BC AEROSPACE WORKFORCE DEVELOPMENT PLAN

Assessment Of Future Demand And Training Needs:
Data and Technical Appendix
December 2002

A. Detailed Occupation Demand

The 2002 demand analysis provides growth projections and estimates for the overall skilled workforce and more specifically for occupations identified by the Aerospace Industry Human Resources Committee as the key occupations for which skill training is a major issue. A summary table in the main report provides projections for the two key fields, as classified by the National Occupational Classification, and for key detailed occupations described by industry job fields and titles. The summary on industry component and key occupations is provided in the following table.

BC Aerospace Sector – Projected Employment Growth
For Selected Key Occupations

Based on trends & industry information on key occupations

	2001/05 Change	Annual Change
Aircraft Manufacturing	360	90
Aircraft Maintenance	370	93
Selected analysis occupations	**730**	**183**
Skilled Workforce (less professional)	**700**	**175**
Key Occupations – Industry Occupational Classifications		
AME - M	158	40
Maintenance technician	50	13
AME - S	100	25
Structures technician	55	14
AME - E	73	18
Avionics technician	24	6
Gas Turbine Engine Repair technician	71	18
Aircraft Structures Fabrication	51	13
Aviation machinist	18	5
Helicopter Dynamic Component technician	28	7
Other skilled occupations	72	18

The data for these key occupations was derived from industry employment trends, which provided a growth number of 700 for the skilled workforce between 2001 and 2005.[1] This overall growth was then allocated to each key occupation based on the proportionate net growth reported in the AIABC 2000 report which provides project-based demand information. The summary table also incorporates some grouping and combining of some of the detailed occupations according to industry specifications. In total, the key occupations as discussed in the

[1] Reflects change over four years: 2001-02, 2002-03, 2003-04 and 2004-05

report account for 628 jobs out of the overall 700 new jobs projected for the sector over this time frame with a further 72 new jobs in other, smaller occupations. While the key occupations are highlighted in the summary, it is important to consider growth in all the skilled occupations when considering overall training requirements. The following table provides the full occupation detail that matches the previous industry job listing of the 2000 AIABC report on the demand for skilled workers.

Aerospace Skilled Workforce - Estimates of Projected Growth

Occupations according to Industry Classifications	2001-2005
Aircraft Interior Technician	14
Aircraft Maintenance Engineer - E	73
Aircraft Maintenance Engineer - M	158
Aircraft Maintenance Engineer - S	100
Aircraft Maintenance Technician	50
Aircraft Non-destructive Inspection Technician	11
Aircraft Reciprocating Engine Technician	0
Aircraft Structural Repair Technician	55
Aircraft Structures Technician (Manufacturing)	27
Aviation/Electrical/Electronic/Instrument Component Technician	11
Aviation Machinist	18
Aviation Mechanic Component Technician	9
Aviation Painter	15
Aviation Welding Technician	6
Avionics Maintenance Technician	13
Composites Fabricator	9
Design Engineers	11
Engineering Technologists (Aerospace)	10
Gas Turbine Engine Repair and Overhaul Technician	71
Helicopter Dynamic Component Technician	28
Plastics Technologist	9
Special Processes	3
Total Skilled	700

Note: The overall employment growth was shared across occupations based on occupation growth anticipated in AIABC year 2000 skills forecast report.

These detailed occupational growth numbers were calculated by applying proportions calculated from the AIABC 2000 demand and skills forecast report. The time period used to provide the proportionate shares for industry occupations was from 2001 to 2005, or the same time period as the 700 total skilled workforce projection refers to.

Most of the key occupations, as reported on in the summary table, are the largest occupations. In some cases there the detailed occupations have been grouped to better illustrate the nature of industry demand.

- The Aircraft Structures Fabricators occupation is composed of the Aircraft Structural Technician, Aircraft Welding Technician, Composites Fabricator and Plastics Technologist occupations.
- The Avionics Technician is the sum of the Avionics Maintenance Technician and the Aviation/Electrical/Electronics/Instrument Component Technician.
- The summary table, which was replicated for this analysis, did not have a clearly identified detailed occupation for the Maintenance Technician that is linked to the AME-M licensed occupation. After reviewing

all of the detailed occupations and previous allocations made to summary fields, it was decided that the appropriate category was the occupation titled Aircraft Maintenance Technician.

The above projections describe the **NET GROWTH projected for the 2001 to 2005 period**.

In addition to growth, in assessing training needs **one must also consider REPLACEMENT NEEDS**.
For this analysis **attrition due to retirement has been estimated as being between 2 and 4 percent of the total skilled workforce**. This attrition pattern suggests that replacement needs would amount to **between 332 and 700 over the four years** from 2001 to 2005.

B. Data Sources & Comments

1. Industry Data

When conducting analyses of industry employment, Statistics Canada Labour Force Survey (the LFS) is the most frequently used general data source. This is because by definition the LFS captures all types of employment, paid worker and own account self employment. The major drawback of the LFS is that it is a survey that cannot provide numbers for small industries and often does not provide detail at a provincial level. This is the case with the aerospace manufacturing industry in British Columbia; employment levels are too small to be reported separately by the LFS. However, aerospace manufacturing employment is reported on in an alternate data series, Statistics Canada Survey of Employment, Payrolls and Hours (SEPH). SEPH is built from information from a rotating sample of firms who report payroll information (as generated for income tax purposes) which is then grossed up to represent the entire industry. SEPH employment numbers refer to paid employees and therefore might exclude some self-employed persons if they are not identified as on the firm's payroll. In the case of aerospace employment, a review of Census information on key occupations shows extremely limited self-employment so the SEPH industry data was seen as not being limited in any way by the employment definition. The choice of SEPH for the aerospace manufacturing industry predicated the choice of SEPH as the data source for the two industries, Air Transport and Air Services, that encompass the maintenance component of the aerospace sector. The SEPH measures for these industries were checked against Labour Force Survey results to ensure that there was no anomaly in using this data source. Both LFS and SEPH track similarly over the 1991 to 2001 period. SEPH annual employment results were also compared with 1996 Census industry employment numbers to confirm the appropriateness of using this data source.

2. Occupational Data

Statistics Canada 1996 Census information on occupations, as classified in the National Occupation Classification (NOC), was extracted from an industry and occupation database. This allowed for establishing a snapshot of occupational employment in 1996 for each industry and then for an estimation of the skilled workforce as a base for further calculations to 2001. While the occupations classified in this way (NOC) does not provide the detail that the industry prefers in order to describe industry requirements, this cut of Census occupations by industry did match the general description of the industry perspective of skilled workforce. The major gap that occurs is in the differentiation of AME license holders, which is not available from the Census. For the aerospace sector the key occupations of instrument/avionics technician (NOC 2244) and aircraft mechanics and inspectors (NOC 7315), which encompass the various AME license categories and related technicians comprise a significant part of the skilled workforce. In addition, the aerospace industry employs a predominant share of all workers in these occupations. This allowed overall information on these key occupations, such as age, unemployment, work patterns, which was also drawn from the Census to be used as aerospace sector labour market indicators.

3. Data Gaps and Potential for Data Development and Use

It will always be difficult to obtain employment readings for the British Columbia aerospace sector. The size of the sector is relatively small and is therefore not automatically captured in LFS type surveys. In addition the maintenance component of the sector is itself only part of other industries and is therefore not measured directly. Beyond this, the aerospace industry requirement for information that identifies licenses means that the usual occupational sources fall short of the ultimate data need. The development of an employer generated database would go a long way to providing more useful data; it is however important that such a database adequately describe the characteristics of firms for which information is included. Typically the inclusions are more likely to

be large firms for which human resources administrative based information is more readily available. It is certainly appropriate to use this type of information if it is supplemented by small firm contact on a more limited basis.

One major question when establishing training needs is the capacity to quantify replacement needs. Core replacement needs come about as workers retire and is usually linked to age structure. Retirement patterns, which are linked to pension rights, would provide additional useful information. For the aerospace industry, with internal ladders to licenses and more senior positions, it would be useful to capture data on how workers do actually move to more senior positions as this would provide both supply and demand information that is important to training needs decisions. This information cannot be developed except by industry employers. A final attrition-related data need is the capacity to estimate flows out of the industry other than retirement. These additional attrition aspects could include movement of workers to other geographic areas, to other industries or a return to education. Industry information shows some quite significant movement from firms. However, it is unclear how much of this is between firms or whether the movement reflects career paths as inexperienced workers obtain sufficient experience to move to a more challenging job.

License information potentially could provide a significant data source and developing this avenue to provide *province*-specific information should be pursued. Not only could counts of AME licenses provide a good indication of the core skilled workforce over time but it would also provide a view of how the mix is changing. This material would also provide a strong basis of comparison with national measures.

The Census data used for this analysis was from 1996, which is the latest available at the time of preparation of this report. **Census labour market data for 2001 will be issued in mid 2003 and a snapshot on the key occupations should be extracted at that time to refresh the information.** However, for this report due to time constraints as well as the fact that new Census information would be made available shortly, the Census data was drawn from standard data sources and these measures were used as best as could be. **Far more could be gained from a special run of Census data.** To avoid overlap with other industries, this report established depth Census measures (age, earnings, and unemployment) on the two key occupations where the aerospace sector essentially makes the labour market. However by acquiring a special run from the Census, it would be possible to probe the age structure of all of the skilled workforce occupations within the aerospace sector. In addition one could link educational attainment to age and indeed look for any significant changes over time. Another useful array for certain occupations, such as machinist, would be work patterns (weekly hours, weeks worked) and earnings for the aerospace sector in comparison with other industries. Other useful Census information includes data that shows the representation of women (which becomes a more crucial issue as the potential youth workforce contracts) and of visible minorities. There is a cost involved in obtaining such detail from the Census but the Census provides a rich data source that could be effectively combined with industry workforce information.

C. Methodology

This study on the assessment of demand and training needs has been completed under a considerable time constraint and was limited to use of existing data and other easy-to-access information.

The forecast of demand and requirements for skilled workers that had been prepared by AIABC in late 2000 and the skilled workforce projections developed in the national human resources study were reviewed. This review was undertaken to establish both validity of these information items as well as to suggest what the existing material could contribute to updating demand projections. On review, it was felt that the demand projections developed by AIABC members in 2000 primarily constituted a set of projections based on planned projects. In addition some of these planned projects are expected to have been cancelled because of economic weakness in 2001 and as a result of the terrorist attacks of September 11th 2001. The national material, while developed on a thorough and consistent basis, provided incomplete information on British Columbia.

Other standard data sources from Statistics Canada were then accessed to collect employment measures that would allow for a more complete, and British Columbia focussed, picture to be derived. These data sources have been described in the appendix. These series, from SEPH and Census counts were matched to create a

picture of overall employment and of the skilled workforce in the two component parts of the aerospace sector: the manufacturing component and the maintenance component. It was felt that there was greater clarity and usefulness in developing employment numbers in this way as the two components show significantly different overall growth patterns. Using this approach also allowed for some matching with output from the national study.

Occupations, using the Statistics Canada standard occupational classification (NOC), were selected for analysis. The occupations that require technical post-secondary education or training and the fabricator occupations were chosen as representing the skilled workforce. Employment numbers for total industry employment for the three industries (aerospace manufacturing, air transport and air services) and for the selected occupations was extracted from the 1996 Census. The same information was extracted from the1991 Census as a check for any anomalies and to see if there had been a significant change in the mix of occupational employment from 1991 to 1996.

For aerospace manufacturing, Census data closely matched the 1996 to 1997 total industry employment data from the SEPH series. The share that the total of these selected occupations comprised in 1996 was applied to the SEPH employment figures for 2001 in order to estimate skilled workforce employment in that year. A simple trend analysis of the annual total employment estimates from SEPH was used to calculate a trend line. In turn, this trend was applied to the overall and skilled workforce to project employment levels to 2005.

On the maintenance side, the selected occupations, as drawn from the 1996 Census, provided an estimate of the skilled workforce in that year. However, the air transport and air services industries include more than maintenance activity. In order to derive an estimate of the overall workforce, industry employment was shared across both maintenance and other functions as well, using key occupations as a guide to function employment. E.g., air transport operations used data on flight crew and ticket agents to estimate the travel function and workforce. This exercise allowed for an estimate of the maintenance overall workforce to be calculated for 1996. The air transport industry and the air services industries had very different total employment patterns over the 1991 to 1996 and to 2001 period with air services employment growing but with employment levels more variable in the air transport industry. However, from 1999 to 2001 the overall industry employment in both these industries, as reported both by SEPH and by the Labour Force Survey, showed a drop in average annual employment. Some impacts of changing administration and technology are one possible cause of these employment drops but a decline in air travel through 2000 and 2001 will also have had a major impact on overall industry employment numbers.

For this research and analysis an assumption was made that, despite a slow down in the travel function from 1999 to 2000, the maintenance function was largely unchanged into 2001. The workforce numbers resulting from this assumption and from the calculation based on this for 2001 also were in line with the BC share of the national maintenance workforce, as reported in the national human resources study. As with the aerospace manufacturing component, industry trend analysis for annual employment measures from 1991 to 2001 was used to derive industry growth rates. A blended growth rate, based on these trends and on the assumption of relative resilience of the maintenance function, was then used to calculate an employment estimate from 2001 to 2005.

The overall growth from 2001 to 2005 for the aerospace sector, projected in this manner, amounted to 700 for the technically skilled workforce. This overall growth was then allocated to the detailed industry classified occupations, as reported in this appendix. This allocation was done using the relative growth patterns for these occupations as had been projected in the 2000 AIABC study. The time period used to calculate occupation shares of net growth was the 2001 to 2005 time period in keeping with the period for which this report's projections were prepared.

In order to provide demand numbers of the key occupations that were already being used to summarize the crucial training needs of the aerospace industry, some of the detailed occupation data was combined. The combination process that had been used to develop the summary occupations was not completely clear. On inspection of the growth numbers in the summary table it was found that some of the combinations included the same detail for more than one summary occupation. There also was no full and clear list of exactly which occupations should be combined or linked in order to develop the grouped or summary material. The

combinations used for the current summary material used what information was made available and than used industry occupational descriptions to complete the listing.

Attrition due to retirement and which leads to industry wide replacement needs was calculated as between 2 percent and 4 percent annually. These attrition rates took into account the age structure of the key avionics technicians and aircraft mechanics workforce and included a review of national attrition rates as well as a review of the latest COPS (Canadian Occupational Projection System) attrition numbers for these occupations. Industry knowledge, which was provided by members of the BC Aerospace Workforce Strategy steering committee, was also factored in when completing the estimation of attrition and core replacement needs.