

## **BC AEROSPACE WORKFORCE DEVELOPMENT PLAN**

### **Assessment Of Future Demand And Training Needs.**

December 2002

#### **Aerospace Sector Composition**

The aerospace sector includes aircraft and components manufacturing activity along with aircraft maintenance activity that occurs in the air transport and air services industries. The grouping of these activities into the aerospace sector reflects the common industrial activity but also that there is some similarity in occupations, skills and training.

While all those involved in the aerospace sector have a good understanding of what is included in their sector, it is important for comparison purposes to be able to refer to the composite industries that make up the sector. This allows for the dimensions of the sector to be more clearly defined and measured. It also provides a basis for reflecting industry issues and economic drivers and, ultimately, in assessing how these factors impact on the sector and shape employment growth or the demand for skilled workers. It is also important, when discussing workforce issues and training needs, that there is an understanding to what degree the key occupations of this sector are also found in other industries and, therefore, if there is further demand or competition for skilled workers.

*A brief note on terminology should help with any confusion over sector names and descriptions. Many economic and human resources studies on areas that are combined for analysis use the term "sector" to describe the entire field, as does HRDC in their sectoral studies. There is a technical reason for this. For various data collection or administrative purposes, a classification system has developed which groups common activities (economic, trade and similar) into a hierarchy of industries that combine according to basic activities. Manufacturing is a major industry group that includes industries which in turn are broken down into even more industries. In a case like aerospace (tourism and high technology are other examples), there is a commonality of interest that crosses the traditional major industry group boundaries. In fact it is often only parts of an "industry" that are combined in order to measure and describe "sectors". In addition measures at an industry level are often used in the analysis and it is easier to differentiate these from the overall by using terms in this way.*

*Those involved in aerospace industrial activity in British Columbia refer to the entire field as the aerospace industry and to the two major areas as sectors. However for the purposes of clarity, the following material will refer to the overall framework as the aerospace sector and will refer to the two separate areas as the components of the aerospace sector. There will be reference made in the data and analysis to industries; this will describe or discuss information that is related to the usual industry classification and terminology.*

In addition to reviewing the sector's own workforce information, this paper will draw upon various external data series, mostly from Statistics Canada. To ensure that references to this external data are readily understood a brief review of definitions used by these series are described here. Industry classifications that are used for standard measures of activity and labour market measures have recently

changed from the SIC (Standard Industrial Classification) to the NAICS (North American Industry Classification System). Both classifications are still in use when extracting information from various data sources. The 1996 Census, which is currently the latest detailed information source on labour market characteristics uses the SIC. Other series on economic activity, trade and aggregate employment measures have moved to NAICS. The sector's workforce information provides description of the workforce in terms of specific AME licenses as well as other job titles. In addition to the sector's own job titles, this review will be using comparative (although sometimes wider) occupational groups that are categorized by the National Occupation Classification (NOC).

The definition of the aerospace sector has certain implications in terms of providing information on employment levels as well as in assessing the demand for workers and training needs for the sector. This review will use a definition that generally matches the sector's own categorization of there being two component parts of the sector, manufacturing and maintenance.

The **Aerospace Manufacturing** component of the sector is classified in NAICS as the Aerospace Product and Parts Manufacturing industry (3364). While certain engineering and technical aspects of aerospace research and product development are also likely to be found in the engineering services industry, those particular aspects are excluded for the purposes of this review.

The **Aircraft Maintenance** component of the sector is a portion of the two industries that are linked in providing air transport and air transport services. These are classified in NAICS as Air Transportation [481] and Support Activities for Air Transportation [4881]. Obviously these two industries' economic functions are not restricted to aircraft maintenance activity. However, the overall activity of the air transport industries does have a major bearing on the amount of and the trends in maintenance activity. It is possible to provide an approximation of overall and skilled workforce levels involved in the sector's aircraft maintenance functions by focusing on the skilled workforce component of the overall air transportation industry. While the aircraft maintenance component is defined in this way, it is **also important to realize that there is some additional aircraft maintenance activity that takes place in other industries, especially in the defense area. This aspect has to be taken into account when assessing demand** in order to provide an effective perspective on training needs.

### **Employment - Recent Trends, Current Employment and Employment Projections**

It is difficult to find data sources that directly provide employment measures of the aerospace sector in British Columbia. The sector is relatively small and on the aircraft maintenance side is composed of sub-groups of major industries. This means that standard labour market measures such as the Labour Force Survey do not provide the type of information or detail required to adequately describe sector employment and especially to identify the skilled workforce. A national study on human resource issues for the aerospace sector discusses these data gaps. In order to overcome this, the sector is developing its own body of information on the sector workforce. The recent national human resources study built much of the national analysis on information collected directly from firms within the sector. However, it is noted in the national material that the level of data and information that is used to derive national trends is insufficient to allow for the same analysis to take place at a provincial level.

This review has taken the approach that various data sources need to be combined to obtain a reading of sector employment and trends.

The aerospace industry association in British Columbia, AIABC, provides a current estimate of an overall workforce of 7,500. This overall measure is drawn from firm-based information.

The following data sources have been added in order to confirm these measures and to draw out labour market information that is useful in assessing demand for skilled workers. Data has been drawn from a Statistics Canada survey of establishments, SEPH (Survey of Employment, Payrolls and Hours that contains measures for Aircraft Manufacturing (NAICS 3364) and for the overall Air Transport and Air Services industries (NAICS 481 and 4881).

In addition information was drawn from the 1996 Census. This material is somewhat dated but can be linked to the industry survey information for that year and provides a valuable way of establishing a skilled workforce measure. Similar material was drawn from the 1991 Census to provide a background for any significant occupation trends. (Note: While there has been a further Census in 2001, labour market measures will not be available until mid 2003.) The Census material also provides the extra occupation information required assessing overall employment in key occupations. The same array of data and measures were extracted for British Columbia and for Canada as a whole to allow for comparisons with the national sector study material, which can provide a further reference point for provincial growth patterns.

Because of the different measures available and to better illustrate the nature of employment growth across the aerospace sector, the employment and employment trends analysis is developed separately for the aircraft manufacturing component and aircraft maintenance component of the industry. The overall employment and skilled workforce projections that result from this separate analysis are then pulled together to consider occupation and skill requirements.

## **Aircraft Manufacturing**

**Employment measures from SEPH show that employment in the Aircraft Manufacturing (NAICS 3364) industry in British Columbia averaged 1,761 in 2001.** This "industry" in its entirety makes up the aircraft manufacturing component of the aerospace sector giving us a current measure of aircraft manufacturing employment. This is an increase of 860 from the 1996 average of 901 or **almost a doubling of the employment in the five years to 2001**. According to the SEPH employment figures, the aircraft manufacturing industry in British Columbia is still a very small share of the national industry, approximately 3.5 percent. However, the share has increased from 2.2 percent in 1996.

The employment measures from SEPH show that there was rapid growth from 1996 to 2000 and that the overall employment level increased only slightly in 2001. This reflects the growth patterns experienced by firms until the economy slowed in 2001 and was further affected by the terrorist attacks in September 2001.

Further data from SEPH for 2002, monthly and therefore subject to greater variability, shows that employment over the first eight months of 2001 averaged 1903, which reflects growth of close to 5 percent for the BC industry compared to the same period in 2001. In comparison, at a national level, the SEPH employment figures for 2002 show a drop in employment of almost 4 percent from 2001.

In 1996 the Census showed that there were a total of 1045 persons employed in aircraft manufacturing in mid-year. This number is close to the monthly detail from SEPH that shows employment increasing each month during 1996. This overall Census count for the industry includes

all occupations, management, administration, clerical as well as professional, technical, trades and fabricating workers. The following table uses the Statistics Canada occupation codes and descriptions to describe the overall skilled workforce. The range of occupations included here is a little wider than those described in industry material from 2000. The inclusion of a couple more occupational categories makes little difference in total number as a relatively few key occupations make up the majority of the skilled workforce. The skilled workforce established through combining these selected occupations stood at 665 in 1996, or 63.6 percent of all employment in the industry. While not included here, a review of the same occupations in 1991 showed a very similar pattern of skilled worker representation in the industry workforce, although the proportion of skilled workers was slightly lower in 1991 than in 1996.

**Aircraft Manufacturing in British Columbia  
Employment in selected skilled occupations**

NOC	Occupation Title	Employment in 1996	
		Number	Share of Canada
	Total All Occupations	1045	2.7%
1472	Storekeepers/parts clerks	15	2.8%
2133	Electrical/electronics engineers	10	3.1%
2146	Aerospace engineers	35	1.5%
2244	Aircraft instrument, avionics technicians	60	2.3%
7216	Supervisors, mechanic trades	35	9.9%
7231	Machinists	65	2.7%
7232	Tool and die makers	10	1.9%
7261	Sheet metal workers	30	5.9%
7315	Aircraft mechanics and inspectors	285	7.0%
9226	Supervisors, mechanical/metal products manufacturi	15	1.4%
9511	Machining tool operators	15	3.0%
9510	Welders and soldering machine operators	0	0.0%
9481	Aircraft assemblers and aircraft assembly inspectors	75	1.3%
9496	Painters and coaters, manufacturing	15	3.1%
	<b>Selected Skilled Occupations</b>	<b>665</b>	<b>3.0%</b>
	Skilled as Share of Total Workforce	63.6%	

Source: 1996 Census

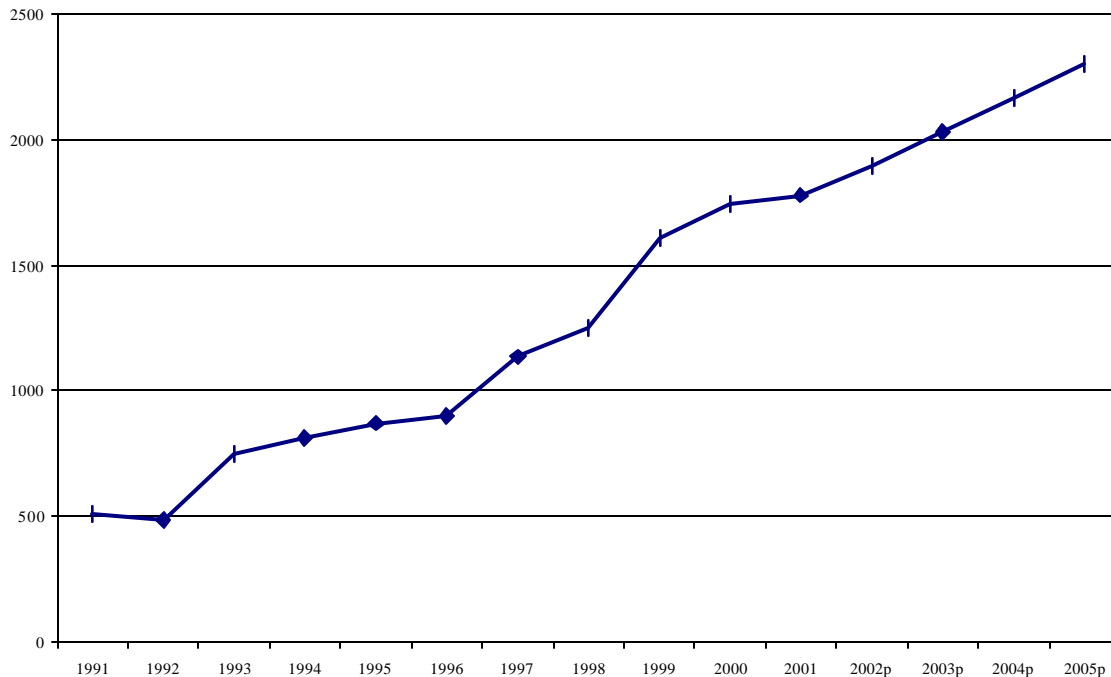
While the industry uses AME license information and other industry/sector job titles to describe the skilled workforce, in general this Census information is equivalent to the sector's grouping of skilled workers. The categorization by the Census is based on the individual's response so it may vary a little from industry titles.

In addition, the two key and large occupational categories of aircraft instrument/avionics technicians (NOC 2244) and aircraft mechanics (NOC 7315) include licensed and other technicians and repair and inspection positions.

By applying the skilled workforce share derived from Census information to the overall employment figures for 2001, the skilled workforce in 2001 is estimated at 1250. This amounts to 70 percent of the overall workforce, based on a slight increase in the share of these selected occupations from 1996.

**A simple trend analysis based on annual average employment levels from 1991 to 2001 results in a projected overall employment level of 2,300 in 2005 for the manufacturing component of the industry.** The following chart provides an illustration of actual employment levels from 1991 to 2001, with projected levels to 2005.

Aircraft Manufacturing Employment: Actual and Projected



**The employment projections to 2005 assume that the trends seen during the 1990s will continue to 2005. These projections are relatively optimistic.** The slower economy had an impact in 2001. At a Canadian level the industry is not performing as well as it did in the latter 1990s. However, on the other hand the employment projection for 2002 is already reflected in employment reports for the January to August months of 2002.

An overall air manufacturing employment level of 2,300 in 2005 is expected to result in a skilled workforce of 1610. Growth over the four years from 2001 is projected at 520 for the overall workforce and 360 for the skilled workforce. **This translates into annual growth of 90 per year in the net demand for skilled workers for the aircraft manufacturing industry in BC – or a growth rate averaging just over 5.5 percent per year.**

### Aircraft Maintenance

As already noted, although there are employment measures for the entire air transport and air services industries, maintenance activity and employment are not reported separately in any of the general surveys.

However, trends in employment in these industries are of interest in providing one perspective on how aircraft maintenance demand could be affected by changes in the demand for air transport.

The SEPH industry information shows that air transport employment (all aspects) in British Columbia amounted to 13,510 on average in 2001. This was an increase of just 4.4 percent from 1996 but was down from 15,866 and 15,299 seen in 1998 and 1999. The air services industry in British Columbia showed overall employment averaging 2,720 in 2001, an increase of 29.7 percent from 1996. Employment in the air services industries, according to the SEPH series, grew substantially from 1996 to 1997, reaching 3,000 with levels remaining in the 2,900 to 3,000 range from 1998 to 2000. Information from the 1996 Census showed employment in air transport at 13,710 and at 2,530 for the air services industries in mid 1996. These census measures fit the SEPH pattern for 1996 to 1997, which showed considerable employment growth over that period of time.

At the Canada level, air transport employment, as reported by the SEPH survey, shows higher employment growth – 21 percent from 1996 to 2001. This growth also includes a slight drop in employment into 2001, similar to the BC results. The air services industry overall employment at the national level also shows higher growth than BC, with employment increasing by about three-quarters from 1996 to 2001.

One question that arises from these national comparisons, in the context of extremely strong aircraft manufacturing employment growth in BC, is whether there has been some change in industry classification of firms in the Statistics Canada business register since this is used to structure industry information. This is a question to keep in mind when considering the occupational mix but it is expected that this will not materially affect the assessment of overall demand for skilled workers.

Occupational information, drawn from the 1996 census, provides a basis for measuring the skilled workforce in that year. The same occupational mix that was extracted for the aircraft manufacturing industry was also extracted for both the air transport industry and the air services industry. As noted before this occupation selection is a little wider than that referred to by sector/industry measures. However, once more there are a very few key occupations that are dominant in the selection and therefore there is little difference in impact on numbers.

The employment numbers for the selected skilled occupations have been combined from both industries and are presented in the following table. This Census information shows that there were 2610 skilled workers in British Columbia employed in the two industries that are most active in aircraft maintenance work. The selected occupations comprised about 16 percent of all employment in these industries. In addition the table shows that the **total employment for these occupations and these industries in British Columbia stood at close to 22 percent of similar national occupational employment.**

**Air Transport and Air Services Industries in British Columbia  
Employment in selected skilled occupations**

NOC	Occupation Title	Employment in 1996	
		Number	Share of Canada
	Total All Occupations	16240	21.7%
1472	Storekeepers/parts clerks	110	25.0%
2133	Electrical/electronics engineers	20	10.0%
2146	Aerospace engineers	40	16.7%
2244	Aircraft instrument, avionics technicians	355	14.3%
7216	Supervisors, mechanic trades	195	30.7%
7231	Machinists	25	21.7%
7232	Tool and die makers	0	
7261	Sheet metal workers	0	0.0%
7315	Aircraft mechanics and inspectors	1785	24.7%
9226	Supervisors, mechanical/metal products manufact	0	0.0%
9511	Machining tool operators	0	
9510	Welders and soldering machine operators	15	15.8%
9481	Aircraft assemblers and aircraft assembly inspect	10	9.1%
9496	Painters and coaters, manufacturing	30	13.6%
	Selected Skilled Occupations	2610	21.8%
	Skilled as Share of Total Workforce	16.1%	

Source: 1996 Census

**Of particular interest is that the single largest occupation of aircraft mechanics, with employment at 1,785 in these industries, amounted to 25 percent of the national workforce in these industries. This larger than population (or industry workforce) share of aircraft mechanics is further emphasized by the share of supervisors (likely to also have aircraft maintenance qualifications).**

The intention is to use these measures to help in estimating the current workforce in 2001/2002 and then to develop employment projections to 2005. However there is a need to be careful in assuming that the maintenance skilled occupation share will remain constant. While employment in the air transport industry dropped after increasing strongly in 1996 to 1998, aircraft maintenance activity is unlikely to have changed in as extreme a fashion. Some occupations in the air transport industry, such as ticket agents, are more vulnerable to traffic downturns and to changing office technology. The estimation of the current skilled workforce in these maintenance industries has therefore used a blended growth rate built from the SEPH industry employment figures.

***The maintenance skilled workforce employment level in air transport has been estimated at 3,050 in 2001, an increase of 440 from 1996. This is the result of an estimated increase of 10 percent in the numbers of skilled workers in the air transport industry from 1996 and in the air services industry by 30 percent.***

**The skilled workforce is supported by other workers (management, administration, cleaners, truck drivers, etc) who are directly linked to the aircraft maintenance function.** The structure of the air transport industry means that in many situations some of these support functions are shared. However, it is reasonable to establish a proxy measure for the overall aircraft maintenance workforce,

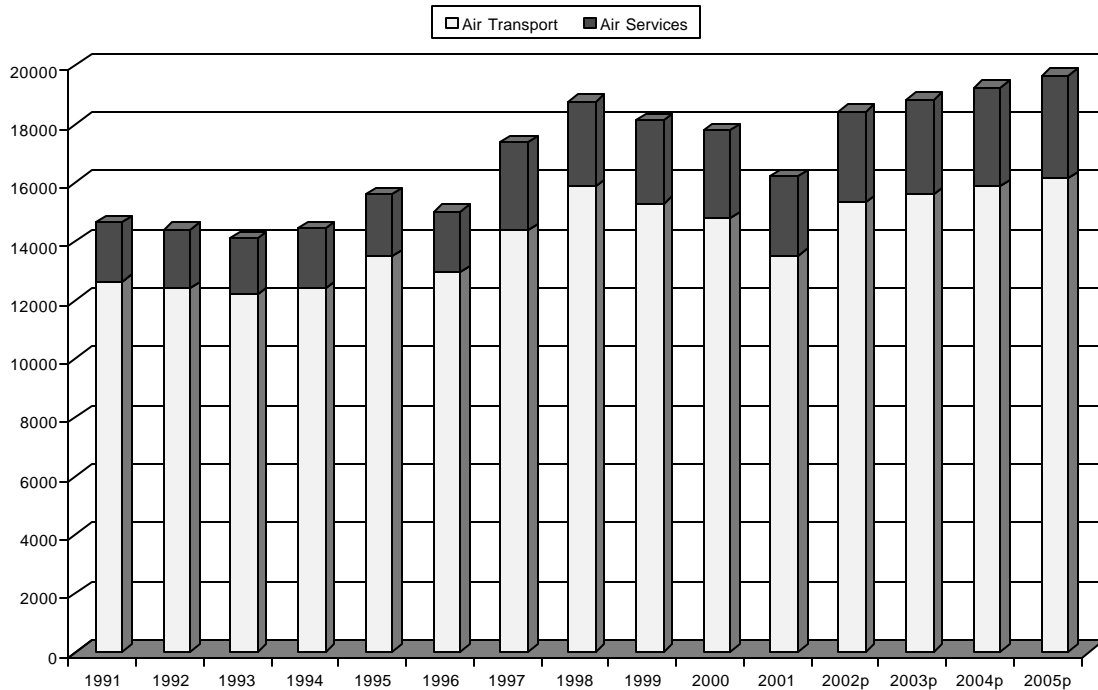
including both the skilled workforce and other workers. This is certainly not a necessary aspect in assessing the requirement for skilled workers but it does allow for the building of a more complete sector employment picture. By looking at different functions (e.g., travel versus maintenance), one obtains an idea, albeit rather rough, of the way in which the whole workforce is divided up by function. **In this situation the skilled workforce is calculated to be close to 60 percent of the overall workforce. This provides an estimate of 5,340 for the overall workforce in the aircraft maintenance component of the aerospace sector in 2001 in BC.**

An alternative measure of the maintenance workforce has been reported in the recently prepared national human resources study, which has drawn on the AME database and internal HR data from maintenance firms. According to the material prepared for this national study, the national maintenance workforce stood at 22,199 in 2000. The workforce in British Columbia was estimated at 6,070. There are obviously major definitional differences between an administrative or license database and an industry employment survey. The snapshot for the 2000 workforce from the national study provides an important guide to the dimensions of the sector. However, since it is just a snapshot, it does not provide trend measures which are of use in developing trends.

Other information from Transport Canada provides a history of licenses from 1991 to 1999 at a Canada level. This data series refers to A/C Maintenance Engineers. The number of licenses in 1999 in this category was 10,711. This series indicated an increase of approximately 500 from the mid 1990s, after gains of about 200 from 1991 to the mid 1990s.

Clearly there is only limited information on the employment levels and on the demand for skilled workers over time. Therefore a trend analysis of total employment levels in air transport and air services has been used to both assess overall industry growth potential and to provide a means of obtaining growth rates in order to derive an employment projection for 2005. The following chart illustrates employment levels from 1991 to 2001 as well as the trend employment projections to 2005 that are based on this history. **These trend measures indicate a recovery of employment levels from 2001 with further recovery or growth to 2005.** Of course the timing of this recovery still depends on the wider economic situation. Information from SEPH for 2002 suggests that employment levels in the air transport and air services sector continue weak into this year. However this method of analysis has the benefit of building on a longer history in an industry that is prone to significant year-to-year changes, either in growth or decline.

Employment- Actual and Projected



The growth rates suggested in this trend analysis have been used to calculate employment projections for aircraft maintenance. **Overall aircraft maintenance employment is projected, based on these trends and on the relative importance of the two industries, to reach close to 6,000 in 2005 while the skilled workforce in the aircraft maintenance component of the sector is projected at 3420 in 2005, an increase of 370 from 2001. This projected net growth of 370 translates into an annual increase of 93 – reflecting a growth rate of 3 percent per year.** This projection is relatively optimistic in the context of the pressures facing air travel as well as the uncertainty that North American, indeed global, economies are facing at this time. At the same time, it appears reasonable to consider that there are increasing maintenance requirements with an aging fleet.

### Aerospace Sector & Key Occupations

The preceding analysis of employment trends provides employment information and projections for the two components of the aerospace sector. These measures, when combined, indicate that the aerospace industry's total skilled workforce numbered 4,300 in 2001. Employment growth, based on industry and occupation trends, is projected at 730 from 2001 to 2005. **If the small number of professional engineers is excluded, the skilled workforce amounts to 4,135 and employment growth is projected at 700 in the four years from 2001 to 2005.**

The aerospace industry uses occupational classifications that provide greater specification of skills than can be found in most of the standard NOC classifications. The following table looks at the projected growth in a couple of ways. One way uses the two key occupations (grouped occupations) as classified under the

standard classification system of NOC to illustrate the type of demand. **The other way uses industry occupational classifications for the largest occupations to provide a reworking of demand in more detail. The projected employment growth for these industry occupations was calculated using the occupation-specific share of new jobs anticipated when the AIABC collected project information in 2000.**

### BC Aerospace Sector - Projected Employment Growth For Selected Key Occupations

Based on trends & industry information on key occupations

	<b>2001/05 Change</b>	<b>Annual Change</b>
Aircraft Manufacturing	360	90
Aircraft Maintenance	370	93
<b>Selected analysis occupations</b>	<b>730</b>	<b>183</b>
<b>Skilled Workforce (less professional)</b>	<b>700</b>	<b>175</b>
<b>Key Occupations - NOC Classifications</b>		
Aircraft instrument, avionics technicians	84	21
Aircraft mechanics and inspectors	406	102
<b>Key Occupations - Industry Occupational Classifications</b>		
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

Notes: Growth for these specific occupations is based on overall employment growth of 700, shared to industry occupations based on project based demand as developed in the 2000 demand report.

Further detail on these and other skilled occupations, as were previously discussed in the demand projections presented in the AIABC, October 2002 report on Human Resources in Aerospace, is provided in Appendix A.

In addition to the aerospace sector's demand for workers, the overall demand for workers in the key occupations also needs to be considered. The standard occupations of aircraft instrument/avionics technicians (NOC 2244) and aircraft mechanics and inspectors (NOC 7315) were chosen to indicate additional needs. These occupations are the largest occupational groups in the aerospace sector and the majority of employment is also concentrated in this sector with a small additional number employed elsewhere across the economy.

The following table shows these two key occupations and overall employment in 1996. This information shows that there are a **small additional number of persons employed in other industries.**

**Most are in the defense sector but there is some employment in industries such as mining and forestry.**

**Key Occupations and Industry of Employment  
British Columbia**

NOC	Occupation	Total all	Total	Defence	Other
		Industries	Aerospace		
2244	Aircraft instrument/avioics	560	415	75	70
7315	Aircraft mechanics/inspectors	2335	2070	165	100

Source: 1996 Census

Requirements for skilled workers, and training needs, are also shaped by attrition from the qualified workforce. This aspect is difficult to assess fully and generally there is insufficient information available to derive adequate measures of attrition. **What is important is to differentiate between attrition that results in the worker leaving the occupation or location and movement that takes place in the same occupation but between employers. This latter movement, while often a concern for employers, does not result in the loss of the skilled worker to the industry.**

There are several aspects that need to be considered when looking at attrition. **Core attrition**, in many occupations, **comes about from retirement of workers and is therefore influenced by the age structure of the workforce.** This core attrition is also affected by aspects such as pension availability, tenure of employment and any special retirement schemes available in the industry. Most human resources studies and occupational demand assessments concentrate on this core attrition measure and typically calculate attrition rates based on the age structure of the population and the probability of retirement.

Other attrition and the equivalent replacement needs occur through worker mobility to other geographic areas and into other occupations. In many cases the movement is within the general occupational field and within the industry or even within a firm as individuals move into more senior or supervisory positions. In industries and occupations where there is significant seasonal variation of work, many leave jobs to look for more stable employment. A somewhat similar situation occurs in cases where an industry experiences major cycles of employment growth and lay-off and workers decide to take up work in other fields. Other factors that have an impact on attrition (and therefore on replacement needs) are unionization, education and training that an individual has taken (invested in) prior to employment and whether there are other opportunities to use their skill set in another field.

The national human resources study refers to the use of a model from Statistics Canada (PERSIM) to simulate personnel changes based on current and historical employee data. This model requires that there be an established database providing age information on the workforce as well as information on exits from the sector. The national study notes that the major influence on attrition numbers calculated though this model comes from the aging of the workforce but it points out that the data probably also includes some aspect of firm specific exits which might not actually be industry exits.

Clearly, there is little similar information available for British Columbia and attrition measures cannot be calculated in the same way.

Some age structure information is available from the 1996 Census. The following table provides information on the age structure of the two key (standard NOC classification) and largest skilled occupations in the BC aerospace sector. Also shown is a comparison with the Canadian age pattern.

**Age Structure of Workforce; Key Occupations**

	British Columbia		Canada
	Number	Percent Share	Percent Share
<b>Aircraft Instrument/Avionics</b>			
Total all ages	560	100.0%	100.0%
15-24 years	25	4.5%	5.5%
25-34 years	150	26.8%	31.7%
35-44 years	120	21.4%	32.8%
45-54 years	145	25.9%	19.2%
55-64 years	110	19.6%	9.5%
65 years and over	10	1.8%	1.2%
Average age		42.8	39.4
<b>Aircraft Mechanics/Inspectors</b>			
Total all ages	2405	100.0%	100.0%
15-24 years	155	6.4%	7.1%
25-34 years	770	32.0%	31.2%
35-44 years	720	29.9%	32.2%
45-54 years	465	19.3%	18.5%
55-64 years	245	10.2%	9.9%
65 years and over	35	1.5%	1.0%
Average age		39.6	39.1

Source: 1996 Census

The information on the age structure points out that **the aerospace workforce is older in British Columbia than in Canada as a whole**. While the size of the younger age groups would have increased along with employment growth in the second half of the 1990s, the British Columbia age structure has a noticeable gap in the 35 to 44 age group. In the Canada wide measure, the 35 to 44 age group provides the largest share of the workforce. In British Columbia, the largest proportion falls into the 25 to 34 age group and there is a large share of the workforce in the 45 to 54 age group.

These two occupational groups account for over half of the skilled workforce and the numbers indicate that there will be sizable replacement needs as older members of the workforce retire. While some of those who were 55 to 64 years of age in 1996 will have already retired, a sizeable number can be expected to retire during the next few years. Similarly the greater numbers of workers who were 45 to 54 years of age in 1996 are now 50 to 60 years of age and will be the retirees of the coming decade.

Age structure information of this type is usually used as the basis of attrition estimates. The COPS (Canadian Occupational Projection System) provides a basic measure of attrition by occupation depending on the age structure. The latest COPS model suggests attrition for these key aerospace occupations of 1.6 percent each year. **Calculating potential attrition from the age structure above provides an annual rate of 2 percent. However, industry information suggests that retirements will be higher than this rate suggests.**

**Therefore attrition, which reflects retirement from the skilled workforce, is projected to be in the range of 2 percent to 4 percent annually. The replacement needs would amount to between 332 and 700 over the four years from 2001 to 2005.**

**At the low end of this projection, replacement needs would be 83 each year. At the top end of this projection, annual replacement needs would start at 165 in 2002 and increase to close to 190 for the 2005 year.**

There is insufficient information to support breaking down this attrition number further by industry occupational classification. **Information collected by the sector on exits in 2000 when project-based demand numbers were prepared refer specifically to firm level exits.** These numbers include permanent industry exits, which result from retirement and other reasons. But the numbers also include firm specific exits. **Since these second type of exits may result in re-employment in another firm within the sector, they are not a true measure of attrition as the industry workforce supply will not have been reduced by such inter-firm movement and such numbers tend to overstate replacement needs.**

In addition, several of the important skill areas are those that typically draw workers from inside the sector or even from inside the firm. In some cases this movement to high skill levels is part of a process to upgrade skills and thus will not result in a replacement opening.

However, firm level exit information does point out that there is often an additional loss of workers from the firm, and perhaps from the industry, and that this, in turn, could expand the demand for additional workers.

Input from key informants in the industry does suggest that there is some loss of skilled workers from the entire aerospace sector. This might be as a result of movement of workers to take up employment in other provinces or abroad, or because workers move to other job fields. Data on this aspect is difficult to collect – especially without a standardized exit interview approach or mechanism for work life history tracking of those who complete aerospace technical training. In BC, there is currently no data available that would allow for this "leakage" from the skilled workforce to be quantified.

Information on new skilled worker supply that will be available to enter the sector from training institutions has been described in the BC Labour Supply Analysis, prepared for the AIABC, in mid 2002. The supply measure is provided as a cumulative total **for the 2003 to 2005 period. Overall supply from training was estimated at close to 810** over the three-year period.

Information on the representation of immigrants in the key occupation workforce shows that, at various periods of time, **immigration has also been a source of new workers.** The following table provides information on immigrants in the aircraft instrumentation and aircraft mechanics occupations in British Columbia in 1996. Comparative information for Canada is also included.

### Immigrant Representation in Key Occupations

	British Columbia			Canada	
	Number	Percent	Share of	Percent	Share of
<b>Aircraft Instrument/Avionics</b>		Share	Immigrant	Share	Immigrant
Total all workers	565				
Non-immigrant population	380	67.3%		77.0%	
Immigrant population	180	31.9%	100.0%	22.8%	100.3%
Before 1961	10		5.6%		9.0%
1961-1970	45		25.0%		28.7%
1971-1980	70		38.9%		34.6%
1981-1990	45		25.0%		20.2%
1991-1996	10		5.6%		7.8%
Non-permanent residents	0	0		0.9%	
<b>Aircraft Mechanics/Inspectors</b>					
Total all workers	2400				
Non-immigrant population	1690	70.4%		77.1%	
Immigrant population	710	29.6%	100.0%	22.5%	100.0%
Before 1961	115		16.2%		13.3%
1961-1970	210		29.6%		27.8%
1971-1980	250		35.2%		33.2%
1981-1990	75		10.6%		18.9%
1991-1996	65		9.2%		6.7%
Non-permanent residents	0	0		2.1%	

Source: 1996 Census

The Census provides information on immigrants but does not specify at what age they entered Canada. It is possible that some of the immigrant population working in these two key occupational groups entered Canada as children completing their training within Canada. However, the nature of a major proportion of the immigration flows and the timing of the entry to Canada for many of those working in these two occupations reflects that at least there have some immigration supply flows into the aerospace skilled workforce.

**The immigrant share for British Columbia is higher than for Canada as a whole.** This is a common pattern across the economy as British Columbia has a larger share of immigrants within the overall population. While this report does not show any non-residents working in these occupations in 1996, this may merely be that the numbers are too small for data reliability.

### Demand, Supply and Shortages

The use of demand projections, including new growth and replacement needs, against new supply is frequently viewed as the only real way of measuring imbalances and identifying potential shortages to suggest that action is needed to develop additional supply.

However, it is rare for such an analysis to actually take place. It is even rarer for it to have a successful conclusion in providing exactly the information that is needed to mount new training. Generally the "numbers" developed on both sides of the equation, demand as well as supply, have too many problems for the result to be fully trusted or do not go far enough in enunciating the exact nature of the skill shortage.

Part of the difficulty in relying on a numerical exercise is that it is exceedingly hard to produce accurate projections of demand. This is the situation even when the occupation in question is of a good size and has tended to have steady employment growth for many years. In this case even a small change in how work is organized can impact on projections. When the occupation or work area has more variable employment, the industry is cyclical and there has been uneven growth year to year, it becomes even harder to provide employment projections that are correct in both timing and dimension.

Even when the forecast of employment levels and new worker demand has been developed, the difficulty in dealing with attrition adds considerable uncertainty to how accurate the overall demand (new plus replacement) picture is going to be.

Adding further complexity is how skills within the workforce are changing or whether the current workforce has the "correct" mix of high level skills or qualifications. The question then becomes, as with the aerospace sector, one of also considering what the optimum levels are in fairly specific skill sets for which there are limited data sources.

The supply side is also complex and requires an understanding that supply may not be only a consequence of output from local training. In Canada, there is considerable inter-provincial worker mobility. This can mean that, at a provincial level, movement of qualified individuals from may throw off an assessment of demand and supply elsewhere. In some fields, there is international movement. This can be into Canada and out of Canada.

On both the demand and supply side one needs to consider the potential for workers transferring skills to another area of work. In some industries, aerospace being one, many key skilled fields are industry-specific, which means the easy transfer out of the industry is reduced. However, where the skills are specific and are developed extensively within the industry, again as occurs in the aerospace sector, demand and supply may be really just need to be entered on different sides of the equation.

This does not mean that is not extremely useful to undertake an exercise to project employment growth, net job growth and the potential or obvious gaps in supply or training routes. In the past few years the discussion around the age of the existing workforce has been very helpful in drawing attention to how the balance of demand and supply may change. All this information is an important part of human resource planning and an important input to educational or training plans.

In addition, there are some indicators, as opposed to direct measures, that can add significant information to the demand, supply and shortages issue. These include labour market measures, such as **employment growth itself, unemployment rates, wages and recruitment information. Employers' considered perspectives on new entrants, skills, future developments and projects, technology application and changes in skill requirements all add important information**, especially when collected into industry views and when based on sound surveys. **It is important here that the employer information does not focus on internal firm specific issues but is reflecting industry concerns.**

**The aerospace sector can point to several indicators that define the sector skilled labour market as tight and prone to selective shortages.** Work is typically full-time, full year and unemployment rates are low. Earnings are higher than average for the full-time full-year worker. Work weeks and annual work patterns are also higher than average. The following provides a brief guide to some important labour

market indicators for the two key occupations of aircraft instrument/avionics technician and aircraft mechanics with an all occupation comparison.

**Labour Market Demand Indicators**

Comparative measures indicating a tight labour market

	<b>British Columbia</b>	<b>Canada</b>
<b>Unemployment Rate %</b>		
Aircraft Instrument/Avionics	0.0%	2.3%
Aircraft Mechanics/Inspectors	2.9%	2.9%
All Occupation Comparison	9.6%	10.1%
<b>Average Weeks Worked</b>		
Aircraft Instrument/Avionics	48	48
Aircraft Mechanics/Inspectors	47	47
All Occupation Comparison	41	42
<b>Average Hours Worked (week)</b>		
Aircraft Instrument/Avionics	42.8	42.5
Aircraft Mechanics/Inspectors	42.9	42.4
All Occupation Comparison	37.1	38
<b>Average Earnings, Full-time, full year workers \$</b>		
Aircraft Instrument/Avionics	46,965	45,714
Aircraft Mechanics/Inspectors	44,388	43,169
All Occupation Comparison	39,414	37,556

Source: 1996 Census

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Dec 10, 2002