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A REPORT ON THE NOVA SCOTIA ROUND TABLE ON ADVANCED TECHNOLOGY SKILLS



Aerospace Industries
Association of Nova Scotia



Aerospace and Defence Branch,
Industry Canada



Nova Scotia Department of
Economic Development and
Tourism

Tuesday, March 7, 2000
International Trade and Convention Centre
Halifax, Nova Scotia

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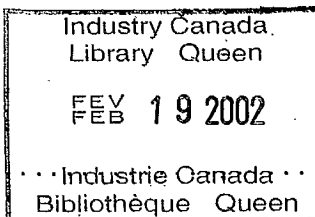
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Aussi disponible en français sous le titre *Rapport de la table ronde de la Nouvelle-Écosse sur les compétences en technologie de pointe*



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Introduction

Aerospace and other advanced manufacturing technology industries are major components of the knowledge-based economy that is emerging in Nova Scotia. Companies in these sectors have achieved outstanding success in the global marketplace and are poised to grow significantly in response to global demand for aerospace and other high-technology products. The full potential of these companies will only be reached, however, if they can continue to develop and maintain a highly effective workforce. The availability of a workforce with the necessary technical, engineering, scientific and managerial skills has been recognized as a critical success factor by the federal and Nova Scotia governments. There are many effective skills initiatives in Nova Scotia and elsewhere in Canada; however, there is much more that needs to be accomplished. Industry, the educational sector and government must develop increasingly effective ways to work together to improve the workforce.

As part of their ongoing efforts to strengthen the aerospace and other advanced technology sectors, Industry Canada's Aerospace and Defence Branch, the Nova Scotia Department of Economic Development and Tourism and the Aerospace Industries Association of Nova Scotia organized a round table on advanced technology skills, which was held in Halifax at the International Trade and Convention Centre on March 7, 2000. The one-day event brought together a group of industry and educational sector executives to address the following question:

How can the aerospace and advanced manufacturing technology industries and the educational sector work more effectively together?

About 25 people attended the round table, including managers of human resources and other functions within industry, educators and representatives of government agencies whose work supports industry. A list of participants is shown in Appendix A. The agenda for the round table, shown in Appendix B, emphasized interactive participation to develop a common understanding of issues and to formulate potential joint industry-educational sector initiatives. This was done through a series of break-out sessions, the outputs of which were combined into group reports. Facilitators were responsible for ensuring that the break-out and combined sessions were as productive as possible. A keynote presentation highlighting the experience of Magellan Aerospace Corporation, an aerospace company with facilities throughout North America, including Nova Scotia, provided some insights to assist the participants in their problem-solving and idea-generation work. The specific activities and outputs are discussed in the sections below.

Opening Remarks

Tony Purchase, Major Projects Executive with Nova Scotia Economic Development and board member of the Aerospace Industries Association of Nova Scotia, opened the round table and introduced **Francis MacKenzie**, Executive Director, Investment and Trade, Nova Scotia Department of Economic Development.

Mr. Mackenzie welcomed participants on behalf of the Nova Scotia government and made the point that there are tremendous opportunities for aerospace companies in Nova Scotia; but they can only be achieved if there is an adequate supply of high-quality employees. He stressed that this message must be communicated to teachers, parents and young people. Mr. MacKenzie concluded by emphasizing that the development of Nova Scotia's aerospace and advanced manufacturing technology sectors requires ongoing partnership between industry and government. He cited the province's Dividend Growth Fund as an example of successful government-industry cooperation.

Ron Kane, Director, Aerospace and Defence Branch, Industry Canada, outlined Industry Canada's role in supporting the aerospace industry's efforts to strengthen its human resources (HR) base. Starting with the Aerospace Skills Dinner (July 1998), which was hosted by the Hon. Ron J. Duhamel, Secretary of State for Science, Research and Development and Western Economic Diversification, the department has been working with industry to help it identify its HR-related needs and develop solutions. Key outputs of the branch have included *Assessment of the Skills and Training Situation in the Canadian Aerospace Industry* (1998), the National Aerospace Skills Symposium (February 1999) and Industry Canada participation in a series of three regional round tables, the third of which was the Halifax event. The first round table was held as part of the Western Aerospace Conference and Trade Show in Edmonton in May 1999. This event was organized by the Alberta Aerospace Association and the Aerospace Industries Association of Canada. The second round table was held in Toronto in November 1999. It was organized as a collaborative effort between the Ontario Aerospace Council and Industry Canada.

Turning to the issues underlying the Halifax round table, Mr. Kane drew participants' attention to the critical need to address technological and management skills in the aerospace and other advanced manufacturing technology industries. He cited several examples:

- During the National Aerospace Skills Symposium, Mark Porter of Bombardier Aerospace quoted a McKinsey & Co. study: "The war to attract, develop and retain executive talent will be the battleground that determines corporate performance." Over the previous few months, the competition among firms for top people had intensified, adding to the sense of urgency.

- *The Globe and Mail* recently reported that two thirds of Canadian executives who responded to a survey said that companies will find it increasingly difficult to retain people with high-technology skills, particularly at the executive level.
- A recent *Business Week* article reported that the traditional business model for education, based on on-campus learning delivered at universities, is undergoing significant change. Other service providers are becoming a major presence in the education market, and some are having exceptional success.
- Information technology, particularly the Internet, is having a profound impact on the way education is delivered.

Mr. Kane indicated that the round table provided an important opportunity to develop a better understanding of industry's critical skills needs and to develop new ideas about how government and industry can work together to address them. He reiterated Industry Canada's ongoing commitment to support the strengthening of human resources within Canada's aerospace and advanced manufacturing technology sectors.

Mr. Eric Meek of Industry Canada's Aerospace and Defence Branch introduced the keynote speaker, Jo-Ann Ball, Vice-president, Human Resources, at Magellan Aerospace Corporation. A summary of Ms. Ball's presentation is provided in the following section.

From Taylorism to the Learning Organization

Keynote Address

Jo-Ann Ball, Vice-president, Human Resources, Magellan Aerospace Corporation

Magellan Aerospace Corporation is a strategically diversified supplier of products and services to commercial and defence aerospace manufacturers worldwide. The company designs, develops and manufactures products such as high-performance composite and metal aerostructures, aeroengine components, aero and industrial engines, and rocket systems. The Magellan group of companies employs 3600 people in 11 locations throughout North America. Companies within the Magellan group include Orenda Aerospace, Chicopee Manufacturing and Bristol Aerospace.

Jo-Ann Ball is Vice-president, Human Resources, at Magellan Aerospace. In her keynote address, she discussed how Magellan companies are transforming themselves from traditionally managed companies into learning organizations. She also outlined the role that industry-educational sector partnership is playing in this transformation. Her presentation is summarized below.

When Jo-Ann Ball joined Orenda Aerospace in 1988, she found herself part of an organization that was burdened with the negative aspects of Taylorism.¹ The approach to managing was "I'm the supervisor, you're the worker, so check your brains at the door." It's not surprising that this killed initiative and led to an "us and them" mentality in the relationship between management and workers. The cost-plus approach to doing business was prevalent throughout the aerospace business at that time, and Orenda was no exception. There was little incentive for management or workers to consider continuous improvement as crucial to the company's survival. Furthermore, the strained relations between management and the workforce limited management's ability to make improvements. Human resources (HR) management at Orenda was weak in several areas. For example, procedures for hiring, promotion and compensation were not systematic. Nepotism and seniority played a greater role than did capabilities and performance. The enthusiasm and team spirit that had been prevalent years earlier, when this company developed the engine for the Avro Arrow, was missing.

In the 1990s, two things happened at Orenda that set the company on a new path. First, there was a change of ownership and inclusion of Orenda, along with several other aerospace companies, in Magellan Aerospace. This served to create a new sense of direction and urgency to strengthen the company. Second, there was a realization among the new ownership and

¹ Fredrick Winslow Taylor, who developed the "scientific management" approach, showed how work performance could be improved by detailed analysis. Unfortunately, he advocated that management do the analysis and considered workers as little more than machines. This resulted in many negative consequences for management-labour relations. Today, empowered workers use techniques that are similar to those of Taylor to analyze and improve their own jobs.

management that the aerospace industry was changing and that the status quo would no longer be sufficient. Throughout the industry, customers were demanding more, in terms of cost, quality and speed. Primes began pushing design responsibility down the supply chain. In response, Orenda set about improving its manufacturing operations and added design and development capabilities.

Successful implementation of these changes required a more highly skilled and flexible workforce. Gaining the support of the workforce for these changes was challenging. Attitudes and relationships had to change. The HR department played a key role, working with management and the union, in creating the climate for this to happen. Fortunately, Orenda had some positives to build on. The company paid good wages and its air-conditioned plant provided a safe and reasonably comfortable working environment.

The HR department developed new processes to build a more capable workforce, including employee recruitment and selection, based on evaluating knowledge, skills and attitudes. The new approach, incorporating behavioural-based interviews and competency tests, assured fairness. Orenda made a decision to substantially increase its emphasis on employee training. The HR department hired a teacher to provide train-the-trainer instruction to selected employees. These employees taught courses in manufacturing skills, such as gas turbine technology, blueprint reading, geometric tolerancing and sheet metal fabrication. The union was initially against having the company provide training. Some union representatives likened it to "mind control." As employees participated in the training, however, their support for the initiative grew. People found that learning the theory behind their work gave them something new — a sense of ownership.

Orenda's increased emphasis on training, coupled with improvements to its other HR systems, has resulted in a more highly skilled and flexible workforce. For example, the number of machinist classifications has been consolidated from six to three, reflecting a broadening of the skill set within each classification. This has led to better career development, including more promotions, among the company's machinists.

Ms. Ball underscored the importance of the relationships between workforce capabilities and competitiveness by providing the audience with the following quotes:

In this world of constant change, the only sustainable competitive advantage is an organization's capacity to learn. Peter Senge 1990

At the heart of this culture [GE's] is an understanding that an organization's ability to learn and translate that learning into action rapidly, is the ultimate competitive business advantage.

Jack Welch, 1999

Orenda has partnered with other companies in the Ontario Aerospace Council (OAC) to develop new mechanisms for employee training. The OAC training committee has sought to identify collaborative initiatives that can make a difference, i.e., add something that is needed but not currently available. This has led to the Aerospace Industry Training Program (AiTP), consisting of two training programs: 1) Basic Manufacturing Skills; and 2) Program and Contracts Management. Ms. Ball pointed out that the Basic Manufacturing Skills program includes both hard and soft skills, since both are needed to break out of the Taylorism approach. OAC designed AiTP to incorporate flexible delivery mechanisms, including in-house and external options. Several Ontario community colleges will be delivering the program, in partnership with OAC. The AiTP initiative is achieving good results for Boeing (Toronto) and Bombardier de Havilland. Orenda expected to begin using AiTP in April 2000.

The OAC training committee is now examining the feasibility of developing supervisory and executive development programs for aerospace managers.² The OAC training committee recognized the need for an executive development program because of the essential role that leadership plays in creating a competitive organization. Companies must have visionary leaders if they are going to survive and grow. We need to identify such leaders within our organizations, and help them expand their capabilities and develop others as leaders.

Ms. Ball discussed an initiative that another Magellan company, Bristol Aerospace, has undertaken in collaboration with the educational sector. The company has sponsored the NSERC (Natural Sciences and Engineering Research Council) Chair in Advanced Materials Research at the University of Manitoba. Bristol's support helps sponsor research conducted by a professor and two to three research assistants. The university and Bristol have found this arrangement to be mutually beneficial. It leverages Bristol's funding support and gives the company access to leading-edge research and promising students. From the university's perspective, it provides an opportunity to work on real-life problems. This initiative has led to additional collaboration between the university and industry. For example, university faculty are involved in consulting to the company and some graduate students do their thesis work on problems with practical applications for Bristol. It has also led to the formation of a University of Manitoba aerospace engineering specialty.

Ms. Ball concluded by turning the audience's attention to the challenge of transforming companies into learning organizations. "Our most important asset is our people" may be a cliché but it is the truth. Companies need employees who can think and are willing to embrace change. Magellan has achieved significant cost reductions — as much as 30 percent for some products — while maintaining or improving quality. It has and will continue to count on its people to accomplish these improvements. The last few years have seen the introduction of a

² The OAC-Industry Canada Round Table held in Toronto, November 22, 1999, focused on the feasibility and preliminary design features of an executive development program. A report is available from OAC.

succession of management techniques that demand an increasingly knowledgeable workforce: from quality circles to lean manufacturing. It's not going to get easier. The demands on companies to acquire and use knowledge will continue to increase. Being a learning organization involves continually changing. The challenge to companies is to become learning organizations. The challenge to educators is to support this transformation.

Work Plan for the Round Table

To maximize the effectiveness of the round table in achieving its objectives, the organizers developed a work plan and provided it to participants in advance. Facilitators were designated in advance and provided with review material on facilitation methods. The emphasis throughout the day was on interactive discussion among participants, through a series of break-out and combined group sessions. Participants were assigned to one of three working groups, based on their preferences with respect to category of skills. The three working groups were as follows:

Group I: Skilled Trades and Other Production Skills

Group II: Engineering, Science and Other Technology Skills

Group III: Managerial Skills

The round table was organized as follows:

Break-out Group: Analysis of Relevant Issues (allotted time: 1 hour, 45 minutes)

The issues considered included the following:

- What are industry's needs with respect to the skills in question?
- How is the educational sector doing in addressing industry's needs?
- What are the constraints faced by industry and by the educational sector?
- What works and what doesn't?

Break-out Group: Developing Preliminary Lists of Ideas (allotted time: 1 hour)

- The groups developed as many ideas as possible to address the needs and overcome the constraints identified in the first session, reserving judgement on their usefulness until later.
- Once an adequate number of ideas was produced, ideas that were similar or identical were merged (within individual break-out groups).

Break-out Group: Prioritizing Lists of Ideas (allotted time: 45 minutes)

- The working groups refined and prioritized their ideas.
- A key question considered was this: Is the idea actionable within the foreseeable future?

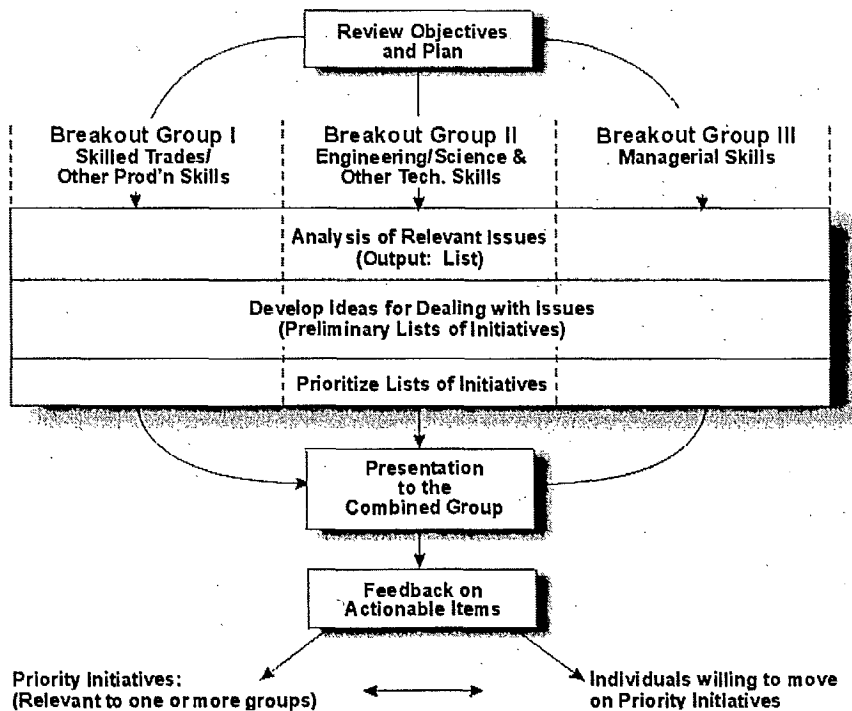
Presentations to the Combined Group (allotted time: 45 minutes)

- Representatives of each working group summarized their analysis of issues and presented their lists of actionable items to the combined group.
- The groups made suggestions on who could be involved in implementing the actionable items.
- Lists of actionable items were posted on the wall for further discussion.

Combined Group Feedback on Actionable Items (allotted time: 1 hour)

- The combined group commented on the actionable items:
 - feasibility
 - similarity and linkages among actionable items from different groups.
- The moderators asked the combined group if it would be useful to do the following:
 - assign priorities to the actionable items by voting
 - combine ideas if they were identical or closely linked, prior to voting on priorities.
- The moderators asked members of the combined group to indicate their interest in participating in follow-up activity on the actionable items.

The flowchart shown below summarizes the work plan. Subsequent sections of this report discuss the outcomes of the break-out and combined group sessions.



Group I Report: Skilled Trades and Other Production Skills

Facilitator	Robbie Shaw
Presenter	Pierre Huppertz
Team Members	Tony Goode, Peter Henderson, René Lalande, Bernardo Li, Barry Nicolle, Howard Sheppard, Harry Soontiens, Allister Thorne

Analysis of Issues

Group I formulated the following list of preliminary ideas dealing with underlying issues and potential solutions.

1. Lack of fundamental skills in the workforce:
 - technical skills
 - problem-solving skills
 - communications (e.g. listening, teaching)
 - teamwork, team building and other human resources skills.
2. Need for flexibility, e.g., to have employees who can perform several skilled functions within a repair and overhaul company.
3. Key concerns are skills and attitude. Employees must have the ability to change roles by the day or hour. Note: In some companies, the workforce is flexible. The concern is that when business expansion occurs the workforce cannot be expanded rapidly enough.
4. Lack of highly technical programs, such as lean manufacturing, demand flow technology and performance support systems.
5. Workers require greater business sense, i.e., understanding the global economy so as to understand basic business drivers (e.g. why outsourcing is necessary, why workers must embrace continuing education).
6. Need for more programs, such as the Bachelor of Technology at University College of Cape Breton (UCCB), and for more three-year co-op programs, to achieve a more well-rounded employee.
7. Need, as early as grades 9 and 10, to begin development of soft skills, and computer, math and problem-solving skills. For example, in PEI, there is an introductory aerospace course, available to Grade 11 students, that deals with this subject matter.
8. Lack of evening courses for current employees to upgrade their skills.

9. A major constraint is the failure to persuade current and prospective employees to acquire more education, so that higher skill levels are available.
10. Virtual delivery (via computers/Internet) of soft skills training may be part of the solution.
11. Customized training needed — designed to be relevant to the employee in his or her day-to-day work.
12. Need to increase the overall level of education of the workforce.
13. Companies have difficulty justifying spending on training because they are concerned that employees will subsequently leave the company, taking the training with them. Part of the solution may be for government to provide tax write-offs for training and co-op programs.

Group I then developed these ideas further, based on two categories: industry-driven and education-driven.

Industry-driven Issues

- Accurately assessing companies' needs for employees having production-related skills
- Opening the door to co-op programs, i.e., increasing company participation
- Developing flexibility in employees (e.g. skills, attitudes)
- Encouraging more lifelong learning
- Recognizing the value of virtually delivered education (e.g. computer-based training)
- Industry needs to allocate funding for employee lifelong learning (e.g. industry should consider training as an investment, government could provide tax incentives)
- Industry needs to provide employee incentives for lifelong learning
- There is a need for some Nova Scotia-based industries to recruit more effectively, and deal with their employees in a more progressive manner
- Active industry endorsement of technical and educational careers

Education-driven Issues

- Need for more comprehensive technical education, e.g., more two- and three-year programs with a greater emphasis on modern manufacturing techniques. Current priorities include lean manufacturing, demand flow technology and performance support systems. These priorities will change over time; the educational sector must be responsive.
- Colleges need to schedule programs to allow greater ease of lifelong learning; need to increase participation by providing greater access
- More emphasis needed on virtual delivery of education programs

Potential Initiatives

Group I formulated a three-pronged approach for developing initiatives to deal with the above issues, based on 1) industry action, 2) educational sector action, and 3) joint action.

Education Issues-driven Action Plan

1. Extend technical education programs to include a broader curriculum, including soft (people) skills, problem-solving skills and business acumen. Also include a greater emphasis on modern manufacturing methods, i.e., lean manufacturing, demand flow technology.
2. Colleges should ensure easier access for lifelong learning in terms of scheduling, location of delivery and availability of virtual learning (e.g. distance learning).

Industry Issues-driven Action Plan

1. The Aerospace Industries Association of Nova Scotia, and other industry associations representing advanced manufacturing technology companies, should mount a communications plan directed at the following groups:
 - a. students from primary school to Grade 12 to help them understand the importance of technology-oriented education, e.g., math, sciences. Mechanisms for reaching this group include plant tours for students and visits to schools by representatives of industry. Consider setting up a Web site aimed at young people and focused on opportunities and the value of high-tech education.
 - b. educational establishments to improve their understanding of the skills and knowledge needed in advanced manufacturing technology industry and persuade them to be more proactive in addressing these needs.
 - c. elected politicians to convince them of the critical need for changes in curriculum and delivery methods, and enlist their support in driving these changes.
 - d. industry to convince companies and employees at all levels of the importance of lifelong learning. Encourage companies to provide incentive programs for learning and to become more involved in co-op programs.
2. Industry should place greater priority on the provision of in-kind contributions in the form of equipment and instructors to support appropriate curricula.
3. Utilize the Shearwater Air Show as an educational and promotional vehicle

Joint Issues Action Plan

1. Develop a formal, ongoing consultation process to do the following:
 - a. assess training needs, including continuing education, developing curricula and identifying delivery methods, e.g., virtual delivery
 - b. make these needs known to the educational sector and to government

- c. encourage government to respond to these needs, e.g., by providing the necessary funding, tax incentives
 - d. encourage the educational sector to respond, in terms of course content and accessibility.
2. The above consultation mechanism should include, but not be limited to, industry, colleges, private training firms, the Nova Scotia departments of economic development and education, Industry Canada and Human Resources Development Canada.
 3. The Aerospace Industries Association of Nova Scotia and Information Technology Association of Nova Scotia should examine the feasibility of instituting the above consultation mechanism.

Group II Report: Engineering, Science and Other Technology Skills

Facilitator	Dr. Lucy Ellen Canary
Presenter	Dick Smyth
Team Members	Bruce Johnston, Ron Kane, Catherine MacDonald, Dr. Andrew Warkentin, Roger Winn

Analysis of Issues

Group II started by examining what is known about industry needs. Key questions considered included the following:

- What is advanced manufacturing technology?
- What sectors are involved?
- Who does it in industry, i.e., what job functions are involved?

The group drew some preliminary conclusions on the above questions:

- Skills needed may vary with the industry sectors and functions involved, e.g., aerospace and biotechnology industries will have some overlap and some areas of divergence.
- Some key employment functions, common to all advanced manufacturing technology industries, include manufacturing engineering, industrial engineering, quality and research and development (R&D).

The group considered the relationship between industry needs and the ability of the educational sector to meet these needs:

1. Life cycle of technologies: There are emerging, mature and declining technologies. Which ones are being emphasized in industry and which ones are being taught to university and college students? Is there a disconnect? Opinions in the group varied. There was no consensus as to whether or not a gap exists.
2. The divergence between industry demand for skills and skills of university graduates has been increasing since the 1960s. There was an informal consensus on this point.

Note: In 1997, the Alliance of Manufacturers and Exporters of Canada (Nova Scotia Division) and Nova Scotia Community College jointly sponsored a study (by Clear Picture Corporation) that examined the needs of the Nova Scotia manufacturing sector over the subsequent several years. The study found that the demand for new graduates was strongest for those from industrial trades and technologies programs, followed by business programs. Employers who took part in the study were generally satisfied with community college graduates but indicated there is some room for improvement. Areas where employers see a strong need for training

include "soft skills" (e.g. teamwork, problem-solving skills, interpersonal skills) and multiple skill certification.

Group II identified several types of skills needed by engineers, scientists and technologists in industry. They are listed below.

Needs with Respect to Hard Skills

- Scientific and engineering fundamentals
- Research methodology, i.e., how to conduct R&D projects
- Basic business skills
- Literacy and numeracy
- Computer literacy; network integration/systems

Needs with Respect to Soft Skills

- Interpersonal
- Individual and teamwork
- Leadership
- Multidisciplinary
- Problem-solving

Group II identified some constraints faced by industry and by the educational sector.

Constraints Faced by Industry

- Need to hire experienced people rather than new graduates (lack of such people)
- Budgetary constraints
- Lack of apprenticeship programs
- Some managers are not graduates, and may not have experience dealing with educational institutions
- Graduates expectations' are out of line with reality, must be tempered

Constraints Faced by the Educational Sector

- Guidance counsellors lack knowledge and orientation regarding manufacturing industries
- Flexibility of universities, i.e., ability to respond to changing industry needs is limited by the national accreditation system for degree programs
- Lack of time and resources necessary to expand curriculum
- Size of the industry in Nova Scotia (can create difficulty in having critical mass for programs)
- Lack of sufficient opportunities to place graduates in Nova Scotia industry (not clear whether this is a real or perceived constraint)
- Lack of government support for new post-secondary initiatives
- Low awareness in high schools of science, engineering and technology careers
- Quality of students entering universities needs improvement (literacy, numeracy)

- Advisory committees are used, but there is generally no means of evaluating their effectiveness in providing information for continual improvement

Group II evaluated the current situation in terms of what works and what needs improvement.

What Works

- Scholarships
- Co-op programs
- Secondments
- Advisory committees
- Industry Transfer Funding agreements (e.g. UCCB CAD/CAM centre)
- Canadian Foundation for Innovation (CFI). CFI was cited as a successful example of matching funding for R&D. Founded with a federal government investment of \$1 billion in 1987, CFI provides up to 40 percent of funds for eligible projects at Canadian universities and other research institutions. For more information, go to the CFI Web site (<http://www.innovation.ca/>).
- Shad Valley Program. This summer learning and employment program designed for top students in senior high school combines science and technology with entrepreneurship. It includes a four-week academic program at one of 10 universities and a five-week work term with a partnering company. More information is available at the Shad Valley Web site (<http://www.shad.ca/>).

What Needs Improvement

- Accreditation system for university degree programs (currently limits ability to respond to changing needs)
- Recruitment of students (need to find ways to get more students interested in technology)
- Guidance counsellors (need greater knowledge of opportunities in industry)
- Teaching of fundamental skills at high-school level
- Awareness of technical/engineering career options among high school students
- Lack of industry volunteer time
- Size of the industry
- Increased government funding needed for HR development, using programs such as the federal-provincial Economic Development Agreement
- Availability of matching funds (need to increase)

Note: Placement of items in the “What Works” category above does not imply that the listed activities are occurring at the optimal level. In fact, the group considered that increasing the level of these activities would be beneficial.

Potential Initiatives

Group II identified the following initiatives and indicated that they should be given a high priority:

1. Survey to define industry needs with respect to engineering, scientific and technology-based skills for the next five years.
2. Inventory of sources of industry/government funding for training and education in advanced manufacturing technology.
3. Building awareness in schools, government and the public:
 - a. teacher's year in industry
 - b. work shadow programs
 - c. plant visits (students/teachers, guidance counsellors)
 - d. promotional aids, e.g., videos
 - e. student credits for time in industry
 - f. mentoring, scholarships
 - g. competitions, career fairs.
4. Implement and promote new mechanisms for integrating technology, science and engineering education:
 - a. Bachelor of Technology program (e.g. the one at UCCB)
 - b. providing transferable credits from colleges to universities
 - c. use of Prior Learning Assessment and Recognition.

Group II also identified several other potential initiatives:

1. Strengthen industry/government commitment to education and training in advanced manufacturing technology (e.g. council for technology).
2. Develop model to provide focused, seamless approach to apply funds to the needs.
3. Encourage apprenticeship through the use of industry-academic partnerships; develop apprenticeship-type program for university level, along the lines of the U.K.'s Higher National Diploma.
4. Strengthen advisory councils, including accountability, having the right members and feedback mechanisms.

5. RDI (Research and Development Initiative) operated by Nova Scotia Science and Technology Directorate is, and can be, a valuable tool for development of engineering and technical people.

6. New mechanisms for recruiting students and teachers.

Group III Report: Managerial Skills

Facilitator/Presenter Dr. Marlon Lewis

Team Members Susan Clark, Dr. Daniel Coleman, Dr. Paul Dixon,
Theresa Ferguson, Maurice Guitton, Duff Mitchell,
Wayne Trowse

Analysis of Issues

Group III developed some preliminary ideas related to managerial skills:

1. Undergraduate courses appear to be doing the job. The problem is that industry is demanding more skills than can be attained in a four-year program.
2. Managerial skills can be characterized as a) functional skills needed by all managers and b) leadership skills needed by senior managers. The former are more straightforward to teach, while the latter are more closely related to personal characteristics and experience.
3. Serious issues with secondary schools:
 - a. lack of attention to basic writing and math skills
 - b. lack of attention to the top 10 percent of students
 - c. needs have to be addressed at individual, corporate, industry association and society levels — incessantly, loudly and from all directions.
4. Cultural problems:
 - a. poor image of manufacturing
 - b. lack of risk taking, entrepreneurial culture.

Group III produced a managerial matrix that assigns a level of urgency for training in various management areas and indicates the factors that should be considered in developing initiatives. The matrix, shown on pages 19 and 20, is an expanded version of the original, based on conversations with several members of Group III.

Potential Initiatives

1. **Leadership**
 - a. Government/industry/education exchange; find ways to include leadership skills in university curricula
 - b. Identification of "anchor" companies to participate
 - c. Develop university culture that fosters leadership skills

- d. Increased incentives to develop leadership skills
- e. Specific programs for the sector

- 2. Business Development**
 - a. Encourage clusters among government, industry and education, both locally and regionally (will make it easier to attract new talent from outside region)

- 3. Financial Management**
 - a. None proposed

- 4. Operations/Manufacturing**
 - a. Promote understanding at secondary-school level of importance of manufacturing to the economy and of career opportunities

- 5. Research and Development**
 - a. Encourage clusters among government, industry and education both locally and regionally (will make it easier to attract new talent from outside region)

- 6. Project Management**
 - a. Professionalize project management training for persons with industry experience; work with Project Management Institute

- 7. Proposals/Contracts**
 - a. Appropriate communication skills have to be taught at secondary-school level
 - b. Personal advocacy can reinforce importance

Additional Ideas for Improving Managerial Skills

- Lifelong educational opportunities are needed, i.e., non-degree courses (available à la carte); focused courses to increase employability and facilitate career advancement; certificate in management program for mid-career managers; industry and education sector have to define specifics. Universities would develop these programs if they could make business case and recoup costs. Also, credentials would have to be transportable. Distance learning not the answer for soft skills, as there is high need for people contact.

- Secondary schools have to be connected to needs of industry. In particular, they should provide more attention to basic writing/math.

- More support needed from both government and industry for elite programs such as Shad Valley.

Managerial Matrix

Management Skill Area	Urgency	Factors to Consider
Financial Management	Low	None suggested; current programs are adequate
Leadership	High	<p>Lack of experienced people available</p> <p>Lack of understanding of corporate culture within educational institutions</p> <p>Corporate culture does not encourage building leadership qualities, i.e., employees focus only on their immediate jobs, not the whole company</p> <p>Incentives are needed to promote leadership: - public recognition - professional recognition</p>
Business Development "Champion"	High	<p>Lack of experienced people available</p> <p>Difficulties in recruiting experienced people from outside region: limited options to change jobs in future without relocation out of region</p> <p>Need to create entrepreneurial culture throughout educational system and industry</p> <p>Incentives are needed to promote entrepreneurship: -public recognition -professional recognition.</p>
Operations/Manufacturing	High	<p>Lack of experienced people available</p> <p>Social and cultural factors in North America discourage young people from seeking manufacturing careers</p> <p>Educational system needs to promote better understanding among young people about what manufacturing is about and its importance to society</p>

Management Skill Area	Urgency	Factors to Consider
Research and Development Management	High	<p>High demand for qualified people but few are available</p> <p>No training programs available specifically directed at building R&D management skills</p> <p>Difficult recruiting people from outside region</p>
Project Management	Medium	<p>Lack of project experience</p> <p>Need for cross-training; ability to function as integrator: facilitating, negotiating skills needed</p> <p>Programs needed that provide a synthesis of formal training and practical experience</p> <p>Formal body of knowledge needed</p>
Proposals/Contracts	Medium	<p>Improved skills needed:</p> <ul style="list-style-type: none"> -technical writing -communications -legal

Combined Group Session

Feedback on Actionable Items

After the three break-out group presentations, the combined group discussed what participants had heard. This session was moderated by Eric Meek of Industry Canada's Aerospace and Defence Branch and Alan Underdown of Underdown Associates. Below are some key points from that discussion:

1. Maurice Guitton (President, Aerospace Industries Association of Nova Scotia) indicated that the Association would be discussing the results of the round table with its membership to determine how best to follow up.
2. Ron Kane (Industry Canada) commented on the perception among some stakeholders that government should do more on the skills issue. In many cases, people are not aware of what government's existing capabilities are, and the flexibility that exists.
3. Several people mentioned that it would be worthwhile to explore working with associations in other provinces. Jo-Ann Ball (Magellan Aerospace), a member of the Ontario Aerospace Council's training committee, indicated that OAC would be pleased to share ideas and training products on a reciprocal basis.
4. Several people pointed out that there were some common themes that emerged from the work of the three break-out groups. Theresa Ferguson (Nova Scotia Department of Economic Development and Tourism) suggested seven themes, shown below:
 - a. **Defining Needs**
 - i. Existing survey work, e.g., Human Resources Development Canada, Alliance of Manufacturers and Exporters of Canada
 - ii. Additional survey work needed for forecasting supply and demand of individuals with specific types of skills
 - b. **Promoting Manufacturing Industry as a Source of High-quality Jobs**
 - i. Industry involvement needed
 - ii. Teachers, guidance counsellors must be involved
 - c. **Addressing Secondary Schools**
 - i. Literacy, numeracy
 - ii. Getting students interested in technology and manufacturing careers

- d. **Curriculum in Colleges and Universities**
 - i. Technical and soft skills
 - ii. Links with industry

- e. **Lifelong Learning**
 - i. Promote among workforce
 - ii. Improve opportunities, e.g., program flexibility is needed

- f. **Cross-national Initiatives**
 - i. Possibility of working with associations in other provinces

- g. **Government Funding**
 - i. Increasing availability and use of various shared-funding options could be considered

Several individuals at the round table indicated their interest in participating in follow-up actions within each of the above areas.

Tony Purchase (Nova Scotia Economic Development) pointed out that, while there is a significant degree of commonality among the ideas that were presented, the break-out group presentations represent a distillation of ideas and identification of priorities by the individual groups. It would be counterproductive, at this time, to consolidate them further, in a way that loses information. Also, some key stakeholders who will be needed to take these ideas forward were not present. They will need to be brought into the discussion.

Next Steps

1. This report is being distributed to everyone attending the round table and other key stakeholders.

2. The Nova Scotia Department of Economic Development and Tourism and the Aerospace Industries Association of Nova Scotia will examine ways, in collaboration with other provincial departments, Industry Canada, Human Resources Development Canada and other stakeholders, to follow up on the ideas developed during the round table.

3. The names of people who expressed interest in participating in follow-up work, and their areas of interest, have been provided to the Nova Scotia Department of Economic Development and Tourism and the Aerospace Industries Association of Nova Scotia.

Conclusion

The round table successfully achieved its immediate objectives:

- generating discussion between industry and the educational sector on underlying skills issues
- producing some ideas for potential initiatives
- identifying some people and organizations interested in following up on the initiatives.

The impact of the round table will depend on the extent to which follow-up occurs. There may be opportunities for the sponsoring organizations, Industry Canada, the Nova Scotia Department of Economic Development and Tourism and the Aerospace Industries Association of Nova Scotia, to work together on skills issues in the future.

A number of the skills issues identified at the Nova Scotia round table are important to industry and the educational sector in other provinces. Opportunities for collaborative initiatives, involving the Association and its counterparts in other provinces, are worth exploring. Industry Canada should promote this type of collaboration since it has working relationships on skills issues with the various associations involved.

Appendices

Appendix A: List of Participants

Jo-Ann Ball	Vice-president, Human Resources	Magellan Aerospace Corporation
Susan Clark	Executive Director	Nova Scotia Council on Higher Education
Dr. Daniel Coleman	Dean, Faculty of Administration	University of New Brunswick
Dr. Paul Dixon	Dean of Commerce	St. Mary's University
Theresa Ferguson	Trade and Investment	Nova Scotia Department of Economic Development and Tourism
Tony Goode	Program Manager, Contract Manufacturing	Litton Systems Canada Limited
Maurice Guitton	Executive Vice-president and General Manager	Composites Atlantic Limited
Peter Henderson	Plant Manager	Orenda Recip Inc.
Pierre Huppertz	Manager, Human Resources	Pratt & Whitney Canada
Bruce Johnston	Vice-president, Government Affairs	Litton Systems Canada Limited
Dr. Lucy Ellen Canary	Director, Advanced Materials and Engineering	InNovaCorp
Ron Kane	Director, Aerospace and Defence Branch	Industry Canada
René Lalande	General Manager	Pratt & Whitney Canada
Dr. Marlon Lewis	President and CEO	Satlantic
Bernardo Li	Sector Development Officer, Aerospace and Defence Branch	Industry Canada
Catherine MacDonald	Managing Director	Aerospace Industries Association of Nova Scotia
Eric Meek	Sector Development Officer, Aerospace and Defence Branch	Industry Canada

Nova Scotia Round Table on Advanced Technology Skills

Duff Mitchell	Sector Development Officer, Advanced Manufacturing Technology Branch	Industry Canada
Barry Nicolle	Business Development Manager	Tecsult Eduplus
Tony Purchase	Major Projects Executive	Nova Scotia Department of Economic Development
Robbie Shaw	Vice-president, Partnerships	Nova Scotia Community College
Howard Sheppard	Manager, Aerospace and Industrial Technology Centre	Holland College
Harry Soontiens	Human Resources Consultant	Human Resources Development Canada
Dick Smyth	Vice-president, Nova Scotia Division	Alliance of Manufacturers and Exporters of Canada
Wayne Trowse	President	Hermes Electronic Limited
Allister Thorne	Principal, Metro Campus	Nova Scotia Community College
Alan Underdown	Consultant	Underdown Associates
Dr. Andrew Warkentin	Assistant Professor, Mechanical Engineering	DalTech
Roger Winn	Chairman, Engineering Department	University College Cape Breton

Appendix B : Agenda for the Round Table

**Nova Scotia Round Table on
Advanced Technology Skills
Agenda
March 7, 2000**

Registration/Continental Breakfast	8:00 to 8:45
Introduction	8:45 to 9:00
Keynote Speaker Jo-Ann Ball, Vice-president, Human Resources, Magellan Aerospace Corporation, Oakville, Ontario	9:00 to 9:50
Review of Objectives and Work Plan	9:50 to 10:00
Break	10:00 to 10:15
Break-out Session: Analysis of Relevant Issues 1. What are industry's needs with respect to the skills in question? 2. How is the educational sector doing in addressing industry's needs? 3. What are the constraints faced by industry and by the educational sector? 4. What works and what doesn't?	10:15 to 12:00
Lunch	12:00 to 13:00
Break-out Session: Developing Preliminary Lists of Ideas	13:00 to 14:00
Break-out Session: Prioritizing Lists of Ideas	14:00 to 14:45
Coffee/Juice Break	14:45 to 15:00
Presentations to the Combined Group	15:00 to 15:45
Feedback on Actionable Items	15:45 to 16:45
Feedback: What Worked and What Could Have Been Done Better?	16:45 to 17:00

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