a teacher-centered approach.

The second group of hypotheses related to the effects of learning-style preference on participants' behaviour. The first hypothesis concerned the effect on the participant's degree of interaction.

4. The amount of participant's interaction, as measured by the number of interventions, will be greater in participants who prefer a student-centered learning style to a teacher-centered learning approach.

The second hypothesis related the effects of the learning style preference to the participant's attitude toward the satellite medium and the course in general.

5. Participants preferring a student-centered learning style will express greater satisfaction with the course and, if attending the satellite course, a more positive attitude towards the medium, than will those preferring a teacher-centered approach.

The third group of hypothesis concerned the effects of the medium on (A) participants' appreciation of various aspects of the sessions, and (B) on their interaction during the sessions.

(A) 6. There will be no significant difference in satisfaction and evaluation of the courses between participants attending satellite courses or the face-to-face course.

7. Participants attending satellite courses will be less critical of the student-centered learning approach as practised than will participants attending the face-to-face course.

8. Of participants attending satellite courses, those using a video-multiplexing system will be more critical of the equipment and less satisfied with the course than those using a single channel audio-video system.

(B) 9. The degree of interaction, as measured by the number of interventions, will be greater among participants attending the face-to-face course than among those attending satellite courses.

10. The proportion of questions to total interventions will be greater among participants attending satellite courses than among those attending the face-to-face course.

METHODOLOGY

Variables

The medium, the participants' preferred learning style and the personality characteristic introversion-extroversion were the independent variables. Medium is operationally defined as the mode of communication used to provide training, and may refer here to either face-to-face or interactive audio-video. Learning style preference is operationally defined as a learner's predisposition for a teaching/learning method which is in accordance with what he assumes to be his and the educator's role and responsibilities in an educational setting. This learning style preference is seen as a single dimension ranging from student-centered on the one hand to teacher-centered on the other. The participants' preferred learning style was measured by two roles-preference questionnaires and participants were grouped (according to scores obtained) as high or low student-centered learners. The personality characteristic introversion-extroversion was measured by the Eysenck Personality Inventory. Participants were identified according to their scores on the E scale as high or low extroverts.

The dependent variables were learning, the amount of participant interaction, satisfaction, attitudes to the medium, evaluation of the course, and evaluation of the student-centered teaching approach. Learning was measured by a learning content test. Participant interaction was measured by an observer's log. The remainder of the dependent variables were measured by questionnaire rating scales: satisfaction by the Satisfaction Scale Questionnaire, attitudes to the medium by the Attitudes Towards Equipment Questionnaire, evaluation of the course by the Learning Session Questionnaire, and evaluation of the teaching approach by the Learning/Teaching Approach Questionnaire.

Experimental Design

An independent group design was used. Two groups attending a long-range planning course via satellite were compared to a face-to-face control group. Participants were assigned to the satellite or face-to-face course. They were then classified according to high or low extroversion, high or low student-centered preference. Satellite course I occurred four weeks prior to satellite course II and the face-to-face course.

Participants

The subjects were 63 middle managers located in either Ottawa, Ontario or St. John's, Newfoundland: 54 from the federal government, 6 from the provincial government, and 3 from university. Table I provides additional detail on courses attended, etc.. Participants in satellite course I were identified after responding to a needs survey; participants in satellite course II and in the face-to-face course were recruited through usual Bureau of Staff Development and Training (BSDT) recruitment procedures.

Setting for the Satellite Courses I and II

Five rooms were equipped with an interactive audio/video system and linked by a closed-circuit television. Of these, four rooms were located on three floors at Memorial University, St. John's, the fifth in L'Esplanade Laurier in Ottawa; each room seated five people at a rectangular table. Four black-and-white 21" television monitors stacked in two's were placed 7 feet in front of the table in each room. This allowed participants to have a full view of every other group. Participants used omni-directional microphones and wore open-air headsets with adjustable volume control. All rooms were provided with flip charts. Name tags on each monitor identified each individual and group.

The facilities in the fifth room, at Ottawa, were different in that a multiplexed green image of each of the four groups in St. John's was displayed. The green color tube was used to reduce the glare, and also because images produced by the multiplexing technique required a higher persistence tube. This room was also equipped with a close-shot manually-switched camera for graphic displays. The two

TABLE I

Selection of participants

Course attended and enrollment procedures used

Time of course	Type of Course	Characteristics of Participants	Enrollment Procedures
April 26 - May 19 Tuesdays & Thursdays 1:00 p.m. - 3:00 p.m. Ottawa time	Satellite I	Middle Managers 11 fed. depts all males 18* - St. John's 4 - Ottawa	Survey
May 24 - June 16 Tuesdays & Thursdays 1:00 p.m. - 3:00 p.m. Ottawa time	Satellite II	Middle Managers 3 univ. adminrs. 5 prov. govt. employees 10 fed. depts 2 females 16 males 15* - St. John's 3 - Ottawa	BSDT format course announcement
May 25 - June 20 Mondays & Wednesdays 1:30 p.m. - 3:30 p.m. Ottawa time	Face-to-Face	Middle Managers 11 fed. depts. 3 females 18 males 21 Ottawa	BSDT format course announcement

*Enrolled. The number of people enrolled is not the same as the number of persons that actually attended the courses.

course directors were at this location, except that at the students' request a course director went to St. John's for the last four satellite Course I sessions.

Setting for the Face-to-Face Session in Ottawa

A large room was equipped with a flip chart and comfortable chairs, but no tables, placed in a full circle allowing all participants and educators to face one another. Syndicate rooms were provided for work in small groups. Participants wore name tags until they knew each other.

Procedure

Satellite sessions were held every Tuesday and Thursday afternoons from 1:00 p.m. to 3:00 p.m. Ottawa time, 2:30 p.m. to 4:30 p.m. Newfoundland time. Face-to-face sessions were held every Monday and Wednesday afternoon from 1:30 p.m. to 3:30 p.m. Two additional hours were available for participants to work in subgroups or by themselves prior to the session in St. John's and after the session in Ottawa. Eight consecutive sessions formed each course.

Participants in the satellite courses had a briefing session prior to their course. The evaluation procedures were outlined, a course plan proposed, and time sheets and pre-tests distributed in order to make maximum use of on-air satellite time.

In all three offerings of the course, participants attended free of charge. For this privilege, it was understood that they would be required to fill out questionnaires evaluating various aspects of the educational sessions.

Learning/Teaching Model

A learning/teaching model was developed to meet the requirements of: a) the adult learner, and b) the demand characteristics of an interactive medium. A student-centered approach was adopted as most suited to these requirements. This approach is person, rather than subject, oriented and attempts to individualize the content and the processes of learning. The content is designed by the instructor to meet the specific needs of the learners. Emphasis is placed on student-to-student interaction, and students are called upon to play an active role. Briefly, the adult learner assumes responsibility for his own learning by identifying his training and development needs, by determining his learning objectives and how he will achieve them, and by negotiating these objectives with other learners in the group. The educator's role, therefore, becomes that of a guide, a consultant who assists the learner as needed.

Course Content

The training needs survey carried out identified long-range planning as one of the major concerns of the

St. John's middle management population. Specific topics to be included in the course were identified by surveying participants about their particular long-range planning concerns. A review of the literature on these topics was compiled into two texts:

1) Forward Planning in Government,

2) Forward Planning: Selected Readings.

The former formed the basis for the course.

Two course directors were chosen from the Staff Development Branch. Both had experience in the development of new courses and knowledge of the teleconferencing medium.

Collection of Data

1. Prior to each course, participants completed the Eysenck Personality Inventory and the Roles (Educator and Learner). Their scores on these two instruments were used to form two dichotomous groups (high vs low extroverts, and high vs low student-centered), split on the mean, to classify participants in terms of the independent variables of personality and teaching/learning style preference.

2. At the end of each session, the participants completed a Satisfaction Scale Questionnaire, and at the end of alternate sessions they completed the remainder of the questionnaires used to measure the dependent variables: Attitudes Towards Equipment, Learning Session, and Teaching and Learning Approach.

3. During the penultimate session, they completed the content test, used to measure the dependent variable of learning.

4. Two observers recorded the behaviour and type of verbal interventions of both participants and educators. (For more details, see the Evaluator's Report, Mendenhall et al, 1977). For the satellite courses, one observer was in Ottawa, the other in St. John's; both attended the face-to-face course in Ottawa.

ANALYSIS OF DATA

Content Test

The unit of measurement of learning was the participant's final score on the content test. Participants were grouped according to a) course attended, b) extroversion, and/or c) learning style preference, and the mean scores of each group were calculated.

Kirk's (1968) method of analysis of variance (to allow for unequal groups) was performed on the appropriate groupings to test the first three hypotheses.

Questionnaires

Scores were computed for each participant for each session of the course by summing his/her ratings of all items on a particular questionnaire. Slightly incomplete data were prorated, grossly incomplete data were excluded. These individual participant/session/questionnaire scores were used either directly or combined over all course sessions into participant/course/questionnaire scores. Mean scores and estimates of variance were then computed for each of the comparison groups needed to test a particular hypothesis, and the significance of the differences between each pair of means examined by means of a t-test. Formulae for small samples were used.

Observations

The observers' records were analysed for both the number and type of interventions. Two units of measurement were used in this study: a) the number of times each participant intervened in the discussion, in whatever way, in any session attended, and b) the proportion of these interventions that were in the form of questions. A high degree of consistency in observers' records was found. The inter-observer reliability co-efficients were: number of participant interventions per session, r=.933; proportion of questions/interventions per session r=.862.

RESULTS

Hypotheses 1 and 2

The mean scores of extroverts and introverts are as follows: satellite course I (9.11; 8.7); satellite course II (9.6; 12.2); face-to-face course (9.5; 10.33). As may be seen in Table II, the analysis of variance indicated no significant differences between introverts and extroverts on learning. This table also shows that participants learned as well in the satellite condition as in the face-to-face condition.

Hypothesis 3

Learning/teaching style preference also seems to have had little effect on students' learning (Tables III and IV). In the satellite course II and face-to-face course there appears, however, to be a slight trend in the direction opposite to that hypothesized - namely, for participants with a preference for student-centered learning approach to have a poorer learning outcome. This relationship only reaches a significant level when both course and attitude are taken

TABLES II - IV - ANALYSIS OF VARIANCE

TABLE II

Learning and Extroversion

Source	Sum of squares	Degrees of freedom	Mean square	F. Test	Significance level
A	25.39	2	12.69	2.56	(10 p.c.)
B	9.69	1	9.69	1.95	(25 p.c.)
AB	2.29	2	1.15	0.23	-
Within cell	173.83	35	4.96		

(N=41)

A = course
B = level of extroversion according to EPI
AB = course and extroversion

TABLE III

Learning and Learning Style Preference

Source	SS	df	MS	F	Sign.
A	20.34	2	10.17	2.398	(.25)
B	8.49	1	8.49	2.002	(.25)
AB	36.59	2	18.29	4.313	(.05)
Within cell	148.43	35	4.24		

(N=41)

A = course
B = learning style preference (high/low student-centered approach) according to Role of Learner Questionnaire
AB = course and preference

TABLE IV

Learning and Teaching Style Preference

Source	SS	df	MS	F	Sign.
A	48.19	2	24.095	2.57	(.25)
B	19.55	1	19.55	2.08	(.25)
AB	3.20	2	7.6	0.17	
Within cell	327.71	35	9.36		

(N=41)

A = course
B = teaching style preference (high/low student-centered approach) according to Role of Educator questionnaire
AB = course and preference

into account. This is because high student-centered participants achieved better than low student-centered participants in the first satellite course, but had lower scores than their colleagues in the second satellite course and face-to-face course.

Hypotheses 4 and 5

Learning style preference was not shown to have a statistically significant effect on the degree of participation. The same results were obtained when comparing ratings on the satisfaction and attitude towards equipment scales, when participants were grouped according to their learning-style preference.

Hypothesis 6

The sixth hypothesis was that there would be no significant difference in evaluation of the courses or in satisfaction between participants attending mediated courses and those attending face-to-face courses.

Table V summarizes the between-course evaluation comparisons. Learners in satellite course I gave more positive ratings ($t=3.22$, $p>.01$) than participants in either of the two other conditions. These data do not support the hypothesis.

Table VI shows that participants on satellite course I were again consistently more satisfied than participants in the face-to-face course ($t=2.88$, $p>.01$). The difference between satellite course II and face-to-face participants was in the same direction, but did not reach a statistically significant level.

While not conclusive, these data suggest that participants attending the satellite courses were more satisfied than participants attending the face-to-face course. Furthermore, participants attending the first satellite course gave more positive ratings than did participants in the later courses.

Hypothesis 7

This hypothesis stated that participants attending satellite courses would be *less* critical of the student-centered approach as practised than would participants attending the face-to-face course.

No significant differences were found and the hypothesis is therefore not upheld. Participants on all 3 courses seemed equally critical of (or favorable towards) the teaching approach as practised.

Hypothesis 8

The eighth hypothesis predicted that participants

TABLE V

Effect of the medium on the course Evaluations

Between course comparisons

Factor	Classification base	Comparison groups	Mean	Number	Standard deviation	t-Test	Level of Significance
Evaluation of the course	Learning session scale*	Face/face	19.938	32	3.627		
		Satellite I	22.579	38	3.037	3.22	.01
		Face/face	19.938	32	3.637		
		Satellite II	20.486	37	3.194	.65	(non)
		Satellite I	22.579	38	3.037		
		Satellite II	20.486	37	3.194	2.88	.01

*Based on 3 sessions only for Satellite II and Face/face and on 2 sessions only for Satellite I; Session 8 omitted for all groups, Session 4 no data available for Satellite I.

TABLE VI

Effect on the medium on Satisfaction

Between course comparisons

Factor	Classification base	Comparison groups	Mean	N	SD	t	Level of Significance
Satisfaction with sessions	Satisfaction Scale*	Face/face	65.435	62	11.176		
		Satellite I	70.602	98	10.883	2.88	.01
		Face/face	65.435	62	11.176		(16%)
		Satellite II	68.026	77	10.557	1.39	(non)
		Satellite I	70.602	98	10.883		(11%)
		Satellite II	68.026	77	10.557	1.58	(non)

*Based on 6 sessions only; Sessions 4 and 7 were omitted because of incomplete data.

using a multiplex system (i.e. the Ottawa sub-groups of satellite courses I and II) would be more critical of the equipment and less satisfied with the sessions than would participants using the single channel audio-video system (i.e. the St. John's sub-groups of satellite courses I and II).

Table VII summarizes the results. In each comparison, the ratings of the St. John's group were higher than those of the Ottawa (multiplexed) group. When the entire St. John's sample is compared with the entire Ottawa sample, a statistically significant difference ($t=3.52$, $p>.01$) is found on the Attitude Towards Equipment Scale. When the St. John's and Ottawa participants in only one course are compared with each other, the Satisfaction Scale ratings produced a significant difference ($t=2.90$, $p>.02$) on satellite course II and the Attitude Towards Equipment scale ratings produced a significant difference ($t=2.76$, $p>.01$) on satellite course I.

These findings were sufficiently suggestive to prompt investigation of the effect of video-multiplexing on learning. The results are also shown in Table VII, and indicate no significant difference between the groups.

<u>Hypothesis 9</u>

The ninth hypothesis predicted that the number of interventions would be greater among participants attending the face-to-face course than among those attending satellite courses.

As may be seen from Table VIII, the difference between the groups is in the expected direction, but it barely reaches significant levels. This is possibly because of the small numbers and wide variation (particularly in the face-to-face groups). The hypothesis was only partially upheld.

<u>Hypothesis 10</u>

The last hypothesis postulated was that the proportion of questions to total interventions would be greater among participants attending satellite courses than among those attending the face-to-face course.

Table VIII shows no statistically significant difference between any of the courses on this factor.

<u>DISCUSSION</u>

Several factors may have contributed to the lack of significant differences between comparison groups. These factors may also limit the general application of the results obtained in the study.

The first factor is the recruitment methods used. Although care was taken to access a representative sample of

*Based on 6 sessions only; Sessions 4 and 1 were omitted because of incomplete data.

TABLE VII

Effect of multiplexing system on satisfaction

Evaluation of the medium and learning

Factor	Classification base	Comparison groups	Mean	N	SD	t	Level of Significance
Satisfaction in general	Satisfaction Scale	Sat.I - Ottawa	3.608	4	.391	.1	(non)
		Sat.I - St. John's	3.697	17	.353		
		Sat.II - Ottawa	3.2	3	.092	2.9	.02
		Sat.II - St. John's	3.589	14	.426		
		Sat.I & II - Ottawa	3.433	7	.356	1.3	(non)
		Sat.I & II - St. John's	3.648	31	.385		
Evaluation of the medium	Attitude towards Equipment Scale	Sat.I - Ottawa	25.727	11	4.756	2.76	
		Sat.I - St. John's	30.444	45	5.463		.01
		Sat.II - Ottawa	26.	9	5.268	1.99	(5 - 10%)
		Sat.II - St. John's	30.05	40	5.159		(non)
		Sat.I & II - Ottawa	25.85	20	4.859	3.52	.01
		Sat.I & II - St. John's	30.259	85	5.294		
Learning	Content Test	Sat.I & II - Ottawa	8.6	5	1.342	1.4	(non)
		Sat.I & II - St. John's	9.792	24	2.519		

TABLE VIII

Effect of the medium on participant interaction

Between course comparisons

*Interventions

Factor	Classification base	Comparison groups	Mean	N	SD	t	Level of Significance
Participant Interaction	Observation Log	Sat. I (obs.1))	3.507	6	2.385		
		Face/face (obs.1)	15.317	6	8.146	3.11	.02
		Sat. II (obs.2)	8.974	7	3.954		(5% to 10%)
		Face/face (obs.2)	16.128	6	7.861	1.85	(non)
	Proportion Questions to Interventions	Sat. I (obs.1)	22%	6	.233		
		Face/face (obs.1)	20.3%	7	.050	.17	(non)
		Sat. II (obs.2)	22.6%	7	.071		
		Face/face (obs.2)	19.7%	7	.034	.89	(non)

Only observer 1 noted items for Satellite I.
Only observer 2 noted items for Satellite II.
Both observers noted items for the Face/face course.
Each observer's results for the Satellite course were only compared with the same observer's results for the Face/face course.
*(Based on mean number of interventions per participant per session).

the public service middle-management population, the recruitment method differed (Table I). This difference may have had an influence on learner attitudes, "articulation of student needs", and personality types present in the earlier (satellite I) and later (satellite II and face-to-face) courses.

The second factor is the nature of the measuring instruments used. The questionnaires had been checked for reliability in previous teleconference studies and the observer ratings showed a high degree of reliability. The content test, however, was necessarily constructed during the first course, and it was impossible to assure its validity or reliability.

The third factor is the limited sample used. It is difficult to obtain statistically significant results with such a small number of participants. To some extent, this liability was overcome in analysis of data from the evaluative questionnaires by using participant/session scores, but this could not be done in the case of the content test, nor the two classifying measures: the EPI and the Roles Questionnaire.

Another factor was that at the students' request, a course director went to St. John's for the last four satellite course I sessions. This established a degree of personal rapport which, together with the participants' satisfaction at having their wishes met, may have provided the groundwork for a more positive evaluation of this course.

These factors may have obscured or enhanced differences between the experimental and control groups. In particular, the observed difference between the two satellite courses is probably due to the differing conditions, as noted previously. Nevertheless, we found no evidence to suggest that learning by satellite differs from learning in face-to-face courses, nor that the recruitment method used has an effect on learning.

The desirability and future use of the multiplexing system is difficult to determine. On the one hand, users seemed to have achieved their learning objectives and were generally satisfied with the sessions. On the other hand, as predicted, full-bandwidth video was rated significantly better than the multiplexing system. It is possible that only a moderate level of satisfaction with the equipment is necessary for adequate learning, or that only certain of the technical aspects are critical.

CONCLUSIONS

Taking into consideration the limitations mentioned above, the following conclusions may be drawn for the student-centered educational approach used in this experiment.

1. Mediated learning produces results comparable to face-to-face learning.

2. Extroverts learn as well as introverts in a mediated setting.

3. Student preference in learning style, as specified in this paper, has no observable effect on learning, on participants' interaction during the sessions, on students' satisfaction with the course or on students' attitudes to the medium.

4. The student-centered teaching approach used was well suited to the needs of the adult learner and was satisfactory in both satellite and face-to-face conditions.

5. The interactive video system used was well adapted to the non-directive learner-centered approach, to the course content, and to active student participation. The use of the video system linked by satellite seems to be as effective as the face-to-face setting for answering a task and person-oriented training need.

These findings indicate that a high-quality video interactive system used in a multi-location setting is technically feasible and highly effective in training. Its actual use and desirability depends on other factors such as costs, organizational structure and future training needs.

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LESSONS FROM THE EVALUATION OF THE CANADIAN EDUCATIONAL EXPERIMENTS ON THE HERMES SATELLITE

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Dès le mois d'octobre 1976, on utilisait le satellite Hermès pour réaliser une série d'expériences de télé-enseignement au Canada. La diversité des possibilités qui ont été examinées a compensé la brièveté relative de chaque projet. L'auteur de cette communication décrit le protocole suivi pour l'évaluation des expériences, le mode opératoire utilisé pour l'examen du produit final à partir des données provenant d'un contexte particulier et les méthodes auxquelles on a eu recours pour réunir les données et les analyser. Nous n'avons pas encore pu nous procurer les données fournies par toutes les expériences, aussi les conclusions dont nous faisons ici état sont-elles fragmentaires et devront-elles par la suite être revues et complétées.

1. The Role of Evaluation

There is general agreement that evaluation should be an aid to decision-making. The evaluation of the educational experiments on Hermes is intended to help the Canadian government reach appropriate policy decisions and to assist the educational community in making choices about the use of satellites. The objectives of the evaluation component are phrased as follows:

> "The evaluation is intended as an overall study of the various uses made of the Hermes satellite in education. It concerns the impact of new telecommunications facilities such as Hermes on educational systems. Particular attention is paid to the geographical widening of access to education and the changes in teaching strategies and methods which such facilities require. The Hermes experiments may provide examples and show that several of the ways in which technology could improve communications in Canada might be useful for education. The study will take these issues into account in drawing general conclusions in the form of a model for future communications systems in Canada. The administrative and logistic aspects of such systems in an educational context will be discussed."

2. The Conceptual Framework

In the past evaluation, like psychological and sociological research, has used either survey or experimental methods. Since the Hermes educational projects were demonstrations rather than experiments in any scientific sense, experimental or quasi-experimental designs were ruled out. Furthermore, although survey methods were germane to some aspects of the evaluation mandate, a broader approach was required to achieve its overall objectives. Such a broader approach, which includes a look at the political and cultural aspects of a project, has been described as illuminative evaluation by Hooper, 1977, and the method we have used derives from Context-Input-Process-Product (CIPP) model in Stufflebeam 1971.

3. Implementing the Evaluation Strategy

In addition to our mandate to evaluate the educational experiments as a whole, each project was required to produce an evaluation report. This required close teamwork between the two levels of evaluation since the overall model and standard instruments (Daniel et al, 1976) which we proposed had to be adapted to the context and objectives of each experiment. It was agreed that individual experimenters would be the first to analyze the data generated and since we are still awaiting the final reports of some projects the conclusions given here, which are based largely on observation of satellite sessions (Côté, 1977) and conversations with experimenters, are subject to revision. It is clear that sharing responsibility for evaluation between several institutions precludes any line of command, making the process long and cumbersome and the product somewhat patchy. However, we maintain that the long-term advantages of promoting a critical awareness at all levels of the project outweighs these drawbacks.

4. Preliminary Conclusions

It will be convenient to list our tentative conclusions in terms of the four facets of the Stufflebeam model.

4.1 Context

As we have observed, the Hermes projects in education were demonstrations rather than experiments. The limited time available for each project, and the often inconvenient scheduling, made it difficult to use the satellite for the whole of a timetabled course. Furthermore, involving Hermes in any activity central to an institution's mandate required that a back-up system be available in case of equipment failure. Given these constraints experimenters were obliged to use the satellite to 'have a go' at conducting various educational activities at a distance. Whilst the results provide pointers about the suitability of different applications they do not constitute a feasibility study even though some experimenters' original written proposals suggested this as an aim. It is worth remarking here that, since a proposal to conduct a satellite experiment is in fact a proposal to direct some of the institution's own resources to this endeavour, there is much to be gained by stating objectives clearly and veraciously and avoiding the rarified, often obfuscating metalanguage characteristic of many research-funding proposals.

One common feature of each of the successfully completed experiments was a dynamic leader. These individuals had the essential qualities of the entrepreneur. They kept the flame of enthusiasm burning during the phase of planning and resource seeking and obtained the support of their institution. Although this strong linking of projects to individuals has been cited as evidence that projects do not really respond to an institutional need we believe this criticism ignores the way innovation takes place. The application of new technologies, in education as elsewhere, depends almost invariably on the drive of a few individuals.

4.2 <u>Input</u>

Some institutions received no outside funding for their experiments. Even those that did still had to redirect significant human and financial resources towards the Hermes project. For Hooper, 1975, this is a healthy phenomenon if the experiments are intended as a springboard to later operational systems. Educational projects which depend on outside funding do not have a high survival rate once the external source dries up.

Detailed comparison of the internal organization of the experiments will have to await the final reports. Although there was inevitably much improvisation all projects were integrated to a large degree into the line structure of the institution. Naturally this did not automatically resolve who was responsible for what. Indeed, in one case it highlighted weaknesses in the institution's own structure, but it avoided the creation of separate project teams.

It is already clear that, given the resources avail able, the Hermes experiments would have involved large numbers of people working long hours on an overload basis however well they had been organized. The evaluators admire the dedication of those running the projects.

4.3 <u>Process</u>

Although the satellite itself operated satisfactorily throughout, the educational experiments were dependent on a total system which included the ground terminals and the equipment attached to them. These systems functioned less well. Video images rarely posed problems but very few experimental sessions were without sound problems. Not enough prior attention was paid to obtaining compatible sound equipment and correcting the feedback problems of group telephony, particularly where multipoint interactive links were involved.

Another weakness in the experimental process was communication between sites for housekeeping purposes. More air time would need to be dedicated to this function in an operational system.

4.4 Product

At least two of the four experimenting institutions intend to conduct a pilot project on the Anik B satellite and one of them has installed a terrestrial video/interactive audio system since completing the Hermes project. This is a useful measure of the success of the experiments. Although one cannot claim that the experiments have proven or disproven either the need or the economic feasibility of using communication satellites in education they have produced a corpus of know-how on the application of interactive telecommunications which will be useful in later projects. We shall summarize some of these lessons in telegraphic form.

- Tele-education need not mean simply courses; research meetings, distant library access and colloquia are additional useful applications.
- Students can learn as well via satellite as in face-to-face sessions.
- The better students are prepared for a tele-education experience, the more they will learn and the more they will enjoy it.
- Interactive discussion does not just happen; an animateur can play a helpful role (Côté, 1977).
- One-way broad-band video links, whilst rarely essential from an instructional point of view, are important for providing reassurance when sound quality and reliability are poor.
- Teaching through a video link requires the instructor to learn new skills, particularly for presenting visual information.
- Staff involved will be happier and more efficient if they have received previous training for their role.

5. The Hermes Project and the Future

The fact that communication satellites exist is not a sufficient reason for using them in education. In order to develop a model for the use of telecommunications in education in Canada, needs analyses and cost studies are required and these are going ahead (Daniel, et al 1977; Daniel, 1977 (a) and (b)). However, even if there prove to be significant needs which could be met at a reasonable cost by an operational satellite network, there is no guarantee that the many political, institutional and administrative obstacles to this development would be overcome. Hooper, 1975, has studied the process of assimilation of technology in education and one of the aims of evaluating the Hermes experiments was to test further some of his hypotheses. Assuming that at least those institutions planning to continue satellite work with Anik B and those now operating terrestrial telecommunications facilities have begun to assimilate this technology, the following factors appear to be favourable:

1. The technology answers significant needs linked to the primary objectives of the institution.

2. The technology blends in with that already in use.

3. The team implementing the technology is integrated into the line structure of the institution.

4. Serious attention is given to training personnel and preparing participants.

5. The institution puts up some of its own resources to use the technology.

6. The technology has high visibility inside and outside the institution.

7. The use of the technology is evaluated by people close to it.

8. Different departments and institutions work together on the project.

9. The technology promotes reforms and developments already under way in the institution.

10. Existing equipment and courseware can be used with the technology.

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THE MOOSE FACTORY TELEMEDICINE PROJECT: A DESCRIPTIVE EVALUATION

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L'expérience de télémédicine de Moose Factory a permis de relier, grâce au satellite technologique de télécommunication Hermès, deux collectivités du nord de l'Ontario soit, l'hôpital général de Moose Factory et une infirmerie située dans la communauté Cree de Kashechewan (communément appelée Kash) d'une part, et le University Hospital de London, Ontario d'autre part. Cet article se propose de présenter succinctement quelques-unes des observations de base faites à partir d'une analyse de l'expérience qui vient d'être réalisée.

Le système de télécommunication consistait en deux éléments principaux:

1 - une liaison audio bilatérale entre Moose Factory et Kash afin d'établir une communication téléphonique fiable entre les infirmières oeuvrant dans ces deux communautés et leur hôpital régional.

2 - une liaison vidéo unilatérale et audio bilatérale entre Moose Factory et London permettant l'hôpital régional isolé de consulter les experts que l'on retrouve dans un centre médical moderne. De plus, on avait établi une liaison audio bilatérale entre Kash et London.

Les diverses activités d'ordre administratif ont été divisées en programmes. Les programmes relatifs aux services cliniques étaient plus nombreux; les autres activités comprenaient les programmes éducatifs et communautaires.

La généralisation de la mise en application d'un service de télémédecine dans le Nord canadien soulève un certain nombre de points plus ou moins importants. L'expérience réalisée à Moose Factory répond à une première question, à savoir "Dans le contexte du nord de l'Ontario, la télémédecine offre-t-elle des services médicaux utiles?" A la lumière des données contenues dans l'évaluation qui suit, la réponse à cette question

semble être franchement affirmative. De par sa nature, l'expérience n'a pas permis cependant de déterminer jusqu'à quel point les services offerts par la télémédecine sont meilleurs (ou moins bons) que tous ceux qu'on pourrait obtenir en choisissant un autre système? Plus important, du point de vue strictement financier, il reste encore à évaluer la rentabilité et les coûts, peut-être très élevés, de la technologie dans ce domaine. Nous estimons que la difficulté et la faible probabilité d'obtenir des données pertinentes pouvant servir de base à l'étude des points susmentionnés l'emportent de loin sur l'utilité éventuelle de ces mêmes données dans la prise de décisions. Il est donc crucial que les évaluateurs planifient ensemble les futurs projets afin de s'assurer que les objectifs de chacun soient mutuellement harmonieux, appropriés et réalisables.

INTRODUCTION

The Moose Factory Telemedicine Experiment used the communications facilities of the Hermes spacecraft to link two Northern Ontario communities, the Moose Factory General Hospital and a nursing station in the Cree community of Kashechewan (popularly known as Kash), with the University Hospital, London, Ontario. The project was conducted between October 1976 and February 1977. While the experiment was conceived by and run from the University of Western Ontario (U.W.O.) a group at McMaster University, Hamilton, was given the responsibility for evaluating the experiment. The focus of this paper will be a summary of some of the primary data generated as part of this evaluation.

The telecommunication system consisted of two principal components:

1. A two-way audio link between Moose Factory (MF) and Kash to provide for the first time reliable voice communication between the community nurses and their base hospital.

2. A one-way video, two-way audio link from MF to London, to make the consultative *might* of a modern tertiary care centre routinely available at the remote northern hospital. In addition, there was a two-way audio link between Kash and London.

Administratively the various activities undertaken were grouped into programs. As might be expected, during the course of the study there was an evolution in the use of the system. The initial list of programs was thus both edited and augmented over time, but numbered 25 at termination. Clinical service programs dominated; other activities included educational and community-oriented programs. While this paper will present most of the findings, combined for all programs, comments on striking inter-program differences are included.

THE TRANSACTION

The analysis which we present here relates to data collected about each unit of work conducted on the system. We have called this unit of work a transaction and defined it as a single activity relating to a service entity. A transaction could be as short as a one-page document telecopied from one site to another, or a short voice communication, through to a formal medical consultation involving a patient with, say, chest pain.

Data was captured about each transaction with a form (Fig. 1) which was completed by each participant at each involved site. The form elicited judgements about the medical quality of each of the communications components used, their importance and ease of use, and the need for two-way video. About one half of the form concerned the effect on the patient and the process of care. Finally, although first on the form, was an item referred to as "gut reaction" which asked respondents to grade their general feelings about the transaction on a scale of excellent to awful! The number of participants at each site varies from transaction to transaction. Many involved a single person at each site although frequently multiple participants were present, for example for a multiproblem clinical consultation or during a nursing-education program. As in most applied research studies some data was lost either because a participant failed to complete a form, or provided a partially-completed form. The clinical questions had a "not applicable" option which was used in some situations by London respondents if they felt they were unable to make a judgement (for instance about the effect on patient outcome).

Descriptive Evaluation

(i) General Comments

In the tables which follow, we present a summary of the transaction data. Data items are summarized by site with Moose Factory-London, and Moose Factory-Kashechewan transactions treated separately. The small number of three-way transactions and those between London-Kashechewan have not been included. In the first two tables concerning the medical quality of the individual communications components and the need for two-way video, we have included *all available responses*. In the remaining tables concerning patient-oriented questions, we have included only the primary respondent at each site in transactions involving consideration

PARTICIPANT'S QUESTIONNAIRE RE U-6 TRANSACTION DATA FORM

FORM # U6-03

SECTION II - Participant's Evaluation

TRANSACTION #..........

PROGRAM #..........

PARTICIPANT..........

DATE..........

DIRECTIONS FOR QUESTIONNAIRE:

PLEASE COMPLETE THIS QUESTIONNAIRE BY CIRCLING THE BEST RESPONSE FOR QUESTIONS 10 AND 15 ONWARDS, AND BY MARKING (✓) IN THE APPROPRIATE SPACES FOR QUESTIONS 11- 14.

DISREGARD THE NUMBERS AND BLOCKS ON THE EXTREME RIGHT.

X· OMIT THIS QUESTION OR THIS PART OF THE QUESTION.

10. WHAT IS YOUR IMMEDIATE "GUT REACTION" TO THIS TRANSACTION?
   1. EXCELLENT
   2. GOOD
   3. FAIR
   4. POOR
   5. AWFUL
   0. NOT APPLICABLE

G ☐ 32

11. FOR MEDICAL PURPOSES, WAS THE QUALITY OF:	1 EXCELLENT	2 GOOD	3 Adequate but modifications would be beneficial	4 INADEQUATE	0 NOT APPLICABLE	
A) VIDEO						Qa ☐ 33
B) VOICE TRANSMISSION						Qb ☐ 34
C) EKG TRANSMISSION						Qc ☐ 35
D) FACSIMILE						Qd ☐ 36
E) ELECTRONIC STETHOSCOPE						Qe ☐ 37

12. HOW VALUABLE WAS EACH COMPONENT TO THE TRANSACTION:	1 ESSENTIAL	2 HELPFUL ONLY	3 NOT USEFUL	4 INADEQUATE	0 NOT APPLICABLE	
A) VIDEO						Va ☐ 38
B) VOICE TRANSMISSION						Vb ☐ 39
C) EKG TRANSMISSION						Vc ☐ 40
D) FACSIMILE						Vd ☐ 41
E) ELECTRONIC STETHOSCOPE						Ve ☐ 42

13. DID YOU HAVE DIFFICULTIES USING THE EQUIPMENT? 1)	1 NO DIFFICULTY	2 MAJOR DIFFICULTY	3 MINOR DIFFICULTY	0 NOT APPLICABLE	
A) VOICE TRANSMITTING EQUIPMENT					Da ☐ 43
B) VIDEO					Db ☐ 44
C) EKG TRANSMISSION					Dc ☐ 45
D) FACSIMILE					Dd ☐ 46
E) ELECTRONIC STETHOSCOPE					De ☐ 47

2) IF DIFFICULTIES, PLEASE COMMENT: ____________________

Figure 1

PARTICIPANT'S QUESTIONNAIRE - Page 2 FORM # U6-03

14. WOULD THE USE OF 2 WAY VIDEO RATHER THAN 1 WAY HAVE:	1 YES	2 NO	0 NOT APPLICABLE	
A) INCREASED YOUR ACCURACY				Wa ☐ 48
B) INCREASED YOUR EFFICIENCY				Wb ☐ 49
C) MADE POSSIBLE A TASK THAT WAS IMPOSSIBLE WITH 1 WAY				Wc ☐ 50
D) MADE YOU FEEL MORE AT EASE				Wd ☐ 51
E) BEEN LESS EFFECTIVE THAN 1 WAY				We ☐ 52

15. ANSWER THIS QUESTION ONLY IF VIDEO WAS USED FOR THIS PROGRAM:
COULD YOU HAVE ACCOMPLISHED THE SAME THING USING VOICE ONLY (E.G. TELEPHONE)?

1. YES
2. NO
3. NOT APPLICABLE

V ☐ 53

16. HOW MEDICALLY USEFUL TO THE PATIENT WAS THIS TRANSACTION?

1. EXTREMELY USEFUL
2. DEFINITELY USEFUL
3. FAIRLY USEFUL
4. MINIMALLY USEFUL
5. OF NO USE
0. NOT APPLICABLE

U ☐ 54

17. DID THE TRANSACTION CHANGE THE DIAGNOSIS?

1. NO CHANGE BUT WAS HELPFUL
2. NO CHANGE AND WAS OF NO HELP
3. MINOR CHANGE
4. SIGNIFICANT CHANGE
0. NOT APPLICABLE

D ☐ 55

18. DID THE TRANSACTION CHANGE THE MANAGEMENT PLAN?

1. NO CHANGE BUT WAS HELPFUL
2. NO CHANGE AND WAS OF NO HELP
3. MINOR CHANGE
4. SIGNIFICANT CHANGE
0. NOT APPLICABLE

M ☐ 56

19. HOW DID THE TRANSACTION AFFECT PATIENT TRANSFER? (LONDON ALWAYS O)

1. CAUSED A PATIENT TRANSFER THAT LIKELY WOULD NOT HAVE OCCURRED IN THE ABSENCE OF THE TRANSACTION.
2. PREVENTED A PATIENT TRANSFER THAT LIKELY WOULD HAVE OCCURRED IN THE ABSENCE OF THE TRANSACTION.
3. PREVENTED AN EMERGENCY EVACUATION OF THE PATIENT.
4. HAD NO EFFECT ON PLANS TO/NOT TO TRANSFER THE PATIENT.
0. NOT APPLICABLE

T ☐ 57

20. HOW MIGHT THE TRANSACTION INFLUENCE THE PATIENT'S EVENTUAL OUTCOME?

1. MARKED INFLUENCE, POSSIBLY LIFE SAVING OR PREVENTION OF MAJOR DISABILITY.
2. DEFINITE INFLUENCE RELATED TO FUTURE WELL-BEING OR PREVENTION OF DISABILITY.
3. SOME INFLUENCE, PROBABLY ONLY RELATIVE TO SYMPTOMS, NOT AFFECTING FUTURE DISABILITY.
4. UNLIKELY TO HAVE AN INFLUENCE ON EVENTUAL OUTCOME.
0. NOT APPLICABLE.

O ☐ 58

21. AS A LEARNING EXPERIENCE FOR YOU, WAS THIS TRANSACTION:

1. EXCELLENT
2. GOOD
3. FAIR
4. POOR
0. NOT APPLICABLE

L ☐ 59

Figure 1 (continued)

PARTICIPANT'S QUESTIONNAIRE - Page 3 FORM # U6-03

22. DID YOU GET THE NECESSARY INFORMATION? 1. YES, COMPLETELY 2. YES, RECEIVED THE NECESSARY INFORMATION (E.G. TO COMPLETE SERVICE), BUT WOULD HAVE LIKED ADDITIONAL INFORMATION. 3. NO BECAUSE OF CTS MEDIUM 4. NO FOR OTHER REASONS (COMMENTS BELOW PLEASE) 0. NOT APPLICABLE	I ☐ 60
23. WAS ENOUGH TIME ALLOTTED FOR THE TRANSACTION 1. ADEQUATE TIME ALLOTTED 3. NOT ENOUGH TIME 2. MORE TIME THAN NECESSARY 0. NOT APPLICABLE	T ☐ 61
24. BLANK	B ☐ 62
25. BLANK	B ☐ 63
26. BLANK	B ☐ 64
COMMENTS PLEASE:	

August 19, 1976

Figure 1 (continued)

of the diagnosis or treatment of an individual patient. Thus educational events, technical feasibility activities and commissioning transactions are not included.

(ii) Medical Quality of Communications Facilities

One of the major questions facing telemedicine in the future is whether the quality of the communication facility is adequate to support patient-care activities. We do not believe that quality is a technical question of measuring resolution, grey scale, etc., but is much more related to whether the quality was good enough for medical purposes.

The data relating to this issue are summarized in Table I. We believe that all respondents have the right to provide input in this area and thus all available assessments have been used. The data are sub-divided by site since quality may vary depending on local conditions or requirements. Finally, the responses for each separate component of the system appear separately in the table with the *good* and *adequate, but modifications would be beneficial* categories lumped together.

Looking first at video, we see that 71% of respondents at London and 79% at MF judged the quality to be excellent. Only 1% or fewer of respondents thought the quality was inadequate for medical purposes. Thus overall, approximately 99% of respondents felt that the quality of the video was at least adequate to meet the medical service requirements.

Voice quality was judged slightly differently at the three sites. The nurses at Kash were most impressed with 86% of instances rated as excellent. This fell slightly to 81% at MF and dropped to 64% at London. London respondents were thus less happy with the voice quality, but whether this was a real problem or simply the result of higher expectations is not clear. What is clear is that the nurses at Kash and to some extent the hospital staff at MF have become accustomed to the unreliability and wavering quality of the HF radio link. In this light Hermes was very impressive to them.

The assessment of video and audio quality varied very little across the various programs. The two exceptions were psychiatry and morphology which rated both consistently lower than the other respondents. It would seem reasonable that a pathologist requires excellent quality video to be able to assess microscopic slides and thus was more demanding. The psychiatry finding on the other hand is a little more puzzling and may be associated with the issue of confidentiality even though this is somewhat tangential to quality.

At this point in the table the volume of data declines dramatically. Although facsimile usage was very

TABLE I

Quality of the Communications Facilities for Medical Purposes

Communications Facility		LONDON RESPONDENTS			MOOSE FACTORY RESPONDENTS			KASHECHEWAN RESPONDENTS		
		Excellent	Good/ Adequate	in- adequate	Excellent	Good/ Adequate	in- adequate	Excellent	Good/ Adequate	in- adequate
Video	n	182	70	3	198	51	1	-	-	-
	%	71.4	27.5	1.2	79.2	20.4	0.4			
Voice	n	163	87	5	258	56	5	54	7	2
	%	63.9	34.1	2.0	80.9	17.6	1.6	85.7	11.1	3.2
Facsimilie	n	15	10	0	4	3	0	-	-	-
	%	60.0	40.0	0.0	57.1	42.9	0.0			
E.K.G.	n	9	1	0	2	1	0	-	-	-
	%	90.0	10.0	0.0	66.7	33.3	0.0			
Electronic	n	2	4	3	4	4	1	-	-	-
Stethoscope	%	22.2	44.4	33.3	44.4	44.4	11.1	-	-	-

high, few telecopying transactions generated a completed data form in their own right. The few forms which did have assessments of facsimile quality usually resulted from situations where this equipment had been used in conjunction with other facilities. What little data we have does suggest that excellent quality was far from being always present.

The EKG transmission equipment and electronic stethoscope were little used. In the case of the EKG the reason seems to have been that EKG's were more easily conveyed as video images, thus negating the need to run the EKG equipment in real-time. The clinical usefulness of the electronic stethoscope was continually limited by extraneous noise problems. The need for both these items of equipment must be questioned in future studies based on this experience.

The overall impression is of little difficulty with any equipment, except the infamous stethoscope. If any difficulty occurred it was at London with the remote camera control unit and the press-to-talk microphone and slight system delay (presumably due to unfamiliarity).

(iii) Need for Two-Way Video

A relatively large section of the form was concerned with the need for two-way as opposed to one-way video. Again this was felt to be a personal judgement and all available data from London and MF have been included. The issue of course has major cost implications for future medical applications of communications technology.

The data relating to the question of two-way video are displayed in Table II. As might be expected, the need for two-way video was felt more by MF respondents than London respondents. The most frequently occurring justification was in terms of making participants feel more at ease (33% at MF) and between one-in-four and one-in-five respondents felt that the process would be affected in terms of accuracy or precision. Two-way video could not be justified on the basis of making a task possible which is impossible with one-way video. Hidden within these averages is a strong time trend and support for two-way video had all but dissipated by the end of the study.

While the issue is clear overall, four of the individual programs (Psychiatry, Nursing Continuing Education, Physiotherapy, and Respiratory Technology) stand out in their special needs in this regard. Participants in these four programs together indicated that efficiency would have been increased on 71% of occasions; this is substantially above the average. In psychiatry two-way video was needed to establish patient rapport; in the other programs the educational component would have been much enhanced with two-way video.

TABLE II

Need for Two-Way Video

Would the Use of Two-Way Video Have,		London Respondents		Moose Factory Respondents	
		Yes	No	Yes	No
Increased your accuracy or efficiency	n %	53 12.9	357 87.1	74 18.7	321 81.3
Made possible a task that was impossible with one-way video	n %	13 6.0	204 94.0	20 3.7	211 91.3
Made you feel more at ease	n %	27 12.1	196 87.9	84 33.2	167 66.3
Been less effective than one-way video	n %	3 1.5	194 98.5	5 2.2	222 97.8
Could you have accomplished the same thing using voice only (e.g. telephone)	n %	36 10.3	313 89.7	47 14.9	269 85.1

TABLE III

How Medically Useful to the Patient Was the Transaction?

How Useful?		London-Moose Factory Transactions				Moose-Factory-Kashechewan Transactions	
		Primary Respondent				Primary Respondent	
		London		Moose Factory		Moose Factory	Kashechewan
Extremely Useful	n %	29 12.6	*14* *7.8*	153 52.6	*97* *53.9*	2 7.7	2 14.3
Definitely Useful	n %	138 60.0	*119* *66.1*	86 29.6	*49* *27.2*	10 38.5	9 64.3
Fairly Useful	n %	45 19.6	*31* *17.2*	29 10.0	*21* *11.7*	6 23.1	2 14.3
Minimally Useful	n %	14 6.1	*12* *6.7*	16 5.5	*9* *5.0*	7 26.9	0 0.0
Of No Use	n %	4 1.7	*4* *2.2*	7 2.4	*4* *2.2*	1 3.8	1 7.1
Not Applicable/ No Answer		83		10		32	24

Figures in italics are results of an analysis restricted to transactions in which both the London response and the Moose Factory response of the primary respondent were non-missing.

At the other extreme to the need for two-way video, is the question of whether video is required at all. The need for video was questioned only if video was actually used and thus the table includes only London and MF respondents. Since we are really interested in the proportion of transactions which could be handled with voice only, it is appropriate to include only one respondent from each site for each transaction. We have included this data in the last row of Table II.

The data indicates that London judged that 10.3% of transactions could have been done with voice only, whereas MF felt that 14.9% could be so managed. The slight difference presumably reflects MF's experience with telephone consultations. The conclusion is that few of the services provided through the project could have been handled by existing landline communications facilities.

Some time trends were apparent in these results. Both London and MF respondents initially said that in over 20% of transactions, voice-only communications would have been sufficient. This rate fell off dramatically at both sites after November and presumably reflects growth in programming experience and sophistication with the video medium.

(iv) Medical Usefulness

The medical usefulness to the patient of the transaction was based on a 5-point rating scale ranging from *extremely useful* through to *of no use*. The data from the primary respondents of patient-oriented transactions are displayed in Table III which is subdivided into the London-MF transactions and the MF-Kash transactions. Looking at the data from the latter group of transactions, we are immediately struck by its paucity and thus our concomitant inability to arrive at any firm conclusions. At the other extreme, the data from MF respondents when working with London is extensive and very complete as judged by the frequency of unknown/NA ratings.

It seems reasonable to assume that the usefulness to the patient of a transaction is best judged by the attending health professional represented by the MF responses on the left of the table and the Kash responses on the right of the table. Of these MF primary respondents judged almost 53% of transactions to be extremely useful to the patient and a further 30% to be definitely useful (comparable figures at Kash were 14% extremely useful and 64% definitely useful). Relatively few (8%) of MF respondents felt that the transaction was either minimally useful or of no use to the patient.

Comparing the MF principal's rating with those London principal respondents who felt they could comment on patient usefulness shows up some differences. London respondents were more reluctant to use the *extremely useful* category but used correspondingly more *definitely useful* ratings. Combining these two together however, still suggests the London respondents were more conservative estimators of the transaction usefulness (72.6% London and 82.2% MF). The small number of MF ratings of MF-Kash transactions does suggest an overall pattern of less usefulness than the London-MF transactions.

(v) Changes in Diagnoses

The act of diagnosis is very central to the process of care, and differential diagnosis is often the subject of a specialty consultation. The label attached to a patient's disorder may in some situations be only marginally related to management or eventual outcome, in other situations it can be of crucial importance. The use of change in diagnosis as a measure of the impact of a transaction is thus questionable, but it does have the advantage of being an objective criterion.

Table IV summarizes the data on changes in diagnoses in the usual fashion. The initiator of patient-oriented transactions at MF judged that the interaction with a London health professional affected the diagnoses in 30 situations of which 13 were major changes and 17 minor changes. This represents a rate of change of 6.3% for major changes and 8.3% for minor changes. Thus in one-in-seven transactions where diagnosis was possibly an issue there was a resulting change. The vast majority of situations in which no change resulted were, however, judged as useful by the MF initiator.

The consultants at London were somewhat more liberal in their assessment of the transaction's impact on diagnosis and felt that on 47 occasions a change occurred. The large number of not applicables/not answered ratings makes these figures a little difficult to interpret as rates, so the percentages provided are of dubious value. A potentially larger number of transactions were judged as *of no use* by London consultants. The slight overestimate of the number of diagnostic changes by the London staff presumably reflects the fact that the consultant's interpretations may not be accepted by the initiating health professional in MF.

Again, little data is available on the Kash connection transactions, but most sessions would appear to be judged as *no change, but helpful* by the nurses at Kash.

(vi) Change in Management

While the diagnosis itself is only a label for the patient's disorder, the decision over management is an action plan. Changes in management resulting from a transaction have a more direct impact on the patient. If telemedicine can provide the MF General Hospital with access to a wide variety of health-professional specialists it should offer great benefits over a system of visiting specialists, telephone consultations or evacuations, in terms of the speed

TABLE IV

Did the Transaction Change the Diagnosis?

Diagnosis Change?		London-Moose Factory Transactions				Moose-Factory-Kashechewan Transactions	
		Primary Respondent				Primary Respondent	
		London		Moose Factory		Moose Factory	Kashechewan
Significant Change	n	20	*9*	13	*6*	2	1
	%	13.8	*10.3*	6.3	*6.9*	9.5	7.1
Minor Change	n	27	*18*	17	*12*	1	0
	%	18.6	*20.7*	8.3	*13.8*	4.8	0.0
No Change But Helpful	n	82	*49*	166	*63*	14	12
	%	56.6	*56.3*	81.0	*72.4*	66.7	85.7
No Change and of No Help	n	16	*11*	9	*6*	4	1
	%	11.0	*12.6*	4.4	*6.9*	1.9	7.1
Not Applicable/ Not Answered		166		96		37	24

TABLE V

Did the Transaction Change the Management Plan?

Management Change?		London-Moose Factory Transactions				Moose-Factory-Kashechewan Transactions	
		Primary Respondent				Primary Respondent	
		London		Moose Factory		Moose Factory	Kashechewan
Significant Change	n	53	*35*	36	*22*	10	6
	%	39.0	*44.3*	18.0	*27.8*	35.7	35.3
Minor Change	n	20	*13*	39	*22*	4	3
	%	14.7	*16.5*	19.5	*27.8*	14.3	17.6
No Change But Helpful	n	49	*26*	114	*32*	13	7
	%	36.0	*32.9*	57.0	*40.5*	46.4	41.2
No Change and of No Help	n	14	*5*	11	*3*	1	1
	%	10.3	*6.3*	5.5	*3.8*	3.6	5.9
Not Applicable/ No Answer		117		99		30	21

Figures in italics are results of an analysis restricted to transactions in which both the London response and the Moose Factory response of the primary respondent were non-missing.

with which areas of concern can be resolved. The first step in demonstrating such benefit is to demonstrate that telemedicine consultations have an impact on management decisions.

The impact of the project on management is summarized in Table V. The initiators of patient-oriented transactions in MF judged that in 36 (18.0%) situations a consultation with London led to a significant management change in the patient's condition and an additional 39 (19.5%) instances resulted in changes of a more minor nature. The bulk of the remaining transactions, even though they didn't result in any modified management decisions, were judged as helpful by the "referring" health professional. In only 11 instances (5.5%) was the transaction judged to be of no help.

As with changes in diagnosis, the London principal respondents in these same transactions judged that they had a larger influence on management with 53 instances of significant change and 20 of minor changes. Adding these two figures together produces a similar total, but many London respondents were not prepared to anticipate the impact of the transaction in terms of a changed management plan. For example, a radiologist when reviewing an X-ray film may not have talked with the referring physician and thus would have difficulty in assessing whether a management change would result or not.

Even with the small amount of data available on MF-Kash transactions, there appears to be some indication that these consultations had an impact on management, without necessarily affecting diagnostic labelling.

A change in the management plan, if it occurs, has an unquestionable impact, but such events should not be given excessive weight in the present evaluation. Many physicians seek consultation for confirmatory reasons and thus *no change, but helpful* is a very important outcome in its own right. It is our view that these data are very impressive and clearly indicate the important services being provided through the Hermes medium. Whether face-to-face "equivalent" consultations would have had significantly better outcomes in terms of resolving issues in management is of course an interesting question. No comparative data is available from this study to answer this question. One might argue that such information could never be available, in that the type of consultancy work a visiting specialist performs at MF is inherently different from the pattern of services offered through telemedicine. In this light, it seems that the most relevant question is whether the consultant in London feels that he or she can offer an essentially equivalent consultation through Hermes, (excluding the laying on of hands), and is equally confident in his or her ability to make clinical judgements.

(vii) Effect on Patient Transfer

Had we been a little more astute in our data collection development early in the study, we might usefully have asked the question; "If Hermes had not been available, how would you have resolved your current clinical problem?" One answer from among the limited set of alternatives would be to evacuate the patient. We have data on this particular option, but upon reflection, this should have been viewed as one of a larger set.

The data on the anticipated effect on patient transfer is summarized in Table VI. To be consistent, we have relied upon the judgement of the primary respondent at MF for both MF-London transactions and MF-Kash activity. Transactions with London were thought to have negated the need for 3 emergency and 21 routine evacuations from MF at the *expense* of 4 transfers which might not have occurred but for the project. The large number of not applicable/no answer responses are almost certainly situations in which the transaction had no effect. Presumably saying N/A means evacuation was not an issue. Similarly one emergency and 4 routine evacuations from Kash were not required as a result of the project, but again an additional 4 evacuations were attributed to the study.

The effect on patient transfers is not an insignificant effect, but not expected to provide the impetus to justify telemedicine from a cost effectiveness standpoint!

(viii) Effect on Patient Outcome

In the final analysis the impact of a transaction should be judged by its effect on the patient's eventual outcome. Unfortunately, the measurement of outcomes in terms of health status is a difficult area and the available techniques were deemed inappropriate for this study. Our attempt to get a handle on outcomes involved the use of a question from the Alaska ATS-6 experiment's data-collection form. It asks a respondent to assess the likely impact on outcome of the transaction in terms of a 4-point scale from *life-saving* incidents to *no effect*. The data from this question are displayed in Table VII.

Again substantial numbers of respondents failed to answer this question presumably because they were not prepared to hazard a guess. The remaining data does, however, indicate a few transactions which had a marked influence possibly life-saving (15 as judged by MF respondents concerning London-MF transactions and 3 as judged by the Kash nurses). In addition, MF reported 101 transactions having a definite influence on outcome and 34 having some influence.

While the denominators are a little confused, these counts do suggest that many of the patient-oriented trans-

TABLE VI

(Effect on Patient Transfer (as judged by Moose Factory Respondent)

How did the Transaction Affect Patient Transfer?		London-Moose Factory Patient Oriented Transactions	Moose Factory-Kashechewan Patient Oriented Transactions
Prevented an Emergency Evacuation of the Patient	n %	3 1.8	1 5.3
Prevented a Patient Transfer that Likely Would Have Occurred in the Absence of the Transaction	n %	21 12.5	4 21.1
Had No Effect on Plans to/Not to Transfer the Patient	n %	140 83.3	10 51.6
Caused a Patient Transfer That Likely Would Not Have Occurred	n %	4 2.4	4 21.1
Not Applicable/Unknown		130	39

TABLE VII

Impact of the Transaction on Patient Outcome

How might the transaction influence the Patient's eventual Outcome?		London-Moose Factory Transactions				Moose-Factory-Kashechewan Transactions	
		Primary Respondent London		Primary Respondent Moose Factory		Primary Respondent Moose Factory	Primary Respondent Kashechewan
Marked influence, possibly life saving or prevention of major disability	n	10	*2*	15	*7*	2	3
	%	7.2	*2.7*	7.7	*9.5*	8.0	21.4
Definite influence related to future well-being or prevention of disability	n	60	*36*	101	*32*	8	5
	%	43.5	*48.6*	52.1	*43.2*	32.0	35.7
Some influence, probably only relative to symptoms, not affecting future disability	n	40	*23*	34	*17*	5	3
	%	29.0	*31.1*	17.5	*23.0*	20.0	21.4
Unlikely to have an influence on eventual outcome	n	28	*13*	44	*18*	10	3
	%	20.3	*17.6*	22.7	*24.3*	40.0	21.4
Not Applicable/ Not answered		177		110		36	24

Figures in italics are results of an analysis restricted to transactions in which both the London response and the Moose Factory response of the primary respondent were non-missing.

actions with Hermes had some influence on the patient's outcome. This is another indication that the system supported health-care services important to the quality of care provided at the MF General Hospital and to the health of the related communities.

(ix) Did you get the necessary information

The question on the form which asked whether the respondent had obtained the necessary information to complete the service was our attempt at answering the clinical-judgement issue - can Hermes provide an equivalent consultation to a hands-on situation. The question as it was worded implied that the clinical judgement would be impaired if the Hermes medium limited the information-gathering activity. The data are displayed in Table VIII. Since this was primarily aimed at the consultant (resource) end of the transaction the most important data is contained in the columns for primary London respondent (for London-MF transactions) and MF respondents for MF-Kash transactions).

Of immediately striking significance is the fact that only a few transactions were compromised by the medium itself. That implies directly that London and MF consultants did not feel that their inability to physically touch the patient was limiting in terms of information. The *yes, but would have liked additional information* category was usually checked because a particular lab test result or x-ray projection was not available and thus no fault of the communications system. The data across the four columns is in good agreement and *not applicable* was not a problem here.

(x) Gut Reaction

The overall subjective assessment of the transaction was referred to as *gut reaction* and is summarized in Table IX.

Looking first at London-MF activities, about 90% of the transactions were rated as either excellent or good by both the MF and the London respondents. The MF respondents were slightly more likely to use the *excellent* label than London, although this is reversed in the *good* category. Moving down to the lower ratings, London respondents were more likely to rate a session as *poor* (9.1%) compared to MF (6.7%). MF however, recorded the only three *awful* ratings.

The MF-Kash activity shows a slightly different picture with the *excellent* category used less frequently, especially by the MF respondents (18.8% MF and 46.9% Kash). There are corresponding increases in the frequency of *good* assessments however, so the sum of excellent and good responses reaches levels quite similar to the London-MF data (87.6% MF and 87.6% Kash). Although these aggregate figures are impressive, the fact that the MF respondents say that only 18.8% of MF-Kash transactions are excellent compared to

TABLE VIII

Did You Get the Necessary Information?

Did You Get the Necessary Information		London-Moose Factory Transactions Primary Respondent London		Moose Factory		Moose-Factory-Kashechewan Transactions Primary Respondent Moose Factory	Kashechewan
Yes, Completely	n	291	*252*	286	*264*	65	63
	%	83.1	*85.4*	85.4	*89.4*	83.3	92.6
Yes, But Would Have Liked Additional Information	n	44	*31*	37	*24*	10	4
	%	12.6	*10.5*	11.0	*8.1*	12.8	5.9
No, Because of CTS Medium	n	1	*1*	3	*1*	2	0
	%	0.3	*0.3*	0.9	*0.3*	2.6	0.0
No, Because of Other Reasons	n	14	*10*	9	*6*	1	1
	%	4.0	*3.4*	2.7	*2.0*	1.3	1.5

TABLE IX

"Gut" Reaction to Transactions

Gut Reaction		London-Moose Factory Transactions Primary Respondent London		Moose Factory		Moose-Factory-Kashechewan Transactions Primary Respondent Moose Factory	Kashechewan
Excellent	n	172	*134*	199	*176*	12	38
	%	52.3	*48.7*	60.5	*64.0*	18.8	49.6
Good	n	122	*112*	105	*83*	44	33
	%	37.1	*40.7*	31.9	*30.2*	68.8	40.7
Fair	n	30	*24*	22	*14*	5	6
	%	9.1	*8.7*	6.7	*5.1*	7.8	7.4
Poor	n	5	*4*	2	*2*	3	3
	%	1.5	*1.5*	0.6	*0.7*	4.7	3.7
Awful	n	0	*0*	3	*0*	0	1
	%	0.0	*0.0*	0.9	*0.0*	0.0	1.2

Figures in italics are results of an analysis restricted to transactions in which both the London response and the Moose Factory response of the primary respondent were non-missing.

60.5% for London-MF transactions must relate to their overall perceptions of the success of these two aspects of the study.

CONCLUDING REMARKS

In making the decision to implement telemedicine more widely in the Canadian north a hierachy of issues must be addressed. This project has provided data for the first step, "In the context of Northern Ontario, can a telemedicine system provide useful medical service?" Based on the data presented here the answer to this question would seem to be a clear "yes". The nature of the experimental design precluded consideration of the next level of concern, namely how, much better (or worse) are these services compared to a viable alternative? One might suggest that on grounds of accessibility the availability of an x-ray interpretation or nephrology consult within two days (as opposed to say two weeks) must represent an improvement in quality of care and in the long run affect health status. On the other hand one might argue that the available medical expertise coupled with a program of visiting specialists and the judicial use of evacuation and telephone would offer indistinguishable quality. In fact the hospital authorities at MF have argued that telemedicine should be seen as a complement rather than an alternative to a program of visiting specialists. At a higher level still is the issue of cost benefit and the potentially high cost of the technology in this area.

In our view the difficulty and low probability of successfully obtaining appropriate evaluative data relating to these wider issues far outweigh the likely utility of such data in decision making. It is thus crucial that policy makers, telemedical experimenters, and evaluators come together in the planning of the next wave of projects to ensure that each group's objectives are simultaneously congruent, appropriate and attainable.

PROJECT IMPLEMENTATION:
MEMORIAL UNIVERSITY'S TELEMEDICINE PROJECT
AS A SOCIAL INNOVATION

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Ce document analyse les réactions des professionnels de la santé des quatre hôpitaux de Terre-Neuve et du Labrador auxquels étaient destinées les émissions télévisées du programme de télé-médecine diffusées à partir de l'Université Memorial. Sont particulièrement intéressants les facteurs qui ont influé sur (a) l'assiduité des participants lors des émissions et (b) l'appui évolutif manifesté au fur et à mesure du déroulement du programme. On examine quatre facteurs susceptibles d'expliquer les variations observées aux plans de l'assiduité et de l'intérêt manifesté. Trois d'entre eux ont précédé la mise en oeuvre du programme: (1) la résistance initiale à celui-ci; (2) la participation aux préparatifs en vue de la mise en oeuvre et (3) le degré de clarté avec lequel tout le projet a été perçu avant le début des émissions. Le quatrième facteur concerne la mise en oeuvre proprement dite: les encouragements fournis aux participants au cours de la période effective de diffusion des émissions. Les facteurs relatifs à la mise en oeuvre et aux phases préalables à celle-ci ont influé sur l'assiduité. Seul le facteur ayant trait à la mise en oeuvre, toutefois, a influé sur le niveau d'intérêt suscité. Cette méthode d'évaluation du programme peut également être considérée comme une mesure de l'efficacité de certaines des stratégies adoptées par les responsables de projets.

Introduction

In this document, Memorial University's Telemedicine Project is examined as a planned change or a social innovation. Research on planned change has recently identified a valuable new major area of investigation: implementation (Fullan and Pomfret, 1977). The project's implementation processes are examined from the perspective of the health-care professionals in the four regional hospitals in Newfoundland and Labrador that participated in the project. Of particular interest are participation rates and people's changing orientations to the general concepts and ideas represented by the project. Four factors are examined in an attempt to account for differences in individual attendance rates and orientations: initial resistance to the project; participation in pre-implementation activities; degree of clarity about the project; and incentives during the actual broadcast period. This examination of the relationships among this set of factors can be seen as an assessment of the usefulness of some of the strategies of change used by project planners.

The Importance of the Problem

What is implementation and why study it? As used here implementation refers to the attempt to put some planned change into practice. In the case of the Memorial Telemedicine Project the planned change is the delivery of continuing medical-education programs by one-way video and two-way audio broadcasts via the Communications Technology Satellite (CTS) or Hermes to health-care professionals (e.g., doctors, nurses, nursing assistants, administrators) in four regional hospitals (House, McNamara and Roberts, 1978). Implementation of the project is divisible into two main components: (1) program production and delivery; (2) participation by health-care professionals in the broadcasts. Some information on the first component of implementation can be found in House, McNamara and Roberts (1978). This paper examines the second component of implementation.

Until recently the literature on planned change emphasized initial resistance to change as the main barrier to change. Consequently, many of the strategies for change concentrated upon ways of eliminating or significantly reducing this initial resistance. The assumption appears to have been that once everyone agreed with the proposed innovation change would automatically occur. Implementation was not even seen as a problem or an area of activity worthy of attention. Obviously, initial acceptance is necessary for implementing changes that rely upon self-governing, discretionary, voluntary activities by those directly involved. It is hard to conceive of a significant change that does not rely to some extent upon self-initiated, voluntary participation. For example, the attendance at the broadcast sessions by the health-care professionals was voluntary.

Even more importantly, what they thought and did during and after the broadcast was also voluntary. The importance of initial acceptance of the change is obvious.

Current research on the implementation of planned change emphasizes that while initial acceptance is important and necessary, it is by no means sufficient to ensure that the desired change will be implemented. There are two ways in which this is so. First, during implementation, practitioners will encounter numerous barriers to change which arise even though there was initial acceptance of the change.

Examples of such barriers are lack of materials, time, training, information, and clarity about the change. These barriers may be sufficiently serious to prevent implementation. People simply give up out of frustration, exhaustion, fear of failure, and so on. Second, acceptance of the change is not necessarily constant. Even when there was initial acceptance for the change, resistance to the change may develop during implementation. Such resistance may be due to a reevaluation of the proposed change by project participants, or it may develop in response to the barriers to change encountered by practitioners during implementation. In this case, it is not so much the change per se, but the way in which it is being implemented (and which participants may perceive as part and parcel of the change) that is the source of the emerging resistance.

By way of summary, then, one reason for studying implementation is that often what happens during implementation can make or break a project. Even carefully drawn plans and a high degree of acceptance prior to implementation can be negated during implementation.

Change and the Telemedicine Project

At first glance, the degree of change which the Telemedicine Project appears to have required of the health-care professionals (hereafter referred to as the users) may seem rather small and inconsequential. After all, users were requested only to sit in front of a television screen for an hour or so every once in a while. Surely, this ought not to present too many problems. Of course, the request involved changes much more complicated than this. Two points deserve emphasis. First, the users were asked to include yet another activity in what were often already crowded schedules and commitments. Moreover, it was not always clear in advance exactly what the activity was to consist of, nor what benefits were to derive from participation in it. Finally, users were asked to participate in this new activity at a time dictated by the activity rather than at a time convenient for the users.

The second point is that, in a variety of subtle and implicit ways, users were being requested to do much more than adjust their schedule of activities. The project planners expected users to react to a set of previously unavailable experiences, many with significant implications for the future. In one sense, the project was on trial with the users being witness, judge and jury.

In pursuit of these complex and somewhat diffuse objectives, the project planners consistently displayed considerable sensitivity to and sympathy for the problem of project implementation. The planners initiated a number of pre-implementation and implementation activities with users in an attempt to minimize any initial resistance to the project, to clarify the nature of the project, and to establish conditions that would enable users to attend the broadcasts.

The activities consisted of numerous meetings in St. John's and the four regional hospitals with key contact people and user groups in general. In addition, a voluminous telephone and letter correspondence evolved.

In designing the project, then, planners were guided by two main concerns. One was to create a set of conditions that would enable and encourage users to participate in the various project activities. The other was to present the project in such a way that users could assess the *potential* value of the approach represented by the project as well as being able to evaluate this specific Telemedicine Project. Ideally, implementation would occur in such a way that those who valued the concepts represented by the project and the actual project prior to implementation would continue to do so upon completion of the project. Those who initially resisted either (or both) the project or the concepts on which it was based would come to accept either or, preferably, both.

Thus, while many studies of implementation document that it is almost universal for resistance to change to develop during implementation, the Telemedicine Project planners were engaging in various activities to produce just the opposite process: a decrease in resistance. How effective were the various strategies in producing the desired outcomes?

A. Participation

Before examining the effects of various conditions and strategies upon the participation and changing orientations of users, it is perhaps useful to describe the extent to which respondents differed in terms of attending sessions (which is the measure of participation) and their changing degree of acceptance of the project and the concepts and ideas it represented (which is the measure of user orientations). Information on these factors was collected through a short, structured questionnaire with some open-ended questions, administered by personal interview to all potential users (i.e., doctors, administrators, nurses, nursing assistants) in the four receiving hospitals. An attempt was made to survey those who did not attend any sessions as well as those who attended one or more sessions. Interviews were conducted at three points in time: (1) just prior to the broadcast period; (2) about half-way through the broadcast period; and (3) immediately following the termination of the broadcast period.

An estimated 269 of approximately 452 potential users attended one or more broadcasts. Of all the sessions, 27 were designed specifically for doctors, 9 for nurses and nursing assistants, 7 for administrators, and a number were of more general interest. There was a wide variation in the number of sessions attended by individuals (Table I). The great majority attended 6 sessions or less, and 183 reported attending none of the sessions. Just as a point of interest, an analysis of the data not reported here revealed that, of

TABLE I

Frequency Distribution for Session Attendance

Number of Sessions	Number Attending[1]	Number of Sessions	Number Attending
0	183	5	21
1	35	6	15
2	38	7-10	32
3	39	11-20	12
4	59	20-26	4

Mean 4.7 Standard Deviation 4.2

[1]During the second (during broadcast period) and third (after broadcast period) interviews, respondents were asked to indicate whether they attended any sessions and, if they had, how many. The estimates given during the third interview were used to calculate Table I. In instances where information existed for the second interview but not the third, the given estimate was transformed using Y = 1.2 X +1.7 (where X is the given second estimate and Y the predicted third estimate) before being entered into the Table. The total for Table I is only 438 as 14 respondents indicated they had attended one or more sessions but declined to estimate how many.

those attending one or more sessions, doctors attended an average of 9.9 broadcasts, nurses an average of 4.3, nursing assistants an average of 2.8, and administrators an average of 4.6. Why did some individuals attend more broadcasts than others? What impact did planner-directed activities (e.g., meetings, circulation of memos) have upon degree of participation?

Table II attempts to provide some answers to these questions. The Table displays the relationship between one of four factors and session attendance. The four factors are: (1) user acceptance of the project prior to implementation (i.e., prior to the broadcast period); (2) the degree of user participation in pre-implementation project activities; (3) the degree of user clarity about the project prior to implementation; and (4) the support of users during implementation. Attendance is measured in two ways. The Attend Yes/No column reports the relationship between various indicators of each of the four factors and whether respondents attended any sessions. The Proportion Attended column examines the relationship between each potential effect and the *proportion* of courses attended by each respondent who attended one or more sessions. The Proportion Attended is the number of sessions attended divided by the number designed specifically for the occupational category (e.g., doctor, nurse) of the respondent.

In Summary, Table II shows the impact of selected conditions on (1) the primary decision to attend or not attend any sessions and (2) the supplementary decision of how many sessions to attend (once it was decided to attend).

A(1). <u>Initial Acceptance and Participation</u>

Before considering Table II in detail, a note of explanation is in order. The statistic used under the Attend Yes/No column is gamma or, where appropriate, Yule's Q, indicated by the subscript ı. Gamma indicates both the direction and the strength of monotonic relationships between two (or more) variables or factors. Gamma can range from +1.0 (a high positive relationship) through 0.0 (no relationship) to -1.0 (a high negative relationship). Thus, the +.44 at the top of the Attend Yes/No column means that a moderately strong positive relationship exists between a general feeling of initial acceptance and whether one would attend any of the sessions. The asterisk means that the chi-square statistic reveals that the relationship is statistically significant at the .05 level or less. The number in the brackets is simply the number of respondents on which complete data existed to carry out these results.

The first section of Table II displays estimates of the effects of four measures of initial acceptance upon session attendance. Prior to the broadcast period, respondents were asked to indicate (1) their general level of acceptance of or enthusiasm for the project; (2) whether they saw the project as being potentially useful for people in their situation; (3) the number of sessions they would *like* to attend; and (4) whether they were looking forward to attending the sessions. It was mentioned earlier that resistance to change is often cited as a main barrier to change. It follows that a high degree of initial acceptance should theoretically produce higher participation rates than a low degree of acceptance. Does the empirical evidence support these predictions? It does. Or, at least the results displayed in Table II suggests that it does.

The relationships that appear in the Attend Yes/No column of the first section of Table II are, in general, as predicted. Project supporters were more likely than non-supporters to attend at least one session.

Proportion Attended combines the eta statistic with an analysis of variance. Eta was used to measure the strength of the relationship. When squared, eta conveniently provides an estimate of the total proportion of variance in one variable explained or accounted for by another. The direction and statistical significance were determined using analysis of variance. The results of the two different tests were then combined. An asterisk means that the relationship is statistically significant at the .05 level or less.

As the first section of Table II indicates, all indicators of initial acceptance except one have small, positive, statistically significant relationships with the proportion of courses attended by respondents. By way of summary, one's initial acceptance of the project influenced whether one would attend at all and how often one would attend.

A(2). <u>Pre-Implementation Participation and Participation During Implementation</u>

One of the strategies used by planners to increase session attendance was the initiation of various activities prior to the actual broadcast period. These activities consisted largely of meetings and other less formal interactions many of which were designed to elicit ideas, complaints, and suggestions from users. These activities were intended to be consultative as well as informative in content. They amounted to an attempt to involve users as much as possible in the project prior to the broadcast period. They were time-consuming and, at times, emotionally as well as physically demanding. Were they worth the effort? What impact did they have on session attendance?

Four indicators of Pre-implementation Participation are reported in the second section of Table II: (1) the number of regular staff meetings attended where the project was discussed by non-project personnel; (2) the number of meetings attended where a project representative discussed the project; (3) whether users were asked by planners for suggestions; and (4) whether users actually offered sugges-

TABLE II

Estimates of the Effects of Pre-Implementation and Implementation Factors upon Session Attendance.

	Attended			
A. Initial Acceptance	Attend Yes/No[1]		Proportion Attended[2]	
1. General Feeling of Acceptance	+.44[1]*	(198)[3]	+.29*	(140)
2. See Project as Useful	-.15[1]	(191)	+.13	(140)
3. Number of Sessions Would like to Attend	+.75*	(207)	+.32	(149)
4. Look Forward to Attending	+.75[1]*	(156)	+.31*	(148)
B. Pre-implementation Participation				
1. Number of Staff Meetings Attended	+.51*	(211)	+.30*	(89)
2. Number of Project Meetings Attended	+.57*	(218)	+.13*	(55)
3. Suggestions Solicited	+.75[1]*	(217)	+.28*	(156)
4. Suggestions Offered	+.78[1]*	(217)	+.15	(49)
C. Clarity				
General Knowledge				
1. Heard About Project	.51[1]*	(275)	+.19	(184)
2. Felt Degree of Clarity About Project	.58*	(205)	+.35*	(153)
3. Satisfaction with Degree of Clarity About Project	.70*	(220)	+.26*	(152)

TABLE II - continued

Specific Knowledge	Attended: Attend Yes/No[2]		Proportion Attended[2]	
4. Number of Sessions Offered	.80[1]*	(215)	+.34*	(155)
5. Topics Offered	.77[1]*	(217)	+.31*	(154)
6. Room Location	.45[1]*	(231)	+.23*	(162)
D. Implementation Support				
1. Included in Work Load	-		+.12	(246)
2. Felt Participant Status	-		+.38*	(252)
3. Difficulty of Attending	-.81*	(242)	.17*	(208)

-Data inappropriate for testing
*The relationship is statistically significant at the .05 level or less. Chi-square used for Attend, F used for Proportion Attended.
[1]This means that Yule's Q was used. Otherwise the gamma is reported.
[2]The eta statistic is the coefficient reported in this column to determine the strength of the relationship. Analysis of variance was used to determine direction and statistical significance of the relationship. Where no sign is reported, it means the relationship is non-linear or non-monotonic.
[3]Number of respondents included in analysis.

tions. The evidence indicates that participation by users in project-related activities prior to implementation influenced both the tendency to attend at least one session and the number of sessions attended.

A(3). Clarity and Participation

Planners also invested a considerable amount of time and energy in disseminating information about the project. The assumption seems to have been that the more people knew about the project, the more likely they were to participate in it. Was this strategy effective? Did it matter how clear users were about the nature of the project prior to implementation? Six indicators of the degree of user pre-implementation clarity are used in the third section of Table II. Three are very general measures: (1) whether users had heard about the project a few weeks prior to the broadcast period; (2) how much they felt they knew about the project; and (3) how satisfied they were with what they knew. The other three are more specific: (4) whether users felt they knew the number of sessions designed specifically for them; (5) whether users felt they knew the topics to be discussed during the broadcasts; and (6) whether users knew the room in which the broadcasts were to be received. All six measures indicated that the degree of clarity possessed by users prior to implementation influenced both whether users would attend or not attend the sessions and the proportion of sessions attended. Clearly, the planners' efforts at information dissemination encouraged users to attend sessions.

A(4). Support During Implementation and Participation

What happens during implementation can make or break even a carefully planned project that enjoys a high degree of initial acceptance prior to implementation. Project planners certainly tried to provide users with as much support as possible during the actual broadcast period. Three indicators, reported in the fourth section of Table II, were used to measure support provided users during implementation: (1) the extent to which participation in the project did not increase the regular work load; (2) whether users felt like participants or observers during the sessions; and (3) the degree of difficulty users experienced in being able to attend sessions. The results in this section are not as clear and consistent as for the others. Still, it appears in general that providing support for users during implementation did result in increased session attendance.

B. Orientations

Our central concern here is with changing orientations over time and not with the orientations that users had at the conclusion of the project. Did users change their orientations to the project during implementation? Did they become more or less supportive? Or did their initial orientations remain fixed throughout the broadcast period?

Table III displays three measures of changing orientation. Support involved the general, global level of enthusiasm or support felt by participants just prior to, during, and immediately after the broadcast period. Preferred Use involved whether participants preferred the satellite system to face-to-face interaction. Future Use involved asking respondents how extensively they would like to use the satellite system in the future. Table III reveals that although the majority of users did not change their minds during the broadcast period, many did. Why did some users increase while others decreased their level of Acceptance? Did any of the planner strategies affect these crucial changing orientations?

TABLE III

Frequency Distribution of Users' Changing Orientations to the Project

		Acceptance	
Direction of Change	Support	Preferred Use	Future Use
Increase	10%	17%	21%
Unchanged	58%	61%	48%
Decrease	32%	22%	31%
Totals	100%	100%	100%
(N)	(169)	(113)	(121)

The Determinants of Acceptance

An analysis similar to that performed for attendance was undertaken for orientations. The analysis of the data revealed that none of the measures used for Initial Acceptance, Pre-Implementation Participation, and Clarity (Table II), were statistically related to Acceptance. This suggests that none of the pre-implementation conditions and strategies had any impact upon users' changing orientations. It was mentioned earlier, however, that it is often what happens during implementation that can make or break a project. With this in mind, the analysis displayed in Table IV is of considerable interest.

Table IV displays the relationships between the three indicators of Implementation Support (see Table II and the discussion of it) and Acceptance. Of all the indicators used in this paper, only Felt Participant Status appears to have had any impact on whether users increased their support of the project. Users who felt more like

TABLE IV

Estimates of the Effects of Support During Implementation Upon Changing Acceptance of the Project

Implementation Support	Acceptance: Support[1]		Future Use[1]		Preferred Use[1]	
Included in Work Load	.12	(136)[2]	0.0	(112)	-.04	(118)
Felt Participant Status	.46*	(140)	.69*	(113)	.47*	(121)
Difficulty of Attending	-.35[3]	(130)	-.06	(98)	-.19	(104)

*The chi-square is statistically significant at the .05 level or less.
[1]This means that Yule's Q was used. Otherwise the gamma is reported.
[2]Number of respondents included in analysis.
[3]Chi-square > .05, Tau significance < .05.

participants than observers during the broadcast period tended to increase their overall support for the project, tended to come to view it favourably with respect to face-to-face interaction, and increased their willingness to continue to use the system in the future.

Discussion

Both prior to and during implementation, project planners initiated a number of activities that were designed to maximize session attendance and to gain user's acceptance of the project. The pre-implementation strategies employed by planners did have a strong impact on attendance, although they did not entirely overcome the effects of initial resistance to the project. However, these same pre-implementation conditions and strategies did not have any impact upon users' changing acceptance of the project. User acceptance did change, but mainly in response to conditions and events during implementation.

Given the preliminary nature of the analysis presented in this paper, any conclusions derived from it must be considered tentative. Still, the impact of social factors (e.g., role relationships among participants, the orientations of various participants) upon what might appear to some as primarily an experiment in applying technology should be apparent. However else one might try to characterize and define Memorial University's Telemedicine Project, it is truly a social innovation. As such, it is subject to the processes and phenomena that are part and parcel of that aspect of planned change referred to as implementation.

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EVALUATION OF IRON STAR:

THOUGHTS FROM MID-STREAM

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On vient d'entrer dans la deuxième moitié de la phase de radiodiffusion du Projet Iron Star. Des émissions sont retransmises quotidiennement par satellite en direction des trois communautés participant au projet (Fort Chipewyan, Assumption et à Desmarais et Wabasca ensembles). Les résultats de l'évaluation effectuée pendant la phase de radiodiffusion ne seront pas disponibles avant quelque temps, mais les bribes d'information recueillies à ce jour nous permettent de faire une ou deux observations. Des problèmes d'évaluation prévus et imprévus ont été mis en lumière. Chacun des trois communautés a un caractère qui lui est propre et le degré de participation de leurs membres à la programmation peut dépendre de plusieurs facteurs. Toutefois, considérant les communautés ainsi reliées, leurs structures et leurs liens avec le reste du Canada, je crois dès maintenant que le Projet Iron Star sera une réussite.

The mid-point in the broadcast phase of Project Iron Star has passed. Evaluation, which has been going on simultaneously with broadcasting, will not yield results for a while yet, but information trickling in is interesting enough to warrant an observation or two from mid-stream. These comments should be read in the spirit in which they are offered. Project Iron Star has now a proven (battle hardened, I might add) all-native production crew. It has weathered some changes and disappointments in various aspects of the broadcast phase. Regularly, daily satellite broadcast transmissions are being beamed to the 3 Project communities, (Fort Chipewyan, Assumption, and jointly to Desmarais and Wabasca), thus we can ask at mid-stream, how are the communities participating in the Project? How are the individual residents participating?

The degree to which individuals from the 3 communities selected to be part of the Iron Star Project actually participate in the programming may be influenced by many factors. It is important to recognize some of those factors, how they may relate to one another, and how they interrelate in each of the three communities or differ across the whole Project. Many of these factors are tied to the make up of the individual participating communities, but by and large, they derive from outside the communities. This is because the communities although distant from and seemingly isolated from metropolitan centres, are only partly isolated. Agencies located in metropolitan centres, small and large, are interacting regularly with members of these settlements on a variety of matters. An example of this metropolitan link would be when, at the beginning of the project, on each of three visits to one community, all of the officers of the Band administration were not "in" but rather in Edmonton attending workshops. Occurrences such as this are commonplace, and are therefore "institutional" factors which influence the participation in and the impact of Iron Star in these communities. The impact of these institutional factors on Iron Star will be illustrated from some very incomplete data gleaned from the first three months of the broadcast schedule.

The word "participation" can mean a number of things. It could mean attendance of individuals at the terminal on broadcast nights. It could mean the involvement of individuals in interaction with the studio or the other communities. Or, it could mean participation or involvement in the production of programming. We will look briefly at all three aspects. We will, however, leave out the attendance and participation of the school children in the daily morning broadcasts.

The attendance-participation of adults can be assessed by counting those attending broadcasts. In all 3 Ironstar communities there has been a marked decline in adult attendance since the inception of the Project in August. Attendance figures for some broadcasts are as yet incomplete. Some of these data are therefore based on estimates or incomplete field logs. 372 individuals visited the terminal in Fort Chipewyan during the first 3 months. Attendance declined markedly in September and recovered somewhat in October. 602 persons visited the terminal in Assumption, half of them doing so in the month of August. Again there was a precipitous drop between August and September, but here the decline continued into October. 618 persons visited the Iron Star terminal in Desmarais, nearly half of them in August. There was a steep decline in September, and a modest but substantial recovery in October.

What can be concluded from these attendance figures? Looking at the individual broadcasts first, the biggest single audience was drawn by the Grand Opening program when all the officials and politicians associated with Iron Star were given bits of air time. This program attracted an audience *3 times larger* than any other. Thus the large audience of this one program accounts for most of the "decline" in attendance. There was only one Grand Opening with all the fanfare and politicians, and it occurred in August.

There were 3 other well-attended broadcasts, however. Two of these were in October, one in August and none in

September. The October broadcasts of tapes of the All-Native Festival were well attended as was the August broadcast which featured the Royal Canadian Mounted Police, the Solicitor General's Office, and the Crown Prosecutor. Thus, these 4 well-attended broadcasts could account for the monthly "decline" in attendance, in as much as these topics or their associated publicity caused high attendance.

Looking at the broadcasts more specifically, each of the three communities contributed to the large audience for the Grand Opening. Desmarais had the largest number. Desmarais also contributed most to the All-Native Festival audience, and Fort Chipewyan produced the largest portion of the audience for the Mounties and Solicitors. Looking at the overall picture, the terminal at Desmarais has been the most frequently attended. In the first month of broadcasting however, Assumption had the greatest attendance. This latter datum is notable only because Desmarais and Wabasca have a combined population of more than 1500 while Assumption has a population of less than 900.

There are two factors which may account for Assumption's (and Fort Chipewyan's) declining participation. First and most tentatively, Assumption is Slavey-speaking while Iron Star is basically Cree-speaking. Fort Chipewyan is both Cree and Chipewyan-speaking with the majority Cree-speaking and many Chipewyan-speakers are bilingual. Desmarais is Cree-speaking. Thus in the case of Assumption, as the Iron Star broadcasts became progressively more "Indian" and less "professional" they may have become more "Cree" and moved away from the "Slavey" version of Indianness and as a consequence they may have become less attuned to the likes and dislikes of Assumption. Secondly and more concretely, the role of the Facilitator in the community may have been a factor associated with the decline in attendance at Assumption and Fort Chipewyan.

Desmarais had no Facilitator early in the broadcast period; this service was not regularly provided until the third broadcast day, just before the Grand Opening. The Facilitator was changed at the end of August. Assumption and Fort Chipewyan had Facilitators from the initial broadcast until the end of August, when they returned to Edmonton. Since that time there has been little continuity in Facilitators in the latter two communities, while Desmarais has had the same one since September 12th. Assumption and Fort Chipewyan experienced especially chaotic times in mid-September or early October.

Attendance at Assumption dropped from the high of 312 in August to 130 in October. Fort Chipewyan, which started much more modestly with 187 in August, had dropped to 101 in October (remember that Assumption dropped continuously while Fort Chipewyan recovered somewhat, 17 from September to October). At the Desmarais terminal there has also been a drop; however, the recovery in October, from

134 in September to 197 in October, indicates a healthier situation than in the other two settlements.

Looking at another aspect of participation, audio-interaction or involvement in daily broadcasts has been sporadic at best. Part of the sporadicity is attributable to the fact that some broadcasts, for example the tape of the All-Native Festival, were entirely entertainment. Although some comments on participation were received ("Enjoyed the show") one would not anticipate much interaction for such broadcasts. The vast majority of broadcasts had a public-affairs segment. As might be expected from the differences between the communities, if one or two communities made comments or participated in voice-return the others did not. There is a slight indication that this reflected the decline in attendance. Assumption made a number of comments and requests in August and September. There was, however, little feed-back recorded from there in October, which left the "mike" open for Desmarais and Fort Chipewyan. Interestingly, while Fort Chipewyan requested more and more broadcasting in Cree, Assumption once asked Joe Dion, President of the Indian Association, to repeat his remarks in English because he had spoken in Cree.

Although the interactive involvement may not have been as strong as the project initiators hoped, my personal observations at the terminals at Desmarais and Fort Chipewyan convince me that the sporadicity of interaction or reticence of participants was quite natural, and should have been anticipated. In each case I observed much good-natured kidding around about whose "turn" it was to talk to the microphone/Iron Star. On occasion someone would talk, but on other occasions no one would. It didn't seem that anyone, except possibly the Facilitator, felf that vocal participation was the price of admission to the terminal.

One difficulty experienced by all participants however, was the occurrence of technical breakdowns; there were 8 in Assumption, 14 in Desmarais, and 7 in Fort Chipewyan. Assumption and Fort Chipewyan were not on the air 3 times each (which obviously lowers attendance).

Finally, it has been impossible for the communities to contribute much to broadcast content at this point. The first portapack video-tape recorder (VTR) went into a community on September 14. It returned to Edmonton for repairs on September 28. Two black and white VTR's were provided to Iron Star by the Department of Health and Welfare and following servicing they were shipped into the communities. The Department of Indian Affairs in High Level provided a VTR in mid-October. That nothing originated by the communities has yet reached the broadcast stage, at the end of October, is not surprising, considering the absence of equipment.

Strictly on the basis of the preceding review of participation by individuals in Iron Star, success appears to be limited. However, considering the communities into which Iron Star is being beamed, the structure of these communities and the nature of their ties to metropolitan Canada, and that we are now only at mid-stream, I think that Iron Star will succeed.

Each community has unique characteristics. Desmarais and Wabasca are two settlements with a joint population of 1660, 868 Indians registered in the Bigstone Band and 792 "others". Some of these "others" are members of Metis Local #129, and some are non-native. This community is in one sense quite sedentary. Most people live there year 'round. In another sense it is much less sedentary. Most of the necessary community services are 85 miles away, in the centre called Slave Lake. True, there is a hospital, and there are schools, and a Band Office in Wabasca or Desmarais; but most of the provincial services upon which those "others" depend are in Slave Lake. None-the-less, community life is active. During the month of September there was a community talent show, a dance at Sandy Lake, the opening of the Community Vocational Centre (CVC) a meeting of the Land Tenure Committee, a meeting of the CVC with Provincial Adult Education officials, a banquet for the softball team, a meeting of the Bigstone Band Council, and a bingo. These are just the specific community activities mentioned by the Facilitator.

Fort Chipewyan is a more flexible community of 1,368 in winter and 1,459 in summer. Of the winter population 880 are Registered Indians (2/3 Cree-speaking) and 488 "others". There is a Metis Local in Fort Chipewyan as in Desmarais. Because it is only accessible by air, or river travel, or winter road, many of the Provincial and Federal Government agencies provide community services locally. This means that in Fort Chipewyan there are numerous committees to which the adults belong or in whose activities they have some interest. These include the Co-op, the Day-care centre, the local committee, various economic development - regional and community planning - preventative social services committees. Fort Chipewyan is also big on bingos (for a while Iron Star pre-empted the Parish Hall's Wednesday bingos) and on softball (the Lions' Clubs of Forts Chipewyan and Smith being deeply involved). Fort Chipewyan has a movie theater, a curling rink, and a very urbanized northern life.

Although Assumption (Chateh - Habay - the Slaves of the Upper Hay River Band) is closer to a centre than either of the other communities (only 70 miles), it is in many ways more isolated. In the initial stages of Iron Star it was almost totally isolated as the gravel roads, the airfield, and a number of houses were flooded or ruined by the heavy rains in the North Peace region. Also, they had been isolated from metropolitan media influence until shortly before the beginning of Iron Star when commercial television was introduced (The Canadian Broadcasting Corporation (CBC) seems sensitive to Iron Star's "competition"). Only one or two television sets were operating at the time Iron Star broadcasts began. This was not the case in the other two communities where television had been widely available for some time (although CBC seemed to be sensitive in Fort Chipewyan too). TV viewing was limited only by the limits of electrification or antennas in both settlements. Assumption is also the smallest of the communities but the most homogeneous. Of 900 resident individuals, only 44 are designated as "others", the remainder are Registered Indians of the Upper Hay River Band. This means that although the settlement itself is not made up of a number of service offices, community services are delivered by the Department of Indian Affairs and Northern Development, and administered by the Department and the Band Office from the centre of High Level. In this case, rather than the plethora of Agency-affiliated committees found in Fort Chipewyan, or rather than the orientation toward Slave Lake found in Desmarais, there is a focus on the local Band Council and its committees.

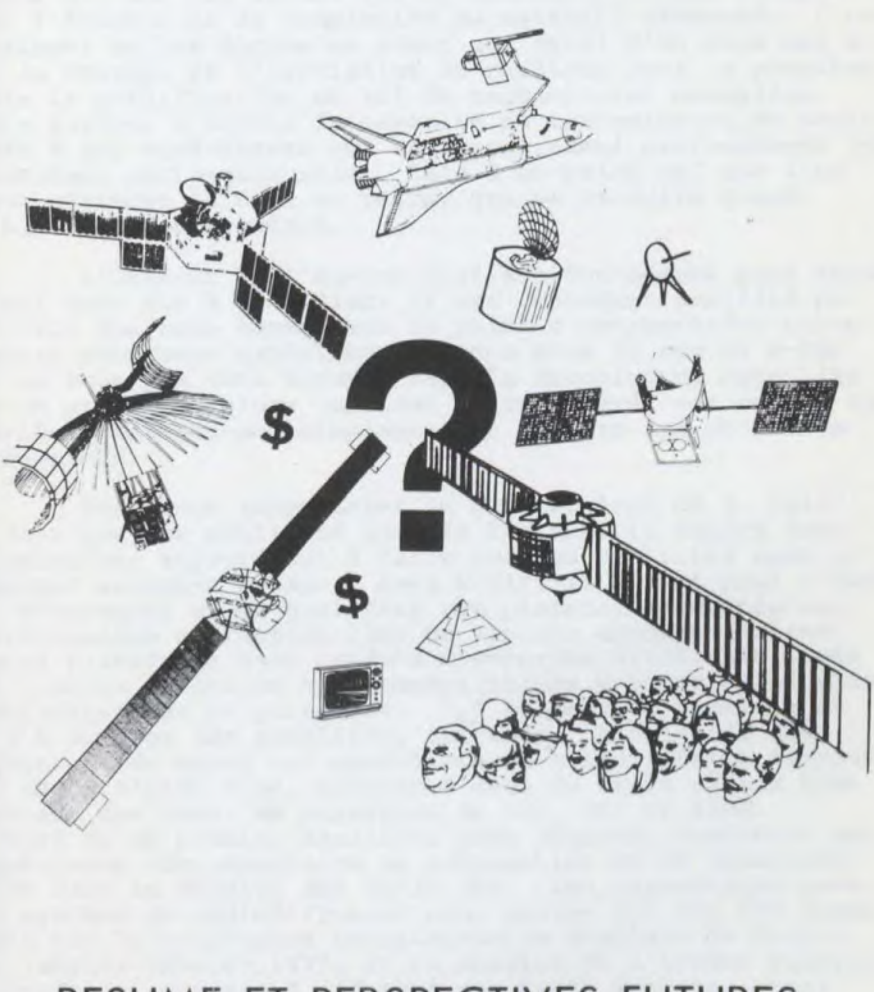
None-the-less, there are local community attractions (although not on the scale of Fort Chipewyan). One observation relating to distractions is that the decline in attendance of individuals from the Upper Hay River Band might be accounted for in part by the drying out of the flooded road. As their physical isolation decreased they might be more likely to take the opportunity to go to town in High Level.

It can be seen from these tentative illustrations that the Project Iron Star target communities are not as isolated as might be thought at first glance. Indeed, they are entangled in a complex web of local and metropolitan ties. Most importantly, they are the objects of or the targets of many on-going metropolitan government agency programs. These, like Iron Star, *need* local participation. Indeed, local involvement is a modern bureaucratic cliche which applies to most "development", "education", or "preventative" social programs. Thus the motivations which caused various agencies to join with Iron Star are the same motives which they use to validate their working in the Iron Star communities. This may account for the fact that there have been only three requests for more information or for a local visit from these government social agencies. They were already there through regular visits. Their local committees or recipients are our audience.

These illustrations show that the real not so isolated project communities are receiving Iron Star and many other communications. This means that we have found both anticipated and unanticipated problems in evaluation. We have become more aware of these problems and will respond to them. We intend to overcome them. (We intend to overcome them by incorporating them into our collection of data at the end of the project's broadcast phase.)

In any case, a great deal has come to pass in the first three months of Iron Star. A lot of water has gone under the bridge (especially around Assumption). To muddy the metaphor completely, being in mid-stream and seeing where we are, I don't think that we evaluators want to change our horses or our questions. We will keep "plugging" on (Oh! what an awful pun).

SUMMARY AND FUTURE PROSPECTS



RESUME ET PERSPECTIVES FUTURES

RESUME ET PERSPECTIVES FUTURES

Anne-Marie Hieronimus

Agence Spatiale Européenne

Paris, France

Mesdames et Messieurs. Je veux d'abord vous dire à quel point j'ai été sensible à l'importance des présentations qui ont été faites ici et combien j'ai été frappée par l'étendue et la complexité du matériel présenté. C'est vraiment un pas énorme en avant que celui d'un pays qui a eu le courage et l'initiative de réaliser pour la première fois la qualification en vol de technologies nouvelles, mais surtout d'offrir la capacité de transmission du satellite à des expériences qui attaquent aussi profondément les problèmes socio-culturels. Cela à un point tel que l'on peut craindre le choc en retour qui se produira quand l'expérience s'arrêtera.

L'intérêt de l'Agence Spatiale Européenne pour Hermès n'est donc pas à justifier; il est cependant amplifié par le fait que nous sommes sur le point d'entreprendre notre propre programme expérimental connu sous le nom de H-SAT. Je ne veux pas vous ennuyer avec la description détaillée de ce programme alors que tout votre intérêt est centré sur Hermès. Laissez-moi simplement en décrire les objectifs essentiels.

Vous vous rappellerez le premier jour où M. Calio a fait quelque publicité pour le Shuttle; il faudra donc m'autoriser aujourd'hui à faire quelque publicité pour le lanceur européen Ariane. Avec H-SAT, il s'agit pour l'Europe de développer et de qualifier une plateforme adaptée aux performances opérationnelles du lanceur européen Ariane. Cette plateforme sera capable d'emporter différents types de charges utiles de télécommunications y compris les plus contraignantes en puissance: 2,5 kw pour la première et 5 à 6 kw pour les satellites suivants. L'objectif est également de mener une expérience en télédiffusion directe 12 GHz à l'aide d'un répéteur à deux ou trois canaux comportant des tubes de puissance de 150, 200 et 450W.
A bord de ce premier satellite nous mèneront également une expérience complémentaire de propagation et de communication dans le domaine des 20/30 GHz. Les caractéristiques du système de radiodiffusion sont celles qui ont été formulées par la Conférence Administrative Mondiale de Genève en janvier-février 1977, et la mission de l'Agence Spatiale Européenne consiste à offrir à ses Etats Membres, ainsi qu'à ceux de l'Union Européenne de Radiodiffusion, une couverture de type national que nous assurerons en déplaçant sur l'Europe deux faisceaux de 0.8° par 1.4° en orientant l'antenne du satellite ou le corps du satellite.

Le système doit permettre dans les zones couvertes, l'utilisation de récepteurs de grand public ayant un facteur de mérite G/T de 6 dB/K°. A titre indicatif, pour votre information, la masse du satellite au lancement est de l'ordre de 1450 kg, ses dimensions sont d'environ 3,7 m de haut, 2,4 m de diamètre et 21m hors tout panneaux déployés. Si l'expérience a un caractère technique important qui concerne entr'autre les composants nouveaux à bord du satellite, la qualité de la réception et de l'émission à l'aide de petits terminaux, elle a une composante importante humaine, sociale, essentielle car nous allons essayer grâce à l'introduction de la technologie spatiale, d'élargir le spectre de la télévision actuelle. C'est par là que les expériences menées à l'aide d'Hermès sont pour nous capitales. Il existe au nord de l'Europe, en Scandinavie, des territoires très étendus à faible densité démographique et dont la desserte en communications demande des réseaux terrestres complexes et coûteux, difficiles à entretenir dans les saisons froides. Ces territoires posent des problèmes comparables à ceux que vous avez évoqués. Il existe des services nouveaux qui pourraient apporter d'importants bénéfices sociaux mais qui ne sont pas offerts actuellement en Europe, faute de porteur adéquat. Je pense à la téléconférence, ou au télé-enseignement, au programme destiné à un public sectoriel mais éparpillé sur le territoire de nos Etats Membres, à la technique du télétexte et de la télémessagerie.

L'introduction, l'expérimentation même de ces nouveaux services peuvent se heurter à des difficultés que vous connaissez bien et qui sont dues aux habitudes acquises, aux structures institutionnelles pré-existantes, au manque d'information sur les possibilités. Le constat de cette situation a été dressé par l'Agence Spatiale Européenne et par ses Etats Membres au long d'une activité de recherches de plusieurs années. C'est pourquoi nous entreprenons un programme expérimental, mais il faut bien dire que nous nous situons avant l'expérience cependant que vous, vous l'avez réalisée. Je suis donc navrée de ne pouvoir contribuer plus à ce symposium, mais heureuse d'expliquer ma présence par le désir de profiter de votre expérience. Je voudrais cependant vous faire part de quelques réflexions sur les exposés présentés et particulièrement sur ceux qui s'adressent aux services qui sont offerts, quitte à oublier le moyen qu'est le satellite.

D'une manière générale, ces expériences socio-culturelles, que ce soit la télémédecine ou le télé-enseignement ou la télévision communautaire, attaquent des problèmes posés par les communautés éloignées, isolées et proposent, à titre d'expérimentation, des solutions.

Il ne fait pas de doute que, ce faisant, elles créent un nouveau type de client mais créent également un besoin qui ne trouvera plus de réponses lorsque l'expérimentation aura cessé. Celà pose de toute évidence le problème criant du passage de l'expérimental à l'opérationnel et c'est à ce sujet que moi-même je veux vous poser quelques questions.

Il apparaît que l'application de la technologie spatiale à la télémédecine et au télé-enseignement peut paraître unique et nouvelle aux populations desservies, mais très peu nouvelle en ce qui concerne l'avancement de l'art en matière de satellite de télécommunications. On peut donc se demander ce que nous apportent ces expériences. Premièrement, la démonstration que les institutions et les organisations peuvent travailler ensemble pour déterminer les besoins et mettre en oeuvre une solution au niveau fédéral, régional, local. Deuxièmement, une bonne certitude que le client nouveau est sensibilisé, intéressé et qu'il existe un marché potentiel important pour le jour où l'usage des satellites à l'effet social se sera développé. Cependant l'absence de données économiques, certes explicable par le caractère récent des expérimentations, et l'absence de données sur l'impact psychologique sont gênantes. L'esprit se heurte au vide laissé par la fin de l'expérimentation. Il vient immédiatement la question: qu'est-ce qui se fera après? La troisième année d'expérimentation avec Hermès peut aider les planificateurs, dont je suis, à formuler les réponses à la question que je viens de vous poser. C'est ce que je souhaite profondément. Je suis heureuse d'ailleurs qu'une partie de cette inquiétude se trouve atténuée par l'enthousiasme plein de promesses avec lequel Madame Sauvé s'est adressée à nous mardi soir. J'avais suivi avec un intérêt identique les expériences américaines sur ATS 6 et la qualité des résultats a donné à espérer qu'il y aurait des suites. J'ai compris que la participation américaine à Hermès est une de ces suites et j'ai noté à une certaine époque la création du Public Service Satellite Consortium; mais le caractère de la présentation de Mme Rockoff montre que des difficultés se sont présentées.

Des informations précises sur ces difficultés aideraient je crois, tout le monde, et c'est celles-là que j'aimerais également demander. Ce qui m'a peut-être le plus frappée et intéressée dans les exposés qui ont été présentés c'est l'effort accompli pour se départir de la télévision conçue comme un mass-media. Pour entreprendre des expériences de type communautaire, établir des systèmes interactifs grâce auxquels un individu isolé, que rien ne prédisposait à utiliser ce type de media, a pu faire parvenir son message. Evidemment, dans la majeure partie des expériences, les participants, du fait de leurs fonctions sociales, professeurs et médecins ou étudiants et infirmières, étaient habitués au dialogue qu'on leur proposait et pouvaient oublier rapidement la machinerie qui les entourait. Cependant, l'expérience de Saskébec qui a été présentée ce matin doit apporter des éléments nouveaux. C'est pour cela que je pense que je représente l'opinion générale en disant que nous attendons avec impatience les résultats de cette expérience surtout en terme de traces laissées sur les participants et leurs entourages. Seront-ils désireux de poursuivre cette télérencontre? Y a-t-il un risque de voir le sujet de leur discussion se réduire, ou voudront-ils au contraire se retrouver régulièrement, simplement pour échanger des nouvelles et parler de la pluie et du beau temps? Répondre à ces questions c'est savoir si la communication au sens technique du terme servira vraiment la communication au sens philosophique du terme et si un jour la terre sera le grand village que les utopistes espéraient au tout début de la radiodiffusion.

Pour les planificateurs il s'agit de savoir quand ce type de communication devrait être pris en compte dans les spécifications de nos satellites. Je prévois cependant que ce media, s'il était généralisé, deviendrait rapidement un outil préféré des groupes de pressions politiques et des mécontents et se heurtera de ce fait lui aussi aux institutions.

Qu'on n'interprète pas trop négativement mes questions. Elles relèvent du souci que j'ai décrit tout à l'heure de voir ces expériences transformées en service permanent. C'est en tout cas, ce que je vous souhaite.

Pour conclure, je souhaite vous dire que je suis heureuse d'emporter avec moi les premiers résultats de votre effort, que je suis restée sur ma faim et que j'attends avec impatience les résultats des expériences à venir.

J'espère que dans le cadre du projet H-SAT nous aurons la possibilité de vous retourner l'hospitalité que vous nous avez offerte, soit à bord du satellite soit dans l'exploitation des résultats obtenus.

"SUMMARY AND FUTURE PROSPECTS"

Richard Marsten

Dr. Duckworth, ladies and gentlemen, colleagues on CTS/Hermes and friends. I must start by acknowledging Dr. Chapman's very kind remarks in his opening statement of the conference. I too, remember our clustering around the blackboard and examining alternatives together, and I think we can both remember, as can a number of the rest of you, some of the trials and tribulations we went through together to get this enormously powerful, enormously complex satellite to fit into much less weight than anybody expected we would be able to do. It has been and continues to be a remarkably successful space program. I think all of us who are privileged to play a part in this can take a great deal of satisfaction, not only in the technical accomplishments, but in demonstrations in both our countries, that this is indeed, as Mme Sauvé remarked last night, a satellite for the people. Indeed, that is the object of all of this space technology. If we do not recognize that what we put in orbit has to provide us some human benefit and contribute to some human progress, then it is all for nothing.

Technologically, we can do anything we want on both sides of the border. That is not the problem. Our problem is clearly to use the tools that we can make with technology to try to solve some of the problems we have in making our societies right. Both of us in Canada and in the United States have been focusing very heavily on applications experiments, to demonstrate the use of high-powered satellite broadcasting into small, simple, inexpensive terminals that anyone can use to provide services of some particular nature -educational, health-care, other kinds of things that could not be provided effectively or in some cases, at all, to the users. In the United States, we are indeed having some philosophical difficulties coming to terms with how we would follow up on the Hermes experiments and what sort of next step we would take to provide continuity beyond ATS and Hermes for our users. Here in Canada, you have taken further steps in the ordering and prosecution of Anik B, which is intended to support pre-commercial applications experiments in continuing demonstrations of satellite broadcasting and which will lead directly to your Anik C, which is to work primarily in the 12 GHz band and which will support communications of a number of kinds.

It is important, I think, to recognize that this sort of capability can indeed support both the kind of satellite communication that the Anik A satellite generation is now supporting and a great many of the so-called community broadcasting services that have been demonstrated on ATS-6 and on Hermes. It is important for several reasons. Technically, it may not be necessary in many of these applications to have the extremely high power found in the CTS/Hermes satellite. It is quite possible to get a picture of adequately high resolution and quality and with adequately good quality audio, with perhaps 20 or 30 watts per channel, and that is the level of power that will be provided in Anik B and in Anik C. It is cheaper to be able to support a variety of services on a single spacecraft or a single generation of spacecraft than to have to loft several different kinds, with essentially different details of technology, and thus increase the cost of what might be comparable communication services in a technical sense.

This provision of combinations of services at moderate satellite power levels also relieves the problem that we are grappling with everywhere in the world, but a particularly knotty problem in what is called Region 2 in the Western Hemisphere, and Canadians and Americans alike are wrestling with this problem. It is called sharing. How do we put broadcast satellites and satellites of the Anik A type together in a very limited region of orbital arc and get them to work together compatibly so that neither interferes with the other's ground stations and so that the transmissions from the earth do not interfere with one another's satellites? If indeed the experiments with Anik B show, as I think the indications are they will, that community-broadcasting and fixed-satellite services can be quite adequately supported in a single satellite of uniform power levels throughout all its transponders, a good deal of the difficulty in that sharing question will have been obviated and we will both be able to breathe easier and provide more service in the available arc. That's a very important aspect of all of the satellite communications that we are jointly pursuing for the future.

Now, we have to do this in a way that makes the whole game affordable. Over a not very long period of time, the costs for earth stations have been coming down quite dramatically. In 1974, before the ATS-6 launch, we were speaking of earth stations that would work in a television distribution mode in the commercial satellite band at a cost for the user of approximately $120,000.00 per station per channel. A year later, that cost was down to approximately $60,000.00. You have heard this morning that stations of a very manageable kind with three or four-and-a-half-meter diameter antennae can be had for approximately $28,000.00. Advances in technology and the ability to generate low-cost mass production processes can bring this cost down still further and make the proliferation of small terminals economically attractive. Companion advances deal with things like Time Division Multiple Access, and other digital techniques for utilizing channels, and low-noise receivers that go with the antennae. The receiver state of the art today, indeed allows a fairly good quality signal to be had, with not terribly much power in the spacecraft. Further, it is evident that people on both sides of the border are concentrating their attention on solid state devices that will reduce the receiver noise by some substantial factor, perhaps one and a half, which would allow the power per channel to be maintained at perhaps 20 or 30 watts and increase the quality of the signal produced at the receiver.

The use of digital methods, as was the introduction of domestic commercial satellite communication systems, was pioneered here in Canada, using technologies largely generated, as I understand it, in Canadian laboratories. INTELSAT has not yet applied TDMA techniques to its system, but will in another year. The United States domestic systems, which came on stream some two or three years after Telesat Canada's system, are planning to apply such techniques for the first time with the launch of the SBS system's first satellite on the space shuttle in about 1890 or 1981. As these techniques advance, and the ability to put more information in either less time or less channel space or both is increased, that can be used to further enhance the quality of the signal one gets without increasing the power that is required in the satellite. This approach tends always to go down the path of more communications capacity per unit channel width or per unit spacecraft weight, and so continually to depress the costs of service. The technologies will continue along these general lines.

I do not wish to take a great deal more time to talk about that, except to observe that even with the coming on stream of the space shuttle, the problem of maximizing the channel capacity and struggling with the weight, a problem that we have all enjoyed together, will still be with us. It will still be with us because the shuttle will put a payload at an altitude of 300 miles and we must locate it on stations at an altitude of 22,000. That means that the shuttle will have to carry secondary propulsion rockets along with the lofted spacecraft. When one carries rockets, one is constrained by the rocket's capabilities, not the shuttle's, to put payload on station. So, I foresee that with the technology advances, the struggles that we had with Hermes in making the mission objectives and the weight will be with us at least through 1985, and we may all enjoy future rounds of the same kind of fun.

That is all I have to say at the present time, other than to speculate that if Anik B's experiments and Anik C's ability to support the traffic go the way I personally think they will, we will probably see the Canadian system having its third "first": the first in the national availability of community satellite broadcasting for national and public purpose. Thank you.

SUMMARY AND FUTURE PROSPECTS

William H. Melody

Simon Fraser University, Burnaby, Canada

I. Introduction

It is a pleasure to join you at this Conference of "Friends of Satellites". Conferences such as this provide an important focal point for a gathering of the clan of advocates, supporters and sympathizers of the satellite technology. It is at once a time to bring together the results of satellite experimentation over the last two years and to lay the promotional groundwork for its continuation. This Conference is more a celebration of satellites than a time of review and assessment. However, if one is to attempt the task of summarizing the current state of affairs and discussing future prospects it must begin with a critical review of progress to date.

Upon reviewing the satellite literature in preparation for this Conference, I was struck by the almost complete absence of critical analysis of the Hermes Program and its experiments, or of the relationship of Hermes to the larger structure of the Canadian and North American telecommunication systems. I discovered volumes of descriptive and promotional material addressing the technical, economic and social potential of satellites and the anticipated benefits of various kinds of experimentation. This in itself provides a strong statement of the current state of affairs and future prospects. For the experimenters and the "Friends of Satellites", everything is going well. Future prospects are promising because committments have been made to launch another satellite that will provide for further satellite experimentation on a longer-term basis. Satellite experimentation is thriving and prospects for its continuance are extremely promising.

But the purpose of developing the satellite technology and of experimentation via satellites is surely something more than to provide a welfare project to keep satellite experimenters employed and the "Friends of Satellites" content. Society's investment in satellites and satellite experiments presumably is directed to obtain benefits that justify the allocation of these resources to satellites rather than to alternative uses. As the present round of experiments approaches completion, it is appropriate to ask what are the perceived benefits of the experimentation undertaken to date and in fact of the Hermes program itself? On the basis of experience to date, what operational satellite services are likely to be developed, when and for what segments of Canadian and North American society? Are satellites the best way to provide these services? Answers to these questions should provide the basis for determining the direction of further satellite development and further satellite experimentation. Yet these questions can be answered only if one assesses the role of satellite experimentation within the context of the total telecommunications system. Only then can a determination be made as to whether and when the results of this experimentation will be translated into operational satellite services for the benefit of users generally.

It is especially appropriate that this panel is honored by the presence of Mr. Ouimet, Chairman of Telesat Canada, who perhaps can tell us what Telesat's plans are for translating the results of the Hermes experiments into operational, on-going satellite services.

Of course, I am sure that the DOC has undertaken a critical review and assessment of its satellite experimentation program, although I have been unable to find one available to the public. One would not want an outsider to conclude that the strongest reason for proceeding with satellite experimentation is the fact that there are now strong vested interests in government, industry and the academic community which are dependent on its continuance and which would have difficulty adjusting to a different state of affairs.

II. Satellite Potential

Because of its unique characteristics, satellite technology offers enormous potential for providing new and different telecommunications services. Satellite technology permits the distribution of a single transmission to multiple reception points; it eliminates transmission costs as a function of either distance or the number of receiving points; it can eliminate a major part of the hierarchical switching system required by landline transmission systems; it can provide a flexibility for providing many communication services that cannot be matched by other technologies; it can provide communication services that cannot be supplied at all by other technologies, especially to geographically-dispersed points and remote areas; and it can permit a specialization in services that can be provided more efficiently by satellite than by landline systems.

But the satellite technology has been around for a long time now. A great many commercial and experimental satellites have been launched, experimented upon and used for the provision of various kinds of services. What has been the experience? To what extent have these enormous potential advantages of satellites been developed and applied in the service of the using public and society?

A rudimentary review of the evolution of the satellite technology and its applications immediately makes one aware that the primary problem area relating to satellite technology is *not* technical. It is not economic. It is not social applications. The limiting factor restraining the development of efficient operational communication services of all kinds by satellite has been the necessity to accommodate the satellite technology to the vested economic interests of organizations that own and control the landline microwave and cable technologies. Thus, the history of satellites has been a history of wasted technological potential and outrageous economic inefficiency in order to preserve the near-monopoly market dominance of the established telecommunications carriers and their landline telecommunication systems. Thus, the further technical and economic development of satellite communications and even social applications will provide for the most part simply a wider gap between the potential benefits and the actual realized benefits of satellites.

III. Commercial Applications

Commercial applications of satellites have been undertaken with full recognition of the fact that in terms of economic efficiency satellites represented a major threat to the landline cable and microwave technologies. INTELSAT has followed policies to limit deliberately satellite development so as not to threaten the undersea cables and the corporations and administrations of the member countries that have vested interests in landline technologies.

In the U.S., the Communication Satellite Corporation (COMSAT) was created as a special corporation that would permit the absorption of control over satellites into the existing U.S. telecommunications industrial structure. COMSAT was created as a corporation that was not only owned in substantial part by the carriers with vested interests in the undersea cable technology, but also COMSAT for all practical purposes could only sell its satellite services to cable carriers. This extremely innovative and very carefully designed institutional structure denied the opportunity for the development of satellite services that were designed and priced on the basis of the characteristics of satellites. It made satellites subservient to landline-based telecommunications carriers whose allowed profit levels are determined on the basis of their investment in landline technologies. As one would expect, the landline carriers preferred making profits to using satellites efficiently. Over the past 10 years, the Federal Communications Commission (FCC) has had to order the landline telecommunication carriers to use satellites even when the purchase of satellite circuits was far and away the most efficient choice. Unfortunately, Canada chose to import this unique contribution to inefficient industrial structure.

In Canadian domestic satellite communications, the creation of Telesat reflects a similar absorption of satellites into the inherited industrial structure in such a way that satellites will not threaten Bell Canada and the other telephone carriers that own and control the landline communications technologies and together make up the TransCanada Telephone System (TCTS). Telesat is owned in substantial part by the existing telecommunications carriers. Telesat only leases satellite service at satellite-channel bandwiths, thus excluding virtually all users except the telephone companies and TV distribution. Telesat is subject to tariff restrictions of the telephone companies relating to interconnection and other matters. Individual users of the satellite system are restricted from earth-station ownership. With all of these restrictions, Telesat has never had an opportunity to act independently and to pursue actively commercial development of satellites. Telesat system capacity has been and continues to be mostly idle. Telesat is being used so little that the unit cost of this mostly unused system is extremely high. If the system were used at a reasonable proportion of capacity, Telesat's unit cost would decline dramatically making satellite services substantially more efficient. However, because of this artificial industrial structure for telecommunications, Telesat is restricted from even approaching development of its technical, economic and social potential.

Moreover, to compound the problem, Telesat has just entered into a contractual arrangement with the TCTS that will provide Telesat a guaranteed existence under conditions where satellite development will be guaranteed not to interfere with the vested interests of the telephone companies in the landline technologies. In the face of this development, what opportunities are there likely to be for taking the results of technical, economic and social experimentation with satellites and turning them into operational services for use by the public? Inasmuch as Telesat now has become a ward of the TCTS, to find out we had better ask Bell Canada and the other landline carriers what they will permit. It is in their economic interests to use satellites only for services that cannot be served at all by landline technologies and only under conditions where there can be no economic threat to the landline carriers. Satellites are not being integrated into the Canadian telecommunications system. Satellites are being made totally subservient to the vested interest in landline technologies regardless of efficiency and service advantages.

Clearly there have been some benefits from satellites actually realized in the extension of services to locations that could not be served by other technologies. But these achievements have been extremely modest in comparison to the enormous committment of resources that has been made and the great potential of satellites. The gap between promise and performance is so great that satellites are well on their way to becoming 20th century pyramids. Indeed, it is interesting to note that the federal government's justification for reversing the CRTC and permitting the Telesat/TCTS contract refers to jobs in the space industry, protecting orbital slots, ensuring that Aniks B and C will be launched, maintaining technological advantage. There is no mention whether these satellites will be used in supplying telecommunications services or whether satellites are the most efficient method of supplying telecommunications services. Is Canada's pursuit of satellites solely for prestige?

If the potential of satellites is to be realized, federal policies must remove the restrictive shackles that prevent Telesat from developing satellite services that reflect the potential efficiency of the technology. But in its wisdom, or shortsightedness, the government has delivered the Telesat lamb to the TCTS lion's den. One can only hope that existing policies that restrict users of satellite services, such as the restrictions on earth-station ownership, the requirements of transponder leasing and the restrictions against interconnection will be liberalized so that at least potential satellite users will have an opportunity to attempt to use the system. But despite recent overtures in this direction by DOC in its circuitous explanation of the government's decision, one doubts the seriousness of this move. For example, if entities other than Telesat are to be permitted to own earth stations, the TCTS has first rights to own them.

Within this structure then, what role does satellite experimentation play? Because of its technical glamor, satellites have attracted government and foundation funding for a wide variety of experimental programs of both a technical and social nature. A significant portion of the experimentation reflects very labored responses to the fact that the satellite technology exists and there must be something interesting that can be done with it. Because it exists, it should be used experimentally.

Under the present institutional structure, who has access to satellites? Central governments in the technologically advanced countries, multi-national corporations, privileged experimenters; in Canada - telecommunications carriers, the TV broadcast industry, privileged experimenters; public access - only as experimenters!

For the next generation of satellites, Canada is at least going to merge the idle capacity of Telesat with the experimentation program. DOC is going to overcome the embarrassment of having a technologically advanced but unused satellite system by subsidizing Telesat with many millions and allocating the capacity for experimental use. Thus, it would appear that DOC and Telesat are planning on Telesat not being able to develop operational services that will sustain themselves financially.

For experimenters this is success beyond your wildest dreams. You have become a permanent part of the institutional structure of satellites that needs experimentation permanently in order to justify itself. And even better, the system does not need, require or even necessarily care about beneficial results! In fact, significant advances in areas that conflict with the interests of the landline telecommunication services would just be an embarrassment because they could not be implemented. So today, let us have a celebration of satellites, 20th century pyramids and the ultimate professional tinker toy.

SUMMARY AND FUTURE PROSPECTS

Alphonse Ouimet

Président du Conseil - Chairman of the Board

Telesat, Canada

I don't know who has said that engineers did not have imagination. If Professor Melody is an engineer, he certainly proved that engineers do have imagination. But I'll come to that later. He is always provocative, which is probably a very useful thing. But allow me to begin in French.

Monsieur le président, nous ne connaîtrons vraiment pas toutes les retombées de ce symposium avant que la Société royale ait publié le compte rendu de nos délibérations. Mais une retombée très agréable pour moi a été la présence de Madame Hiéronimus et de Madame Rockoff qui ont apporté à nos discussions non seulement leur charme mais aussi une grande lucidité d'esprit. Je les félicite ainsi que les organisateurs qui les ont invitées.

Comme je suis le dernier à prendre la parole, je voudrais avant de parler de l'avenir m'acquitter d'un autre devoir agréable. Je crois que le but de ce symposium est de nous faire connaître, à nous les délégués ici, et aussi par notre entremise de faire connaître au public en général toute l'importance de l'expérience Hermès. Si c'était là l'objectif, il a été pleinement atteint. Nous devons aussi reconnaître la contribution importante qu'a apportée la Société royale en collaborant avec le Ministère des communications et aussi avec la NASA dans l'organisation de ce symposium. Aussi, comme nous avons plusieurs délégués qui viennent des Etats-Unis, permettez-moi de dire quelques mots à nos collègues américains.

Messieurs, quand vous venez au Canada, vous entendez souvent parler "du problème canadien", de cet ensemble de problèmes qui proviennent du fait que nous vivons si près de vous. Ces problèmes sont importants, surtout celui de préserver une identité culturelle propre au Canada. Mais c'est là tout simplement l'aspect négatif de nos relations et je crois que ce que nous avons entendu aujourd'hui, et l'expérience Hermès elle-même, prouvent qu'il y a aussi beaucoup d'avantages à être voisin des Etats-Unis. Je peux vous dire, en me basant sur mon expérience personnelle du tout début de la télévision, que nous avons profité pleinement de la technologie américaine dans ce domaine. Je suis content de voir que, bien que nous n'ayons que peu contribué à cette technologie au début, nous avons maintenant fait certains progrès. Dans le cas d'Hermès, par exemple, j'ai l'impression qu'il y a eu contribution dans les deux sens, et je m'en réjouis. Et ça, grâce au travail du Ministère des communications, au travail de John Chapman et de tous ses experts du Centre de recherches en communications. Et ici je parle tout aussi bien en temps que Président du Conseil de Télésat Canada qu'en mon nom personnel. Je suis sûr que Télésat n'aurait pas été la première institution nationale à utiliser des satellites géostationnaires pour les communications intérieures d'un pays, n'eût été l'expérience des satellites Alouette et Isis; n'eût été aussi tout le travail préparatoire fait par Chapman et ses collègues pour faciliter et préparer la venue de Télésat. Maintenant je crois que je devrais continuer en anglais afin que tous puissent me comprendre sans difficulté.

Personally and as Chairman of Telesat, I would like to acknowledge the role played by the Department of Communications (DOC). If it hadn't been for their efforts long before Telesat was born, Canada would not have had the first synchronous domestic satellite system in the world; I am sure of that. If it hadn't been for Hermes, and its opening up of high-power 12/14 GHz transmission, I don't think we'd be launching Anik B in about one year. And, were it not for Anik B and Hermes, there would be no Anik C in about three years from now.

So we owe a great deal to DOC and I wanted to say so publicly, not only in terms of technical development but also in terms of the support which DOC continues to give Telesat. Without overstressing this point, I have the impression that Madame Sauvé the other evening was in fact also giving a great deal of support to Telesat's vision of the future.

And now, what about that future? By the way, I will not attempt to answer the criticism that my colleague on my extreme left (Professor Melody) has just brought up. I hope you can organize another symposium sometime when we could deal properly with the points he has raised. When the organizers of the present symposium wrote down "the future" as the subject of discussion this afternoon, they probably had in mind a number of futures. First of all, the future of satellites generally. Let me deal with this one quickly in one word. That future certainly looks very bright and I don't think I have to do any more promotion on that score. Satellites are part of our daily life today. In the United States, any time a TV program comes via satellite, it has to be so indicated on the screen. I think the FCC insists on a "via satellite" caption, as if it were some kind of deceit to use satellites without saying so. In Canada there is no such requirement, probably because there are so many TV satellite transmissions. The CBC transmits most of its programs via satellite, in English and French, right across the country every day and every hour. So, satellites are here and, irrespective of what we've heard earlier, I think they are already doing a tremendous job. So much so that nobody notices it. It has just become commonplace.

What about other aspects of the future of satellites? The organizers probably also had in mind the future of experimental high-power satellites of the Hermes type. Obviously, the future of this kind of satellite is necessarily limited. By their very nature, experimental satellites, if at all successful, live only a short time and then rapidly give place to operational satellites to which they give birth. In this respect, Anik B will be experimental only in the sense that it will continue the Hermes experiments on the higher frequency band. I should mention here that we propose to supply to DOC, who is paying for the 12/14 GHz operation of the satellite, a commercial grade service. I don't like to use the word "commercial" in this sense, but that is the word used in North America when we want to talk about a service of high quality and dependability. This is surely a misuse of the word.

Dr. Chapman has already mentioned that, although still experimental, DOC's use of Anik B will go much further toward the final form of social services to be expected from satellites. With Anik B, instead of individual experimenters, institutions will be brought in so that they may develop the structures necessary to carry out the social services, which will be possible later using the Anik C's. So, when Professor Melody was asking what would come out of all these experiments, I can answer him right now. What will come out, to start with, is Anik B and then the Anik C's with their high-capacity high-band transmissions.

With these new types of satellites, in addition to the present services of the Anik A's on 4/6 GHz, I hope we'll be able to meet most of Canada's satellite needs, whether for entertainment such as broadcasting or for education, telemedicine and so on. If there are still needs to be met after this, there will be further developments. But so far, I think we have been building our satellite system in a very rational manner by taking carefully weighed steps; going through experimental stages when needed and gradually getting involved with fully protected operational type satellites. I think we have done rather well up to date and I see no reason why we shouldn't do equally well in the future.

In conclusion, if I may be a little more philosophical, there is one thing that worries me a bit. It is the fact that we seem to find it difficult to raise our vision above the immediate obstacles in our way. Of course, there will be initial problems in coordinating satellite, microwave and cable technology. Problems also in adapting social institutions to the new technical ways of delivering medical, educational and other social services. But, to use a metaphor, if we could lift our vision to the height of the satellite itself, these initial obstacles would look very small compared to the importance of the objectives ahead. The fact that so much of our technology comes from the United States does not necessarily mean that it has to be used in the same manner and in the same institutional and ideological framework. We must always be careful not to take ourselves for the United States. Because of our much more limited resources, we have had to develop our own indigenous approach to large-scale social projects. With its mixed economy, Canada has been much less hesitant than the U.S. in pooling both public and private initiative and resources to meet national needs, as for example in the case of transportation and communications.

Most of the problems raised by Maxine Rockoff the first day will, I am sure, in due time be overcome at least in this country, and I hope, in the United States also. I don't see how we could tolerate very long the impediment by private interests, whether they be those of doctors or of any other professionals, of social measures which are taken in the general public interest. I believe we have all the institutions necessary to limit the damage which this sort of self-serving approach could make. So, I think that the future of the applications of Hermes: telemedicine, tele-education and all the other "tele'es" which have not been discussed here - and there are many other such social services - also looks very bright. That we will solve our present problems, there can be no doubt. But, in Canada, we will do so only by using our limited resources of money and people in the most efficient way. And the only way we can have efficient telecommunications of any type, for telemedicine, tele-education, television, cablevision, electronic funds transfer, facsimile in the home, or what have you, is to be sure to develop in the first place the most efficient general telecommunications system possible in the country. One that can serve all the needs. And technically, as far as transmission is concerned, all the needs are the same, as eventually they will all translate into some form of time-sharing digital impulses. Looking inside a satellite transponder or a fibre optic or a coaxial cable, nobody will ever tell the difference between a René Lévesque, preaching separatism from Quebec, and Pierre Trudeau, promoting federalism from Ottawa. The technical contents of television, telemedicine, tele-education and so forth will all be the same - electrical impulses.

The important thing, therefore, is to have a strong universal telecommunications network which can carry anything, anywhere in Canada by using the most suitable means of telecommunications available. It should matter little to the communicator whether his message is delivered by satellite, by microwave, by fibre optics, or by a combination of all these means together.

Our telecommunications system should be like the black box Professor Lafrance talked about, it should be transparent. The users do not have to know what is inside or what makes it work. Through proper planning, I think we can get that kind of "transparent" telecommunications system in Canada. With such an integrated service, the people of tele-education, telemedicine and so forth will forget about their Greek prefix "tele" and start to concentrate on medicine, on education and on any other social communication services required by modern society.

Editorial Note

After reviewing these comments, Mr. Ouimet suggested that the following note be added to avoid possible misunderstanding.

"Many of the Hermes experiments or their equivalent can be continued on the Aniks B and C, but not all. Hermes is basically a single channel satellite which concentrates all its power to achieve single channel single beam "direct to home" transmission. This type of experiment will not be possible on the Aniks which have to divide their power between many channels in simultaneous operation. The introduction of regular "direct broadcasting" satellite service must await further developments and demonstration of its economic viability."

DISCUSSION

MR. ARNIE KLEIN:

I am particularly interested in what will replace Hermes Satellite for American experimenters. I have been informed that the Public Service Satellite Consortium (PSSC) is in favour of the Hughes Syncom proposal. Now, to my understanding, that does not include Hermes frequencies, that is S-band only, and it doesn't seem to make much sense to me. I was wondering if Dr. Marsten could comment on that.

DR. MARSTEN:

I will try to comment on it, but since I am not a member of the PSSC, and I haven't had a very direct connection with the Hughes Syncom 4 proposition, this is going to be somewhat spongy. I understand that what Hughes is offering in Syncom 4 is a large spin-stabilized bus designed to fit into the shuttle bay and to be lofted from shuttle altitude on a second stage rocket; and Hughes has been representing this as totally financed out of its own capital. What Hughes proposes to finance out of its own capital so that in fact, the shuttle doesn't loft a dead payload for what amounts to an ingot of iron is one broadcast channel at 2.5-2.60 GHz and the power of something like 40 or 50 watts. Now, in the American context, that is geared directly to be a follow-on, to the experimenters complex that worked with ATS-6 where the two broadcast channels operate at 2.5-2.69 GHz at power levels of approximately 15 watts per channel. In that regard, Hughes is reputed to have said that that is the limit of capitalization it proposes to put into a spacecraft that will be utilized for other purposes, not necessarily its own.

My understanding, and this is also probably second, if not third hand, of the PSSC's interest is that it is attempting to aggregate from its membership and potential clients, enough capital to put additional transponder channels into Syncom 4. Those channels haven't been defined yet. It is not clear how many of them there will be and whatever number that is, since they haven't been defined yet, it isn't clear either how many of them will be at 2.5 to 2.69 GHz and how many of them will be at 12. I think, until the Consortium is able to define better what its own constituents traffic demands are and how much money it has, it is premature to level criticism at what may or may not be on Syncom 4.

MR. KLEIN:

Well, what if it was a question of one or the other? What kind of cost differential would it involve if they were to put Hermes transmitters on board instead of S-band?

DR. MARSTEN:

First of all, it isn't clear to me and I don't think it is clear to a lot of people that one would necessarily want to put Hermes transmitters on board the way we put them on Hermes. This is not a criticism, for those of you who aren't engineers, of what we put on Hermes, it's simply a recognition that once you have done an engineering job, and you've learned all the good things about it, you've also learned enough to understand why you probably wouldn't do it exactly that way again, particularly when you are going for more kinds of services. I would not, for example, ever again approach a design the way we approached ATS-6. But at the time, we were all convinced that that was quite the right thing to do and the rationale is just too involved to detail. So, I don't think that's appropriate. If one looks at the kind of power level that is being proposed at S-band, approximately 50 watts, and the power levels that might be proposed at Ku-band, maybe 20 watts maybe 40 watts, the cost differential is probably not very great and I don't think I would say any more than that, because again the channel capacity is not defined and the links are not defined and the coverage is not defined, so to ask me how much something is going to cost when I don't know what the traffic demand is, or the link characteristics or even the coverage areas, it is not a question I could answer or I think anyone else.

MR. KLEIN:

I would just like to say my concern stems from the fact that ATS has severe limitations in regard to video-uplinks in that there are only two in Rosman and Denver to my knowledge and that many experimenters do want it to video-transmit.

DR. MARSTEN:

Monday morning quarterbacking is very very profitable. When you are in fact weight limited, power limited and the entire experiment is put on approximately a year after you have frozen the design and you unfreeze it just to accommodate that, people who come in after the fact have to accept certain limitations. We were well aware of those and I think we were quite able to make the same comments to all of the original prospective experimenters approximately 3 years before we launched ATS-6.

MR. GABY WARREN:

My question is also addressed to Dr. Marsten. From his remarks, and it would appear that he feels that when we move from experimental to operational systems, what we're probably going to have is operational hybrids, we are probably going to have satellites which combine transponders providing direct broadcasting and other transponders providing what we know as fixed-satellite services. Now, as he knows because of the '77 World Administrative Radio Conference which was held earlier this year in Geneva to plan the broadcasting-satellite service, there is a regional conference for the Americas which is planned for 1982 in which the specific planning for the Americas will be done, not only within the 12 GHz band, not only for the broadcasting satellite service, but also for the fixed-satellite service which shares that particular band in the Americas. Now, the plan that is going to have to be worked out as agreed upon at the conference which was held earlier this year will have two portions of the band which are reserved for the broadcasting satellite service for the Americas and 2 portions which are reserved on a primary basis for the fixed-satellite service, and we have to work out a plan on that basis. Well, as long as we keep experimenting, there is no problem because these are plans for operational systems, but if, when we go operational, what we have is hybrid systems combining the broadcasting satellite service and the fixed-satellite service, how can we work on the plan in 1982 which will take this into account?

DR. MARSTEN:

That is very well put, Gabe. The present generation of operational spacecraft and the fixed-satellite service all operate at 6 and 4 GHz. Intelsat 5 is planned to operate as a hybrid satellite. It will carry transponders that operate at 6 and 4 and it will carry transponders that operate at 14 and 12; all will be in the same spacecraft. Advanced Westar which will be the second generation of Western Union's United States Domestic Commercial System is also being planned to have transponders at 6 and 4 and transponders at 14 and 12. I don't need to tell you about Anik B, you know more about it than I; even though it's an experimental bird, the fact is that in all of these types of spacecraft, the power levels of the 14 and 12 GHz birds will be at about 20 watts. Now, there has been enough experience already with the 20-watt transmitter on Hermes to show that you can get a reasonable signal, rather acceptable quality for broadcast video services, and if that's the case, one could indeed indulge in quite a number of different kinds of video-transmissions to small terminals, be they teleconferencing or distribution of educational materials or distribution of health-care information or whatever. The satellite really doesn't care and the users, as long as their terminals satisfy the technical standard laid down for service in those bands, don't care either. My point was directed to the fact that you could get, with the technical characteristics that are going to be available in that generation of spacecraft, quite acceptable performance to have what we now call community broadcasting transmission operated over what we now call fixed-service satellite. Since the performance is not really dependent on the semantics but only on the technical characteristics, the result of all of this, for which there is now ample data in hand, and Canada is the possessor of a good deal of it, could well be to obviate a very messy sharing problem. I agree that the WARC '77 did set up certain categorical restrictions. It did so based on the assumption that there would not be hybrid satellites and that the standards required for community broadcasting and those required for fixed-satellite service were so disparate that you could not put them in the same satellite or that you couldn't run the two apparently different kinds of service through the same kinds of transponders. In fact, you can, and I suggest that by the time WARC 1982 rolls around, and the Region 2 countries find themselves facing this messy problem, there will probably be enough data so that a look at what is real and what is semantic approaches the problem in a rather different way and recognizes that there may only be a very limited application of what we now call direct-reception broadcast.

DOUG TOWERS:

I think, with due allowance for the provocative nature of some of Dr. Melody's remarks, we must congratulate him for the courage of his conviction, I think he has articulated some of the concerns that many of us have had about the extent to which the potential of satellite communications in Canada will be realized. I think, however, having posed these questions, it is only fair that we ask Dr. Melody just what kind of solutions, what kind of constructive action he feels can be taken at this stage to improve the situation.

DR. MELODY:

The first item is to hope that the case that has just been brought before the Supreme Court is successful and that the Cabinet decision is overturned. That may cause a constitutional crisis in Canada, I don't know. Let me summarize briefly why I think this agreement between Telesat Canada and TCTS has come about. I think, the structure of Telesat in Canada was adopted lock, stock and barrel from the structure adopted for COMSAT in the U.S. I think that has put Telesat in a situation virtually from the beginning of its life where it has not had the opportunity to develop its potential, so as a matter of principle what I would advocate is to take the shackles off Telesat and the current contract as I read it is very definitely the very last shackle. The difficulty is that in the CRTC's rejection of the contract, the CRTC did not go the step further and say "if Telesat is to operate independently so that it can take advantage of the efficiencies of satellites, there are other policies that must go along with it". Clearly, if you have a company that is owned by firms and can virtually only sell to firms whose fundamental economic interest is making sure that the advantages of the satellite technology are not developed, they will not be developed. A key source of the problem that will continue is the simple fact that the telephone companies are regulated on the basis of their investment in landline plant and facilities. That means that every time Bell Canada spends a dollar, landline piece of investment, whether it's efficient or whether it isn't, they are allowed to earn the regulated going rate of return which is 10 or 12%. Everytime they lease a channel from Telesat, they are allowed to recover the cost of the lease, period! So the incentive system is such that the future in Canada that I see, is simply a repeat of what has happened to COMSAT in the U.S. over the last six, eight, ten years. What happened there was that U.S. Bell and the other telephone companies did not wish to use satellites at all. Even when it was obvious that satellite use was the most efficient they would prefer to build additional cables, and some of you may be aware there was even a recent proposal to build yet another cable across the Atlantic. The Federal Communications Commission (FCC) fortunately rejected that and I understand now there has been some discussion about building it from Europe to Canada, which would be an interesting case for continued inefficiency. The specific policy directions that I would recommend would be first to liberalize our station ownership: that in itself is insufficient; secondly, to require if not permit Telesat to lease circuits as small as voice-grade circuits and not satellite channels; thirdly, on interconnection. Interconnection I think will have to be established as part of regulatory policy and interconnection is necessary if the telecommunication system is to take advantage of the relative efficiencies of the different technologies. The notion I am speaking of here is not one of what some people interpret to be as unbridled competition where we have a duplication of everything. The essence of the free-enterprise system is that those particular interests that can perform functions most efficiently are the ones that should perform those functions. So, therefore I do not expect Telesat, or would never expect Telesat, to get into the local telephone business. I would fully expect policies be established so that satellites are used where satellites can be used most efficiently. Under the existing institutional structure, the only way I can see that coming about is by reducing this endless stream of restrictions and barriers which restrict Telesat's freedom from the markets and which restricts users and even intermediaries from access to the market; and in that way, people will begin to compare the relative efficiencies of different technologies and make choices on that ground. I'm very concerned that this particular industrial structure that has been adopted may be worse than either extreme in that, had the government adopted a policy of simply giving the satellites to Bell Canada or to TCTS in the first instance, you would not have the incentive structure to have satellites unused the way they are now. You may have different problems from that degree of aggregation of monopoly power, but it may not be as inefficient as the existing system. I think the U.S. in following a more competitive policy with regards to domestic satellites has done so only after a very long and disappointing experience with international satellites, and it's come around to that after that experience. I suspect Canada will too, maybe in five or ten years.

MR. OUIMET:

I guess I'm expected to respond to this point, although I would suggest to my colleague that we stop after this exchange. Frankly, the Telesat/TCTS arrangement and the fact that there was a CRTC decision which was reversed by the Cabinet and all this; this is quite an internal sort of problem which I am sure will be resolved eventually in the Supreme Court of Canada in about four years from now. It has been stated in no ambiguous terms that the carriers control Telesat. Now, what are the facts?

The carriers own 50 percent - a little bit less than 50 percent - and the government owns the same number of shares. And there is one share held by the President of Telesat.

Now, I find it extremely difficult to imagine the position where the carriers, who have exactly the same number of shares as the government has, would be controlling it and not the government. If you ask the carriers, I think they would be likely to say to you that the fact that the government is a 50 percent owner, puts the control in the hands of the government. Well, I'm Chairman of the Board and I know how the decisions of the Board are taken and I can tell you the carriers do not control Telesat. The Board of Directors controls Telesat, and we have taken into account the fact that it is half-owned by government and half-owned by carriers; and I don't think this is a bad solution. The carriers of course found themselves in a difficult situation. Because of their 50 percent ownership, the government and the carriers were at the same time our owners, our customers and our competitors. And yet the fact that we've been able to work out an agreement which was satisfactory to all concerned, and received approval not only of the TCTS, but also of the government, of the Department of Communications, I think shows that there is something worthwhile in that agreement. To me it was the only efficient way of providing telecommunications in Canada.

We cannot do it the way the United States do it; by saying let's have competition between A & B and C & D. They are fifteen times our size economically. We cannot do that.

The second thing that was said - much was made of the fact that Telesat, up to this point, controls station ownership - the earth-station ownership, - but it hasn't been said that in the decision of the government - and Mme Sauvé mentioned this last evening: she said that the question of ownership would be reconsidered, would be looked at. So we can't say anything about this at this moment; we don't know which way it will go. It must be obvious to you that if we're going to end up by having terminals on top of igloos and on top of homes and buildings across the country, in remote areas, and there are thousands of them, it would be impossible for Telesat to own all of these terminals. Things have changed since we've started.

Now, on 4 and 6 GHz, it's another matter, there were good reasons at the start why we did not want to divide the responsibility for that link. If there were problems, where were they? Was the problem due to the satellite, the down-beam, or is it in the reception or was it in the equipment of that station on the ground? So we thought the safe way to handle it, certainly at the beginning, was to have undivided responsibility and I don't think anybody can question that. Now, for the future, let's have a look at it and see the best way of doing it.

Things change and they've already been changed, in effect, by the position the government has taken of reconsidering this.

Now, this other thing about leasing partial channels, up to this point, Telesat has only leased whole channels to anybody who wanted a whole channel; and because it is expensive to lease a whole channel, this was limited to certain categories of users. Now the government has also said, I think in the conditions they have attached to their varying of Telesat decisions; that this limitation - I don't even remember whether they said it would be removed or consideration would be given to its removal. It shows that to me it is not of tremendous importance. Some way will be worked out in the public interest so that there are no limitations for the smaller users. I think the limitation was removed, but it was left in the hands of CRTC to decide when it should be done or not; so back into the regulatory authority's hands.

Now, it was mentioned that Telesat, of course, could not get into the local telephone business. Frankly, we never had any intention of doing this. I think we would be wasting a lot of time transmitting telephone messages over the equator, a 45,000 mile circuit to come back to the neighbouring streets. There's nothing in that argument.

Now, there was another thing, but I don't know whether - yes, I wrote down economist. What I would ask Dr. Melody to do is to stop talking about generalities, even if they are provocative, amusing, create stimulation, and all this, and write a paper where he would show that whatever he's proposing now would be in the better interest of the Canadian public than what those responsible have already agreed to do and in that case we certainly will give it consideration. But at the moment there is nothing on paper with figures which shows that it would be more economical to do it his way or that it would be in the long-term public interest to do it. And, until this is done, frankly, I think we are just amusing ourselves.

DR. DUCKWORTH:

Following Dr. Melody's comment I think we'll accept Mr. Ouimet's suggestion that we move to another area.

DR. MELODY:

May I take your question seriously: if I submit my paper, you will adopt it. I have already prepared such a paper and I'll be happy to send you a copy and the paper does show specifics and the particular specific that I would like to draw to your attention is a recognition that in economic terms the vast majority of costs of supply and service by a satellite are fixed costs. They must go in at the time you create the capacity. Therefore, when a system is used at a small level of capacity, the unit costs are extremely high. When the system is used at a very high level of capacity, the unit costs are extremely low. The data with regard to Telesat, shows that Telesat is operating at a very low proportion of capacity and yet it is earning a profit - not a high enough profit, but a profit on the order, I believe, of 5 or 6% rate of return on investment. According to my calculations, if you calculated the unit cost on the basis of virtually any reasonable operational level of capacity use, let us say 70-75 percent of capacity, the unit cost would decline dramatically and that would allow Telesat to reduce its rate dramatically, like by a factor of 3 or 4 maybe. That, if Telesat did that, I would think that on the basis of efficiency the telephone carriers should, if they operated on the basis of efficiency, purchase all of the capacity that Telesat has. And the only reason they would not do it would be if they were afraid that Telesat might show them up by that efficiency. So those are the specific numbers I think that can be readily calculated and I'll be happy to supply them and I will look forward to rate reductions.

MR. OUIMET:
That's a good start. Continue in that direction.

MR. HUTCHISON:
I am the Editor of *The Electronics Communicator*. Just one brief comment - I know you asked us not to dwell on the subject - I would just like to make the point, from Mr. Ouimet's excellent illustration of the ownership of Telesat, that perhaps the control of Telesat is in the hands of David Golden who owns a single share and because he holds the balance of power, undoubtedly controls Telesat.

MR. OUIMET:
Yes, of course.

MR. HUTCHISON:
More seriously, it has been suggested that perhaps the next level of telecommunications or applications of telecommunications satellite will be in the form of direct broadcast. I would like to ask you, Mr. Ouimet, as Chairman of the Board of Telesat and former chief executive officer of CBC, whether you see the role of, or I should say the management operation of that generation of satellite capability in the hands of Telesat or in the hands of the CBC, or some other agency within our institutions in Canada.

MR. OUIMET:
You know, a long time ago, the CBC considered the possibility of getting into the satellite operation itself. The CBC is the biggest single customer of Telesat and actually its needs for the future I think are even much greater than the use it is making now of Telesat facilities. Having had experience in both the CBC and in Telesat, I will not try to speak for the CBC, but I will give you my personal opinion as a man who knows a bit about both. I think the CBC has got a big job to do in terms of what it does now - programming. And just in the same way as the CBC chose not to have its own microwave operations, and it could have done it when we started, we, in effect, were the motivators of the telecommunication company in establishing a microwave system. At that time, we were the only certain customer. But running a microwave network, running a satellite operation and also doing radio and television programs in

English, and in French, national, regional, local and overseas; serving the northern communities and all, is a big job. You can't do it all. So I would say it is unlikely that this will come about; I cannot see the CBC owning its own direct broadcasting satellite.

Second thing: little has been said about direct-broadcasting satellites, because by implication the Hermes type of satellite, because it's got a high-power tube, can be received over manageable small-size receivers or terminals which you can put on a roof. Let's have a look at that in terms of the future. There's no doubt that direct-broadcasting satellites will come about and will play an important role in extending services in many countries of the world including Canada and particularly in the remote areas. But this is a personal opinion and I give it as such; not a Telesat opinion; not a CBC opinion. But it strikes me that the direct-broadcasting satellite as an operational instrument, which will, I think, become operational only in the early 1980's or the mid 1980's - is arriving too late. For, I would say 85-90 percent of the Canadian population will by that time be served practically entirely by cable in urban areas and suburban areas. Right now, 50% of Canadians all across the country are getting their service by cable. And this is increasing at a rapid rate; still it will saturate, I don't know at just what level, but we think probably 80% of the people in urban areas will be getting it via cable and will be getting what? - the possibility of 35 channels, if money can be found to program the 35 channels, but there are no real technical limitations.

Now, for a broadcasting satellite to compete with that kind of delivery system in urban areas is a very tall problem. Sure, you can imagine a sort of platform in the sky where you would have huge solar arrays which would give you the power necessary to operate a similar number of channels and that would be a huge satellite - it would be very costly. But even if you do it, do you think that the subscriber to the cable in the city who by that time will have used those converters, getting everything on the cable by just pushing a button on it, will say, "Now I'm going to go on my roof and put up one of these nice $50 dishes and I have directed it just that way, and there is a bit of snow there so I have to be careful not to fall off, and then there might be a few trees in the way because the elevation angle is fairly low". For what? Drawing on some of my engineering intuition as well as of some of my administrative experience, I say it will be too late. It might have done it and perhaps it might have been the way, but I think cable will be very competitive to anybody who tries to do this five or six years from now. Frankly, and personally I think it came too late, but I won't say the same thing about some other countries. Some of the developing countries may find a way to eliminate one step in their telecommunications development through the use of such satellites. And it is not every country who considers that 35 channels is a reasonable amount of programming to put before its citizens.

DR. DUCKWORTH:

Ladies and gentlemen - the weather is bad and I know some are worried about getting home. Would I have your concurrence if I entertained one further question?

A. CASEY-STAHMER:

This is to Mme Hieronimus. I am from DOC. Après avoir écouté la situation de chez nous - sur les choses politiques, régulatoires et économiques dans l'introduction du système satellite, j'aimerais savoir quelle est l'attitude en Europe où l'on a autant de membres que d'états? Quelle est la planification dans le domaine régulatoire, politique, économique pour y introduire en Europe les systèmes de satellites qu'on planifie?

A.-M. HIERONIMUS:

La situation particulière de l'Agence Spatiale Européenne est qu'elle a affaire à dix états membres et que chacun des dix états membres est parfaitement souverain à sa propre règlementation, sa propre analyse de ses besoins, et de ses propres idées quand à son futur.

En ce qui concerne la télévision, l'Europe est représentée en particulier par l'Union Européenne de Radiodiffusion qui est un endroit où les radiodiffuseurs parlent un peu; mais il est certain aussi que les vingt ou quarante membres de l'U.E.R., suivant qu'on s'adresse à des membres à part entière ou à des membres associés, chacun de ces membres a sa propre souveraineté, ses propres règles, ses propres études, ses propres besoins et sa propre définition du futur. Alors, c'est vous dire que nous progressons avec lenteur quand nous essayons de définir un satellite, un oiseau, du genre de ceux dont nous avons parlé ce matin et au cours des derniers jours.

Je crois que c'est la raison pour laquelle la réunion administrative de Genève a décidé, pour couper court à tous les problèmes, que les satellites de radiodiffusion seront national en Europe. C'est-à-dire que chacun d'entre-eux aura sa couverture, le nombre de canaux qu'il souhaitera et pourra donc définir en toute tranquilité chacun chez soi exactement ce qu'il veut faire. Donc, ça nous évite beaucoup de ces problèmes de planification. Ces problèmes, par contre, nous les retrouvons au niveau de l'expérimentation. Parce qu'à peine avons-nous commencé à démarrer un programme de satellite, à peine essayons-nous de nous intéresser à son programme d'expérimentation, que chacun de nos états membres vienne frapper à notre porte, tout au moins s'asseoir autour de nos tables pour nous dire - moi, je veux utiliser ce satellite, mais bien entendu, comme je le désire: tous les jours, entre sept heures et neuf heures du soir, le samedi et le dimanche, si possible, de quatre heures à huit heures dans l'après-midi - et ils sont dix ou quinze à nous dire exactement la même chose. Alors, pour parler de programmation maintenant, c'est très difficile. Grâce au ciel nous avons quelques habitudes de traiter avec ce genre de problème et finalement les problèmes son identiques d'un pays européen à l'autre, malgré les grandes différences linguistiques, culturelles, géographiques. Ce que nous allons essayer de faire c'est d'éviter que chacun des membres de nos assemblées européennes reprenne pour son compte les mêmes expériences, en particulier les mêmes expériences techniques, et que le temps utilisable du satellite puisse être réparti astucieusement en fonction de l'intérêt des expériences et des plans de chacun de nos états membres quand à l'adoption d'un système opérationnel après cette expérimentation. J'espère que j'ai répondu à votre question.

DR. DUCKWORTH:

Before I bring the conference to a close, I wonder if Dr. Chapman, who's name has often been used in the discussion, would wish to make any benedictory remarks.

DR. CHAPMAN:

Thank you very much Mr. Chairman.

First of all, I would like to thank Mr. Ouimet for the very generous words he spoke just before coffee break. It is my conviction that the needs of Canada for the use of satellite technology are so evident, so obvious that if it hadn't been myself who had the privilege of being in the right place at the right time - to be able to do something - that other Canadians would have been here to have done the job. And having said that, I would like to move to the point of this seminar, to discuss the experiments on the Hermes satellite. I, myself, have felt that the conference was an outstanding success. I have been in the position Dick Marsten mentioned; we have struggled with problems, and it is the problems which have tended to end up on my desk. It's given me a great deal of pleasure to be here and to hear about it's successes, which I haven't had the opportunity to hear about before, and to listen to all the users explaining what they got out of the use of the satellite on both sides of the border. I think it has shown the importance of bringing together the institutions, those that provide services and those that use services, the individuals themselves that create the need, to give them the opportunity for hands-on experience; and the most encouraging thing to me has been to see how well that has been proved out in practice.

As I mentioned at the opening session, the Hermes experiments are not over, and I explained the reasons why we thought this was an appropriate time to have a bit of stocktaking on the Hermes experiments. And one question, which is, I suppose, obvious is whether this seminar, this symposium should not be repeated - perhaps in a year or two years' time when we have more experience because I think that one of the benefits of this kind of meeting is to bring together the various people who have an interest and including Dr. Melody and the very provocative and very valuable points he brings forward which must certainly be addressed perhaps - once again to another seminar devoted to some of those questions which have been raised. But I would leave with you - I would appreciate hearing either directly or indirectly from those who have participated in this seminar - whether they think that perhaps this should be the first of more than one meeting. And I want to thank all of you for making this such a valuable and successful symposium.

DR. DUCKWORTH:

On your behalf - je voudrais remercier Mme Hieronimus, M. Ouimet, Dr. Marsten and Dr. Melody for their presentation. For my own part, I thank you for your attendance, for your attention and your participation.

I think it would be appropriate if I expressed the thanks of all, reiterating really maybe what Dr. Chapman said to the Organizing Committee, to La Société royale du Canada, and particularly to the Chairman of the seminar - Dr. Locke. The symposium is now ended.

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