Management
Consultants

Currie, Coopers
& Lybrand Ltd

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GOVERNMENT TELECOMMUNICATIONS AGENCY

REVIEW OF COST RECOVERY PRACTICES AND PRINCIPLES

February 15, 1979

GOVERNMENT TELECOMMUNICATIONS AGENCY

TABLE OF CONTENTS

APPENDICES

GOVERNMENT TELECOMMUNICATIONS AGENCY

I. INTRODUCTION

In July 1978 Messrs. D.E. MacNair and P.F. Wade of Currie, Coopers & Lybrand met with Mr. A.B. Donaldson and other members of the Government Telecommunications Agency (GTA) management to discuss the cost recovery practices of the Agency. It was felt that these could be improved in terms of economy, effectiveness and user satisfaction. A proposal was subsequently developed by Currie, Coopers & Lybrand to:

- review present practices
- evaluate billing arrangements under alternative funding structures (such as full appropriation and revenue dependency)
- develop recommendations for a new or modified system.

The project was started in mid-October, with Mr. P.F. Wade as the operating consultant and Mr. D.E. MacNair as the partner-in-charge. Mr. W. Hooper of Coopers and Lybrand, later joined the project to develop cost analyses.

Alternate arrangements for managing pooled telecommunication costs were reviewed under conditions of appropriation, revenue dependency and cost recovery. It is our opinion that, with modifications to cost allocations, sampling methods, and system procedures, etc. the arrangements for

operating under cost recovery should be continued at the present time.

II. STUDY SCOPE OF WORK

Work on the study covered an elapsed period of three months. During this time we became familiar with all relevant aspects of the G.T.A. role, organization and operations.

A. FAMILIARIZATION

In order to become familiar with GTA's operations, problems, etc; we:

- Interviewed key managers in the Agency
- Spoke to representatives of Treasury Board (TB) and the Office of the Comptroller General
- Interviewed carrier personnel (Bell Canada)
- Had discussions with the staff of a regional office (NCR)
- Attended a conference of GTA regional managers where the project was discussed
- Interviewed staff at headquarters, with a concentration on personnel in the Finance and System Management divisions
- Attended a meeting of the Telecommunications Advisory Committee (TAC) and presented a progress report on the study
- Carried out in-depth statistical analyses relating to the sampling of call records
- Developed a computer simulation model to evaluate the effects of various costing alternatives (such as methods for overhead allocation).

Specifically, we assembled pertinent information relative to:

- Role and organization of the agency (Appendix I)
- Services provided (Appendix II)
- Cost, billing and revenue systems (Section III below)
- Future trends in telecommunications technology (Section IV below)
- Secondary problems which impinge on billing operations (Section V below)

B. OBSERVATIONS AND SELECTION OF ALTERNATIVES

Based on the information assembled we:

- Seclected three alternatives for funding the costs of government telecommunication services (Section VI below)
- Developed criteria for evaluating billing arrangements under the alternative conditions (Section VII below)
- Performed a macro evaluation of each alternative against the agreed criteria (Section VII below)

C. RECOMMENDATIONS MADE

The conclusions of our evaluations were translated into a conceptual design for a proposed new billing system (Section VIII below)

In addition, a work plan was then prepared for developing and implementing the modifications recommended. (Section IX below)

As indicated above, pertinent details are set out in subsequent sections and appendices of this report.

III. COST, BILLING AND REVENUE SYSTEMS

The discussion of charging practices will occupy most of the remainder of this report. However to illustrate the relative importance of the services we are showing here a summary of costs vs revenue by service.

Cost Recovery by Service - 1978

Service	% Total Revenue	% Total Costs	Over (under) recovery $'000
Shared voice	79	73	2,246
Dedicated voice	9	9	124
Shared data (GDNS)	6	7	(356)
Dedicated data	6	5	(134)
Consulting	1	5	(1,816)
Profit	-	-	50
Unexplained over-recovery			11
TOTAL:	101	99	0
TOTAL ($'000)	40,330	40,266	

Note that the distribution of overhead in the cost figures is not the same as that currently employed by GTA. The major difference is that most of the indirect overhead is currently allocated to the shared voice inter-city service whereas we have allocated it to each service on the basis of direct overhead labour dollars. Another difference is that some of the overhead directly associated with a service has not been charged by GTA in the past to that service. (Reference Appendix IV for greater detail).

From these figures it would appear that:

- the shared voice service was subsidizing other services by approximately $2 million in 1978. The major beneficiary was the consulting service. Some of this subsidy may be explained on the basis that a portion of the 'consulting'

cost was really related to necessary shared voice customer support; however, we have no details to corroborate this.

- with allocated indirect overhead, the shared data service (GDNS) and the dedicated data service do not seem to be paying their way.

A. PRESENT COST ALLOCATION AND BILLING PRACTICES

The main factors which underly current billing practices are:

- Each year at March 31, recoveries for the year must be within $150,000 of expenditures. This is a requirement mandated for the revolving fund method of financing currently used by the Agency.

- Where costs can be directly related to the usage for a billing code, these are charged to the code plus a fixed mark up of between 5% and 10% to cover overhead. This principle can be employed for all services except consulting and shared voice.

- For shared voice inter-city charges, costs are apportioned on the basis of a "percent of use" factor: This factor is, in some instances negotiated and in other instances based on traffic sample data.

Summary notes on the cost allocation and billing practices currently employed are set out in Appendix III.

B. SUMMARY OF IDENTIFIED PROBLEMS

Most of the difficulties which will be discussed below relate to the recovery of inter-city shared voice costs which account for 65% of the total volume of cost.

The cost allocation and rating procedures in general are subject to the following problems:

1. They are complex.
2. The original principles underlying the calculation of the inter-city charges appear reasonable even if one might take issue with a few concepts (such as the practice of allocating overhead to a circuit leg on the basis of DDD savings - or the cross-subsidization between services).
3. As exceptions to the initial procedures appeared, ad hoc decisions were often made to resolve them. Thus at this point the procedures seem a welter of fragmentary, often inconsistent, calculations. (This should not be interpreted as a criticism of existing operation staff who have been obliged to 'make do' in the absence of rationalized policies).
4. Frequently the effort required to adjust for some exception is not commensurate with its dollar impact.

5. The procedures are not documented in any way. In fact many are so complex as to be almost 'undocumentable' as they now stand.

6. Many procedures are not kept up-to-date, e.g. ON-NET rates not current with OFF-NET.

7. Some of the charge policies differ from region to region because of regional autonomy. (An example would be the charging of non-prime time to ON-NET calls).

8. In a significant number of the consolidations there has been no objective basis (based on a sample or otherwise) for determining the user's '% of use' factor. (See Appendix V showing all recording facilities by consolidation). Even when call records have been obtained, the '% of use' factors used in determining the bill may have been seriously out-of-date.

9. Where '% of use' factors are based on small samples such as in Ottawa, changing the factor in the middle of the fiscal year can cause a significant change in the user's charges - even if his usage has not changed.

10. The recent user practice of requesting a billing code to cover a smaller and smaller number of locals, has caused a proliferation in the number of bills issued each month as well as magnifying the effect of sampling errors mentioned above. Appendix VI shows that 67% of billing codes in Ottawa/Hull represent 50 locals or fewer.

11. The need to balance the revolving fund creates extra work on the part of GTA staff but we believe the process in general is well handled and does not create excessive fluctuations in the user's bill. The only exception to this is the case of a carrier increase (that occuring in 1978 was 22%). No attempt has been made in the past to incorporate predictions of these increases into the rate setting. In fact, it may not be practicable.

12. Billing preparation problems contribute to the problems of management of the cash flow of the revolving fund:

a. The bills are frequently late in being issued. Staffing problems and delays caused by the late arrival of accurate support information (e.g. OFF-NET figures, etc.) are contributing factors.

b. Some difficulties have been experienced in collecting accounts on time. This is due to a combination of factors, including an out-of-date accounts receivable system. (Users who do not agree with their bill frequently withhold payment for a few months).

c. As a result of the above, GTA must pay interest on its overdraft ($350,000 last year).

d. No interest is charged to delinquent accounts, although there is no TB policy against this practice.

e. Sometimes even the $6 million overdraft limit is not enough, and invoices from suppliers must be held.

C. IMPACT OF PROBLEMS

The consequences of the problems recorded above can be examined insofar as (1) they affect the user directly and (2) their effect internally.

1. Effect On User (only Ottawa users were interviewed)

From the user's standpoint, it is the inter-city ON-Net charges which create problems.

a. The major complaint relates to the wide fluctuations in these charges which can occur and for which no satisfactory explanation can be advanced. This creates serious problems in meeting budgets.

b. A second problem stems from the first, namely that the sampling errors and time lags in the '% of use' factor result in there being no apparent relationship between the user's calling activity and his bill. Since explanations from GTA may be difficult to comprehend he may be left with the feeling that the whole process is unfair and he is paying more than his fair share.

c. A third complaint not as forceful as the above relates to the difficulty that a user has in preparing his budget. Further assistance from GTA re projected increases in rates etc. would be welcomed.

d. Other comments from users related to the need for more information to control misuse (they were often unaware that sample call records were available to them) and the inability to reconcile DSS year end summaries of telecommunications costs with GTA payments. (Treasury Board send out an annual questionnaire relating to telecommunications costs).

2. Effect Internally

The complexity of the procedures and the absence of documentation explaining them creates a situation in which:

a. GTA is very dependent on a few individuals who developed the practices.

b. The calculations are difficult to check.

c. Anomolies can arise such as that discovered recently when it was found that on occasion a user will be billed twice for one portion of an OFF-NET call.

d. An excessive amount of time is spent by Regional and Head Office staff in responding to user enquiries and complaints.

e. The amount of calculation and the dependence on carrier-supplied statistics can result in the late preparation of bills.

f. The present method of allocating overhead by service may create an erroneous impression regarding the ability of each service to pay its way.

IV. FUTURE TRENDS

Future trends in the telecommunications industry were taken into consideration during this study. A few factors are noted here.

A. IMPACT OF NEW TECHNOLOGY OR COMPETITIVE DEVELOPMENTS

- Possible recognition of CN-CP as a voice carrier thus giving Bell Canada competition.

  Consequences

  If Bell or CN-CP were prepared to give a large customer such as GTA a significant discount on DDD service, it would be desirable for GTA to re-evaluate the savings resulting from a government IX network. (Loading inappropriate overhead into IX costs could invalidate the conclusion in such a situation).

- Alternatives to the TDA device for recording traffic statistics may be made available. For example, Bell claims that TABS is now available in Ottawa and could be implemented in 12 months, about the time when the present TDA contract runs out. The

estimated cost for 100% call detail is $2.50 per local (nearly four times that of the present 16% sample - reference Appendix V).

- It will be possible for certain types of switching equipment to restrict calls emanating from a particular local from reaching specified geographical areas. If the costs are not excessive this feature could be used in some instances to control telephone misuse.

B. BILLING IMPLICTIONS OF POSSIBLE NEW SERVICES

Telecommunications, word processing, data processing and other forms of electronics are in a mushrooming stage of development. Therefore, facsmile networks and other forms of electronic mail are becoming more and more cost effective. Since most of these will have the capacity to record traffic statistics, the determination of the traffic created by any billing code is not likely to be a significant problem.

As can be from the above, future developments should facilitate, rather than increase the difficulty, of collecting traffic statistics. In turn, this would assist in reducing the arbitrary element in the bill determination.

V. OTHER PROBLEMS

During the course of our review we identified relevant areas in which there are policy matters requiring clarification or re-examination.

1. Impact of The Lack of a Monopoly for GTA

It is believed within GTA that the lack of a policy compelling users to go through GTA for services such As GDNS or Telpak leasing is detrimental and may result in higher over-all telecommunications costs to the Government. For example if non-GTA users of CN-CP telex services were to join GTA, GTA would be in a better negotiating position for the Government as a whole.

2. The Role of GTA re: Misuse of Telephone System

At present there seems to be some lack of agreement regarding GTA's responsibilities for controlling user misuse of the voice network (eg personal calls). The general GTA position is that while they are prepared to help the user identify misuse (by supplying detailed call records in response to authorized requests), it is the user's responsibility to control misuse. Most Government employees appear to believe that use of the network is 'free'. The Treasury Board has not taken a firm stand in the matter of personal telephone calling (even during prime time). This ambiguous attitude has harmful consequences since telecommunications officers are reluctant in some cases to publicize use of facilities such as WATS.

3. The role of GTA in developing new services

It is not clear how much responsibility GTA carries for developing new applications for telecommunications technology. Nor is it clear how such projects are to be budgeted and approved.

4. Roleof GTA re: education of user departments

There is no clear statement regarding GTA's role in ensuring that user departments make the most economic use of telecommunications' equipment. While some training is provided by GTA, users indicated in their interviews that there was a substantial demand for more training and general technical information.

5. Regional autonomy

At present regional managers seem to have a degree of autonomy in matters relating to cost recovery which is inimical to the development of an effective cost recovery system. For example, a region can make no attempt to collect traffic statistics e.g. Montreal, or it can decide that a 50% sampling frequency is appropriate e.g. Vancouver. Similarly, one region can decide that it will charge ON-NET

users for calls in non-prime time (Vancouver) when the other regions do not. This autonomy will have to be reduced to some extent in the interests of uniformity.

6. Responsibilities within GTA Headquarters

There is some confusion regarding the roles and responsibilities of the various groups withing HQ. This coupled with a staffing problem in the Finance area has contributed we believe, to some diseconomies in the Agency. The major problem areas have been identified and, if addressed, can be remedied relatively quickly if the staffing difficulties can be overcome.

It is important that progress be achieved in resolving the above issues, as failure to do so in some cases (e.g. uniformity of practices among regions) could impair the effectiveness of the system proposed in Section IX.

VI ALTERNATIVES TO BE EVALUATED

Three alternatives (macro policies) for funding the costs of government telecommunications costs have been selected for evaluation:

- Full (or partial) appropriation
- Cost recovery
- Revenue dependency.

These alternatives are described in greater detail below.
Note that if either cost recovery or revenue dependency is considered to be the appropriate policy, sub-alternatives must be evaluated. Such matters as the method of allocating overhead to a service and the basis for user charges (or rates) must then be considered. Finally, details regarding the frequency of billing, and aids for user budgeting and forecasting must be determined.

A. FULL (OR PARTIAL) APPROPRIATION

1. Definition

(In the absence of a universal definition for this funding method a set of assumptions are set out below)

- All telcommunications services (with approved exceptions) would have to be obtained by government departments and agencies through GTA.
- Norms and guidelines would be issued by TB relating to GTA levels of service and user constraints.
- An annual GTA budget for all relevant telecommunications costs would be prepared (these elements would be removed for Departmental budgets- dollars and man-years). This would be based on usage forecasts, cost projections, etc.
- This annual budget would be covered by an appropriation.
- Submission for a supplemental increase would have to be prepared for TB in the event of carrier rate increases and/or unpredicted increases in service use or overhead costs.
- GTA would be given a strong control function in which the Agency could approve, withhold or cut-back telecommunications services in order to keep within authorized dollars and man-years - possible confrontation with norms.
- No bills would be prepared.

2. Implications

- In the cases where supplementary submissions were not approved, costs would have to be reduced in the overhead and/or operating areas. This would likely result in a reduction of service quality or service level.

- Administrative costs would increase to cover the detailed preparation of forecasts and user communication (explanation and policing). Theoretically these could be more than off-set by the elimination of the billing operation and the resulting savings in GTA, user departments and DSS. We believe, however, that in practice, this saving would not exceed 10 man-years.

- Reliable statistics as comprehensive (or more comprehensive) than now would be necessary to support the estimates in the submission, monitor usage of services by departments and support GTA planning and network management.

- It would seem to us that valid criteria on which GTA could make decisions for withholding or cutting back services would be very difficult to develop and justify.

- There do not seem to be practical methods whereby the department's use of the resources could be controlled e.g. limiting the number of locals and restricting others from access to long distance calling does not prevent individuals from calling from someone else's phone.

B. COST RECOVERY

1. Definition

(No change is assumed relating to GTA's current quasi-monopoly, situation).

- This alternative is essentially that now in effect. However, we have developed recommendations which would overcome some of the present problems identified elsewhere in this report.
- GTA's annual budget is subject to a man year constraint but no dollar restriction.
- Costs are recovered from using departments on the basis of charging principles which have been developed by TB (e.g. must be usage related) and must be approved by TB after consultation with the Telecommunications Advisory Committee.
- There may be some criterion (contained in a proposed Comptroller General paper on revolving funds) that a GTA service should be discontinued if total costs for the service exceed those of comparable services obtainable from outside and the difference is not justifiable. (This would serve as a mechanism to ensure 'value for money').
- At year end, revenues must be within a stated tolerance of total costs.
- Bills would be prepared on a regular basis.

- Government departments can take advantage of GTA quantity discounts for dedicated circuits while dealing directly with the carrier.

2. Implications

- Administrative costs would be at the same level as now (or lower if our recommendations are adopted).

- GTA has flexibility in setting service levels and budgeting its overhead.

- Reliable traffic statistics would be necessary for billing and GTA planning and network management.

- Responsibility for balancing costs and revenue at year-end rests primarily with GTA.

- The basis for billing would be usage related and easy to explain (There would be 'rates').

- The proposed basis for charging would be logical and equitable.

- User budgeting would be facilitated.

- Information would be available on a limited "as requested" basis to contain misuse.

C. REVENUE DEPENDENCY

1. Definition

(Assume a regulated monopoly - details requiring further definition)

- Certain services would be available to users only through GTA.
- Rates would be approved by TB for a year and published.
- Submissions for rate increases would have to be prepared in the event of carrier tariff increases and/or unpredicted increases in service use or overhead costs.
- In the case where submissions were not approved, costs would have to be reduced in the overhead and/or operating areas. This would likely result in reduced service levels or quality.
- Depending on the operation of the monopoly, the user might or might not receive his DDD bills directly from the carrier.

2. Implications

- The billing implications would be similar to those for the proposed cost recovery system i.e. bills would be prepared every month.
- TB would have greater control over GTA overhead than now.
- TB would have greater control over service levels than they do now because these would be an integral part of GTA's submission justifying their rates.

- Users could forecast their GTA bills more accurately unless carrier rate changes were passed on by GTA, in which case they would be in the same position as in the cost recovery situation.
- GTA would get greater revenue under the monopoly situation but there is no guarantee that total telecommunications cost per standard unit of service would decrease.
- The basis for billing would be usage related and easy to explain.
- The rate negotiations would lead to extra administrative costs on the part of the participants (TB, GTA, User departments).
- Reliable traffic statistics would be necessary for rate negotiations, billing, and GTA planning and network management.
- Information would continue to be available on a limited as requested basis to contain misuse.

VII. CONCLUSIONS AND RECOMMENDATIONS

In this section we will first describe the criteria against which the alternatives have been assessed, then draw conclusions leading to our recommendations.

A. CRITERIA

These criteria were developed after discussions with GTA personnel, representatives from Treasury Board and the Comptroller General, and user departments and agencies. They were then presented to a meeting of the TAC in December.

The selected policy and practices should:

1. Be economical to administer and easy to explain.

2. Provide reliable information to support decision making within GTA e.g.

   - network planning
   - reconcialiation of local-based data with trunk data
   - detect misuse
   - monitor trends in calling patterns
   - reflect 'true' costs to the extent practicable

3. Meet TB and Comptroller General guidelines and objectives, e.g.
   - all direct costs (plus a reasonable proportion of indirect overhead) must be allocated to each service (for revenue dependency and cost allocation).

   - user charges should be usage related

   - the user should be accountable for his charges and should be 'cost aware'

   - charging practices should encourage economic behavior (ie be cost related)

4. Be acceptable to the users

- the charges should compare favourabley to those of an outside supplier
- they should appear logical and equitable
- information provided and the process of billing should facilitate user budgeting
- facilities should be provided to the user (on request) to assist him to control misuse of the services.

B SELECTING AN ALTERNATIVE

1. Based on the broad and incomplete definition employed, the full appropriation alternative would seem to have little to recommend it. Administrative costs would likely not diminish appreciably and user accountability and cost awareness would be reduced. In our view the full appropriation system is not practical for telecommunications services in general at this time. Although, it might be appropriate for the research activities (non-cost recoverable) which are now listed under 'consulting', if the expenditure is significant and not directly related to an existing service.

2. In choosing between a revenue dependency alternative and a cost recovery alternative we can see little to support the move to a revenue dependency system (using the criteria which have been developed). It is assumed that the benefits which would accrue from the monopoly aspect of revenue

dependency and from closer control by TB over telecommunications costs could be obtained independently without adopting the rate setting feature. In fact, the only difference of any consequence between the two is the fact that 'rates' must be negotiated with the revenue dependency option whereas the cost recovery option permits GTA to increase its 'rates' without negotiation.

In all other respects the two are almost identical:

- the traffic statistic requirement is the same for both cases although the absence of usage data would have more severe consequences in the case of revenue dependency due to the more formal nature of the rate setting and application.

- the billing and accounts receivable machinery is the same for both.

- GTA has more flexibility with cost recovery in recovering unpredicted cost increases. With revenue dependency such shortfalls would be translated into reduced service if the additional funds could not be obtained, in time, through increased rates.

- a usage-related rationale for determining user charges i.e. setting rates, would have to be developed in both cases.

- both options meet the current stipulated TB and Comptroller General guidelines:
  - both would be usage related
  - user accountability and cost awareness would be the same.
  - costs would be charged to a service in accordance with guidelines.

- administrative costs might be higher for revenue dependency due to the rate negotiations.

- from the user's standpoint, almost every aspect of the two systems would appear the same. The only exception is that an unpredicted (by GTA) increase in cost might result in a decrease of service in the case of revenue dependency whereas with cost recovery the user's bill might be higher than expected.

The main argument here is that 90% of the costs are based on tariffs (for carrier supplied services) over which GTA has no control. Secondly, costs for the major service (the inter-city shared voice network) are only weakly related to usage, and then with a log. (See Appendix VII which, with the exception of the rate increase in 1976, shows that inter-city operating costs are relatively constant over a year).

Consequently the concept that GTA will perform more efficiently by having to live within negotiated rates does not seem to have much support. In effect, rates would be set (on a necessarily arbitrary basis) and any shortfall in revenue would be reflected in a reduced level of inter-city service which would be felt generally throughout the Government.

If the objective is to reduce telecommunications costs within the Government, an alternative would be a voluntary reduction in the use of the services by the user, both in areas where there is a direct usage related charge by the carrier and in the use of Government operated facilities. In time a pronounced level of effort in the latter area will be reflected in lower network costs.

Based on the above evaluation we conclude that the cost recovery alternative be continued to fund all of GTA activities with the possible exception of the research function. If the latter is determined to require significant funds, it is suggested that these be covered by an appropriation within the DOC budget.

VIII. CONCEPTUAL DESIGN OF COST RECOVERY SYSTEM

As noted on page 13 there are a number of other issues to address, now that the cost allocation alternative for funding has been recommended. These are:

- how overhead should be allocated to a service and then to a cost centre
- details regarding the basis for 'rates' setting, the frequency of billing, and aids for user budgeting and forecasting.

To this we must add some suggestions on how to deal with the absence of call recording detail since this information has been indentified as being essential for both user billing and GTA facilities management.

A. ALLOCATION OF OVERHEAD

It would appear that the TB and Comptroller General guidelines are quite explicit on this issue:

> 'direct overhead should be allocated to the service together with a reasonable proportion of indirect overhead'.

As noted earlier this is not the present practice, all indirect overhead plus some other being allocated to the inter-city shared voice network. Present practices should therefore be adjusted to conform to the above guidelines.

B. 'RATE' SETTING

1. Carrier Billed Services

For all services other than shared voice it would appear that the 'rate' should be set as the supplier's rate plus a percentage mark up based on an estimate of the overhead (direct and indirect) which will be allocated to that service for the year.

2. Shared Voice Local

For shared voice local, the estimated total annual costs (overhead and operating) allocated to this cost centre for a consolidation should be divided by the number of locals in the consolidation. We would propose consideration that all costs associated with producing the Government directory would be included in this figure and that one directory be distributed per local. Extra directories for the public (available

through DSS or for Government departments) should be sold at printing costs involved. Revenue accrued would be taken into consideration when determining the allocation.

This recommendation is based on the fact that the major costs associated with the directory are relatively fixed - being associated with the record keeping of changes, the type setting etc. Once the printing run has been set up the incremental cost of printing a copy should be low at that time.

3. Shared Voice Inter-City

This is the most contentious area. Note that costs are relatively fixed during a year and that over 90% are tariff items billed by a carrier. See Appendix VII which shows such costs for the period April 1976 - August 1978. There are two problems to address:

- define charge unit and what should comprise the basis for determining the "rates".

- if the charge unit is call related, as TB guidelines suggest, it will be necessary to overcome conditions where either no call records exist or technical facilities permit the monitoring of only a small sample of the locals.

a) Determining INTER-CITY 'rates'

A number of issues must be addressed here:

- how should overhead be allocated? e.g. should it be apportioned to circuit groups or some other sub-group?
- what is a charge unit?
- using what efficiency factors should costs be allocated to usage units?
- should there be a charge for non-prime time calls?
- should OFF-NET 'rates' be the same as ON-NET?

It is proposed that most of these details be settled in the detailed design stage of this project. At that time the full range of options can be given a comprehensive evaluation.

In this regard, we have developed a computer program that will enable us to evaluate the effect on 'rates' of a variety of methods for overhead allocation (e.g. to circuit groups based on proportion of savings over DDD rates, to circuit groups based on the proportion of costs, etc.) A number of other factors such as efficiency factor, characteristics of the average call etc. can also be varied. This program will enable us to change factors and get a new rate schedule within half an hour.

It would appear that the charge unit should be message minutes weighted in some way to reflect costs (e.g. by distance).

b) Estimating Inter-City Traffic in the Absence of 100% Call Recording*

Where there are no facilities whatever for recording inter-city traffic by call originator, there is a serious problem and efforts must be continued to resolve it.

Toronto has equipment in place which will remedy the situation for 75% of the locals. However, Quebec and the Atlantic provinces (20% of the network) will be without call recording facilities for 1979. For such cases the present '% of use' procedures will have to be continued.

Ottawa which has technical facilities for recording only 16% of the locals should not present a problem under the proposed system as long as we can expand the number of locals covered by a billing code to say 200 as a minimum except in exceptional cases, and talk about an annual profile for the billing code. (This could be compared to the annual profile on which a resident's heating bill is estimated).

It should be possible with the 16% sampling facilities to estimate the annual inter-city usage for a billing code (defined as above) to within 10%. This conclusion is based on tests we performed and would have to be verified by further studies.

*(The average seasonal traffic pattern for the inter-city network is illustrated in Appendix VIII. The growth of inter-city calling for the past 6 years is shown graphically in Appendix IX).

Each user billing code would then be billed 1/12 (for monthly bills) or 2/12 for (bi-monthly bills) of the past year's usage profile updated to take account of projected changes in usage pattern such as the addition or deletion of programs within the department.

Actual usage would be monitored and performance outside a specified tolerance band would necessitate an adjustment.

There should be only minor adjustments (using methods similar to those currently employed) to ensure at year end that revenues match expenditures within the allowable margin.

IX. GENERAL RECOMMENDATIONS

A. RECOMMENDED ACTION

1. Clarify responsibilities within GTA relating to the cost recovery process:

- authorization of supplier services
- approval of supplier invoices
- decisions relating to rating policy:
  - local rates (shared voice)
  - ON-NET rates (prime vs non-prime differential etc.)
  - OFF-NET rates
- development of '% of use' factors:
  - sampling procedures
  - authorization of payments to carriers for call records
  - approval of factors

- monitoring of factors used in the calculations:
  - average holding time
  - % CCS split by consolidation etc.
- collection of delinquent accounts
- etc.

2. Bring costing practices into line with agreed upon definitions (direct overhead relating to a service etc).

3. Continue with the cost recovery philosophy for funding GTA except in the case of non-recoverable research expenditures. If these are significant and not directly related to an existing service, we propose that they be covered by an appropriation.

4. Relate charges to usage and costs:

   a) For all services other than shared voice, mark up supplier invoices to cover overhead costs.

   b) For shared voice local charges, 'rates' should be based on a per local charge.

   c) For shared voice inter-city, charges should be call related based on 'rates' which will have to be established. (Rules for the allocation of overhead and the determination of rates have not yet been finalized. We have developed a simulator which can be used to evaluate a variety of alternatives during the detailed design phase of this project).

5. Change the billing practices for inter-city shared voice as follows:

   a) '% of use'factors would be developed by department (not billing code) to reflect the annual IX

calling profile of the department. These would be supplied to the department in October each year,

b) the department's IX calling activity (total units) would be monitored each month to determine adherence to the projected calling profile. Points falling outside a statistical tolerance band would indicate that an adjustment was necessary.

c) the preparation of bills would be based on estimates as much as necessary to avoid delays. Averages and percentage factors would be developed where required.

6. Initiate steps to acquire call recording facilities where there are none. For Ottawa, it is recommended that the rules defining a billing code be changed to stipulate a minimum local population size of say 200. Statistical sampling plans based on these groupings could then be devised which would provide estimates of annual usage with a prescribed reliability.

B. NECESSARY TASKS

The following tasks are necessary to put the recommendations into effect.

1. Obtain approval for recommended cost recovery policy. (It will be necessary for the General Manager to determine the level of approval required. This will govern the resources to be devoted to this task).

2. Clarify GTA organizational relationships and responsibilities.

3. Complete an overhead cost study to develop, and obtain approval for, a uniform method for allocating overhead to service:

   - define services (including research)
   - study cost behavior
   - develop principles - obtain agreement
   - prepare guidelines

4. Develop a detailed design for cost recovery procedures:

   - Evaluate alternatives for overhead allocation to cost centres
   - Establish principles for 'rate' setting
   - Refine simulator program developed by CC&L to facilitate the previous two steps
   - Prepare budget for GTA - by service
   - Analyse seasonal patterns and the variability of IX calls by local.
   - Evaluate call record sampling alternatives and secure approval for the selected options.
   - Prepare directives for call recording.
   - Refine existing procedures and computer programs for traffic data analysis to incorporate changes.
   - With available data, develop tentative user profiles for IX shared voice calling.
   - Discuss profiles with selected users and confirm their practicability.
   - Develop detailed procedures to prepare user bills (tie in with task #5)
   - Develop and test computer aided procedures for the calculation of rates and user charges.

5. Complete the design and implementation of the billing, accounts receivable and collection system incorporating the charges requires to accomodate the new billing arrangements:
   - complete design specifications to include preparation of bills, adjustment for actual charges vs estimate, entry of receipts and preparation of ageing reports.
   - evaluate alternative software and hardware suppliers and make selection
   - monitor progress

6. Document procedures, manual and computerized.

7. Train GTA staff.

8. Develop material for user familirization and introduce profile concept.

9. Implement.

10. Fine tune the system.

C. BENEFITS

The revisions proposed for existing billing practices should bring a variety of benefits:

For GTA

- A defensible rationale will be established for cost recovery and billing practices.
- Policies will be more uniform across the country.
- The larger billing centres and the streamlined operating procedures should reduce administration costs.

- The concept of a user profile for inter-city billing is easy to understand and should result in fewer unexplainable fluctuations. Thus complaints should be reduced.

- With fewer bills to issue and the use of estimates to avoid delays, bills should be prepared on time.

- The different approach to traffic volume estimation in Ottawa should provide more reliable data for GTA planning and network management.

- The changes in costing practices should permit the faster identification of non-profitable services.

For the User

- User understanding and acceptance of the system will be improved.

- Budgeting will be facilitated.

- Fluctuations in billing will be reduced (Ottawa).

X. CONCLUSION

We have completed our review and indicated problems with present practices of cost recovery and billing in the Agency. Alternative methods of Agency funding were evaluated and the present funding method (cost recovery) endorsed as being most appropriate at this time. A number of recommendations were developed to overcome the deficiencies in existing systems. When implemented these should

provide the Agency with a method for charging and billing which has a rational basis, costs less to administer, improves management control and meets the test of user acceptance and accountability.

CURRIE, COOPERS & LYBRAND LTD.

APPENDICES

GOVERNMENT TELECOMMUNICATIONS AGENCY

ROLE AND ORGANIZATION OF THE AGENCY

The program objective of the Agency is to "plan, establish and manage telecommunications facilities and services that will satisfy the requested needs of federal departments and agencies on an economic basis". To meet this objective, facilities are located at headquarters in Ottawa and in five regional offices. At headquarters, responsibilities are grouped under five divisions. We had most of our contact with two of these:

Finance: with responsibility for:

- pricing principles and policies for cost allocation
- billing and collection activities

Systems Management: with responisibility for:

- medium range planning
- the management of the telecommunications networks
- negotiations with suppliers
- the management and procurement of data collection and processing facilities

The regional offices are responisble for:

- making arrangements with local carriers for switchboards, tie trunks, operators, listings in public directories and traffic statistics on trunks and locals.

- training of telecommunications officers and clerical staff in user departments re; proper use of telephone equipment
- local consulting staff
- approving and negotiating the '% of use' factors with user departments (except for National Capital Region where responsibility for this is unclear)
- setting rates for local shared voice services
- following up on delinquent accounts
- providing explanations for bills
- approving and monitoring all requests for equipment from carriers

GOVERNMENT TELECOMMUNICATIONS AGENCY
SERVICES PROVIDED

There are five major classifications for the services provided by GTA. These are:

- shared voice (including the directory service)
- dedicated private line
- shared data
- dedicated data
- consulting

The main characteristics of these services are summarized below:

1. Shared Voice

- Comprises approximately 80,000 locals on the shared network (Some departments such as DND and External Affairs have their own independent telephone networks).
- There are two categories of telephone service:
  - local
  - inter-city (IX)

a. Local

- This comprises calling facilities between locals within a 'consolidation' (where a consolidation can be viewed as a giant switchboard serving all government telephones in a locality such as Ottawa-Hull). Some locals may be 'restricted' and have no access to the inter-city network or DDD dialing.
- Each consolidation has a directory service.

b. Inter-city

- This comprises 19 consolidations connected by Telpak, IX, and WATS circuits leased by GTA. (A regional GTA office may be responsible for more than one consolidation).

2. Dedicated Private Line

- Consists of facilities which are dedicated to a specific department. Such facilities could be Telpak circuits, OPX services of Zenith services.

- Carrier charges are distinct for each user.

3. Telex network (Government Data Network Service - GDNS)

- Approximately 1000 stations across Canada
- Connected to CN-CP's telecommunications (a voice grade analogue network - up to 180 baud)
- GTA provides an operations' centre to monitor quality of service, relay service calls, obtain originals of garbled messages. (There are a large number of government teletypes on the CN/CP system outside the GDNS).
- carrier charges are distinct for each user

4. Dedicated data

- Consists of carrier provided service such as Data Route, Broadband, etc.
- Carrier charges are distinct for each user.

5. Consulting

- A service covering three categories of activity:
  - free user-associated service (minor investigations, etc.)
  - billed user-requested investigations
  - research projects such as the development of a facsimile network

GOVERNMENT TELECOMMUNICATIONS AGENCY
PRESENT COST ALLOCATION AND CHARGING PRACTICES

Description of Practices by Service

There are two main principles which underly current practices:

- Each year at March 31, recoveries for the year must be within $150,000 of expenditures. This is a requirement mandated for the revolving fund method of financing currently used by the Agency.

- Where costs can be directly related to the usage for a billing code, these are charged to the code plus a fixed mark-up of between 5 and 10% to cover overhead. This principle can be employed for all services except consulting and shared voice.

The charging principles by type of service are summarized below. (Because of its complexity, shared voice is discussed last).

1. Dedicated private line

   The user is billed monthly for his charges (as billed by the carrier) plus a percentage mark-up.

2. Shared Data (GDNS)

   The supplier gives GTA a bulk discount of 15%. GTA passes 7% of this on to the user, retaining 8% to cover operating and overhead costs.

3. Dedicated data

Same as(1)

4. Consulting

Most consulting services specific to a user are provided free. When major investigatory projects are authorized by a user these are billed at $170 per man day. The latter figure was developed some years ago and has not been updated since.

5. Shared voice

Two classes of service are provided, local and inter-city.

a. Local

Local costs consist of:

- cost of equipment (such as switchboards)
- operator salaries
- government directory listings

These costs are summarized by consolidation and are billed back as a fixed monthly charge per local. Examples of current charges are:

Vancouver - Victoria	$1.60 per local
Edmonton	3.00
St-John's	3.00
Halifax	1.00
Quebec	3.75
Montreal	2.75
Ottawa	1.50

Note: No head office overhead is charged nor any of the overhead for the regional GTA office.

b. Inter-city

Inter-city calls fall into two classes for charging purposes:

OFF-NET

ON-NET

OFF-NET calls are calls initiated by government personnel, placed through a government operator, and charged to the user's card code (issued and controlled by GTA).

ON-NET calls are billed 'en bloc' for a billing code as described below.

The policy is to allocate most of GTA overhead (direct and indirect) to this service and to keep calculated 'rates' proportional to DDD rates. It should be noted that these 'rates' are used in the conventional sense only for OFF-NET calls. This policy results in regional cross subsidization.

A key factor in this process is the '% of use' factor. Where call records can be obtained from the carrier on a sampling or 100% basis (see Appendix V), these calls are rated (prime time calls only) using the GTA internal rate schedule, and the total bill is projected bases on the sampling frequency i.e. a factor of 10 is applied in the case of a 10% sample etc. All such bills are added together and the % of the total corresponding to each billing code is called its'% of use' factor. Such factors are calculated sporadically.

Where there are no call records, the '% of use' factor is negotiated by the regional manager on the basis of number of locals or whatever seems reasonable.

Inter-city charges are prepared every two months (see exhibit 1 for a more detailed explanation).

1. The relevant costs for the two months are allocated to each consolidation (these consist of carrier charges for the circuits and overhead expenses).

2. All relevant OFF-NET charges are deducted.

3. The remainder is apportioned to billing codes using the '% of use' factors.

GOVERNMENT TELECOMMUNICATIONS AGENCY

DETAILED STEPS FOR INTER-CITY SHARED VOICE BILLING

The inter-city network is comprised of a series of legs or circuits. Thus Vancouver-Calgary is a circuit, Calgary-Regina is a circuit, etc. Telpak and IX circuits are leased from carriers and can be added or subtracted on a monthly basis. Because of the tariff structure and differential traffic volumes between consolidations it is necessary to optimize the network on the basis of circuit groups rather than individual legs. The Ottawa-Toronto-Kingston-Ottawa is one such group. Another is the Vancouver-Calgary-Regina-Winnipeg-Ottawa-Vancouver group.

Under present practices, leasing costs per leg are normalized within a circuit group on a uniform cost per mile basis.

1. Each month, the overhead is allocated to each leg in proportion to savings for that leg. (Calculated by comparing the leasing cost for the leg to the estimated cost of all calls in that leg at DDD rates).

   In effect there is geographical cross-subsidization.

2. Every two months, a target contribution figure is calculated for each consolidation for the period:

   $$\text{Target contribution for the consolidation (\$)} = \sum \left[\begin{array}{l} (\%\ \text{split} \times \text{normalized current costs}) \\ +\ \text{allocated OH} + \text{WATS charges summed} \\ \text{over all relevant circuits.} \end{array} \right]$$

   Note: each leg involves two consolidations. This % is based on periodic analyses of carrier produced data. Present factors have not been changed for a number of months.

3. The next step is deduct* the total of all rated OFF-NET calls originated by the consolidation from the target contribution to give an adjusted target contribution. (The rating of off-net calls involves much time consuming work, both mechanized and manual. There are serious time lags and frequent unshceduled delays which hold up the preparation of the bills).

   *(This is an oversimplification. There is first a debit and credit procedure between consolidations to adjust for calls originated by billing codes not resident in the consolidation).

APPENDIX III
Exibit 2

GOVERNMENT TELECOMMUNICATIONS AGENCY
SPECIMEN GTA PREPARED BILL

Government of Canada / Gouvernement du Canada
Department of Communications / Ministère des Communications

COPY / COPIE 7

INVOICE - FACTURE 080989

ACCOUNT NO. - N° DE COMPTE	PERIOD - PÉRIODE	INVOICE DATE FACTURE	SERVICE AREA - RÉGION DE SERVICE
[illegible]	01/08/78--30/09/78	22/08/78	OTTAWA

COLL.	PROJECT - PROJET	LINE OBJECT - ART. D'EXÉC.	RECOVERY - RECOUVREMENT
			OTT063

REMARKS - REMARQUES	ITEM ARTICLE	AMOUNT - MONTANT
	V1	1695.00
PRIME TIME CALLING 26619.88		
NON PRIME TIME CALLING 10.00		
TOTAL 26629.88	V2	26629.88
4XXX ONLY	V3	5.00
	V4	44.37

SEE REVERSE SIDE FOR ITEM DESCRIPTION - VOIR LA DESCRIPTION DES ARTICLES AU VERSO

TOTAL ▶ 28374.25

[illegible]

Accounts are due when rendered and payable in Canadian funds to the Receiver General for Canada.

Les comptes sont payables, sur réception, au Receveur Général du Canada, en devises canadiennes.

Please direct inquiries to GTA at:
Pour toute demande de renseignement, communiquer avec l'ATG à:

NATIONAL CAPITAL REGION
SYSTEM CONSULTANTS
OTTAWA, ONT. TEL: 996-0964

GTA REGIONAL COPY - COPIE DE L'ATG - RÉGION

17-11 (777)

CODES

V1 -local shared voice

V2 -inter-city shared voice

GOVERNMENT TELECOMMUNICATIONS AGENCY

COMPARISON OF COSTS AND REVENUES BY SERVICE

The distribution of overhead in the cost figures represented in the table below is not the same as that currently employed by GTA in determining cost recovery figures by service. Finance has however confirmed the figures we have developed.

Service	Expenditures $'000		Revenue $'000	Gain(Loss) $'000	Gain(Loss) %
Shared Voice					
(Local and inter-city)	Operating	27,499			
	Direct	839			
		28,338	31,674	3,211	11.3
	Allocated O.H.	1,090			
		29,428	31,674	2,246	7.6
		(73%)	(79%)		
Consulting					
	Operating	-			
	Direct O.H.	1,066			
		1,066	217	(849)	(79.6)
	Allocated O.H.	967			
		2,033	217	(1816)	(89.3)
		(5%)	(1%)		
Dedicated Voice					
	Operating	3,480			
	Direct O.H.	75			
		3,555	3,787	232	6.5
	Allocated O.H.	108			
		3,663	3,787	124	3.4
		(9%)	(9%)		

Service	Expenditure $'000		Revenue $'000	Gain(Loss) $'000	Gain(Loss) %
Shared Data (GDNS)					
	Operating	2,547			
	Direct O.H.	78			
		2,625	2,536	(89)	(3.4)
	Allocated O.H.	267			
		2,892	2,536	(356)	(12.3)
		(7%)	(6%)		
Dedicated Data					
	Operating	2,052			
	Direct O.H.	90			
		2,142	2,116	(26)	(1.2)
	Allocated O.H.	108			
		2,250	2,116	(134)	(6.0)
		(6%)	(5%)		
TOTAL	.....	40,266	40,330		
		(100%)	(100%)		

Note: Overhead allocation is based on direct labour dollars, except for interest ($321,000) which was allocated on the basis of revenue.

FACILITIES FOR INTER-CITY CALL RECORDING PRESENT & PROJECTED AS OF NOVEMBER 1978 INCLUDING 'RESTRICTED LOCALS

Consolidation	No. of Locals	% of Total	Present Facilities	Projected Facilities
Alberta				
. Calgary	1050	1.3	LAMA - 100%	No change
. Edmonton	1708	2.2	TDA 100% on 69	LAMA (100%) by 1983
		3.5	50% on the remainder	
British Columbia				
. Vancouver-Victoria	6000	7.6	TDA - 50% of lines scanned per month (every month switch)	No change
Manitoba				
. Winnipeg	2837	3.6	None	BITECH (100%) in 12 months?
New Brunswick				
. Fredericton	529	.7	None	BITECH (100%) in 12 months?
. Moncton	696	.9	None	-do-
. Saint-John's	450	.6	None	-do-
		2.2		
Newfoundland				
. St.John's	1145	1.4	None	BITECH 100%
Nova Scotia				
. Halifax	4604	5.8	None	BITECH (100%)

Consolidation	No. of Locals	% of Total	Present Facilities	Projected Facilities
Ontario				
. Hamilton	973	1.2	None	Awaiting CDRS
. Kingston	18	-	None	-do-
. London	717	.9	None	-do-
. Ottawa	41,625	52.6	TDA - 16%	May get LAMA or CDRS
. Toronto	4,319	5.5	None	CDRS - 100% for 3200 (in place)
		60.2		CDRS - 100% for 1100 (in 18 months)
Quebec				
. Montreal	6,415	8.1	None LAMA - 100%	No definite plans
. Quebec	3,054	3.9	None	-do-
. Sherbrooke	582	.7	None	-do-
		12.7		
Saskatchewan				
. Regina	1,392	1.8	LAMA - 100%	No change
. Saskatoon	978	1.2	LAMA - 100%	-do-
Grand Total	79,116	100.		

SUMMARY OF CALL RECORDING CAPABILITY AND COSTS

	No. of Locals	% of Total	Estimated cost of sampling and processing. per local in consolidation	per local sampled
No capability (incl. Montreal & Toronto)	28,071	35.5	-	-
16% sampling				
. Ottawa	41,625	52.6	.70	4.30
50% sampling				
. Vancouver	6,000	7.6	1.40	2.80
. Edmonton	1,708	2.2	2.92	5.66
100% detail				
. Calgary	1,050	1.3	2.45	2.45
. Regina	1,392	1.8	not calculated	
. Saskatoon	978	1.2	"	"

GOVERNMENT TELECOMMUNICATIONS AGENCY

DISTRIBUTION OF LOCALS PER BILLING CODE*

FREQUENCY TABLE

From	Number of Locals up to and Incl	No. of Billing Codes	Rel. Freq.%	Cumul. Freq.
1	10	199	38.0	38.0
10	20	67	12.8	50.8
20	30	35	6.7	57.4
30	40	27	5.2	62.6
40	50	25	4.8	67.4
50	100	62	11.8	79.2
100	500	93	17.7	96.9
500	1000	15	2.9	99.8
1000	1500	1	.2	100.0
		524	100.0	

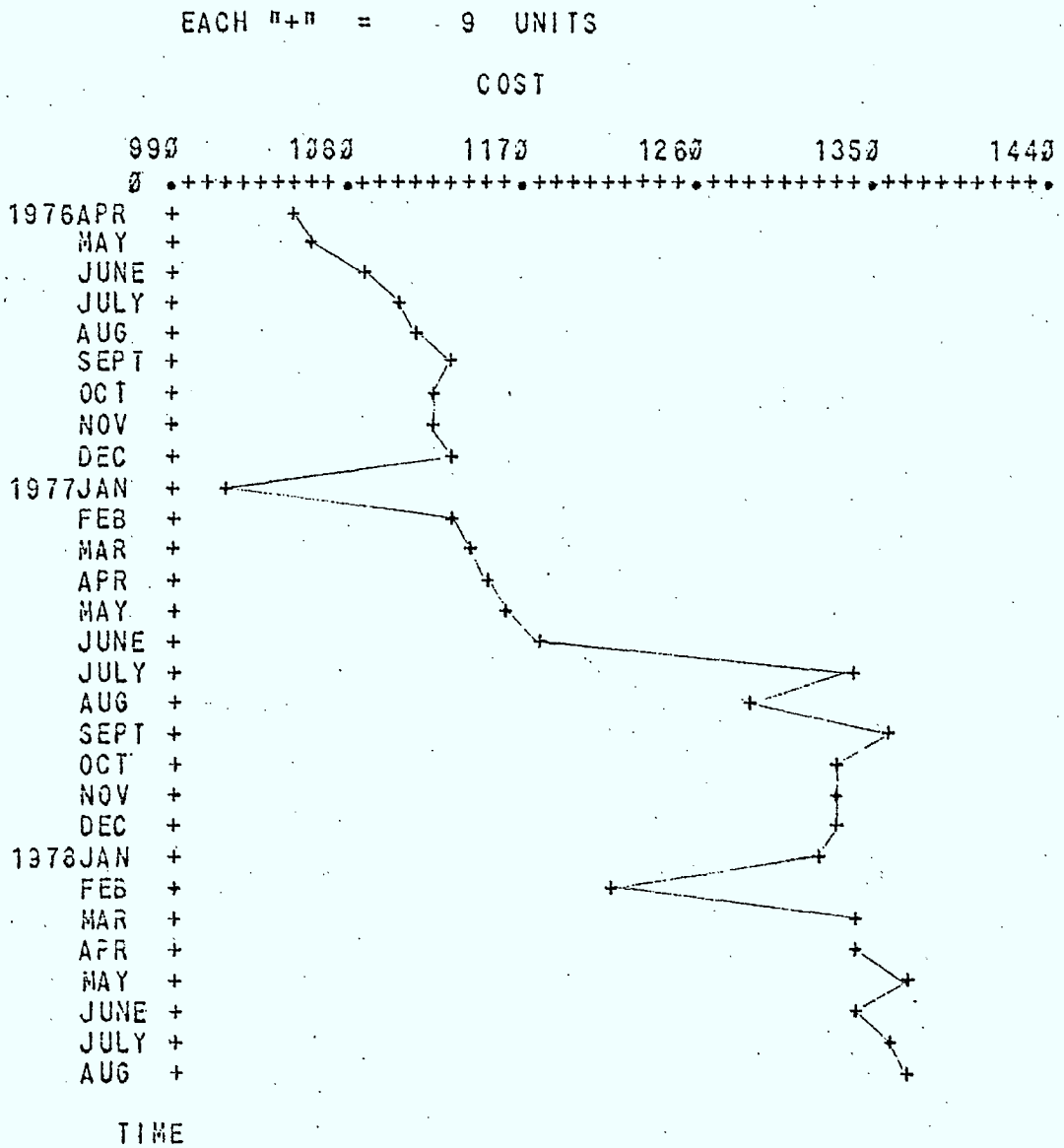
Mean - 79.6 locals per billing code

Std. Dev. - 146

* Ottawa/Hull (as of October 1978)

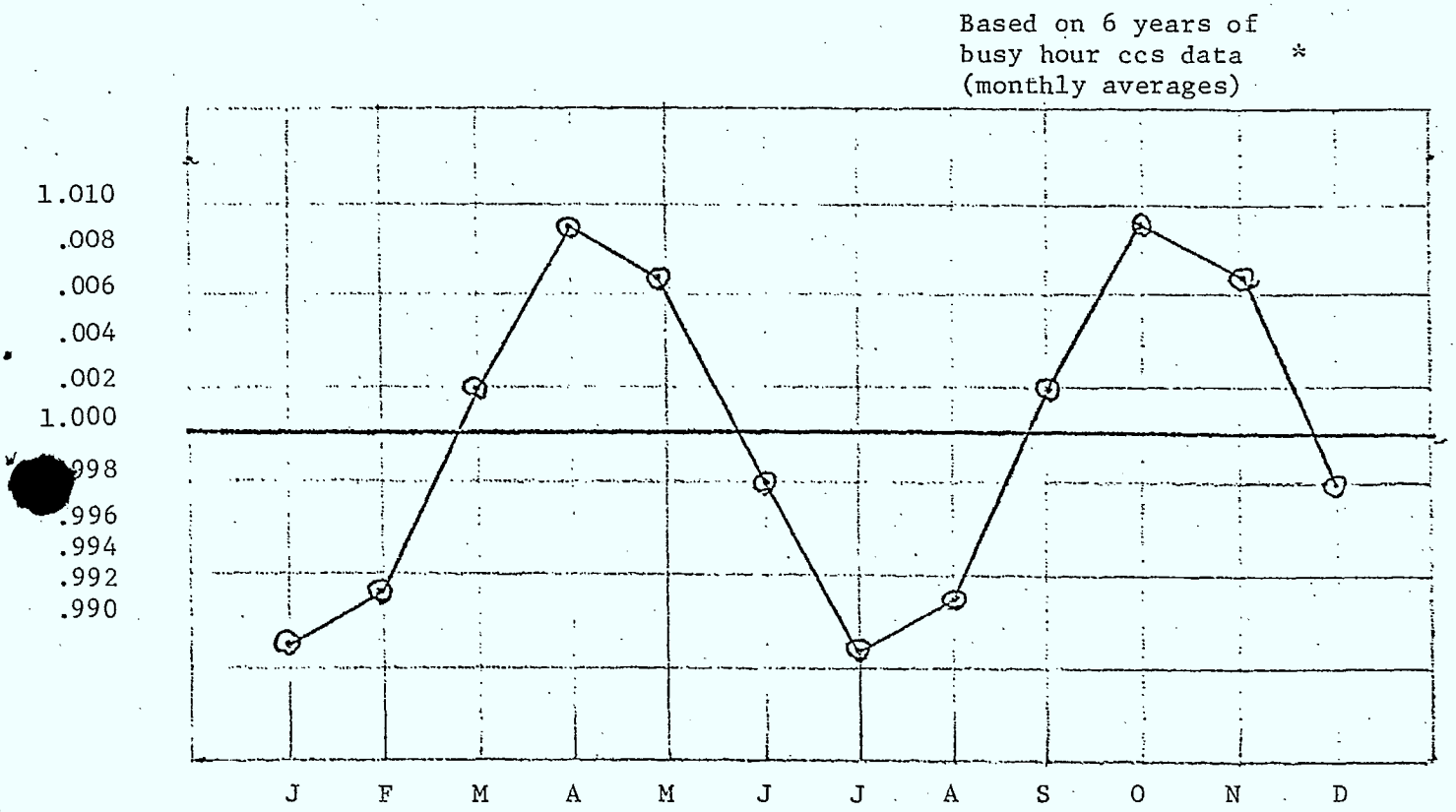
HISTORY OF MONTHLY TELPAK COSTS
EXCLUDING DEDICATED PRIVATE LINE

$ X 1000



GOVERNMENT TELECOMMUNICATIONS AGENCY

SEASONAL PATTERN FOR INTER-CITY CALLING



* SOURCE MONTHLY TRAFFIC REPORT

GROWTH OF INTER-CITY CALLING 1973-1978

De-seasonalized busy hour CCS's
(x 1000)

EACH "+" = .800 UNITS