

New Horizons

A Report on New Zealand's Aviation Industry

Prepared for:

New Zealand Trade & Enterprise



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15 June 2010



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Acknowledgements

Knotridge Limited would like to thank those organisations and individuals who were interviewed or who responded to the survey for the time they gave to provide the information requested. Without their information and thoughtful responses and insights, this report would not have been as accurate or complete.

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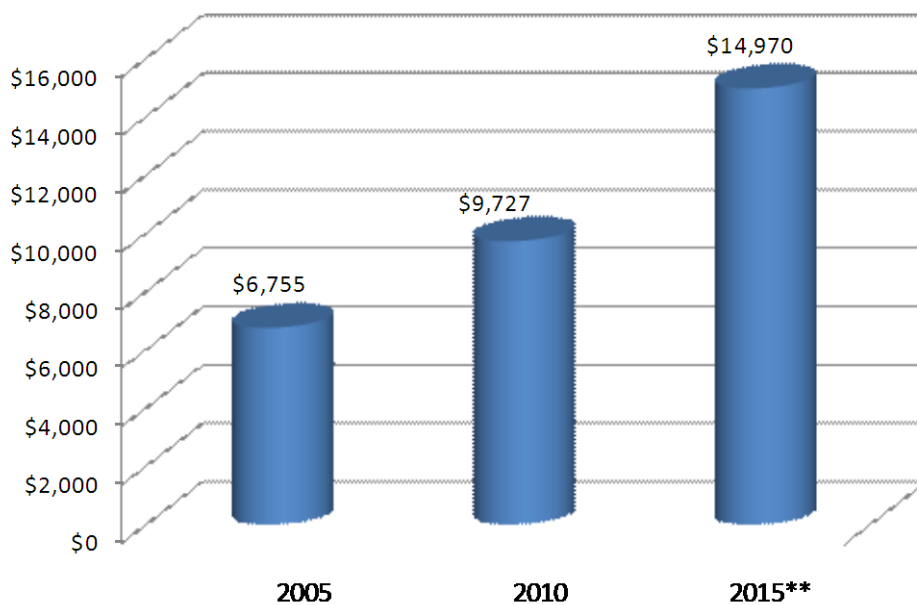
I. Executive Summary

New Horizons was commissioned by New Zealand Trade & Enterprise (NZTE) to establish the current size of the aviation industry, establish recent and future growth drivers and constraints, and reset five year growth challenges for the industry.

Knotridge Ltd completed this analysis on behalf of NZTE using a combination of publicly available secondary source data together with primary source information gathered from interviews with 64 industry organisations and experts. The analysis identified significant export and offshore opportunities together with other opportunities for growth.

The New Zealand aviation industry in 2009 is estimated at \$9.7 billion in revenue, with \$5.9 billion from domestic activities and \$3.8 billion from export activities. There are more than 1,000 organisations participating in the industry, employing 23,525 staff with wages and salaries estimated at \$1.3 billion. Using input / output economic modelling, the direct and indirect impacts of the New Zealand aviation industry together have been calculated at 11.8% of total revenue across the New Zealand economy and 6.9% of GDP in the year to December 2009.

The aviation industry is estimated to have grown from a total of \$6.8 billion in 2005 to \$9.7 billion in 2009. This represents a growth rate of 9.5% per annum over the five year period. The data indicated increased productivity during this period, with average revenue per employee growing from \$366,700 to \$456,861. The industry is conservatively forecast to grow by 2015 to \$12.6 billion (5.3% per annum) or, based on more optimistic assumptions, to \$15.0 billion (9.0% per annum).



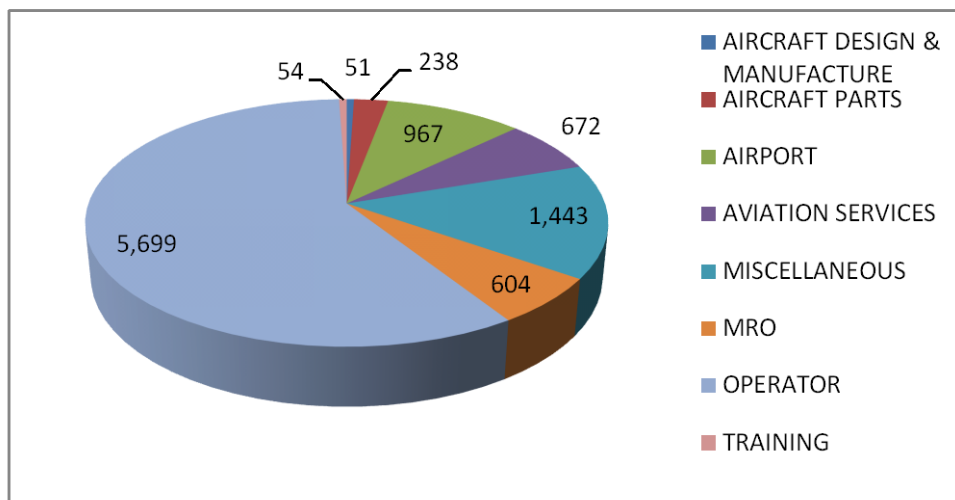
* All dollars are in millions NZD

** Forecast estimate

Figure 1: Aviation Industry Growth

The aviation industry was divided into 12 geographic regions for analysis. Each organisation was classified into a region based on the location of its headquarters. The Auckland region had by far the largest number of aviation organisations – 263 – and, with revenue of \$7 billion, was the source of approximately 72% of the revenue for the industry.

For the purposes of analysis the aviation industry was divided into 8 major sectors (shown in the figure below): Aircraft Design & Manufacture; Aircraft Parts; Airport; Aviation Services; Miscellaneous; MRO (Maintenance, Repair & Overhaul); Operator; and Training. Selected sectors were further divided into sub-sectors of interest, to better understand the nature of the activity and prospects for future growth. The Operator Sector generated the majority of aviation industry revenue, at \$5.7 billion, or 59% of the total revenue. At \$1.4 billion the second largest sector was Miscellaneous which included \$1.3 billion of Fuel revenue.



* All dollars are in millions NZD

Figure 2: Revenue by Sector

During the course of the interview process a number of broad themes emerged relating to constraints, limitations and opportunities to facilitate growth:

- Investors are now very risk averse with limited venture capital funds available;
- Some of New Zealand’s most innovative businesses are in danger of being lost offshore due to a lack of capital;
- At times national and regional funding and development strategies from government support agencies are not aligned;
- The lack of a united “New Zealand Inc.” approach at times denies the opportunity for smaller businesses to become involved in significant export ventures; and
- Partnerships with a “Brand New Zealand” focus with government agency support would allow organisations to co-operate rather than compete with each other.

Amongst the many opportunities identified by those interviewed, the following opportunities were considered to have significant potential for growth.

- **MRO:** utilise current spare capacity and capability for additional Maintenance, Repair and Overhaul activity.
- **Space Industry:** New Zealand has competitive advantages in a global market which has significant growth potential.
- **Helicopter Operations:** high growth worldwide in oil and gas support provides an opportunity to apply New Zealand expertise and skill.

- **Design & Manufacture:** several innovative designs are ready for development, and there is strong capability to develop and produce new technology-based aircraft designs.
- **Wind Tunnel Testing Facility:** there is potential for such a facility in New Zealand, however a feasibility study is required.
- **Business Transformation:** organisations can enter new markets with creative transformation of their business and market approach.
- **The New Zealand Vintage Aircraft Industry:** New Zealand now has the intellectual property and capability to build any vintage aircraft.
- **Titanium:** New Zealand's ability to produce titanium powders targeted for specific niche applications is a significant competitive advantage.
- **Airports:** offshore demand for New Zealand airport design, unique automated ground handling equipment and services appears to be strong.

Based on our understanding of the issues and analysis of the information and views gained from the aviation industry, Knotridge Ltd makes the following observations:

- A 'whole of government' approach would benefit aviation industry organisations, who are impacted by the requirements of multiple layers of regulation;
- The current trend is for less and better regulation however, for some aviation industry organisations, regulation is a business enabler;
- The government, financial and business environment at times constrains and does not encourage high performing industry to stay in New Zealand;
- New Zealand's infrastructure can be better utilized and there are potential partnering opportunities for the use of government assets by private industry;
- The lack of extensive bilateral Mutual Recognition or Government to Government agreements constrains growth in some areas, such as MRO and STCs;
- Further development of the "Brand New Zealand" marketing image of New Zealand's aviation industry should leverage the significant intellectual property, systems, software, products and services of New Zealand organisations;
- The business model and brand for the "Academy New Zealand" pilot training organisation concept requires definition and support from industry and government; and
- "Weightless Exports" and "using our brains not our bodies" should be the approach from the New Zealand aviation industry to increase opportunities for export sales.

The New Zealand Aviation Industry has a number of significant competitive advantages and a depth of aviation history, knowledge and skills which place it well to pursue these opportunities. The encouraging progress of a number of entrepreneurial New Zealand businesses, using sophisticated technologies and intellectual property developed in New Zealand, was evident from this research. To best ensure these opportunities are successfully progressed, input is required from industry and from government in order to achieve the necessary alignment of strategy, resources and actions.

II. Project Scope

Aviation New Horizons was launched to establish the current size and potential growth opportunities of the New Zealand aviation industry. The purpose of this project was to:

- quantify the size of the aviation industry with a reasonable level of accuracy and high degree of confidence that the entire industry was included in the analysis;
- establish recent and future growth drivers and constraints, and identify opportunities for the industry;
- re-set five year growth challenges for the industry and enable New Zealand Trade & Enterprise (NZTE) to better align government assistance and development activities with market activities, and provide milestones that can be shared by Government agencies, key industry organisations and the wider aviation community; and
- present the findings to industry.

The quality of the results was determined by two factors: the degree of confidence desired in the result, and the accuracy, or degree of acceptable error. While time and cost considerations constrained the project scope, sufficient interviews and research achieved a level of 90% confidence (target was 80%) and achieved the target of 80% accuracy (error rate of 20%). Final accuracy depended on the accuracy of the original data, whether enough data was available for a particular sector, and primary data validation. The project produced the following deliverables:

Table 1: Project Deliverables	
Deliverable	
-	Mid-term report, including methodology, assumptions & gaps
1a	Matrix of revenue from domestic activities
1b	Matrix of revenue from international & export activities
1c	Estimates of confidence and accuracy
1d	Multiplier(s) of spill over effects
1f	Industry data map
2a	Analysis of past industry growth
2b	Documentation of methodology, assumptions & gaps
3a	Analysis of future industry growth
3b	Documentation of methodology, assumptions & gaps
4	Refresh the 2015 growth plan
5	Presentation of findings for industry meeting

The analyses, combined with data from organisations and industry experts, identified export and off-shore opportunities. Other than identifying some broad industry and economic trends, it is not within the scope of this project to include an analysis of specific global/regional markets and opportunities. The project also did not include a detailed analysis of domestic demand or linkages across the industry. Calculation of economic impact focused on sector level activity levels and multiplier effects, and did not extend to the economic impact of individual sub-sectors. For example, the benefit of topdressing to agriculture is likely to be much greater than is reflected in the multiplier effects.

In addition to the deliverables above, this project produced a comprehensive list of over 1,000 organisations within the aviation industry, including location and descriptive information that is in the public domain. This list was provided to NZTE as an additional benefit.

III. Methodology

The methodology focused on sourcing a broad range of data across all New Zealand aviation industry sectors, sub-sectors and regions. This broad approach was driven by the fragmented and incomplete nature of the available data on the industry. The steps in the methodology are summarised below:

Table 2: Methodology	
Process Step	Activities
1) Prepare a list of all NZ aviation organisations	<ul style="list-style-type: none"> a. CAA Certificate data b. AIA membership data c. AIC membership data d. Aviation New Zealand membership data e. Wings Directory
2) Collect secondary data	<ul style="list-style-type: none"> a. CAA data - Official Information Request b. Department of Labour data request c. Statistics New Zealand data request
3) Select organisations for primary research	<ul style="list-style-type: none"> a. Sort organisations by geographic area, sector & sub-sector b. Identify organisations representative of geographic area and sector c. Finalise list of key organisations / review with NZTE
4) Develop data request & questionnaire	<ul style="list-style-type: none"> a. Select parameters to meet reporting objectives b. Develop quantitative data request c. Develop qualitative questionnaire d. Develop matrix for aviation industry sectors & sub-sectors
5) Interview selected organisations	<ul style="list-style-type: none"> a. Schedule and complete in-person and telephone interviews b. Write up qualitative data reports c. Ensure data requests are completed and returned d. Identify key industry experts for overview and key trend commentary
6) Collate primary & secondary data	<ul style="list-style-type: none"> a. Integrate primary & secondary quantitative data into sectors & sub-sectors b. Seek further data as required to fill data gaps c. Integrate qualitative information into sectors & sub-sectors d. Integrate industry expert comments
7) Analyse quantitative & qualitative data	<ul style="list-style-type: none"> a. Analyse quantitative information and extract themes b. Analyse data and produce sector & sub-sector data sheets c. Analyse overview information and extract themes d. Combine sector & sub-sector analysis, quantify size of NZ aviation industry e. Further analyse sector & sub-sector data into geographic regions
8) Prepare report	<ul style="list-style-type: none"> a. Deliverable 1: Quantification of the Industry b. Deliverable 2: Industry Analysis c. Deliverable 3: Future Growth d. Deliverable 4: Refresh the 2015 Growth Plan

Data sources, methodology and analyses were carefully documented such that future studies can use the same methodology to produce comparable results. Details of how each step was to be conducted were reviewed with NZTE as part of the work plan. The result is a high level of confidence in the accuracy and validity of the final datasets.

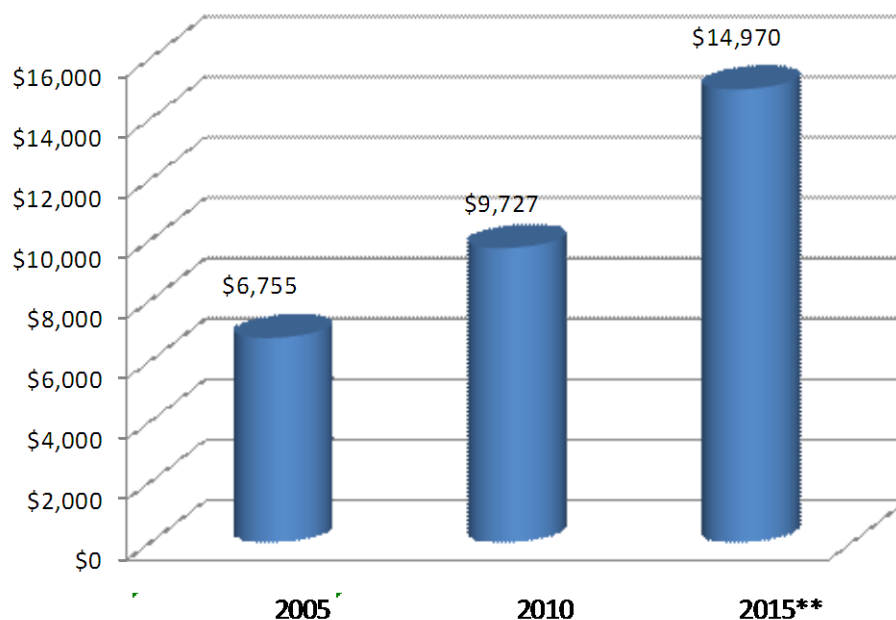
Knotridge worked closely with a wide range of government, agencies, associations and providers in the New Zealand aviation industry. The methodology incorporated a review of relevant research and economic data currently available, combined with data from industry groups and private research (“secondary research”). Careful analysis and cross referencing of this data was used as a basis for further enquiries and interviews with leaders knowledgeable in each sector of the industry (“primary research”).

While there were limitations on both primary and secondary research, each was of significant value when used in conjunction with the other. Secondary data was generally broadly sourced, either across whole populations or in carefully defined statistically significant sample sizes; impartially collected by data collection experts; based on standardised methodology; and available (in most instances) in time series. A detailed discussion of the methodology and its limitations can be found in Appendix C.

IV. Industry Overview

The New Zealand aviation industry is estimated at \$9.7 billion in revenue, with \$5.9 billion from domestic activities and \$3.8 billion from export activities. There were more than 1,000 organisations that contributed to the aviation industry, employing 23,525 staff with wages and salaries estimated at \$1.3 billion.

In summary, the aviation industry is estimated to have been \$6.8 billion in 2005. The industry grew to \$9.7 billion in 2009 and is forecast to grow to \$15.0 billion by 2015.



* All dollars are in millions NZD

** Forecast estimate

Figure 3: Aviation Industry Growth

A. Sector & Sub-sector Definitions

The industry was divided into 8 major sectors for analysis purposes (see Tables 3 and 4). These sectors were chosen based on major activities, such as Airport, Operators, etc. Selected sectors were further divided into sub-sectors of interest, to better understand the nature of the activity and prospects for future growth.

Table 3: Sector & Sub-sector Descriptions	
Sector & Sub-Sector	Description
AIRCRAFT DESIGN & MANUFACTURE	Design, manufacture & assembly of general aviation aircraft
AIRCRAFT PARTS Parts Comp Supplies Avionics Comms	Suppliers of parts, components and supplies Avionics, communications and related products & services
AIRPORT Operations Infrastructure	Commercial and non-commercial airport operations Includes consulting services, paving, construction
AVIATION SERVICES Government & Defence Non-government Services	Government, defence, met services, air traffic control Includes legal, insurance, aircraft sales, aerospace, etc
MISCELLANEOUS Fuel Logistics	Refiners, suppliers and distributors of fuel Includes freight forwarders and freight handlers
MRO Airline GA Fixed Wing GA Rotary Wing	Includes cabin interiors, engine overhauls and interior fitouts Domestic & international commercial airlines Fixed wing, for commercial, general aviation and private Rotorcraft, for commercial, general aviation and private
OPERATOR Airline GA Commercial GA Private	Domestic & international commercial airlines Commercial operations including tourism, agriculture, charter Includes private owners and non-commercial operators
TRAINING	Airline & general aviation pilot, engineering & design training

Each organisation was classified into a sector and sub-sector according to its predominant activity, as usually only a single set of accounts are available for all activities the organisation engages in. However, a few organisations, such as Air New Zealand, are structured to have separate accounting divisions. This meant that Statistics New Zealand was able to split the revenue according to activity. This analysis applied similar decision-making, so that, except where detailed information was available, only the revenue from the larger organisations was apportioned to appropriate sectors and sub-sectors. It is therefore possible that revenue in a sector or a sub-sector might be overstated or understated as a result of this process. However, great care was taken to ensure that the grand total for the aviation industry was not affected by sector allocations.

Table 4: Sector & Sub-sector Revenue				
Sector & Sub-Sector	Organisation Count	Total Revenue*	Domestic*	Export*
AIRCRAFT DESIGN & MANUFACTURE	25	50.5	13.6	36.9
AIRCRAFT PARTS				
Parts Comp Supplies	72	218.0	87.2	130.8
Avionics Comms	<u>13</u>	<u>20.0</u>	<u>5.0</u>	<u>15.0</u>
	85	238.0	92.2	145.8
AIRPORT				
Operations	98	600.0	600.0	0.0
Infrastructure	<u>7</u>	<u>366.9</u>	<u>241.5</u>	<u>125.4</u>
	105	966.9	841.5	125.4
AVIATION SERVICES				
Government & Defence	12	227.0	210.7	16.3
Non-government Services	<u>141</u>	<u>445.2</u>	<u>205.1</u>	<u>240.1</u>
	153	672.2	415.8	256.4
MISCELLANEOUS				
Fuel	15	1,330.6	633.8	696.8
Logistics	<u>61</u>	<u>112.4</u>	<u>78.7</u>	<u>33.7</u>
	76	1,443.0	712.5	730.5
MRO				
Airline	19	508.6	203.4	305.2
GA Fixed Wing	61	74.7	63.5	11.2
GA Rotary Wing	<u>13</u>	<u>20.8</u>	<u>17.6</u>	<u>3.1</u>
	93	604.1	284.5	319.5
OPERATOR				
Airline	18	5,160.3	3,092.6	2,067.7
GA Commercial	269	537.6	444.0	93.6
GA Private	<u>97</u>	<u>1.0</u>	<u>1.0</u>	<u>0.0</u>
	384	5,698.9	3,537.6	2,161.3
TRAINING	84	53.5	38.5	15.0
GRAND TOTAL	1005	9,727.1	5,936.2	3,790.8

* All dollars are in millions NZD. Primary data is latest available financial year; secondary data is FY 2008

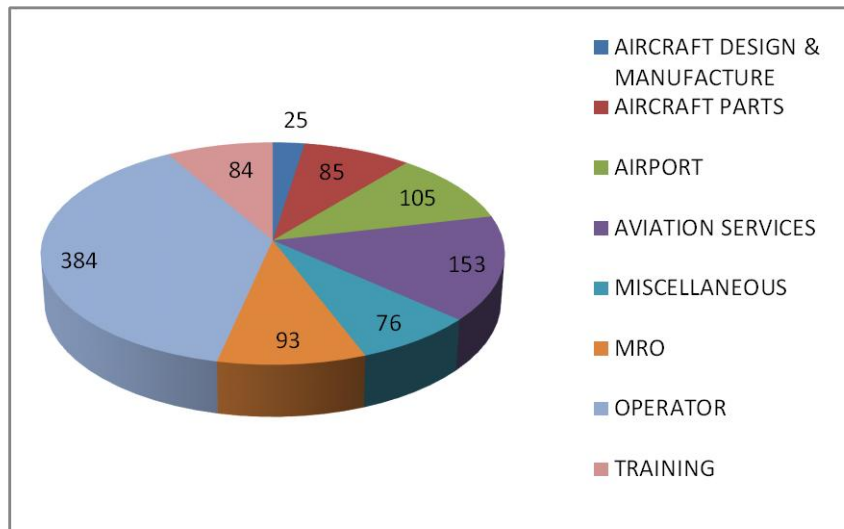
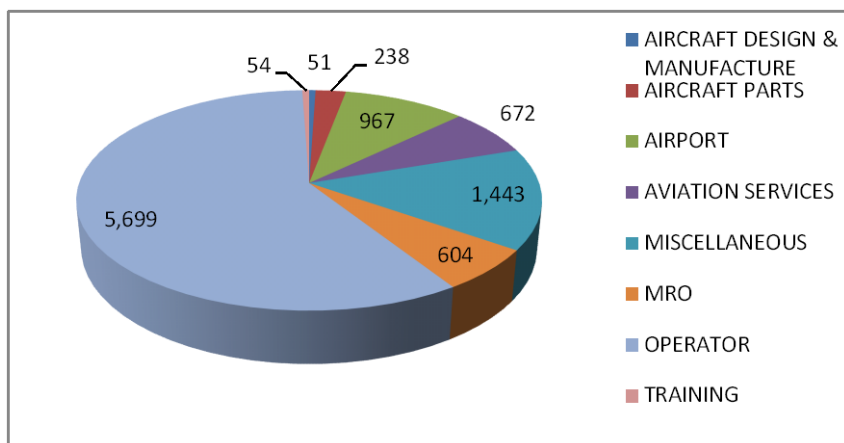


Figure 4: Number of Organisations by Sector

The Operator Sector was comprised of 38% of New Zealand aviation industry organisations, with the majority engaged in General Aviation Commercial activities. The demand for commercial services by the Tourism and Agriculture Sectors has given rise to a large number of operators, most of whom have less than 10 employees. The next largest sector in terms of number of organisations was Aviation Services, which included the umbrella organisations.

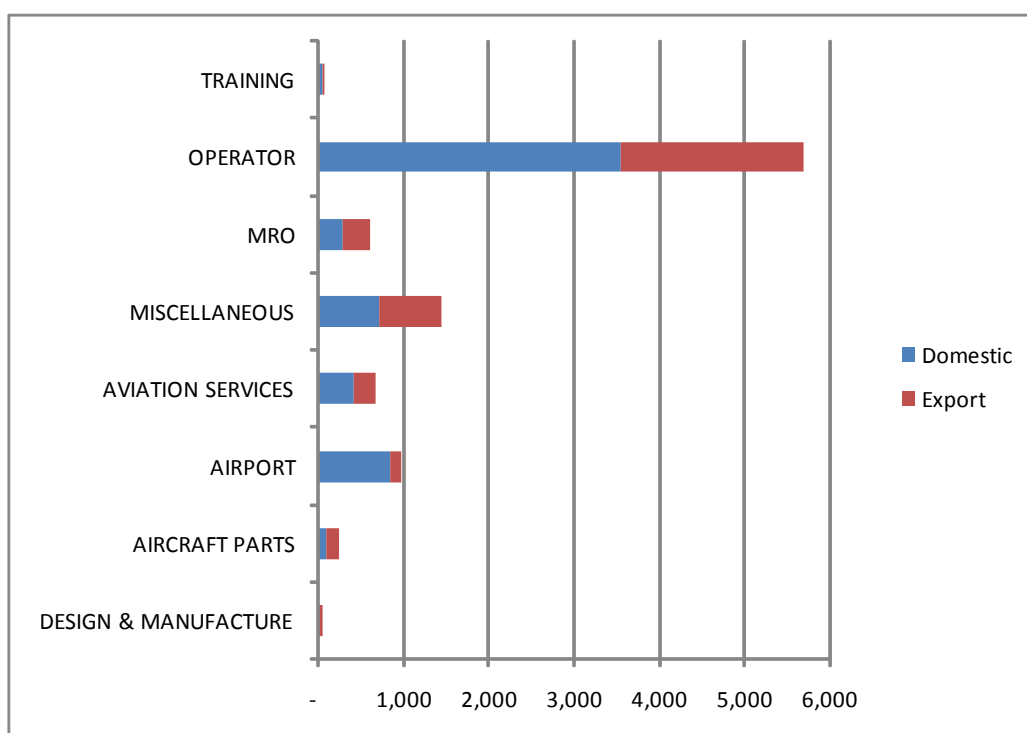


* All dollars are in millions NZD

Figure 5: Revenue by Sector

The Operator Sector generated the majority of aviation industry revenue, at \$5,699 million, or 59% of the total revenue. The bulk of this revenue came from the Airlines Sub-sector, which generated \$5,160 million of which \$3,093 million was derived from domestic activities and \$2,068 million was derived from export activities. The Fuel Sub-sector was the second most significant contributor of revenue at \$1,331million. \$633.8 million came from domestic activities, with \$696.8 million from

export activities. In the Fuel Sub-sector, revenue from international flights was apportioned between domestic and export, taking into account international travel by New Zealand residents.



* All dollars are in millions NZD

Figure 6: Domestic vs Export Revenue by Sector

Table 5: Revenue per Employee by Sector - 2009			
Sector	Revenue (\$m)	Employees	Revenue per Employee
Aircraft Design & Manufacture	50.5	225	224,444
Aircraft Parts	238.0	813	292,743
Airport	966.8	1,153	838,508
Aviation Services	672.2	2,216	303,339
Miscellaneous	1,443.0	643	2,244,168
MRO	604.1	3,302	182,950
Operator	5,698.9	14,473	393,761
Training	53.5	700	76,429
Total / Average	9,727.0	23,525	413,475

Table 5 shows the average revenue per employee for each sector in 2009. At \$2.24 million per employee the Miscellaneous Sector figure is nearly 3 times the next closest sector (Airports). This

figure primarily reflects the impact of the Fuel Sub-sector in which relatively small numbers of staff provide approximately \$1.3 billion worth of fuel across New Zealand.

B. Geographic Regions

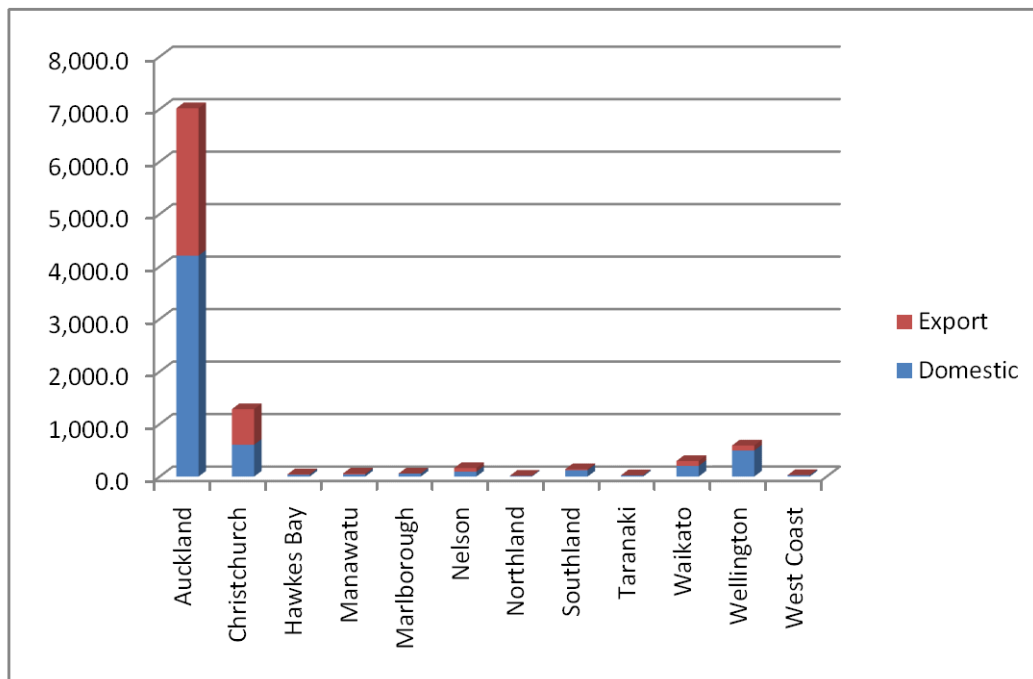
Regional aviation industry activity was analysed by apportioning revenue across 12 geographic regions. Apportionment was calculated sector by sector on the basis of the organisations within each region using data on their activities and the number of staff together with industry-wide data from interviewees, industry associations and secondary data sources such as Statistics NZ. Because data could not generally be split where companies had operations in more than one region, it was necessary to allocate all company revenue to the region where the company had its headquarters.

While the methodology has some limitations it was considered the best available given the difficulties associated with solely using the regional location of aviation industry employees as a proxy for allocating revenue. The key difficulty with this approach was the variability in the average revenue per employee across the sectors, as reflected in Table 5 above. It is possible this method caused activity to be overstated or understated across regions, particularly given all revenue was allocated to the region where each company was headquartered, but the total amount for the aviation industry remained unchanged.

As seen in Table 6 below, the Auckland region had by far the largest number of aviation organisations – 263 – and, with revenue of \$7,028 million, was the source of approximately 72% of the revenue for the industry. Auckland included organisations located at the Auckland and the Ardmore airports, as well as the smaller airports in the area. The Christchurch region was the next largest at \$1,284 million.

Table 6: Revenue by Region				
Region	Organisation Count	Total Revenue*	Domestic*	Export*
Auckland	263	7,017.5	4,209.3	2,808.2
Christchurch	112	1,285.7	607.4	678.3
Hawkes Bay	49	44.6	37.5	7.1
Manawatu	45	57.9	42.6	15.3
Marlborough	20	58.5	58.0	0.5
Nelson	66	163.6	94.0	69.6
Northland	43	14.8	13.8	1.0
Southland	104	142.2	122.1	20.1
Taranaki	26	23.7	23.2	0.5
Waikato	158	297.6	203.7	93.9
Wellington	95	592.5	497.0	95.5
West Coast	<u>24</u>	<u>28.4</u>	<u>27.5</u>	<u>0.9</u>
Total	1005	9,726.9	5,936.1	3,790.8

* All dollars are in millions NZD. Primary data is latest available financial year; secondary data is FY 2008



* All dollars are in millions NZD

Figure 7: Domestic vs Export Revenue by Region

The Airline Operator, Airport and Fuel Sectors were the predominant source of revenue in every region. For most other sectors, it was interesting to note that the export revenue was greater than the domestic revenue. A detailed presentation of revenue by region, broken down by sector and sub-sector, can be found in Appendix E.

C. Limitations

In some cases, it was not possible to analyse selected sub-sectors of interest. For example, in the Airport-Infrastructure Sub-sector, it was not possible to separate airport fit outs from services. Organisations were unable to report this information separately or there was no clear primary source of revenue on this basis.

In other cases there were insufficient numbers of organisations within a sub-sector or geographic region to permit analysis. Confidentiality concerns caused some sub-sectors to be combined with others. For example, there were very few organisations whose primary source of revenue came from cabin interiors, interior fit outs and engine overhauls. In addition, there were many organisations in the MRO sector who engaged in these activities as a portion of their overall business. Therefore these three sectors were combined into MRO. However, since cabin interiors, interior fit outs and engine overhauls are a growing source of export revenue, where possible the qualitative data was analysed regarding the relative financial health or the potential for growth.

The sparseness of data became very apparent in the analysis of domestic or export revenue by sector, sub-sector and region. In those cases where there were too few organisations to permit analysis, that data was incorporated into the next most logical fit for sector or region.

D. Classification questions

During the interviews, questions arose regarding which organisations fall within the aviation industry and which ones fall in other industries. This project took a conservative approach so as to not overstate the size of the industry. Some specific questions are addressed below.

1. Criteria for inclusion in the aviation industry

Organisations were included when their primary source of revenue came from aviation activities. Organisations who derived some revenue from aviation work but whose primary source were other industries were only included in this analysis if the amount of revenue was significant (such as, more than \$10 million) and could be clearly separated from other industry sources. For example, the analysis did not include revenue from several well-known manufacturers of parts, since it was difficult for those organisations to identify the revenue that came only from their aviation customers. On the other hand, the analysis did include aviation fuel, as refiners and suppliers clearly identify aviation fuels as a separate source of revenue.

If an organisation derived some but not a large amount of revenue from supplying products or services to the aviation industry, that revenue was captured by way of economic impact and flow on effects. For example the parts manufacturers that were excluded in the above example would have their revenue included in the economic impact multipliers as aviation industry activity.

2. Interrelation of sectors

The sectors and sub-sectors in the aviation industry that create demand are Operator, Defence, and to some degree, Training (that is, the training of non-professional pilots). It could be argued that all other sectors exist in support of the activities of the demand-creating sectors. However, this view does not take into account the significant export revenue from the other sectors, nor that the other sectors would not exist independently of the overall aviation industry, or at least not to the same extent. Where a narrower definition of demand-creating sector would be useful for decision-making, a revised estimate of revenue can be derived from the Sector Analyses in Appendix D.

3. International vs. Export

Some activities which involve the provision of goods and services internationally cannot properly be regarded as exports. A good example is the international Airline revenue derived from New Zealand residents travelling overseas. Care has been taken to ensure that such activity has been allocated to domestic revenue.

4. Classification of airline passenger business

Commercial airline passengers travel to and within New Zealand for a combination of business, personal and tourism reasons. This project decided that, no matter the reason for this travel, the revenue derived from this activity was part of the aviation industry and included in the Airline Sub-sector provided the operator concerned had a substantive base of operations in New Zealand. As a consequence data for Foreign Air Operators Certificate airlines was excluded. Note that for analysis of the broader New Zealand economy as a whole, care would need to be taken to ensure tourism related aviation was not double counted.

5. Airline cargo

Cargo activity was split between operators of cargo and the logistics required to support the cargo operations. As a result, the Logistics Sub-sector might appear understated, as cargo activity conducted by the major airlines was captured in the Airline Sub-sector.

6. Defence

The largest component of aviation activities of a defence nature came from the Royal New Zealand Air Force (RNZAF). It could be argued that the majority of the financial elements of the RNZAF are not specific to aircraft or aviation. This project chose to include only those elements of RNZAF that were not counted elsewhere and were specific to purchase, maintenance and operation of the aircraft. All other RNZAF activities were excluded.

V. Industry Analysis

Analyses were conducted of each sector to understand past growth drivers, current situation and potential for growth. Summaries are presented in Appendix D.

A. Aviation Industry – 2005

When considering how the New Zealand aviation industry is likely to develop over the next five years it is relevant to consider its development over the preceding five years.

Table 7: Aviation Industry - Estimated Revenue 2005 - 2009					
Year	2005	2006	2007	2008	2009
- Domestic	3,985	4,246	4,692	5,221	5,936
- Export	2,770	3,075	3,397	3,939	3,791
Total	6,755	7,321	8,089	9,160	9,727

* All dollars are in millions NZD.

The aviation industry grew from a total of \$6.8 billion in 2005 to a total of \$9.7 billion in 2009. This represented a growth rate of 9.5% per annum over the four year period. Table 7 reflects an increase over the period in the proportion exports comprise as a percentage of total revenue. In 2009 exports were calculated at 39% of total revenue. The market sectors are set out in Table 3 above.

These figures were derived from Statistics NZ industry data plus additional economic data obtained from a wide range of other sources. In order to prepare the above data picture of the aviation industry in 2005 (and in subsequent years), calculation of the current industry size based on FY 2009 data at \$9.7 billion was taken as a starting position. This took into consideration a number of economic activities which were not included in the Statistics NZ data.

Then, taking into account sector by sector specific data points provided by primary and secondary data sources (including the Statistics NZ data), revenue was estimated for 2005 onwards. An example of where specific data points were taken account, there is evidence of very significant growth in the manufacturing and repair of aircraft in the mid to later part of the 2005-2009 period (in 2008 this revenue increased by 32% over 2007).

Table 8 below sets out key Statistics NZ data on the New Zealand aviation industry for the period 2005 through to 2008 (2009 data is not available until October 2010). For confidentiality reasons, only partial data was available for the 2006 and 2007 years and some interpolation was therefore required. However the resulting data was considered to be relatively accurate because the data subset for which full information was available represented approximately 87% of estimated total revenue.

Table 8: Aviation Industry Growth 2005 to 2008 - Statistics NZ Data

Year	2005	2006	2007	2008
Revenue (\$ millions)	5,532.7	5,996.2	6,459.7	7,315.0
<i>year on year growth rate</i>		8.4%	7.7%	13.2%
Salaries & Wages (\$ millions)	1,052.2	1,220.7	1,235.5	1,272.7
<i>year on year growth rate</i>		16.0%	1.2%	3.0%
No of Employees	15,088	15,347	15,085	16,011
<i>year on year growth rate</i>		1.7%	-1.7%	6.1%
Average Revenue per Employee	366,700	390,708	428,209	456,861
<i>year on year growth rate</i>		6.5%	9.6%	6.7%
Average Wage / Salary	69,738	79,541	81,903	79,489
<i>year on year growth rate</i>		14.1%	3.0%	-2.9%

Data was sourced from Statistics NZ Annual Enterprise Survey from 2005 through to 2008 (the latest available data). Full data was available for 2005 and 2008 however, for confidentiality reasons, only partial data was available for 2006 and 2007. This required some interpolation however the resulting data is considered reasonably accurate given the available data is estimated to cover approximately 87% of the total.

A further limitation of the Statistics NZ data was that a number of significant economic activities, which were directly driven by the aviation industry, were excluded. These included the supply of aviation fuel, currently estimated to exceed \$1.3 billion per annum, and other activities such as airport infrastructure construction and consultancy, software and aviation related industries such as sheet metal working where supply was not solely for the aviation industry. The Statistics NZ data also did not provide a split between export and domestic revenues.

Despite these limitations the Statistics NZ data is based on a comprehensive data collection methodology and therefore is considered very reliable. The data indicated increased productivity as employee numbers were static through 2005 to 2007, despite revenue increases, and finally grew in 2008 at just half the rate of increase in revenue. Productivity during this period increased, with average revenue per employee growing from \$366,700 to \$456,861.

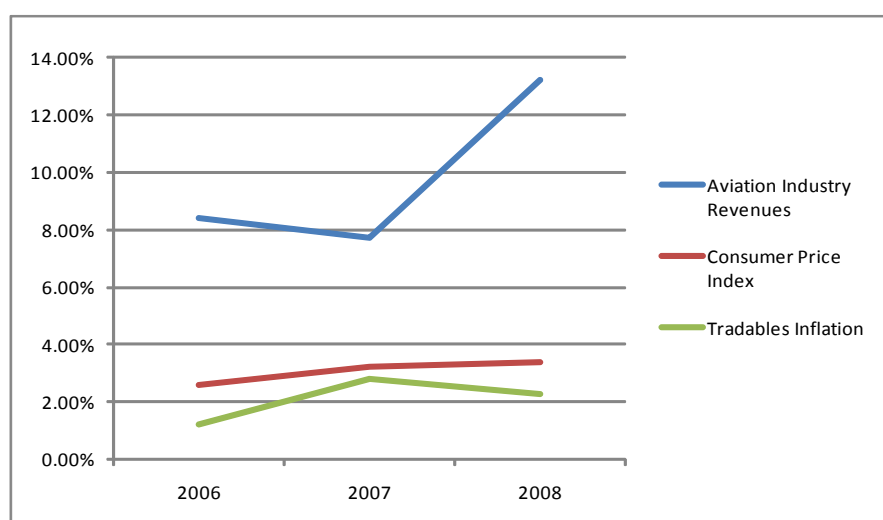


Figure 8: Year on Year % Growth in Aviation Revenue vs Inflation Measures

The data show that revenue grew from \$5.5 billion in 2005 to \$7.3 billion in 2008 with year-on-year revenue percentage increases ranging from 7.7% to 13.2% per annum. While this data was not inflation adjusted, Figure 8 above clearly indicates the level of growth was well above the rate of inflation.

B. Previous Industry Estimates

Independent work prior to this project estimated the size of the New Zealand aviation industry in 2007 at \$2 billion, with \$800 million in export revenue. Based on the size of the industry today, (\$9.7 billion with exports of \$3.8 billion), there is clearly a difference in the basis for the numbers. It is likely that the prior estimate did not consider all of the sectors and sub-sectors that form part of the current estimate. In addition, the current estimate had the advantage of access to financial reports and primary interview data that most likely the prior estimators were not able to obtain.

A concern that has been expressed is that sale of large aircraft by an operator such as Air New Zealand might have artificially inflated the revenue figures for the industry. This is not likely to have occurred, given the strict conditions imposed by accounting revenue recognition rules. Those rules mandate that when an asset such as an aircraft is sold, only the difference between the sale price and the book value can be classified as revenue. For example, if Air New Zealand sold a Boeing 747 for \$105 million, and the book value was \$100 million, then only the difference, i.e. a profit on sale of \$5 million, would be taken to revenue.

C. Past Growth Impediments or Constraints

The aviation industry is impacted by global economic conditions perhaps more than other industries. It is generally considered that the aviation industry leads into a down economy and lags a rising economy. A significant part of the demand for the industry comes from travel & tourism, which are more deeply affected by economic conditions than other sources of demand.

Interviewees mentioned a number of times that the lack of financing has had a significant negative effect on their ability to grow the company, introduce a new product or expand into a new market.

Bilateral Agreements are absolutely key to success across a number of sectors. This includes general trade agreements as well as agreements and updates with the FAA and EASA. For a number of companies, ITAR issues have been a challenge. Although some companies have been successful working on their own through and around the lack of a specific agreement, this is clearly an area where industry seeks more government involvement and support.

D. Key Sectors that Produced Growth

Industry growth during this period, despite the difficult global economy, was driven mostly organically through expansion of exports, creation of products from intellectual property, and addition of new products and services to existing businesses.

Organisations from several sectors began new export initiatives during this period. In particular, MRO companies invested in facilities and expansion of services. This allowed some of them to weather the global recession and be better positioned for future growth.

The Aircraft Parts Sector grew through supplying the growing MRO Sector, and growth will track MRO growth to a large degree. However, organisations in this sector also had opportunities to increase their exports, as more industry parts were purchased directly via the Internet.

Of significance since 2005 is that Air New Zealand took several of their divisions and established them as separate corporate entities. This enabled each division to establish its own identity and pursue business external to Air New Zealand (while continuing to support the parent company as a supplier). Altitude is an example where the independent organisation has established an

international reputation in the aircraft cabin interior fit out market that is allowing it to win significant export business. While still at an early stage, this has great growth potential.

VI. Future Growth

A. Growth Projections

Conservatively, the aviation industry is forecast to grow to \$12.6 billion by 2015, while more optimistic assumptions place the estimate at \$15.0 billion by 2015. Growth projections by sector and sub-sector are summarised in Table 9, with details in Table 10 and Table 11 further below.

Table 9: Forecast Revenue Summary 2015					
	Current Revenue	Conservative Forecast	% Annual Growth	Optimistic Forecast	% Annual Growth
Domestic	5,936.2	7,481.0	4.7%	8,790.8	8.2%
Export	<u>3,790.8</u>	<u>5,138.6</u>	6.3%	<u>6,179.3</u>	10.3%
Grand Total	9,727.1	12,619.6	5.3%	14,970.1	9.0%

* All dollars are in millions NZD

Using estimates for the Asia Pacific region published by Boeing¹ and by International Air Transport Association² (IATA), a conservative rate of 5% and an optimistic rate of 7% growth was used for calculation. That base rate was increased or decreased as a result of:

- projections by individual organisations, particularly where the organisations explained their strategies to achieve significant increases or their reasons to expect significant decreases;
- identified current market opportunities combined with appropriate competitive strengths of New Zealand or certain New Zealand operators;
- the potential impact of anticipated regulatory, legal or market circumstances, e.g. signing up to the Capetown Convention, is expected to allow some New Zealand organisations to compete offshore when previously they could not because they could not get financing for aircraft used outside of New Zealand; and
- identified markets where conditions are particularly tight and may constrain growth below that rate; e.g., the agricultural operators.

The specific assumptions for each sector are described in the sector tables in Appendix D.

¹ Boeing Current Market Outlook 2009-2028, The Boeing Company

² The International Air Transport Association (IATA) forecast global capacity to increase by 4%, and Asia Pacific capacity to increase by 7.3%. For purposes of this report, a conservative rate of 5% and an optimistic rate of 7% were chosen.

Table 10: Conservative Forecast Revenue Growth 2015, by Sector & Sub-sector

Sector & Sub-Sector	Total Forecast Revenue*		Domestic*		Export*	
	Conservative	% p.a. growth	Conservative	% p.a. growth	Conservative	% p.a. growth
AIRCRAFT DESIGN & MANUFACTURE	76.8	8.7%	17.4	5.1%	59.4	10.0%
AIRCRAFT PARTS						
Parts Comp Supplies	322.0	8.1%	111.3	5.0%	210.7	10.0%
Avionics Comms	<u>30.6</u>	8.9%	<u>6.4</u>	5.1%	<u>24.2</u>	10.0%
	352.6	8.2%	117.7	5.0%	234.9	10.0%
AIRPORT						
Operations	765.8	5.0%	765.8	5.0%	0.0	0.0%
Infrastructure	<u>510.1</u>	6.8%	<u>308.1</u>	5.0%	<u>202.0</u>	10.0%
	1,275.9	5.7%	1,073.9	5.0%	202.0	10.0%
AVIATION SERVICES						
Government & Defence	252.2	2.1%	220.4	0.9%	31.8	14.3%
Non-government Services	<u>713.4</u>	9.9%	<u>249.1</u>	4.0%	<u>464.3</u>	14.1%
	965.6	7.5%	469.5	2.5%	496.1	14.1%
MISCELLANEOUS						
Fuel	1,698.2	5.0%	808.9	5.0%	889.3	5.0%
Logistics	<u>168.2</u>	8.4%	<u>100.4</u>	5.0%	<u>67.8</u>	15.0%
	1,866.4	5.3%	909.3	5.0%	957.1	5.6%
MRO						
Airline	649.1	5.0%	259.6	5.0%	389.5	5.0%
GA Fixed Wing	87.9	3.3%	73.6	3.0%	14.3	5.0%
GA Rotary Wing	<u>26.5</u>	5.0%	<u>22.5</u>	5.0%	<u>4.0</u>	5.1%
	763.5	4.8%	355.7	4.6%	407.8	5.0%
OPERATOR						
Airline	6,586.0	5.0%	3,947.0	5.0%	2,639.0	5.0%
GA Commercial	658.5	4.1%	540.4	4.0%	118.1	4.8%
GA Private	<u>1.0</u>	0.0%	<u>1.0</u>	0.0%	<u>0.0</u>	0.0%
	7,245.5	4.9%	4,488.4	4.9%	2,757.1	5.0%
TRAINING	73.3	6.5%	49.1	5.0%	24.2	10.0%
GRAND TOTAL	12,619.6	5.3%	7,481.0	4.7%	5,138.6	6.3%

* All dollars are in millions NZD

Table 11: Optimistic Forecast Revenue Growth 2015, by Sector & Sub-sector

Sector & Sub-Sector	Total Forecast Revenue*		Domestic*		Export*	
	Optimistic	% p.a. growth	Optimistic	% p.a. growth	Optimistic	% p.a. growth
AIRCRAFT DESIGN & MANUFACTURE	146.1	23.7%	21.9	10.0%	124.2	27.5%
AIRCRAFT PARTS						
Parts Comp Supplies	436.8	14.9%	111.3	5.0%	325.5	20.0%
Avionics Comms	<u>43.7</u>	16.9%	<u>6.4</u>	5.1%	<u>37.3</u>	20.0%
	480.5	15.1%	117.7	5.0%	362.8	20.0%
AIRPORT						
Operations	966.3	10.0%	966.3	10.0%	0.0	0.0%
Infrastructure	<u>1,171.5</u>	26.1%	<u>788.8</u>	26.7%	<u>382.7</u>	25.0%
	2,137.8	17.2%	1,755.1	15.8%	382.7	25.0%
AVIATION SERVICES						
Government & Defence	268.2	3.4%	220.4	0.9%	47.8	24.0%
Non-government Services	<u>860.3</u>	14.1%	<u>286.7</u>	6.9%	<u>573.6</u>	19.0%
	1,128.5	10.9%	507.1	4.0%	621.4	19.4%
MISCELLANEOUS						
Fuel	1,866.2	7.0%	888.9	7.0%	977.3	7.0%
Logistics	<u>229.5</u>	15.3%	<u>126.7</u>	10.0%	<u>102.8</u>	25.0%
	2,095.7	7.7%	1,015.6	7.3%	1,080.1	8.1%
MRO						
Airline	751.1	8.1%	259.6	5.0%	491.5	10.0%
GA Fixed Wing	103.5	6.7%	81.0	5.0%	22.5	15.0%
GA Rotary Wing	<u>28.8</u>	6.8%	<u>22.5</u>	5.0%	<u>6.3</u>	15.1%
	883.4	7.9%	363.1	5.0%	520.3	10.2%
OPERATOR						
Airline	7,237.6	7.0%	4,337.5	7.0%	2,900.1	7.0%
GA Commercial	754.7	7.0%	622.7	7.0%	132.0	7.1%
GA Private	<u>1.0</u>	0.0%	<u>1.0</u>	0.0%	<u>0.0</u>	0.0%
	7,993.3	7.0%	4,961.2	7.0%	3,032.1	7.0%
TRAINING	104.8	14.4%	49.1	5.0%	55.7	30.0%
GRAND TOTAL	14,970.1	9.0%	8,790.8	8.2%	6,179.3	10.3%

* All dollars are in millions NZD

B. Key Themes

During the interviews, a number of broad themes emerged from across the entire industry related to constraints on, limitations to and opportunities to facilitate growth. These are summarised below:

1. Investment

Investors are now very risk averse with limited venture capital funds available. This situation is likely to continue for the next 5 years. Government and the aviation industry need to find a way to get organisations started and grown to the point where larger investors are willing to participate. Ways must be found to minimise risk in these organisations so that they are more attractive to investors.

2. Potential Loss of Innovative Businesses

Access to capital has been particularly challenging in New Zealand. Many aviation businesses with innovative products and strong growth potential have been unable to take advantage of business opportunities. This situation may require businesses to move their operations offshore in order to obtain the necessary capital. Some of these organisations have international reputations and frequently receive unsolicited purchase offers and inducements from local and state governments to move offshore. Note that this issue, as well as investment above, is not unique to the aviation industry.

3. Government Support Agencies

At times national and regional funding and development strategies from government support agencies are not aligned. In some cases there has been conflicting aims or duplication of effort. Funding is not always transparent and there is no overall post-implementation review. The development of a governance structure that has oversight of the aviation industry's priorities and ensures that these mesh with government strategic direction and funding is required.

At times the lack of a united "New Zealand Inc." approach denies the opportunity for smaller businesses to become involved in significant export ventures. Partnerships with a "Brand New Zealand" focus with government agency support would allow these organisations to co-operate rather than compete with each other.

There is a lack of awareness in some sections of industry of the marketing and other support options available from Government. To some degree this is matched by a reluctance of the support agencies to engage with organisations in an early development phase.

4. Central Government

Businesses are impacted by the requirements of multiple layers of regulation. This presents an opportunity for national and local government to focus on facilitating approval processes and providing a 'whole of government' approach.

The current trend from government is for less and better regulation. Whilst there is support and encouragement for this trend, this view runs counter to the aviation industry's best interests with the current limitations to NZCAA rule development. Unlike many other industries, in some cases aviation industry members require regulation to enable their business.

The government, financial and business environment at times constrains and does not encourage high performing industry to stay in New Zealand. The introduction of ETS (Emissions Trading Scheme) as from the 1st July 2010 and the difficulties obtaining venture capital are examples.

New Zealand's infrastructure can be better utilized. There are partnering opportunities for the use of government assets by private industry and the current government has signalled its intention to have more PPP's (Public Private Partnerships).

5. NZCAA

More can be done to achieve Mutual Recognition or Government to Government agreements. Growth in some areas, such as MRO and Design Organisation approval of STCs, is constrained through lack of mutual recognition of other countries' regulatory approvals. Pursuit of agreements will open significant opportunity for the aviation industry.

Some sectors see NZCAA as a bureaucracy that is not engaged with industry. Additionally they see that there is a risk of erosion of the New Zealand regulatory environment that has been an advantage in the past. Other sectors rely on the credibility and technical expertise of the NZCAA and leverage off international bilateral agreements for export opportunities.

Rule development is required to keep up with technology demands and ICAO standards. Financial resources and capability limit the ability of the NZCAA to complete this work. Lack of appropriate legislation limits opportunity for the aviation industry.

6. Labour

There appear to be no labour constraints at this time. Prior to the global recession, there were shortages in many parts of the industry (aircraft engineering, assembly, pilots, instructors, etc.). The recession has enabled industry to recruit staff from within New Zealand with the skills, experience and knowledge required.

However, the memories and lessons learnt as the result of strong growth some two to three years ago should not be forgotten. Worldwide economic recovery combined with pursuit of market opportunities may cause these shortages to reoccur.

There is an opportunity to improve the way that industry attracts, selects and trains the next generation of aviation industry personnel. Industry has raised issues and perceptions that will need attention to enable future growth.

C. Categories to Facilitate Growth

Many opportunities identified by industry fall into the three following categories:

- **“Brand New Zealand”**: There is an opportunity to further develop the marketing image of New Zealand's aviation industry. This should leverage the intellectual property, systems, software, products and services of New Zealand organisations that are operating around the globe offering such diverse products as: expertise in airport design and infrastructure; space launch capability; aircraft manufacture and design; airline operations and management; MRO operation and management; instrument procedure design; calibration of nav aids; worldwide geophysical survey; and aviation training in all forms. Development of this image is required with implied standards, excellence and value of product. The establishment of Aviation New Zealand began the process of establishing a strong aviation brand, and it is suggested that stronger linkages to the overall New Zealand brand would bring greater benefits to the industry in attracting international business.
- **“Academy New Zealand”**: The business model and brand needs definition and support from industry and government. The proposed organisation would use resources from Air New Zealand, RNZAF and other training providers. Qualities of excellence, high standards and value are key. This model would allow New Zealand capacity and capability to be harnessed and offers significant export opportunities, subject to international licensing approvals. Under current arrangements the students, employers and training organisations are constrained by a policy framework that dates back to 2003 when funding arrangements for tertiary institutions were frozen and fees capped. As a result most of New Zealand's training organisations are under severe financial pressure.

- **“Weightless Exports”** and “using our brains not our bodies” should be the approach from the New Zealand aviation industry to increase opportunities for export sales. New Zealand is an incubator for good ideas and is a good testing ground for new products. Examples include Rocket Lab, Altitude Aerospace, and Right Hemisphere.

D. Significant Opportunities

The following opportunities are considered to have the greatest potential for growth. To achieve the more optimistic growth projections, support for and investment in these opportunities are likely to have the greatest impact.

1. MRO

There is spare capacity and capability for MRO and other facilities without a requirement for capital expenditure. The introduction of new technology fleets is expected to reduce maintenance requirements by up to 25%, releasing further capacity for export work. Alignment with an OEM creates opportunities for avionics sales and repairs and engine overhaul. A number of airlines in the Asia-Pacific region are increasing their fleet size, thereby increasing regional opportunities for New Zealand to capture the MRO work.

2. Space Industry

New Zealand-based Rocket Lab provides access to space that is inexpensive and reliable. The market in the United States and other countries has significant growth potential. Rocket Lab provides an entire rocket launch system whereas other launch facilities require clients to liaise with many agencies, adding complexity and cost. The freedom of airspace in New Zealand is a significant competitive advantage.

3. Helicopter Operations

New Zealand organisations have a reputation for a high level of expertise and skill. The high growth worldwide in oil and gas support is an opportunity to apply these capabilities. The increased capability and sophistication of modern helicopters has increased the demand for operators, such as those in New Zealand, with the expertise and safety record to operate in rugged locations performing work as diverse as fire suppression, seismic recording, filming and agricultural spray.

4. Design & Manufacture

New Zealand expertise and capability could be used to develop and produce new technology based aircraft designs. For example, a new aircraft for the top-dressing industry is expected to address a domestic need and create an export opportunity (China is a potential market). Light Sport Aircraft (LSA) is a growing market worldwide which New Zealand has the necessary capabilities to exploit. New Zealand aircraft designers have a number of innovative designs to meet the demand from diverse general aviation markets.

5. Wind Tunnel Testing Facility

It is apparent that there is potential for such a facility in New Zealand. An analysis of the market in 2009 indicated that there is a large unmet demand for testing time in a high quality wind tunnel. The highest quality best instrumented wind tunnels around the world are fully booked for years in advance. A feasibility study is required to fully quantify the demand, costs and pay back.

6. Business Transformation

Organisations can enter new markets with creative transformation of their business and market approach. One example is an organisation that services non-flight-critical cabin equipment that has

developed mobile asset tracking software systems. Another example is the change of a traditional agricultural top-dressing organisation into a rapidly expanding global geophysical survey operation. Fire fighting and insect control present additional opportunities.

7. The New Zealand Vintage Aircraft Industry

New Zealand has an international reputation for making quality products. The Vintage Aviator has created the right environment for people to re-learn the skills required to build vintage aircraft using modern techniques. New Zealand now has the capability to build any vintage aircraft. A “New Zealand Inc.” approach that connects the component parts of the industry will enable success.

8. Titanium

There is increasing worldwide demand for titanium to make light weight aircraft parts. New Zealand’s ability to produce titanium powders targeted for specific niche applications is a significant competitive advantage.

9. Airport Infrastructure

Offshore demand exists for New Zealand companies providing a range of goods and services relating to airport infrastructure. This includes airport design, navigation aids, instrument approach procedure design, automated ground handling equipment, signage, consulting and management services. New Zealand companies have innovative products and services to meet these needs, and many airports worldwide are looking to upgrade their technology with these types of products.

E. Policy Recommendations

Several of these recommendations are the result of the themes identified from the interviews and described above. This section provides a brief recap in the form of a recommendation.

- **National and Regional Funding and Strategy Alignment:** This will ensure that there is a sense of national purpose in the delivery of funding and that regional and national investments complement each other.
- **Venture Capital Availability:** The government and the aviation industry should investigate funding mechanisms for organisations that are lacking in capital for R & D or marketing.
- **The Regulator (NZCAA):** There have been calls from industry for NZCAA to have a commercial focus in addition to its safety role. It is unusual for an aviation regulator to have a function other than safety and it is suggested that the duty of care and commercial focus for industry should belong with the Ministry of Transport. A modest investment to overcome regulatory issues that are barriers to market development and that reduce cost to industry would likely provide a good return for New Zealand
- **Progress Free Trade and Bilateral Negotiations:** Increase opportunities available for New Zealand organisations by further development of Free Trade agreements, bilateral arrangements and mutual recognition. Any ability for New Zealand industry to develop opportunities on the back of Air Service Agreements should be thoroughly investigated.
- **ITAR (International Trade and Arms Regulation):** If New Zealand were a signatory to this treaty it would facilitate global equipment sales.

VII. Refresh the 2015 Growth Plan

The New Zealand Aviation Industry Capability & Issues Review (“Peet Report”), published in February 2007, identified New Zealand capabilities and constraints, analysed aviation market value and opportunity, and provided recommendations for an overall aviation strategy.

This project supports the findings in the Peet Report that priority should be given to markets where: a) competition, regulatory and other barriers to entry are relatively low; b) prospects for joint venturing are reasonably high; c) there is a proven or developing demand; and d) synergies exist with New Zealand conditions.

The Peet Report identified some significant initiatives to pursue, and there have been some successes as a result. AIA further developed the strategies that were proposed, and formed Aviation New Zealand as a subsidiary to focus on international export opportunities. Aviation New Zealand has been instrumental in coordinating collaborative efforts among New Zealand companies to pursue international opportunities, and in promoting New Zealand capabilities to international prospects. The Peet Report identified international pilot training market, specifically end-to-end airline pilot training, as a high growth market. Aviation New Zealand worked with a consortium of New Zealand training organisations, with the result that at least one contract has been secured and others are in process.

The Peet Report also recommended pursuing the engineering & MRO market, where there was international demand for engineering capability. A further examination identified large aircraft interior fitout as a target market; the result is that Altitude has successfully secured interior fitout contracts and has significant prospects for more.

To grow the New Zealand aviation industry and achieve the optimistic 2015 growth targets, the near term milestones in Table 12 are suggested. Industry engagement is essential at the beginning of these processes, to select and drive the commercial opportunities with government support.

Table 12: Suggested Near Term Milestones

Branding and Marketing	Target	Who
Deepen the current "Aviation NZ" brand by building in other unique NZ attributes, particularly innovation, safety and our pioneering spirit.	Sep-10	Aviation NZ
Develop a plan to increase the use of this brand by "approved" member organizations who can leverage it for export and offshore opportunities through licensing.	Jan-11	Aviation NZ
NZ Companies underestimate the maturity and high regard that the NZ aviation industry is held in, and need to step up and be more aggressive. The industry organisations may consider supporting marketing training, collateral or even a marketing service.	Oct-10	Aviation NZ
Deepen the collaboration between NZ companies so that international clients can be secured and locked in with more holistic broad offering. Aviation New Zealand has some successes in leading collaborative efforts, and could expand in additional areas, possibly using a secure internet site for members to canvas other for support by posting gaps in their offerings and establishing a blueprint for structuring collaborative efforts.	Dec-10	Aviation NZ
Market Analysis		
Identify global aviation mega trends, and focus investment on highly unique and differentiated opportunities, which will provide better margins. Two example trends are the fuel efficiency sustainability area, which is likely to dominate the aviation industry in the next decade and which may be addressed by new technologies, products or services using titanium and composites, niche special purpose platforms ranging from micro-lights to small personal jets to address lack of infrastructure in emerging economies, and pilot training to address significant global shortages.	Sep-10	Aviation NZ & NZTE
Increase surveillance of market opportunities to build light aircraft in NZ, utilising NZ's many free trade agreements, and bi-lateral treaties for mutual recognition of aviation standards. An example is to partner with Chinese investors where they can build in China for the China market, but lack the connections and approvals to build aircraft for other global markets.	Ongoing with quarterly analysis	Aviation NZ & NZTE
Increase the focus on China, India, Russia and Brazil as the power economies of the future. Without exception, each market has infrastructural gaps which NZ companies can exploit, and possibly dominate if there is a coordinated approach.	Ongoing with quarterly analysis	Aviation NZ & NZTE
Policy		
A "whole of Government" focus is required to align strategies, remove roadblocks, and provide better resourcing to key organisations including NZ CAA, and NZTE. The industry needs to establish a working committee with Government agencies at senior levels to support the industry holistically.	Oct-10	AIA and Govt
Improving Capability and Capacity		
There are many examples where a NZ firm has a commercial relationship with an OEM offshore. These large OEM's often have technology gaps or needs which could be supplied from other NZ companies without threatening the original NZ-OEM relationship. These opportunities will require the goodwill of the NZ Companies, but could potentially be brokered by Aviation NZ	Dec-10	Aviation NZ
Many NZ aviation companies lack capital to expand and grow. Consideration to forming an international capital aviation fund, or to creating a commercialisation entity that takes ideas and commercialises them in return for equity.	Dec-11	AIA/AIC and Investment NZ

VIII. Economic Impact

It is well understood that economic activity in one sector will have consequent economic impacts on a range of other sectors, both upstream and downstream, because that sector will have suppliers of goods and services and customers of its own. These impacts then flow on through other sectors. The extent of these impacts will depend on the nature of the activities and the resulting linkages with other sectors.

Multipliers are a means of assessing the economic benefits of such activity and can be used to calculate:

- the additional revenue generated upstream and downstream by additional economic activity; and
- the extent of revenue at risk if the economic activity should cease.

One option for the calculation of multipliers is the use of input/output models, which seek to simulate economic reality. They are based on accounting tables which trace the linkages and the level of purchases and sales between sectors. These models yield multipliers which can be used to calculate the total direct, indirect and induced effects on jobs, income and output.

Dr. Warren Hughes, Honorary Fellow in Economics from the Waikato School of Management at the University of Waikato, was commissioned to use his model to calculate the multipliers applicable to the aviation industry. His study calculated total impacts, after allowing for direct impacts plus all flow-ons, for several aircraft related sectors as shown in the table below:

Table 13: TOTAL IMPACTS OF AIRCRAFT RELATED ACTIVITY ON THE NZ ECONOMY, YEAR END 2009

AIRCRAFT RELATED ACTIVITY	Revenue or Output \$ m	Net Household Income \$ m	Employment Persons	GDP or Value Added \$ m
Aircraft Manufacture & Servicing	3,406.6	649.1	16,882	1,543.6
Air Passenger & Cargo Services	20,535.5	2,647.5	72,952	8,624.3
Airport Operations & Support	5,808.1	537.3	14,824	2,557.4
Pilot Training	237.7	53.0	2,023	133.0
Total Impacts from Aircraft Activity	29,987.9	3,886.9	106,681	12,858.3
NZ Totals for year ended December 2009	254,061.3	73,993.7	1,919,295*	185,548.9
Percentage Impacts for Aircraft Activity	11.8%	5.3%	5.6%	6.9%

*As at February 2009

The aggregate impacts over all four aircraft related sectors average 7.4% over the four economic impacts. The most important of these being that for GDP with aircraft related activity as defined in the report accounting for 6.9% of NZ's GDP in the year to December 2009. The direct and indirect impacts of the New Zealand aviation industry together have been calculated at 11.8% of total revenue across the New Zealand economy for the same period. Further details of the methodology and results are in Appendix F.

While input/output models have limitations, they are founded on a basis of measured activity and therefore can be considered as being an objective and reasonably reliable basis for producing multipliers. An alternative and more traditionally employed approach is to estimate appropriate multipliers. This approach has an advantage over input/output models in that the multipliers can be based on an understanding of the particular current market dynamics applying to the sector concerned. In contrast, input/output models use the linkages determined at a particular point in time to calculate multipliers (which in the case of the model used by Dr. Hughes, is understood to be 2004). However estimated multipliers should be used with caution as they are difficult to develop and to verify. For these reasons it is necessary to take a conservative approach to ensure the impacts are not overstated.

In addition to the general impacts on professional services, finance, property, utilities, wholesale trade and the very significant level of trade within the sector, the aviation industry has particular impacts on a number of other sectors:

- the Aircraft Design & Manufacture Sector impacts on engineering and other technical services, sheet metal industries, IT technology and services;
- the Aircraft Parts Sector impacts on other transport modes, IT technology and services, technical supplies, metals supply and processing;
- the Airport Sector significantly impacts on other transport, construction, retail, tourism sectors, technology and technological services;
- in the Aviation Services Sector the Non-government Sub-sector (which includes aircraft sales, consulting, finance, insurance, software, space, security and umbrella organisations) impacts on IT technology and services, recruitment, professional services, technical services, other technology providers;
- the Miscellaneous Sector (fuel and logistics) impacts on other transport modes, technical services, IT technology and services;
- the MRO Sector (which includes maintenance, repair, overhaul, cabin interiors, engine overhauls and interior fitouts for Airlines and GA Commercial and GA Private (fixed wing and rotary) aircraft) impacts on engineering and other technical services, IT technology and services;
- the Operator Sector – Airlines and GA Commercial and GA Private have very significant impacts on other transport modes, tourism, horticulture, media services and agriculture, such as the top-dressing industry impact on the agricultural sector; and
- the Training Sector – Airline, GA and Engineering Training has particular impacts at the regional economy level on local suppliers.

In establishing a multiplier for the aviation industry, consideration was given to where the total aviation industry revenues estimated in 2009 at \$9.7 billion were 'spent'. The greater the proportion of revenue which remained within New Zealand, the greater the economic impact would be. The high level calculation was that as much as 75% of this revenue remained within or was repatriated to New Zealand. Further assumptions then needed to be made about the flow-on effects of that spending within New Zealand. It was also necessary to take into account the fact that some activities which would ordinarily be accounted for by multipliers (such as aviation fuel purchases) were treated as direct aviation industry activities in this report.

Based on analysis of the above factors, the appropriate multiplier was calculated at 2.52 times. This calculation, which was considered to be conservative, meant that for every \$1.00 of aviation industry revenue the combined upstream and downstream impacts would result in a total further \$1.52 of revenue arising. Using these multipliers, the estimated 2009 revenue had an additional economic impact of \$14.8 billion, for a total direct and indirect impact of \$24.5 billion. The forecast 2015 revenue would be expected to have an additional economic impact of \$22.8 billion, for a total direct and indirect impact of \$37.7 billion.

Table 14: Aviation Industry Economic Impact			
Multiplier: 2.52 times			
	Multiplier	2009	2015
Estimated / Forecast Revenue*	1.00	9,727.0	14,970.1
Additional Economic Impact*	<u>1.52</u>	<u>14,785.0</u>	<u>22,754.6</u>
Total Direct & Indirect Economic Impact	2.52	24,512.0	37,724.7

* All dollars are in millions NZD.

Finally, a further factor to be considered in addition to the economic impacts is that the aviation industry can be seen as a significant enabler of commerce in general and in particular of high-value sectors such as tourism, agriculture and horticulture. For example, the extent of the disruption and dislocation caused by recent volcanic activity in Iceland provides a good measure of the economic significance of the aviation industry as a whole.

Appendix A: Abbreviations and Acronyms

AIA	Aviation Industry Association	ICAO	International Civil Aviation Organisation
AIC	Aviation Industry Cluster	IP	Intellectual Property
Airways	Airways Corporation	ITAR	International Trade and Arms Regulation
Altitude	Altitude Aerospace Interiors Ltd	LSA	Light Sport Aircraft
ANZA	Australia New Zealand Aviation Mutual Recognition Agreement	Met	Meteorological Service
ANZSIC 06	Australia New Zealand Industry Classification 2006	MRO	Maintenance, Repair & Overhaul
ATPL	Airline Transport Pilot Licence	NZ	New Zealand
Avgas	General Aviation gasoline	NZCAA	Civil Aviation Authority (New Zealand)
CASA	Civil Aviation Safety Authority (Australia)	NZD	New Zealand dollar
CPL	Commercial Pilot Licence	NZTE	New Zealand Trade & Enterprise
CTC	CTC Aviation Training Limited	OEM	Original Equipment Manufacturer
DER	Designated Engineering Representative (United States)	PPP	Public Private Partnership
EASA	European Aviation Safety Authority (European Union)	RNZAF	Royal New Zealand Air Force
EMS	Emergency Medical Services	R & D	Research & Development
EFTS	Equivalent Full-time Student	Stats NZ	Statistics New Zealand
ETS	Emission Trading Scheme	STC	Supplemental Type Certificate
EU	European Union	TEC	Tertiary Education Commission
FAA	Federal Aviation Administration (United States)	UAE	United Arab Emirates
FTE	Full Time Equivalent	UAV	Unmanned Aerial Vehicle
GA	General Aviation	US	United States
IATA	International Air Transport Association	USD	United States dollar

Appendix B: Data Sources

Primary Data Sources

AEL Engineering Services Limited	Hawkes Bay Aviation Ltd
Aviation Industry Association	Helicopters (NZ) Ltd
Air BP	Independent Signs Ltd
Air Fiordland Limited	Investment New Zealand
Air New Zealand Ltd	JMI Aerospace Ltd
Airports Association	John Jones
Airways Corporation of New Zealand Limited	John Sinclair
Airwork (NZ) Limited	Kiwi Air Limited
Astral Ltd	Mainfreight International Ltd
Aviation Industry Cluster	Marlborough Helicopters Ltd
Aviation New Zealand	Martin Aircraft Company Limited
Aviation Security Service (AvSec)	Massey University
Board of Airline Representatives (NZ) (BARNZ)	Metal Tech Engineering
Boston Marks Group (Avsure)	Nelson Marlborough Institute of Technology
Canterbury Aero Club (Inc)	New Zealand Civil Aviation Authority (NZCAA)
Customs Brokers & Freight Forwarders Federation (NZ) (CBAFF)	New Zealand Parachute Industry Association Ltd
Christchurch Engine Centre (CEC)	New Zealand Refining Company Ltd
CTC Aviation Training (NZ) Ltd	Northland Aviation Ltd
Dave Bamfield	Pacific Aerospace Limited
Des Ashton	Radiola Aerospace Limited
Don McCracken	Redfort Group Limited
Eagle-I Airline Planning	Rishworth Aviation Limited
Farmers Air Ltd	Rocket Lab Limited
Fieldair Engineering Ltd	Royal New Zealand Aero Club
Flight Cell International Ltd	Royal New Zealand Air Force (Ohakea)
Flight Interiors Limited	Sounds Air Travel and Tourism Ltd
Flight Structures Ltd	Spider Tracks Limited
Gallagher Industries	Super Air Ltd
Glidepath Limited	Tasman Cargo Airline (DHL)
Gliding New Zealand Inc	UDC Finance
Hawker Pacific NZ Ltd	Vincent Aviation Ltd

Secondary Data and Industry Information Sources

Airbus Global Market Forecast 2009 – 2028

Annual Enterprise Survey 2008, Statistics NZ

Boeing Current Market Outlook 2009 – 2028

MRO in New Zealand (Aviation New Zealand), Knotridge Limited, January 2009

New Zealand Aviation Data Review, Centre for Air Transport Research, 22 December 2009

New Zealand Aviation Industry Capability & Issues Review, Peet Aviation, February 2007

Top of the South Aviation Strategy Report 2010, Nelson/Marlborough/Tasman REDA

New Zealand Wind Tunnel Pre-Feasibility Study, Knotridge Limited, August 2009

Aviation Industry Association (AIA) (www.aia.org.nz)

Aviation New Zealand (www.aviationnz.co.nz)

Centre for Aviation (www.centreforaviation.com)

Customs Brokers & Freight Forwarders Federation (NZ) (CBAFF) (www.cbaff.org.nz)

Meat & Wool New Zealand (www.meatnz.co.nz)

Flight Stats (www.flightstats.com)

International Air Transport Association (IATA) (www.iata.org)

New Zealand Agricultural Aviation Association (NZAAA) - A Division of the Aviation Industry Association (www.nzaaa.co.nz)

New Zealand Airports Association (www.nzairports.co.nz)

New Zealand Department of Labour (www.dol.govt.nz)

New Zealand Wings Directory (<http://www.wingsdirectory.com>)

New Zealand Civil Aviation Authority (NZCAA) (www.caa.govt.nz)

Statistics New Zealand (www.stats.govt.nz)

For some of the sources listed above, special data requests were made in addition to data and reports published by the organisations.

Additional sources of data were:

Individual organisation web sites

Public company financial reports

Appendix C: Detailed Description of the Methodology

The methodology focused on sourcing a broad range of data across all New Zealand aviation industry sectors, sub-sectors and regions. This broad approach was necessitated by the fragmented and incomplete nature of the available data on the industry.

Data sources, methodology and analyses were carefully documented such that future studies can use the same methodology to produce comparable results. Details of how each step was to be conducted were reviewed with NZTE as part of the work plan. The result is a high level of confidence in the accuracy and validity of the final datasets.

Knotridge worked closely with NZTE and other government agencies, industry associations, research organisations, and importantly, the producers and providers in the New Zealand aviation industry. The methodology incorporated a review of all relevant research and economic data currently available, combined with data from industry groups and private research (“secondary research”). Careful analysis and cross referencing of this data was used as a basis for further enquiries and interviews with leaders knowledgeable in each sector of the industry (“primary research”).

While there were limitations on both primary and secondary research, each was of significant value when used in conjunction with the other. Secondary data was generally broadly sourced, either across whole populations or in carefully defined statistically significant sample sizes; impartially collected by data collection experts; based on standardised methodology; and available (in most instances) in time series.

A. Data Collection Phase

Comprehensively mapping the New Zealand aviation industry required the collection and careful analysis of primary data from aviation industry participants as well as secondary data from organisations such as Statistics New Zealand and the Department of Labour.

The first step entailed building a comprehensive database of businesses and organisations that contribute to the aviation industry. The list currently has more than 1,000 entries. Each organisation was tagged by sector, sub-sector and region. Sources of information included NZCAA, AIA, AIC, Aviation New Zealand, Wings Directory and individuals in the aviation industry.

The data collection phase involved two principle approaches:

- Primary Research: detailed in-person and phone based interviews of approximately an hour in duration with key aviation industry participants identified from the database.
- Secondary Research: on-line data extraction and commissioned data extracts from NZCAA, Statistics New Zealand and the Department of Labour. Data and reports from other organisations were also collected and referenced and incorporated as appropriate.

1. Primary Research

The research had two goals: 1) collect quantitative data directly from organisations to validate secondary data and to fill in gaps in the secondary data and 2) provide qualitative information and insight. Over 1,000 potential organisations and individuals were identified for primary research. Careful selection from this list for interview in person or by phone was based on:

- significance to the sector(s) and sub-sector(s) and the geographical regions in which they operate;
- ensuring a representative and meaningful sample at the sectoral and regional levels ;
- likelihood of significant growth in the next 5 years, as identified by preliminary research and discussions with NZTE and industry;
- representing the views of a number of industry participants;

- whether organisation activities include aviation industry research, analysis or data collection; and
- ensuring as broad a cross-section of industry input as possible within the project scope.

The interview solicited executive views of their business drivers, current and future trends that do or could affect their business, innovation in technology and services, regulation, opportunities, risks and constraints.

After commencing the project two additional means of primary data capture were employed:

- Aviation Industry Association sent out the questionnaire to its members using its on-line survey tool. A 3% response rate was achieved, which is comparable to the response rate typically obtained in on-line surveys; and
- Targeted approaches to 8 selected industry experts.

The number of 'main' interviews was expanded from 35 to 64 in order to obtain adequate industry coverage. The range of quantitative data sought was expanded to include cost structures, earnings and key balance sheet items. Capturing this data enabled a high level analysis of earnings, return on investment, financial leverage, etc., and was used to validate future growth capability and stability of the sector or sub-sector.

Primary research provided greater granularity at the sector, sub-sector and regional level; was more current; and was highly pertinent to key facets of the study. For example, data provided by industry participants when discussing areas of future growth or barriers to growth contributed significantly to the analysis and preparation of Deliverables 2 and 3.

2. Secondary Research

Secondary data was collected on the workforce and businesses participating in the New Zealand aviation industry; domestic and international economic conditions; and the aviation industry internationally. Secondary data capture included revenue, export and domestic sales, EBITDA, number of employees, salaries and wages, and R&D spend. Data was assessed on a regional basis, broken down into sector and sub-sector.

Secondary data sources included:

- Statistics New Zealand, Department of Labour, other government departments (economic development, tourism, treasury, research science and technology, transport);
- statutory bodies such as NZCAA;
- industry associations relevant to aviation such as AIA, AIC and Aviation New Zealand;
- major airlines operating in and out of New Zealand;
- international aviation bodies and consultancies; and
- recent industry related reports and articles to reference regional and international trends, drivers, constraints and opportunities.

B. Analysis Phase

The second phase involved cross-referencing and validation of data and, where definitive data was lacking, to use the available data to provide informed estimates. This data was compiled to provide a data map of the New Zealand aviation industry by sector, sub-sector and region.

Data from multiple sources were connected and cross referenced to deliver a higher level of confidence in the accuracy as well as the reach across sectors and regions.

Two separate approaches were used to analyse the upstream and downstream economic impacts of activity in the aviation industry in New Zealand. One approach was the application of simple

multipliers based on work of a similar nature. The second approach used a robust economic model based on the 112 Industry Sectors.

C. Limitations

A number of challenges were identified prior to project commencement, and other areas became apparent as the work progressed. Key issues arising were:

- collecting sufficient data to provide an adequate basis for establishing figures at the sector and sub-sector level;
- comparing primary data with other datasets because they related to different time periods or were compiled on different bases, or data was incomplete or based on estimates;
- collecting data at the regional level was challenging because of the difficulty in obtaining sufficient information, even where respondents were willing to assist. The regionalisation of data was limited to allocating data on the basis of the regional aviation employment data. This approach had some accuracy limitations but provided a broad measure; and
- obtaining a high level of response to requests for data was challenging and time consuming, however satisfactory levels were achieved for analysis purposes.

Statistics New Zealand and the Department of Labour were key data sources. The available datasets (on their own) fell short of meeting the information requirements. Key reasons for this were:

- the aviation market sectors and sub-sectors specified in order to provide an appropriate level of detail for the Project do not match the Australia New Zealand Industry Classification 2006 (ANZSIC 06, the classification standard for most data capture);
- only 3 out of the 500 ANZSIC 06 industry classifications are unique to aviation;
- in the case of the 'Air and Space Transport' classification, data was not made available because the small number of organisations would breach confidentiality rules;
- many Statistics New Zealand datasets do not provide regional breakdowns;
- a number of relevant industry classifications are not unique to aviation, e.g. 'Technical and Vocational Education and Training' includes pilot training; and
- a number of organisations are active across a number of industries, including aviation. Data is not available on the extent to which they are involved in aviation.

To optimise the value across all datasets, and to address the limitations, the methodology included:

- collection and analysis of secondary datasets at an early stage in the project, identifying key gaps and uncertainties so that primary research could capture this key data;
- cross-referencing among secondary datasets, e.g., registration data obtained from CAA on the New Zealand aircraft fleet provided a comparative measure for other data on industry revenue and cost structure, allowing an orders-of-magnitude check and enabling estimation of sub-groups;
- cross-referencing between secondary and primary datasets, e.g., data from primary sources on revenue and staff levels allowed a good check on secondary industry data and filling of gaps which arose for confidentiality reasons; and
- cross referencing between primary sources, e.g., confidence in the estimates of the size of a sector or sub-sector from primary sources increased if interviewee estimates were broadly in accordance.

Appendix D: Summary Tables by Sector & Sub-sector

Sector : Aircraft Design & Manufacture		
Key Statistics (annual)		<i>All dollar amounts are NZ \$ millions</i>
Current Status	Statistic	Comment
Total Revenue	\$50.5	This sector includes: aircraft design, drafting and design consulting services; manufacture and assembly for single and multi engine; piston & gas turbine aircraft, microlights and non-powered aircraft.
Domestic Revenue	\$13.6	Design organisations exist at many manufacturers, MROs and producers of parts, components and supplies. This sector does not include the revenue from these organisations, as that revenue was not reported as a separate division. For example, revenue from Altitude and Air New Zealand design organisations are included in the MRO Sector. Given confidentiality concerns, it was not possible to report design or manufacturing as separate sub-sectors.
Export Revenue	\$36.9	Export revenues are predominant, representing over 70% of total revenue
Number of Organisations	25	Presently there are a relatively small number of organisations in the sector. Based on data drawn from the Wings Directory, AIA, NZCAA and other sources
Staff Employed (FTE's)	225	Based on information obtained directly from providers, from web based research and from Wings Directory.
Salaries & Wages	\$17.3	Based on information obtained from Statistics NZ
2015 Forecast		
Conservative Estimates		
Total Revenue	\$76.8	
Domestic Revenue	\$17.4	Estimated growth to track general industry of 5% per annum.
'Export' Revenue	\$59.4	Exports represent significant growth opportunity. Estimated 10% per annum
Optimistic Estimates		
Total Revenue	\$146.1	
Domestic Revenue	\$21.9	Estimated potential growth of 10% per annum.
'Export' Revenue	\$124.2	Potential to grow at 15% per annum. 1 early stage microlight manufacturer has forecast very large growth; this forecast has been significantly discounted for this calculation, but still accounts for a large percentage of the total.
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Aircraft Design & Manufacture	
Key Activities Issues & Opportunities	
Area	Description
Key Services	<p>Design companies provide engineering consulting and design services. Design approval services originate with delegated approval authority from the Director of Civil Aviation.</p> <p>The sector includes companies that manufacture and assemble general aviation aircraft including single engine, multi-engine, microlights, helicopters, gyrocopters, gliders, balloons, etc.</p>
Key Markets	<p>Design: Historically NZ has been the primary market. In the last two years there has been significant growth from Australia, the US and Europe.</p> <p>Manufacture: Approximately 50% of aircraft manufactured are sold in NZ. Other major markets include South Africa, Papua New Guinea, Australia, and Southeast Asia.</p>
Key Opportunities	<p>Market for aircraft modifications and upgrades is growing & maturing. There is significant potential for more export sales especially in Indonesia and the Philippines.</p> <p>Certification can be done in NZ for approximately 2/3 of the cost in the US or Europe, and is supported by bilateral agreements with US & the EU. There are over 20 new aircraft designs with large niche markets that could be developed and manufactured in NZ.</p> <p>China and India are increasing their demand for general aviation aircraft. NZ-China relations represent fewer barriers to entry for NZ manufacturers. China is potential market for agricultural aircraft, which is NZ's heritage and strength. Defence outside NZ represents a large opportunity.</p>
Key Challenges	<p>An on-going challenge is recruitment, training and experience levels of design & engineering staff. Capital is scarce to promote development of new designs and growth. Lack of harmonisation between regulatory authorities causes unnecessary complication and additional cost for certification of NZ STC's on US type certificates. Could resolve by extending the US and EU bilaterals to all STCs. Today NZ companies hire a US Designated Engineering Representative (DER) or partner with a DER firm in the US in order to export designs and STCs.</p> <p>As companies grow and penetrate off-shore markets (especially the US), there is a greater risk of litigation. This requires the high annual expense associated with product liability insurance.</p>
Regional Distribution	90% of companies are located in Auckland, Hamilton or Christchurch.
Summary	<p>Aircraft design companies have matured and are landing bigger deals. This is driven by building a reputation with successful, profitable outcomes for the customer. The market has followed and grown from the maturation of the design organisations, rather than the other way around.</p> <p>Aircraft manufacturing is small but has significant potential. International regulation is both an enabler and a barrier to growth. The industry is significantly constrained by the lack of capital.</p>

Sector : Aircraft Parts

Key Statistics (annual) *All dollar amounts are NZ \$ millions*

Current Status	Statistic	Comment
Total Revenue - Parts Components Supplies - Avionics Communications - Total	\$218.0 <u>\$20.0</u> \$238.0	This sector includes the supply to the aviation industry of: - parts, components and supplies (including fabrication and assembly) - avionics, communications and related products & services. A manufacturer which derives the bulk of its revenue from avionics or communications equipment will have that revenue reflected in the Avionics Communications Sub-sector (e.g., SpiderTracks, Flight Cell, TracPlus)
Domestic Revenue - Parts Components Supplies - Avionics Communications - Total	\$87.2 <u>\$5.0</u> \$92.2	Parts are primarily provided by MRO organisations which import and install the products. There are however some domestically based parts manufacturers as well as NZ agents for major OEM parts. An increasing trend, particularly in the case of avionics / communications equipment, is the direct sourcing of products from offshore via the internet
'Export' Revenue - Parts Components Supplies - Avionics Communications - Total	\$130.8 <u>\$15.0</u> \$145.8	Export parts revenue is driven primarily by the major MRO facilities operating within NZ
Number of Organisations - Parts Components Supplies - Avionics Communications - Total	70 <u>15</u> 85	Based on data drawn from the Wings Directory, AIA, NZCAA and other sources
Staff Employed (FTE's)	813	Based on information obtained directly from providers, from web based research and from Wings Directory.
Salaries & Wages	\$39.20	Based on information obtained from Statistics NZ
2015 Forecast		
Conservative Estimates		
Total Revenue - Parts Components Supplies - Avionics Communications - Total	\$322.0 <u>\$30.6</u> \$352.6	
Domestic Revenue - Parts Components Supplies - Avionics Communications - Total	\$111.3 <u>\$6.4</u> \$117.7	Estimated 5% per annum growth, tracking the overall industry.
'Export' Revenue - Parts Components Supplies - Avionics Communications - Total	\$210.65 <u>\$24.2</u> \$234.81	Most growth in this sector to come from exports. Estimated 10% per annum.

Aircraft Parts Sector (continued)

Optimistic Estimates		
Total Revenue		
- Parts Components Supplies	\$436.8	
- Avionics Communications	<u>\$480.5</u>	
- Total	\$917.3	
Domestic Revenue		
- Parts Components Supplies	\$111.3	Estimated 5% per annum growth, tracking the overall industry.
- Avionics Communications	<u>\$6.4</u>	
- Total	\$117.7	
'Export' Revenue		
- Parts Components Supplies	\$325.5	Most growth in this sector to come from exports. Estimated 20% per annum.
- Avionics Communications	<u>\$37.3</u>	
- Total	\$362.8	
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Aircraft Parts	
Key Activities Issues & Opportunities	
Area	Description
Key Services	This sector involves the supply of parts, components, rotatable supplies and avionics, communications and related products & services to the aviation industry. It includes the supply of composites and specialist materials and the manufacture of parts to the manufacturing sector.
Key Markets	NZ and Asia Pacific are the key markets for the supply of parts to MRO and manufacturing organisations. A NZ parts manufacturer supplies high quality tooling and support equipment for MRO and manufacturers in the UK, Germany and Singapore.
Key Opportunities	<p>Generally the growth in this sector is a result of the growth in the MRO and Manufacturing sectors. However, some organisations are developing niche markets in the supply of avionics that have global applications for communications, tracking and navigation. Sales of product to the US military hold significant promise for the future.</p> <p>The manufacture of parts, tooling and support equipment to extremely high standards by one organisation in this sector has been recognised by its international customers. In conjunction with the probable future involvement in a NZ titanium industry, this organisation has strong potential for growth. The technologies developed in NZ to produce titanium powder to customer specifications open up significant potential export opportunities for materials to manufacture high quality, high margin aviation grade parts.</p>
Key Challenges	ITAR (International Trade and Arms Regulation) limits the ability of NZ companies to source products with ITAR prohibited technology out of the US. If NZ was a signatory to this treaty it would facilitate military equipment sales to and from the US and other worldwide military forces. Note that NZ is not a signatory to ITAR but Australia is.

	<p>Traditional parts supply through OEM distributors has changed. There is a trend of NZ owners and MRO to use distributors in the US and the EU and to import parts and avionics via the internet.</p> <p>There are new sources of competition from suppliers of off-shore parts organisations whose business in their traditional markets has been depressed. These suppliers have recently moved into NZ and are perceived to be doing well.</p>
Regional Distribution	Parts organisations are distributed throughout the country, with many MRO organisations having parts organisations within their business.
Summary	Generally domestic demand does not match the capability of this industry sector, in that organisations could do more work without additional investment in plant and equipment. By aligning MRO effort and working together to focus on off-shore opportunities, there is significant potential for the sector to be successful exporting offshore in Asia.

Sector : Airports

Key Statistics (annual)

All dollar amounts are NZ \$ Millions

Current Status	Statistic	Comment
Total Revenue - Operations - Infrastructure & Services - Total	\$600.0 <u>\$366.8</u> \$966.8	Based on analysis of the annual reports and information provided by the companies. Revenue for the top 3 airports accounted for 93% of this: Auckland \$369m, Wellington \$96m and Christchurch \$90m. The next largest airport was Queenstown at \$11m.
Domestic Revenue - Operations - Infrastructure & Services - Total	\$600.0 <u>\$241.4</u> \$841.8	A key component of the Infrastructure & Services Sub-sector is major capital works, primarily runway and terminal developments. The Airports Association indicates infrastructure projects totaling approx. \$900m are under action or consideration by NZ airports. To date \$400m of this is committed, with the majority of these commencing in 2010. Estimates are based on the available data on capex and on repairs and maintenance within NZ.
'Export' Revenue - Operations - Infrastructure & Services - Total	\$ 0.0 <u>\$125.4</u> \$125.4	Data from interviews and secondary sources indicates that exports come from signage, security systems, navigational aids, baggage handling systems and other fitout activities.
Number of Airports	27 sched 71 non-sched	Data obtained from airport and related websites.
Number of Organisations - Operations - Infrastructure & Services - Total	98 <u>7</u> 105	Based on data drawn from annual reports, airport web sites, the Wings Directory, AIA, NZCAA and other sources.
Staff Employed (FTE's) - Operations - Infrastructure & Services - Total	903 <u>250</u> 1153	Auckland, Wellington and Christchurch airports alone directly employ 555 staff. Total staff was calculated based on annual reports and data drawn from the Wings Directory, AIA, NZCAA and other sources.
Salaries & Wages	\$73.8	Employee expenses are available for the major airports. For all others, data was used from Statistics NZ
Passenger Numbers	28,345,326	Based on data provided by the Airports Association total passengers in the 2009 calendar year were: Domestic 18,547,106 <u>International 9,798,220</u> Total 28,345,326
Aircraft Movements	717,197	Data on aircraft movements was available for the larger airports but not for the smaller. Using Blenheim airport as a proxy for smaller regional airports aircraft movements have been estimated.

Airports Sector (continued)

2015 Forecast		
Conservative Estimates		
Total Revenue		
- Operations	\$765.8	
- Infrastructure & Services	<u>\$510.0</u>	
- Total	\$1,275.8	
Domestic Revenue		
- Operations	\$765.8	5% per annum growth mirrors overall airline growth & growth in tourism. Assumes infrastructure projects continue at current levels.
- Infrastructure & Services	<u>\$308.1</u>	
- Total	\$1,064.9	
'Export' Revenue		
- Operations	\$ 0.0	Export of expertise and IP increases growth rate to 10% per annum
- Infrastructure & Services	<u>\$202.0</u>	
- Total	\$202.0	
Optimistic Estimates		
Total Revenue		
- Operations	\$966.3	
- Infrastructure & Services	<u>\$1,170.8</u>	
- Total	\$2,137.1	
Domestic Revenue		
- Operations	\$966.3	Tourism and industry growth rate higher than forecast (10% per annum), and most infrastructure projects under consideration are funded and commenced.
- Infrastructure & Services	<u>\$788.8</u>	
- Total	\$1,755.1	
'Export' Revenue		
- Operations	\$ 0.0	Export of expertise and IP increases growth rate to 25% per annum
- Infrastructure & Services	<u>\$382.7</u>	
- Total	\$382.7	
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Airports Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	The Airport Sector is divided into the Operators Sub-sector which operate the airports and the Infrastructure & Services Sub-sector. The latter includes runway and terminal development, signage, security systems, navigational aids, baggage handling systems and other fit out activities
Key Markets	The Operators Sub-sector is domestically based however the Infrastructure & Services Sub-sector is estimated to earn approximately one third of its revenue off-shore.

Key Opportunities	<p>Increases in tourism will drive passenger growth. Queenstown for example has had 20% growth year on year dramatically exceeding expectations.</p> <p>Online websites now provide mechanisms for airlines and airports to negotiate alliances. Airports are now more competitive and talk directly to the airlines seeking to attract additional operators to their airport, either through contract pricing or a joint ventures.</p>
Key Challenges	<p>As from October 2008 the aircraft and freight activities, airfield activities and specified passenger terminal activities of Auckland, Wellington and Christchurch airports have been subject to information disclosure regulation under the Commerce Act. This has given rise to uncertainty regarding future return on investment should intervention by the Commerce Commission result in development not progressing.</p> <p>Airport runway capacity and other infrastructure may limit taking advantage of potential growth opportunities. There is sensitivity to environmental issues - food miles, holidays closer to home; airports are thinking more about their environmental footprint. Airport noise and urban creep may pose limitations on airport development.</p>
Regional Distribution	<p>Airports with both domestic and international capability are spread relatively evenly throughout NZ. It is noteworthy that Auckland airport has almost 50% of the total passenger volume and that Christchurch and Wellington between them have a 40% share. The remaining 10% is shared between other regional airports.</p>
Summary	<p>Airports are now maturing as competitive businesses and are seeking to have more control over their individual organisation activities. They are working with Airways and airlines to ensure that the requirements of airlines are met with regard to the levels of service and capacity.</p> <p>Airports are now entering a phase where they are looking outward for opportunities, the purchase, operation and management of off-shore airports being an example. Airports are seeking to use IP gained in the course of the managing airports in other business ventures that are not necessarily in the aviation industry sector.</p> <p>The importance of airports as hubs of economic activity is illustrated by the note in Auckland Airports FY09 Annual Report that while it had approximately 300 staff the airport area had approximately 12,000 staff.</p>

Sector : Aviation Services

Key Statistics (annual)

All dollar amounts are NZ \$ millions

Current Status	Statistic	Comment
Total Revenue - Government & Defence - Non-government Services - Total	\$227.0 <u>\$445.2</u> \$672.2	The sector is comprised of two sub-sectors: Government & Defence comprised of: air traffic control, meteorological services, NZTE, defence, regulatory and government. Non-government Services comprised of: aircraft sales, consultants, finance, insurance, legal, security, software, umbrella organisations, space and other. <u>Consulting</u> consists of small and large companies with wide-ranging services, whose revenue is derived from consulting engineering, airport planning, management and business support. <u>Finance</u> is based on the source of funding for aircraft. Non-aircraft lending is excluded, as its impact is captured in the analysis of flow on effects. Air New Zealand banking, finance and insurance are excluded, as they are likely to be an off-shore purchase. <u>Aviation insurance</u> companies derive the bulk of their revenue from insuring aircraft. Data was gathered from primary interviews with insurers and from secondary sources. Revenue from aviation security products and services was derived from primary interviews plus passenger data. <u>Software</u> companies develop and sell products in a wide range of aviation Sub-sectors, both domestically and internationally. While space is a small component of revenue today, it has the potential to grow rapidly based on global demand.
Domestic Revenue - Government & Defence - Non-government Services - Total	\$210.7 <u>\$205.1</u> \$415.8	Key components of domestic aviation spending in this sector are air traffic control, aviation security and regulatory services. Defence spending directly on aviation services was included only for those areas where that data was not captured elsewhere as revenue. This included education & training, repairs & maintenance and purchased services.
'Export' Revenue - Government & Defence - Non-government Services - Total	\$16.3 <u>\$240.1</u> \$256.4	A key contributor to export revenues is the provision of consulting services.
Number of Organisations - Government & Defence - Non-government Services - Total	12 <u>141</u> 153	Based on data drawn from the Wings Directory, AIA, NZCAA and other sources
Staff Employed (FTE's)	2,216	Based on information obtained directly from providers, from web based research and from Wings Directory.
Salaries & Wages	\$144.0	Based on information obtained from Statistics NZ

Aviation Services (continued)

2015 Forecast		
Conservative Estimates		
Total Revenue		
- Government & Defence	\$252.2	
- Non-government Services	<u>\$713.4</u>	
- Total	\$965.6	
Domestic Revenue		
- Government & Defence	\$220.4	Minimal to flat growth in government & defence. Aircraft sales, legal, finance, umbrella organisations assumed flat. The rest are estimated 5% per annum growth.
- Non-government Services	<u>\$249.1</u>	
- Total	\$469.5	
'Export' Revenue		
- Government & Defence	\$31.8	Growth opportunities for export of government & defence organization exports. Space significant forecasted revenue included as reported by RocketLabs. Other key sub-sectors estimated from flat to 10% per annum growth based on company forecasts, except software is estimated at 15% per annum in export.
- Non-government Services	<u>\$464.3</u>	
- Total	\$496.1	
Optimistic Estimates		
Total Revenue		
- Government & Defence	\$268.2	
- Non-government Services	<u>\$859.8</u>	
- Total	\$1,128.0	
Domestic Revenue		
- Government & Defence	\$220.4	Minimal to flat growth in government & defence. 5% to 10% per annum forecast for the key sub-sectors.
- Non-government Services	<u>\$286.7</u>	
- Total	\$507.1	
'Export' Revenue		
- Government & Defence	\$47.8	Growth opportunities for export of government & defence organization exports. Space significant forecasted revenue included as reported by RocketLabs. Aircraft sales 5% per annum. legal, umbrella assumed flat. Other key sub-sectors estimated at 5% to 15% per annum, based on organisation forecasts and industry trends. Software is estimated at 35% per annum in export.
- Non-government Services	<u>\$573.6</u>	
- Total	\$621.4	
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Aviation Services Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	<p>This sector is comprised of two sub-sectors.</p> <p>Government & Defence: this includes CAA, Avsec, Airways, Met Service, defence and other Government activity.</p> <p>Non –Government Services: this includes insurance and aviation consulting services which make the largest revenue contribution. The sub-sector also includes a broad spectrum of organisations who provide services to or for the aviation industry, including, software, financial and legal services. The sub-sector also includes aircraft sales and the space industry.</p> <p>Significant services and influence, but not revenue, are provided by a large number of umbrella organisations. This sub-sector includes museums, publishing & media companies, photographers, pilot accessories and shops, and others which contribute a small amount of revenue.</p>
Key Markets	<p>Consulting services are provided globally by NZ based firms. Aircraft sales and insurance have a substantial off-shore component. Most of the other services within the Non-Government Services Sub-sector have a NZ focus. The exception is the space industry. While it is a young industry, its focus is almost all off-shore with clients in the US, Australia, Spain and UAE along with potential opportunities beyond those.</p>
Key Opportunities	<p>In the Government Sub-sector, Airways has off-shore commercial activities with strong growth potential for yield management software and training supplied to the FAA and other air traffic control providers. Software development companies such as Right Hemisphere have significant export earnings and are an example of how NZ organisations leverage their intellectual property.</p> <p>Rocket Lab is the only rocket launch service in the southern hemisphere. This organisation’s technical competence and leadership in the development of a viable NZ space industry demonstrates the excellence required for “Brand New Zealand.”</p>
Key Challenges	<p>Availability of financing/capital.</p>
Regional Distribution	<p>Most of the larger organisations are in Auckland and Wellington, with smaller concentrations in other major cities. There is a long list of smaller organisations in this sector, and they are distributed throughout the country.</p>
Summary	<p>This is a diverse sector with a large number of organisations. The vast majority of the non-governmental organisations are small. There are some significant opportunities for the “weightless exports” of services and intellectual property. Space represents a significant revenue growth opportunity.</p>

Sector : Miscellaneous		
Key Statistics (annual)		<i>All dollar amounts are NZ \$ Millions</i>
Current Status	Statistic	Comment
Total Revenue - Fuel - Logistics	\$1,330.6 <u>\$112.4</u> \$1,443.0	This sector combines two sub-sectors: Fuel and Logistics. Fuel relates primarily to Jet A1 fuel and to a much lesser extent AvGas. Logistics relates to revenues derived from the handling of goods which are shipped by air, with the exception of the cost of air freight itself. The air freight cost is captured in the Operator Sector.
Domestic Revenue - Fuel - Logistics	\$633.8 <u>\$78.7</u> \$712.5	The analysis of fuel revenues is based on data provided by the industry and logistics revenue is calculated on the basis of freight revenue data.
Export Revenue - Fuel - Logistics	\$696.8 <u>\$33.7</u> \$730.5	Fuel purchased in NZ for the purpose of international flights has been apportioned between export and domestic, taking into account international travel by NZ residents.
Number of Organisations	76	Based on data drawn from the Wings Directory, AIA, NZCAA and other sources.
Staff Employed (FTE's)	643	Based on information obtained directly from providers, from web based research and from Wings Directory.
Salaries & Wages	\$31.0	Based on information obtained from Statistics NZ.
2015 Forecast		
Conservative Estimates		
Total Revenue - Fuel - Logistics	\$1,698.2 <u>\$168.2</u> \$1,866.4	Note that fuel prices are very volatile, so forecasting revenue is difficult.
Domestic Revenue - Fuel - Logistics	\$808.9 <u>\$100.4</u> \$909.3	Domestic growth estimated at 5% per annum based on industry growth.
Export Revenue - Fuel - Logistics	\$889.3 <u>\$67.8</u> \$957.1	Fuel export growth rate of 5% per annum. Logistics export 15% per annum, based on low end of IATA data and forecasts and company forecasts & plans.

Miscellaneous Sector (continued)

Optimistic Estimates		
Total Revenue - Fuel - Logistics	\$1,866.2 <u>\$229.5</u> \$2,095.7	Note that fuel prices are very volatile, so forecasting revenue is difficult.
Domestic Revenue - Fuel - Logistics	\$888.9 <u>\$126.7</u> \$1,015.6	Fuel domestic growth estimated at 7% per annum based on optimistic industry growth. Logistics domestic growth estimated at 10% per annum based on industry growth + general growth in use of air freight.
Export Revenue - Fuel - Logistics	\$977.3 <u>\$102.8</u> \$1,080.1	Fuel export growth rate of 7% per annum. Logistics 25% per annum export, based on higher end of IATA data and forecasts and company forecasts and plans.
Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C		

Miscellaneous Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	This sector combines Fuel and Logistics. Revenue from sales of JetA1 fuel makes up the bulk of total sales, the balance being Avgas. Logistics relates to revenues derived from the consignment of freight, customs brokerage, dangerous goods packaging, and other activities completed by freight forwarders. Most freight forwarding organisations also use ground and sea freight services; in this study only the aviation component of this activity has been captured.
Key Markets	Fuel revenue is derived from sales within NZ to general aviation and to a mix of domestic and off-shore airlines. Logistics companies have significant export or off-shore revenue. Key markets are Australia, Asia and the US.
Key Opportunities	Fuel revenues are directly related to economic activity and international trends. NZ companies have been evaluating the production of JetA1 biofuel. There are good opportunities in international logistics focused on high end, high value logistics and asset management services.
Key Challenges	The risks and constraints to this sector are economic. Logistics revenues rely to a high degree on the available airline cargo capacity, which is the total available space on wide and narrow body passenger and pure freight aircraft. Dependant on economic conditions, operators change the gauge of equipment to raise load factors. A change from wide to narrow body passenger equipment reduces the ability to carry cargo, and may give opportunities for pure freight operators. Increasing fuel cost may impact on the frequency of flights and capacity. A

	reduced frequency may drive clients to seek other methods of transport, or to exit from production with consequent impact on cargo volumes and logistics revenue.
Regional Distribution	Most of the larger organisations are in Auckland and Wellington, with smaller concentrations in other major cities.
Summary	Fuel is a large sub-sector, with growth tied entirely to growth in operations. NZ is not a fuel exporter. Logistics represents a growing sub-sector, with export or off-shore opportunities available.

Sector : MRO

Key Statistics (annual)

All dollar amounts are NZ \$ Millions

Current Status	Statistic	Comment
Total Revenue	\$604.1	The MRO Sector is comprised of 3 sub-sectors: Airlines, GA Fixed Wing and GA Rotary. Included in the Airline Sub-sector are the activities of aircraft interior manufacture and fitout companies. Note also that the parts component of MRO activities has been separately calculated and shown in the Aircraft Parts Sector.
Export ¹ Revenue Only	\$319.5	The export segment of the MRO Sector is primarily driven by the Airlines Sub-sector
Airlines Sub-sector - Domestic - Export - Total	\$203.4 <u>\$305.2</u> \$508.6	Airlines MRO represent over 80% of total MRO activity.
GA Fixed Wing Sub-sector - Domestic - Export - Total	\$63.5 <u>\$11.2</u> \$74.7	MRO organisations which service both Fixed Wing and Rotary aircraft have been allocated to GA Fixed Wing. This may over-estimate this sub-sector.
GA Rotary Sub-sector - Domestic - Export - Total	\$17.6 <u>\$3.1</u> \$20.8	MRO organisations which service both Fixed Wing and Rotary aircraft have been allocated to GA Fixed Wing. This may under-estimate this sub-sector.
Number of Organisations	93	The number of MRO organisations is estimated based on data obtained from the Wings Directory, AIA and directly from industry participants.
Staff Employed (FTE's)	3302	FTE numbers have been prepared on the basis of information contained in the Wings Directory, supplied by AIA, sourced through online research or through interview with industry participants.
Salaries & Wages	\$254.0	Based on information obtained from Statistics NZ

MRO Sector (continued)

2015 Forecast		
Conservative Estimates		
Total Revenue	\$763.5	
Export ¹ Revenue Only	\$407.8	
Airlines Sub-sector		
- Domestic	\$259.6	5% per annum domestic- tracks closely to industry; 5% per annum export assumes small amount of additional growth - current trend.
- Export	<u>\$389.5</u>	
- Total	\$649.1	
GA Fixed Wing Sub-sector		
- Domestic		3% per annum domestic based on organisation forecasts.
- Export	\$73.6	
- Total	<u>\$14.3</u> \$87.9	
GA Rotary Sub-sector		
- Domestic	\$22.5	5% per annum domestic based on organisation forecasts.
- Export	<u>\$4.0</u>	
- Total	\$26.5	
Optimistic Estimates		
Total Revenue	\$883.4	
Export ¹ Revenue Only	\$520.3	
Airlines Sub-sector		
- Domestic	\$259.6	5% per annum domestic, 10% per annum export assuming wins of more export business accelerate the current trend.
- Export	<u>\$491.5</u>	
- Total	\$751.1	
GA Fixed Wing Sub-sector		
- Domestic	\$81.0	5% per annum domestic, 15% per annum export assuming wins of more export business
- Export	<u>\$22.5</u>	
- Total	\$103.5	
GA Rotary Sub-sector		
- Domestic	\$22.5	5% per annum domestic, 15% per annum export assuming wins of more export business
- Export	<u>\$6.3</u>	
- Total	\$28.8	
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

MRO Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	<p>Maintenance-Repair-Overhauls (MRO) Sector includes companies whose primary source of revenue is servicing or updating airframes, engines, avionics, components, mechanical, electrical or cabin interiors in any way. Many companies generate revenue from more than one aspect of this broad definition of MRO, and also generate revenue from other services such as parts supply, manufacture and air freight.</p> <p>Some companies do both rotary and fixed wing MRO, many are focused on just one or the other. Several of the smaller companies also do work in other industries – cars, trucks, marine, recreational vehicles – aviation is not their sole source of revenue.</p>
Key Markets	<p>The MRO Sector services two key geographic markets: Asia Pacific and NZ, with revenues split approximately equally between them. Air New Zealand is a customer and a competitor for many of the companies in this group – Air New Zealand’s Engineering Services is a primary player in this market.</p>
Key Opportunities	<p>Having made significant capital investment in facilities, companies are looking to increase utilisation and leverage their expertise. 24/7 operations could lower costs for airlines and be a growth market for smaller MRO providers. Low cost carriers contract out their work, which is an opportunity for independent MRO providers and Air New Zealand.</p> <p>Non flight-critical components: There is a large market and a significant base already in place in NZ. Overhaul and major assemblies is a large market with high margins. A niche opportunity is services for vintage aircraft restorations and replicas, where NZ has developed unique expertise.</p> <p>Interiors and Fit outs: airlines now change out and upgrade interiors more often. This trend is driven by higher standards, introduction of new technology and customer service/brand. Interior design and fit out projects often lead to collaboration across multiple NZ companies, so growth impact reaches farther than just the organisation getting the contract. Growth is expected to be highest in the VIP/Business jet category, more so than airline and general aviation aircraft.</p>

Key Challenges	<p>Capturing off-shore MRO contracts is more difficult because of location – either need to ferry the aircraft or ship the components to NZ, or the organisation needs facilities off-shore. Depends on the service for the former if it's worth it. For general aviation MRO, it is important to have a location that is close to the customer. Consolidation so that one organisation owns several locations might help margins.</p> <p>It is difficult to compete with labour costs in countries like China and India. However, NZ has an advantage with expertise and global reputation. There is some concern about availability of aviation related and specialised skilled labour, such as sheet metal work, hydraulics, or upholstery. Margins are getting tighter as labour costs go up, and there is less demand with the economic downturn.</p> <p>New technologies mean less maintenance less often.</p>
Regional Distribution	<p>Concentrations are in the major metropolitan areas (particularly Auckland and Christchurch), but MRO organisations are located all over the country wherever there are airports.</p>
Summary	<p>There are specific niche opportunities that present significant growth, particularly with exports. To capitalise on those requires an organisation of scale or significant collaboration among companies is required to achieve scale. This is a significant sector within the aviation industry. The continued success and profitability of these organisations is an important goal for the aviation industry and the NZ economy.</p>

Sector : Operator

Key Statistics (annual)

All dollar amounts are NZ \$ Millions

Current Status	Statistic	Comment
Total Revenue - Airline - GA Commercial - GA Private Total	\$5,160.3 \$537.6 <u>\$1.0</u> \$5,698.9	The sector is comprised of Airline, GA Commercial and GA Private Sub-sectors. These in turn incorporate a range of aviation activities including passenger and cargo services, agriculture, emergency services, and recreation. Total revenue including export revenues, is estimated at \$5.76 bn. Air New Zealand is a key contributor with \$4.1 bn in passenger and cargo revenue in 2009. Note that reported revenue only includes aircraft sales to the extent they differ from current book value. Data has been sourced from interviews, survey data, annual reports, web based research, industry experts and secondary data from sources such as Statistics NZ, Dept of Labour, NZCAA and industry organisations.
Domestic Revenue - Airline - GA Commercial - GA Private Total	\$3,092.6 \$444.0 <u>\$1.0</u> \$3,537.6	The Airline Sub-sector is predominant with the operations of Air New Zealand, Qantas, Jetstar and Pacific Blue contributing most significantly to this.
Export Revenue - Airline - GA Commercial - GA Private Total	\$2,067.7 \$93.6 <u>\$0.0</u> \$2,161.3	Export revenue includes the revenue from international passenger services; Air New Zealand's international passenger revenues constitute the majority of this. Revenue from flights to and from NZ by foreign owned airlines which do not have a substantive base in NZ have been excluded.
Aircraft Fleet - Commercial - Private Total	1,011 <u>3,424</u> 3,987	Based on NZCAA records of NZ registered aircraft. This includes the following categories: Aeroplane, Helicopter, Glider, Gyroplane, Balloon, Amateur Built Aeroplane, Amateur Built Helicopter, Amateur Built Glider and Microlight.
Sector Organisation Split - Airline - GA Commercial - GA Private Total	18 269 <u>97</u> 384	Based on data drawn from the Wings Directory, AIA, NZCAA and other sources
Employees - Airline - GA Commercial - GA Private Total	12,138 2,320 <u>15</u> 14,473	Based on information obtained directly from providers, from web based research and from Wings Directory it is estimated there are 12,715 staff across a range of occupations
Salaries & Wages	\$940.7	Based on information obtained from Statistics NZ

Operators Sector (continued)

2015 Forecast		
Conservative Estimates		
Total Revenue		
- Airline	\$6,586.0	
- GA Commercial	\$658.5	
- GA Private	<u>\$1.0</u>	
Total	\$7,245.5	
Domestic Revenue		
- Airline	\$3,947.0	5% per annum growth for airlines all sub-sector except Agriculture and GA Private.
- GA Commercial	\$540.4	
- GA Private	<u>\$1.0</u>	
Total	\$4,488.4	
'Export' Revenue		
- Airline	\$2,639.0	5% per annum growth.
- GA Commercial	\$118.1	
- GA Private	<u>\$0.0</u>	
Total	\$2,757.1	
Optimistic Estimates		
Total Revenue		
- Airline	\$7,277.1	
- GA Commercial	\$940.0	
- GA Private	<u>\$1.0</u>	
Total	\$8,218.1	
Domestic Revenue		
- Airline	\$4,337.5	7% per annum based on industry and company forecasts.
- GA Commercial	\$622.7	
- GA Private	<u>\$1.0</u>	
Total	\$4,961.2	
'Export' Revenue		
- Airline	\$2,900.1	7% per annum based on industry and company forecasts.
- GA Commercial	\$132.0	
- GA Private	<u>\$0.0</u>	
Total	\$3032.1	
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Operator Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	<p>Passenger and cargo airline services. Charter and tourist passenger operations, agricultural top-dressing and spraying operations by rotary and fixed wing aircraft, EMS (Emergency Medical Services) by rotary and fixed wing aircraft. Commercial adventure aviation activities that range from gliding, ballooning, sky diving, hang gliding.</p>
Key Markets	<p>Outside NZ, Asia, Australasia and in some cases global markets are within reach.</p>
Key Opportunities	<p>ANZA operations to / from and within Australia based on the NZ operators NZCAA certificate have considerable growth potential.</p> <p>Taking an airline model that has been developed, refined and proven in NZ to similar geographic off-shore locations.</p> <p>Worldwide operations on geo-physical survey, exploration for minerals, oil etc. Worldwide aeronautical calibration of radio nav aids is now a potential activity for NZ operators. There has been a policy change in some EU jurisdictions that now allows contestability of supply.</p> <p>Worldwide oil and gas exploration is presently in a growth phase; support operations by NZ rotary and fixed wing operators have high growth potential. Air New Zealand to continue to leverage off and improve market share by maintaining its focus on excellence of product and use of appropriate technology to drive efficiency, revenue, safety and customer experience forward.</p>
Key Challenges	<p>Inflationary pressures are mounting and placing additional pressure on margins: GST, Airways and airports charges are moving upward; ETS (Emission Trading Scheme) charges will occur.</p> <p>Retaining our top performing companies and preventing these being sold or moving off-shore is a priority.</p> <p>The fixed wing agricultural aviation fleet requires a significant level of replacement. The present fleet has little residual value and to date the financial returns do not justify replacement.</p>
Regional Distribution	<p>The major carrier Air New Zealand has its headquarters based in Auckland. Other domestic airlines are located in Auckland (4) Waikato, Nelson, Wellington, Christchurch (3) and the Chatham Islands. Other general aviation operators are spread relatively evenly throughout NZ with a centre of activity around Auckland</p>
Summary	<p>Airline operators have been affected by the recession with reduced domestic and international loadings. A recovery is now underway and positive growth of 5% year on year is forecast for both passenger and cargo revenues. General aviation has been similarly affected by the recession but signs of a recovery are coming through. Increased costs, fuel, airways and airports will place further pressure on margins and on profitability.</p>

Sector : Training

Key Statistics (annual)

All dollar amounts are NZ \$ Millions

Current Status	Statistic	Comment
Total Revenue	\$53.5	<p>The Training Sector is comprised of 3 sub-sectors: Airline, General Aviation and Engineering; however, for reasons of confidentiality, the data cannot be provided separately.</p> <p>Key providers of pilot training are: CTC, Massey University, flying schools, aero clubs affiliated to the Royal New Zealand Aero Club and a group of providers operating under the aegis of the Nelson-Marlborough Institute of Technology, which also provides aircraft engineering training. NZ airlines have internal training systems for pilot and engineering training, however no data is available.</p>
Domestic Revenue	\$38.5	Government (part) funding is currently available for 600 Equivalent Full-time Students (EFTs).
'Export' Revenue	\$15.0	A number of students come from offshore to train in NZ.
Total Assets	\$100.0	The principal asset of training providers is the training fleet of aircraft. Based on the number of each different type of aircraft and estimated values for each the total value of the training fleet is estimated at \$100.0m.
Number of Aircraft	448	Based on data drawn directly from some training providers, NZCAA and Wings Directory.
Number of Organisations	84	Based on data drawn directly from the Wings Directory, the RNZAC and several other training providers.
Staff Employed (FTE's)	700	Based on information obtained directly from providers and from Wings Directory. These are predominantly pilots.
Salaries & Wages	\$28.0	Based on data obtained from a major provider to calculate an average wage /salary expense total.
2015 Forecast		
Conservative Estimates		
Total Revenue	\$73.3	
Domestic Revenue	\$49.1	5% per annum growth, tracking the overall industry growth & therefore demand for pilots.
'Export' Revenue	\$24.2	10% per annum, assuming small increase in the number of foreign student revenue.
Optimistic Estimates		
Total Revenue	\$104.8	
Domestic Revenue	\$49.1	5% per annum growth in domestic training.
'Export' Revenue	\$55.7	Assuming growth 30% per annum in exports to higher growth regions - China, SE Asia, through active entry into these markets. This growth is predicated on the New Zealand Limited execution.
<p>Important Note: This data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy. It is important therefore that, before acting on the information provided, the assumptions used in producing it and the caveats placed on it are fully understood. These assumptions and caveats are set out in Appendix C</p>		

Training Sector	
Key Activities Issues & Opportunities	
Area	Description
Key Services	Pilot training is predominantly for Commercial Pilot Licence (CPL) and Instrument Rating with a portion of training to Airline Transport Pilot Licence (ATPL) level. Aircraft engineering also forms part of the Training Sector.
Key Markets	Predominantly NZ, with the EU and Southeast Asia being key sources for overseas students.
Key Opportunities	China, India, Middle East, and to a lesser extent Asia Pacific, are the key areas of opportunity due to burgeoning demand for pilots in these markets where pilot training is not well established or of sufficient scale. One major training provider noted China was "too big to ignore". The industry majority view is that this is best progressed through a "New Zealand Limited " approach with Government involvement, linked to free trade or other bi-lateral agreements
Key Challenges	Training pilots just to CPL level is widely regarded as not meeting industry requirements, the focus should be on ATPL; NZ organisations must be prepared to work together to progress off-shore opportunities even if they compete domestically; it is a challenge to maintain profitability given current EFTS funding levels.
Regional Distribution	The provision of flight training is primarily distributed through the Waikato, Nelson-Marlborough, Canterbury and Auckland regions.
Summary	This sector has struggled to remain profitable given the EFTS funding has been fixed at 2003 levels and the cost structure (particularly fuel costs) has increased. However a number of factors provide NZ with a competitive advantage in driving growth in the sector: relatively free airspace; supportive regulatory environment; 70 years aviation history in NZ; well-established industry capable of quality outputs; lower cost base than Europe or North America.

Appendix E: Regional Tables by Sector & Sub-sector

Table 15: Sector & Sub-Sector Domestic Revenue by Region

Sector & Sub-Sector	Auckland	Christchurch	Hawkes Bay	Manawatu	Marlborough	Nelson	Northland	Southland	Taranaki	Waikato	Wellington	West Coast
AIRCRAFT DESIGN & MANUFACTURE	2.1	--	--	--	1.1	--	--	--	--	8.4	1.9	--
AIRCRAFT PARTS												
Parts Comp Supplies	40.0	9.9	1.0	2.5	7.7	11.3	0.2	0.5	0.5	9.6	3.9	--
Avionics Comms	<u>1.6</u>	<u>0.4</u>	<u>0.4</u>	<u>0.8</u>	<u>0.2</u>	<u>0.2</u>	--	--	--	<u>0.2</u>	<u>1.2</u>	--
	41.6	10.3	1.4	3.3	7.9	11.5	0.2	0.6	0.5	9.8	5.1	--
AIRPORT												
Operations	373.2	90.0	3.0	4.8	1.2	4.2	0.6	21.6	--	4.8	96.6	--
Infrastructure	<u>150.2</u>	<u>36.2</u>	<u>1.2</u>	<u>1.9</u>	<u>0.5</u>	<u>1.7</u>	<u>0.2</u>	<u>8.7</u>	--	<u>1.9</u>	<u>38.9</u>	--
	523.4	126.2	4.2	6.7	1.7	5.9	0.8	30.3	--	6.7	135.5	--
AVIATION SERVICES												
Government & Defence	--	--	--	--	--	--	--	--	--	--	210.7	--
Non-government Services	<u>145.6</u>	<u>14.4</u>	<u>2.1</u>	<u>2.1</u>	<u>2.1</u>	<u>2.1</u>	<u>2.1</u>	--	--	<u>14.4</u>	<u>20.5</u>	--
	145.6	14.4	2.1	2.1	2.1	2.1	2.1	--	--	14.4	231.2	--
MISCELLANEOUS												
Fuel	469.8	98.3	0.6	0.6	2.2	3.2	0.6	8.2	--	2.5	47.0	0.6
Logistics	<u>49.0</u>	<u>11.8</u>	<u>0.4</u>	<u>0.6</u>	<u>0.2</u>	<u>0.6</u>	--	<u>2.8</u>	--	<u>0.6</u>	<u>12.7</u>	--
	518.7	110.1	1.0	1.3	2.4	3.7	0.7	11.1	--	3.2	59.6	0.6
MRO												
Airline	78.7	29.6	0.9	7.0	25.1	34.4	--	--	--	18.5	9.2	--
GA Fixed Wing	27.9	4.4	2.5	1.9	1.9	4.4	0.6	1.3	1.9	12.1	4.4	--
GA Rotary Wing	<u>12.0</u>	<u>0.9</u>	--	--	--	<u>1.1</u>	--	<u>0.5</u>	--	<u>3.2</u>	--	--
	118.6	34.9	3.5	8.9	27.0	39.9	0.6	1.8	1.9	33.7	13.7	--
OPERATOR												
Airline	2,798.8	275.2	--	--	--	--	--	6.2	--	--	12.4	--
GA Commercial	53.3	31.1	22.2	13.3	13.8	26.6	8.9	71.0	18.2	124.3	35.5	25.8
GA Private	<u>0.1</u>	--	--	--	--	--	--	<u>0.2</u>	--	<u>0.2</u>	--	--
	2,852.2	306.4	22.3	13.3	13.8	26.7	8.9	77.4	18.2	124.5	48.0	25.9
TRAINING	7.1	5.1	3.1	6.9	2.0	4.2	0.5	1.0	2.5	3.0	2.0	1.0
GRAND TOTAL	4,209.3	607.4	37.5	42.6	58.0	94.0	13.8	122.1	23.2	203.7	497.0	27.5

* All dollars are in millions NZD. Primary data is latest available financial year; secondary data is FY 2008

"--" denotes insufficient data within the region for reporting purposes; data combined with nearest larger region to preserve confidentiality

Table 16: Sector & Sub-Sector Export Revenue by Region

Sector & Sub-Sector	Auckland	Christchurch	Hawkes Bay	Manawatu	Marlborough	Nelson	Northland	Southland	Taranaki	Waikato	Wellington	West Coast
AIRCRAFT DESIGN & MANUFACTURE	--	--	--	--	--	--	--	--	--	32.0	4.9	--
AIRCRAFT PARTS												
Parts Comp Supplies	17.4	110.9	--	2.4	--	--	--	--	--	--	--	--
Avionics Comms	<u>5.4</u>	=	=	<u>4.9</u>	=	<u>0.9</u>	=	<u>0.4</u>	=	=	<u>3.4</u>	=
	22.8	110.9	--	7.3	--	0.9	--	0.4	--	--	3.4	--
AIRPORT												
Operations	--	--	--	--	--	--	--	--	--	--	--	--
Infrastructure	<u>85.0</u>	<u>1.3</u>	=	=	=	=	=	=	=	<u>39.1</u>	=	=
	85.0	1.3	--	--	--	--	--	--	--	39.1	--	--
AVIATION SERVICES												
Government & Defence	--	--	--	--	--	--	--	--	--	--	16.3	--
Non-government Services	<u>213.7</u>	<u>9.2</u>	=	=	=	=	=	<u>1.1</u>	=	<u>4.6</u>	<u>11.5</u>	=
	213.7	9.2	--	--	--	--	--	1.1	--	4.6	27.8	--
MISCELLANEOUS												
Fuel	537.9	105.2	--	--	--	--	--	8.4	--	1.4	43.9	--
Logistics	<u>21.0</u>	<u>5.1</u>	<u>0.2</u>	<u>0.3</u>	=	<u>0.2</u>	=	<u>1.2</u>	=	<u>0.3</u>	<u>5.4</u>	=
	558.9	110.3	0.2	0.3	--	0.2	--	9.6	--	1.7	49.3	--
MRO												
Airline	40.7	258.9	--	5.7	--	--	--	--	--	--	--	--
GA Fixed Wing	9.0	0.8	--	0.5	0.3	--	--	--	--	0.5	--	--
GA Rotary Wing	<u>2.5</u>	<u>0.2</u>	=	=	=	=	=	=	=	<u>0.2</u>	=	=
	52.2	259.8	--	6.2	0.3	--	--	--	--	0.8	--	--
OPERATOR												
Airline	1,871.3	184.0	--	--	--	--	--	4.1	--	--	8.3	--
GA Commercial	3.7	1.9	6.9	0.9	--	68.3	0.9	4.7	0.5	2.8	1.9	0.9
GA Private	=	=	=	=	=	=	=	=	=	=	=	=
	1,875.0	185.9	6.9	0.9	--	68.3	0.9	8.8	0.5	2.8	10.1	0.9
TRAINING	0.6	0.9	--	0.6	--	--	--	--	--	12.9	--	--
GRAND TOTAL	2,808.2	678.3	7.1	15.3	0.5	69.6	1.0	20.1	0.5	93.9	95.5	0.9

* All dollars are in millions NZD. Primary data is latest available financial year; secondary data is FY 2008

"--" denotes insufficient data within the region for reporting purposes; data combined with nearest larger region to preserve confidentiality

**NZ ECONOMIC IMPACTS FROM AIRCRAFT
MANUFACTURE, AIR SERVICES,
AIRPORT OPERATIONS
AND PILOT TRAINING IN NZ
FOR THE YEAR ENDED DECEMBER 2009**

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June 2010

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EXECUTIVE SUMMARY

This report estimates the economic impacts for the NZ economy emanating from activities in the four aircraft related sectors shown in the following table.

BASIC DATA ON FOUR AIRCRAFT RELATED SECTORS FOR THE YEAR ENDED DECEMBER 2009

Economic Measure	Aircraft Manufacture & Servicing	Air Passenger & Cargo Services	Airport Operations & Support	Pilot Training	TOTALS
Revenue \$ millions	\$892.6	\$5,698.9	\$1,639.0	\$53.5	\$8,284.0
Employees	4,430	14,473	3,369	700	22,972
Gross Salaries \$ m	\$340.7	\$940.7	\$217.8	\$28.0	\$1,527.2
Revenue/Employee \$	\$201,490	\$393,761	\$486,495	\$76,429	\$360,613
Average Gross Salary \$	\$76,914	\$64,997	\$64,648	\$40,000	\$66,481

Data in the above table for Revenue, Employment and Gross Salaries are designated as direct or first round impacts with resulting flow-on impacts to other sectors of the NZ economy. These flow-on impacts have been estimated using a 112-sector economic model of the NZ economy for the year ended December 2009. This model is based in part on employment in the 112 sectors as estimated by **Statistics NZ** as at February 2009. The direct data in the above table was generated by Knotridge Ltd for New Zealand Trade & Enterprise as part of the New Horizons project (June 2010). This project sought to identify the level of sector and sub-sector economic activity across the aviation industry in New Zealand using data collected from industry participants and a range of secondary data sources.

Total impacts, after allowing for direct impacts plus all flow-ons, for each aircraft related sector are shown in the following table.

TOTAL IMPACTS OF AIRCRAFT RELATED ACTIVITY ON THE NZ ECONOMY FOR THE YEAR ENDED DEC 2009

AIRCRAFT RELATED ACTIVITY	Revenue or Output \$ m	Net Household Income \$ m	Employment Persons	GDP or Value Added \$ m
Aircraft Manufacture & Servicing	3,406.6	649.1	16,882	1,543.6
Air Passenger & Cargo Services	20,535.5	2,647.5	72,952	8,624.3
Airport Operations & Support	5,808.1	537.3	14,824	2,557.4
Pilot Training	237.7	53.0	2,023	133.0
Total Impacts from Aircraft Activity	29,987.9	3,886.9	106,681	12,858.3
NZ Totals for year ended December 2009	254,061.3	73,993.7	1,919,295*	185,548.9
Percentage Impacts for Aircraft Activity	11.8%	5.3%	5.6%	6.9%

*As at February 2009

The aggregate impacts over all four aircraft related sectors average 7.4% over the four economic impacts. The most important of these being that for GDP with aircraft related activity as defined in the report accounting for 6.9% of NZ's GDP in the year to December 2009.

INTRODUCTION

Economic impacts for the NZ economy emanating from the above activities have been estimated using a (previously constructed) 112-sector economic model of the NZ economy for the year ended December 2009. The industries or sectors in this economic model are *italicised* for easy identification. Four activities related to aircraft manufacture and servicing (AM&S), air passenger and cargo services (AP&CS), airport operation and support activities (AOS) and pilot training (PT) are examined using the above economic model to gauge their individual and aggregate impact on the NZ economy. Note that these abbreviations will be used in this report to distinguish them from activities in the *italicised* 112 sectors or industries in the economic model.

The previously constructed economic model of 112 sectors can be used to calculate impacts although the model sectors do not exactly match the above aircraft related activities being analysed. The differences between the sectors and aircraft related activities are noted below:

Aircraft Manufacture & Servicing (AM&S): This activity is included in model sector number 52 *Other Transport Equipment*. This includes production of railway rolling stock as well as aircraft manufacture and servicing of aircraft. Based on employment numbers, over 90% of activity in this sector of the economic model relates to aircraft.

Air Passenger & Cargo Services (AP&CS): These activities are included in the model sector 76 *Air Services*. This is the one activity that matches almost perfectly with that in the economic model. However, sector 76 also includes activities related to airport operation as well as passenger and cargo services, and is in part applicable to the AOS activity (see below). Approximately 45% of *Air Services* activity is applicable to AP&CS operations.

Airport Operations & Support (AOS): As noted above, some of these activities are included in sector 76. However, the operations of customs agents and freight forwarders have traditionally been included in sector 75 of the economic model which is *Water & Rail Services*. As a result, we utilise the technologies of both this sector and the *Air Services* sector to estimate the impacts of AOS activity on the NZ economy.

Pilot Training (PT): Pilot Training is but one activity in the economic model sector of *Other Education*, sector 101. This sector includes non-university tertiary type study such as language schools, secretarial schools, modelling schools, film, TV, media, art schools, police training as well as driver and pilot training. Only 4.5% of employment in this sector is related to Pilot Training.

The 112-sector economic model allows us to explore how activities in the above industries or sectors are linked to other sectors or industries in the NZ economy. In particular, the model estimates the flow-on impacts emanating from initial extra activity in one of the above aircraft related activities into other NZ sectors in order to calculate a total (direct plus flow-on) impact for the activity in question. Linkages can be of two types. First, activity in AM&S will require inputs from other sectors such as *Basic Metal Manufacturing, Structural & Fabricated Metal Products, Electricity, Other Industrial Equipment* and similar supplying sectors. As a result, increased production in AM&S will result in increased production in these and similar supplying sectors. Increased production in all sectors will lead to increased employment in these sectors with resulting increased household expenditure as employees spend their increased wages. All such linkages of this type are labelled backward linkages and can be dichotomised into industrial and consumption flow-ons. Both types of flow-ons can be summarised in a so-called multiplier that readily estimates the total impact from increased activity in any sector. Backward linkages are important since they are effectively part of the activity generated in an initiating sector such as AM&S. If all AM&S activity in NZ ceased, the total loss to the NZ economy would include these backward linkages as estimated by the economic model, as well as the direct losses due to cessation of AM&S production.

Secondly, forward linkages show how the increased output from a sector or activity will be utilised in forward linked sectors or industries using this increased production. As for backward linkages, all flow-on impacts for forward linkages can be dichotomised into industrial or consumption flow-ons. For example, increased aircraft production will allow increased supply of say *Agricultural Services* (aerial topdressing) which will require increased employment in *Agricultural Services* which in turn increases household expenditures due to increased overtime and/or new employment (consumption forward linked flow-on). The model assumes that all increased production is immediately utilised somewhere in the economy or (a fixed proportion) goes into stocks or inventories. In reality, the proportion going into inventories can vary with the business cycle so that the forward linkages could over or underestimate the flow-on impacts that result in a particular time period. This is one limitation of the 112-sector models that must be accepted in the following analysis.

In contrast to the backward linkages, if all AM&S activity in NZ ceased, the forward linkages would not necessarily be lost to the NZ economy. Commercial aircraft could be serviced in Melbourne or Sydney rather than Auckland or

Christchurch. Topdressing aircraft could be imported from overseas with *Agricultural Services* (sector 9 in the model) unaffected, although perhaps less profitable than with NZ produced and serviced aircraft from AM&S.

Each of the four aircraft related activities listed above will be analysed individually for their impacts on the NZ economy. The four economic impacts estimated are total revenue or output, net household income after tax and saving (e.g. superannuation), employment and gross domestic product (GDP) or value added. More detail on these impacts is contained in the Methodology Appendix. Finally, the impact sum over all aircraft related activity can be expressed as a percentage of the corresponding NZ totals. This results in a summary percentage impact of aircraft related activity on the NZ economy.

TABLE 1: BASIC DATA ON FOUR AIRCRAFT RELATED SECTORS FOR THE YEAR ENDED DECEMBER 2009

Economic Measure	Aircraft Manufacture & Servicing	Air Passenger & Cargo Services	Airport Operations & Support	Pilot Training	TOTALS
Revenue \$ millions	\$892.6	\$5,698.9	\$1,639.0	\$53.5	\$8,284.0
Employees	4,430	14,473	3,369	700	22,972
Gross Salaries \$ m	\$340.7	\$940.7	\$217.8	\$28.0	\$1,527.2
Revenue/Employee \$	\$201,490	\$393,761	\$486,495	\$76,429	\$360,613
Average Gross Salary \$	\$76,914	\$64,997	\$64,648	\$40,000	\$66,481

Revenue per employee is highest for Air Passenger & Cargo Services. The average salary for Pilot Training is a lot lower than for the other three aircraft related sectors.

The data in Table 1 summarise the so-called direct or first round impacts of the four aircraft related activities analysed in this report. Direct activity in each of the above industries induces industrial flow-ons, both backward and forward in all other sectors supplying inputs and using outputs. It also induces consumption flow-ons due to the employment created in the above four industries and the sectors supplying inputs to and using goods and services from the originating (direct) activities. For example, *Agricultural Services* uses aircraft for spraying, topdressing etc. so employment in NZ's *Agricultural Services* sector is dependent to some extent on using reliable products provided by Aircraft Manufacturing & Servicing. Similar examples apply to the other three aircraft related sectors in Table 1.

The following analysis relates to each of the four basic aircraft related activities in turn. The direct, backward-linked and forward-linked impacts are shown in detail together with the top ten sectors listed for each type of linkage. Finally, aggregate values of all four sectors show the total impacts of aircraft related activity on the NZ economy for the year ended December 2009.

AIRCRAFT MANUFACTURE & SERVICING

Recall that AM&S is but one activity in sector 52 of our 112-sector model or *Other Transport Equipment*. The impacts detailed below are due to the activities on the identified 4,430 employees in AM&S producing an estimated \$892.6 m in output for the year ended December 2009. Total employment in the *Other Transport Equipment* sector as at February 2009 was 4,700 so that around 94% of the activity in this sector was in fact related to aircraft in the December 2009 year.

TABLE 2: ECONOMIC IMPACT OF AM&S ON THE NZ ECONOMY FOR THE YEAR ENDED DECEMBER 2009

SOURCE OF IMPACT	REVENUE \$ MILLIONS	NET HOUSEHOLD INCOME \$ M	EMPLOYMENT PERSONS	VALUE ADDED OR GDP \$ M
Direct impact	892.6	238.5	4,430	418.6
Backward-linked Flow-ons	621.3	120.8	2,898	301.0
TOTAL (Direct + BL)	1,513.9	359.3	7,328	719.6
<i>Multiplier (BL only)</i>	<i>1.70</i>	<i>1.51</i>	<i>1.65</i>	<i>1.72</i>
Forward-linked Flow-ons	1,892.7	289.8	9,554	824.0
TOTAL (Direct + BL + FL)	3,406.6	649.1	16,882	1,543.6
<i>Multiplier (BL + FL)</i>	<i>3.82</i>	<i>2.72</i>	<i>3.81</i>	<i>3.69</i>

BL = Backward-linked FL = Forward-linked

Recall that the backward linkages show inputs from supplying sectors into AM&S. If AM&S in NZ ceased all activity, the backward linkages above estimate the resulting losses to the supplying sectors. Included in the backward linkages are the flow-ons to sectors servicing households that result from expenditure by employees in AM&S and its supplying sectors. To summarise, if AM&S ceased all activity in NZ, the total job loss for the NZ economy is estimated at 7,328 jobs. The other impacts can be interpreted similarly.

The forward linkages show how the output from AM&S is utilised by other sectors in the NZ economy. Such linkages include industrial (as in sectors using aircraft to produce goods and services) and consumption (employees in sectors relying on aircraft services and spending their wages in the normal course of living). Note that if AM&S production ceased in NZ, the estimated forward-linked flow-ons in Table 2 would not necessarily be lost to the NZ economy. The required inputs could be imported from say Australia so these using sectors (see Table 4 below) would be able to continue in business with aircraft services, although presumably not as cost-effectively as before. The forward linkages therefore represent *potential* losses to the NZ economy but not certain losses as is the case for the backward-linked flow-ons.

The multipliers shown in Table 2 summarise the impacts for AM&S for the four impact measures. The total multiplier for Net Household Income at 2.72 is somewhat lower than the other three. This can be explained by the average incomes earned in AM&S compared to its linked sectors. The 4,430 jobs generated directly in AM&S enjoy an average gross salary of around \$77,000 (includes super, ACC etc. and before tax). In contrast, the 2,898 backward-linked jobs average salary is around \$60,000 and that for the 9,554 forward-linked jobs is around \$43,000. Accordingly, the direct jobs in AM&S are high-salaried compared to the linked flow-on jobs so the resulting total net income is lower than might otherwise be expected. This results in a lower net income multiplier. The multiplier estimates that every \$1 of net income generated in AM&S generates another \$1.72 of net income somewhere else in the NZ economy after all flow-ons are accounted for. The primary use of multipliers is in making statements such as this to highlight the importance of the initiating activity for the NZ economy after all sector interactions are accounted for. Of course, the higher the multiplier, the more important is the direct activity in question.

From Table 2, we see that the forward linked flow-ons exceed the direct plus backward-linked impacts for all measures with the exception of net household income. This demonstrates the importance of AM&S as a source of inputs for other producing sectors in the NZ economy.

BACKWARD LINKAGES

The top ten backward-linked sectors to AM&S are shown in Table 3.

TABLE 3: TOP TEN SUPPLYING SECTORS TO AM&S YEAR ENDED DEC 2009

REVENUE/OUTPUT				EMPLOYMENT			
Inputs from supplying sectors into AM&S				Persons in supplying sectors to AM&S			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Other Transport Equip	60.52	31.8	1	Other Transport Equip	300.40	34.1
2	Wholesale Trade	28.25	14.8	2	Wholesale Trade	104.80	11.9
3	Electricity	9.79	5.1	3	Retail Trade	76.97	8.7
4	Technical Services	9.20	4.8	4	Technical Services	65.13	7.4
5	Struct & Fab Metal Prd	7.04	3.7	5	Pest & Cleaning	34.57	3.9
6	Communications	6.81	3.6	6	Struct & Fab Metal Prod	31.13	3.5
7	Computer Services	6.69	3.5	7	Computer Services	30.28	3.4
8	Retail Trade	6.08	3.2	8	Employ & Security Serv	21.35	2.4
9	Air Services	5.78	3.0	9	Air Services	18.67	2.1
10	Financial Services	3.54	1.9	10	Communications	18.38	2.1
Top 10 supplying sectors		143.70	75.5	Top 10 supplying sectors		701.68	79.5
Remaining 102 sectors		46.57	24.5	Remaining 102 sectors		180.42	20.5
Total Industrial Linkages		190.27	100.0	Total Industrial Linkages		882.10	100.0
Consumption Flow-ons		430.99		Consumption Flow-ons		2,016.33	
TOTAL BL Revenue \$ m		621.26		TOTAL BL Employment Persons		2,898.43	

BL = Backward-linked

The revenue flow-ons in Table 3 show that AM&S is the most important revenue-linked sector for AM&S. In other words, firms in the AM&S industry are supplying each other with various inputs, and these are the most important linkages for this activity. *Technical Services* (specialised engineering etc.) is also a closely linked supplier to the industry.

For both Revenue and Employment, the backward-linked Consumption flow-ons significantly outweigh the Industrial flow-ons. Recall that the Consumption linked flow-ons result from employees in AM&S and the supplying sectors spending their income earned in the normal course of living. The top ten linked sectors in Table 3 above are all high salaried sectors with the possible exceptions of *Wholesale* and *Retail Trade*, *Pest & Cleaning* and *Employment & Security Services*. This goes some way in explaining the high Consumption flow-ons relative to the Industrial flow-ons.

FORWARD LINKAGES

The top ten forward-linked sectors using goods and services provided by AM&S are listed in Table 4. They include *Agricultural Services* (as in aerial topdressing) and *Other Sport & Recreation* (as in tourism, skydiving etc).

TABLE 4: TOP TEN USING SECTORS OF AM&S OUTPUT YEAR ENDED DEC 2009

REVENUE/OUTPUT				EMPLOYMENT			
Using sector revenue dependent on AM&S				Using sector employment dependent on AM&S			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Air Services	201.22	14.6	1	Air Services	650.28	10.1
2	Electricity	112.90	8.2	2	Agricultural Services	532.08	8.3
3	Non-Building Const'n	66.20	4.8	3	Primary & Sec Education	412.05	6.4
4	Other Transport Eq	60.52	4.4	4	Other Sport & Recreation	368.87	5.7
5	Local Government	59.92	4.3	5	Post School Education	359.59	5.6
6	Seafood Processing	57.11	4.1	6	Non-Building Construct	310.90	4.8
7	Wholesale Trade	53.74	3.9	7	Other Transport Equip	300.40	4.7
8	Other Sport & Recrea	50.28	3.6	8	Retail Trade	260.90	4.1
9	Agricultural Services	42.98	3.1	9	Ancillary Services	251.46	3.9
10	Ancillary Services	42.58	3.1	10	Local Government	221.93	3.5
Top 10 supplying sectors		747.45	54.1	Top 10 supplying sectors		3,668.46	57.1
Remaining 102 sectors		634.60	45.9	Remaining 102 sectors		2,756.48	42.9
Total Industrial Linkages		1,382.05	100.0	Total Industrial Linkages		6,424.94	100.0
Consumption Flow-ons		510.64		Consumption Flow-ons		3,129.12	
TOTAL FL Revenue \$ m		1,892.69		TOTAL FL Employment Persons		9,554.06	

FL = Forward-linked *Ancillary Services* = plumbing, electrical work, roofing etc. in construction services

In this case, the industrial forward-linked flow-ons far outweigh the consumption linkages. For the forward-linked employment impact, the 11th ranked sector is *Defence* at 201.18 persons, which would be expected for this activity and its involvement with aircraft.

To more fully understand the figures in Table 4, recall that total AM&S revenue for the December 2009 year (direct impact Table 2) was estimated at \$893 m. If this activity and resulting revenue were reduced to zero, the resulting potential loss of revenue for *Air Services* as shown in Table 4 would be \$201 m. Of course, AM&S services previously supplied by NZ firms could be supplied by Australian firms and the \$201 m potential revenue loss by *Air Services* recouped, although at presumably lower profitability. Other listed sectors would show corresponding losses. Similarly, potential employment losses in the *Air Services* sector are estimated at 650 jobs.

Accordingly, Table 4 shows revenue and job losses for the NZ economy should AM&S production in NZ cease. Conversely, if AM&S production in NZ were doubled (i.e. increased by \$893 m annually), Table 4 shows potential revenue and job gains for the top ten using sectors that could now augment their own activities using increased inputs now available from expanded AM&S production. Total potential gains for the NZ economy across all sectors for

Revenue and Employment are shown at the bottom of Table 4. While these forward linked gains assume proportional expansion of existing activities across all currently using sectors, the aggregate value of the forward-linked gains provides a credible estimate to calculate the total gain for the NZ economy resulting from doubling production in AM&S. This gain assumes that the current usage mix of AM&S production is maintained for the increased AM&S production. Note that the forward linked gains for the Net Household Income and GDP impacts are shown in aggregate in Table 2 as well as those for Revenue and Employment detailed above in Table 4.

AIR PASSENGER AND CARGO SERVICES

These activities will be summarised as AP&CS which is sector 76 or *Air Services* in the 112-sector economic model. For the activities covered in this report, 14,473 employees produced a total revenue of \$5,698.9 m in the December 2009 year. In the 112-sector economic model, sector 76 includes total employees of 32,050 as at February 2009. Accordingly, we are only accounting for the activities of around 45% of employees in this sector of the 112-sector economic model of the NZ economy. Note that activities of travel agents and similar activities are excluded from the following analysis of AP&CS activity.

TABLE 5: ECONOMIC IMPACT OF AP&CS ON THE NZ ECONOMY FOR YEAR ENDED DECEMBER 2009

SOURCE OF IMPACT	REVENUE \$ MILLIONS	NET HOUSEHOLD INCOME \$ M	EMPLOYMENT PERSONS	VALUE ADDED OR GDP \$ M
Direct impact	5,698.9	658.5	14,473	1,919.9
Backward-linked Flow-ons	6,132.2	818.3	22,020	2,867.1
TOTAL (Direct + BL)	11,831.1	1,476.8	36,493	4,787.0
<i>Multiplier (BL only)</i>	<i>2.08</i>	<i>2.24</i>	<i>2.52</i>	<i>2.49</i>
Forward-linked Flow-ons	8,704.4	1,170.7	36,459	3,837.3
TOTAL (Direct + BL + FL)	20,535.5	2,647.5	72,952	8,624.3
<i>Multiplier (BL + FL)</i>	<i>3.60</i>	<i>4.02</i>	<i>5.04</i>	<i>4.49</i>

BL = Backward-linked FL = Forward-linked

All multipliers in Table 5 are higher than those for AM&S in Table 2, with the exception of Revenue. The levels of impact, as in over 70,000 jobs, are very high for AP&CS activities. Of course, for a modern economy, air services for both passengers and cargo is a rapidly expanding industry with ever increasing globalisation of economic activity.

BACKWARD LINKAGES

The top ten backward-linked sectors for Revenue and Employment are listed in Table 6.

TABLE 6: TOP TEN SUPPLYING SECTORS TO AP&CS FOR THE YEAR ENDED DECEMBER 2009

REVENUE/OUTPUT				EMPLOYMENT			
Inputs from supplying sectors into AP&CS				Persons in supplying sectors to AP&CS			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Air Services	902.31	25.3	1	Air Services	2291.53	18.2
2	Equipment Hire	302.72	8.5	2	Retail Trade	1524.53	12.1
3	Wholesale Trade	214.66	6.0	3	Equipment Hire	733.51	5.8
4	Financial Services	155.52	4.4	4	Business Admin Service	707.46	5.6
5	Retail Trade	153.18	4.3	5	Employ & Security Serv	637.63	5.1
6	Communications	149.11	4.2	6	Wholesale Trade	325.64	5.0
7	Business Admin Serv	140.04	3.9	7	Other Transport Equip	478.46	3.8
8	Property Services	130.65	3.7	8	Financial Services	401.46	3.2
9	Other Transport Eq	122.65	3.4	9	Bars & Restaurants	378.38	3.0
10	Computer Services	96.08	2.7	10	Road Freight	367.23	2.9
Top 10 supplying sectors		2,366.74	66.4	Top 10 supplying sectors		8,145.83	64.7
Remaining 102 sectors		1,198.25	33.6	Remaining 102 sectors		4,436.47	35.3
Total Industrial Linkages		3,565.00	100.0	Total Industrial Linkages		12,582.3	100.0
Consumption Flow-ons		2,567.17		Consumption Flow-ons		9,437.88	
TOTAL BL Revenue \$ m		6,132.17		TOTAL BL Employment Jobs		22,020.18	

BL = Backward-linked

As for AM&S, firms within the *Air Services* sector exchange goods and services to the extent that it is its own closest-linked sector. Note that *Other Transport Equipment* (or AM&S) is also a closely linked sector.

For both Revenue and Employment, the backward-linked Consumption flow-ons are somewhat less than the Industrial flow-ons. Recall that the Consumption linked flow-ons result from employees in AP&CS and the supplying sectors spending their income earned in the normal course of living.

FORWARD LINKAGES

TABLE 7: TOP TEN USING SECTORS OF AP&CS OUTPUT FOR THE YEAR ENDED DECEMBER 2009

REVENUE/OUTPUT				EMPLOYMENT			
Using sector revenue dependent on AP&CS				Using sector employment dependent on AP&CS			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Air Services	902.31	22.5	1	Air Services	2291.53	16.5
2	Wholesale Trade	507.18	12.6	2	Wholesale Trade	1478.16	10.6
3	Road Freight	142.49	3.5	3	Retail Trade	1170.72	8.4
4	Retail Trade	117.62	2.9	4	Road Freight	571.86	4.1
5	Meat Processing	114.29	2.8	5	Business Admin Service	547.10	3.9
6	Business Admin Serv	108.29	2.7	6	Bars & Restaurants	412.42	3.0
7	Water & Rail Services	87.07	2.2	7	Central Government	353.51	2.6
8	Central Government	80.82	2.0	8	Other Sport & Recreat	345.83	2.5
9	Seafood Processing	68.20	1.7	9	Water & Rail Services	283.63	2.0
10	Communications	60.06	1.5	10	Ancillary Services	268.91	1.9
Top 10 supplying sectors		2,188.33	54.5	Top 10 supplying sectors		7,723.67	55.6
Remaining 102 sectors		1,828.02	45.5	Remaining 102 sectors		6,159.36	44.4
Total Industrial Linkages		4,016.35	100.0	Total Industrial Linkages		13,883.03	100.0
Consumption Flow-ons		4,688.05		Consumption Flow-ons		22,575.71	
TOTAL FL Revenue \$ m		8,704.40		TOTAL FL Employment Jobs		36,458.74	

FL = Forward-linked

Ancillary Services = plumbing, electrical work, roofing etc. in construction services

The forward linkages summarised in Table 7 indicate that important exporting sectors such as *Meat Processing* and *Seafood Processing* are closely dependent on AP&CS activities for profitable operation. *Road Freight* is also a sector that requires extensive AP&CS output reflecting the interdependent nature of logistics in a modern economy. The delivery of high-value primary produce and food such as crayfish, berries, fruit (and related products as in floriculture) to high-value markets such as Tokyo and Los Angeles (and now China) will be of increasing importance to the future profitability of NZ's major exporters.

The exact meaning of the above figures in Table 7 is the same as previously noted for forward linkages for AM&S above (see Table 4).

AIRPORT OPERATIONS & SUPPORT

The activities for the above emanated from 3,369 employees across NZ producing an estimated \$1,639 m of revenue in the December 2009 year. These activities are included in sector 76 of the 112-sector economic model (analysed previously as AP&CS) but also include activities similar to those in sector 75 of the model *Water & Rail Services*. For example, services provided by custom agents are included in sector 75 of the economic model and not sector 76. Operations at airports will require similar inputs (e.g. electricity, security etc) to operations at seaports. Accordingly, in order to more accurately capture the impacts of these activities using the 112-sector model, sectors 75 and 76 were allocated equal shares of direct economic activity. The resulting linkages and flow-ons are shown below.

TABLE 8: ECONOMIC IMPACT OF AIRPORT OPERATIONS & SUPPORT ON THE NZ ECONOMY FOR YEAR ENDED DEC 2009

SOURCE OF IMPACT	REVENUE \$ MILLIONS	NET HOUSEHOLD INCOME \$ M	EMPLOYMENT PERSONS	VALUE ADDED OR GDP \$ M
Direct impact	1,639.0	152.5	3,369	664.4
Backward-linked Flow-ons	1,951.1	182.5	5,012	922.0
TOTAL (Direct + BL)	3,590.1	335.0	8,381	1,586.4
<i>Multiplier (BL only)</i>	<i>2.19</i>	<i>2.20</i>	<i>2.49</i>	<i>2.39</i>
Forward-linked Flow-ons	2,218.0	202.3	6,442	971.0
TOTAL (Direct + BL + FL)	5,808.1	537.3	14,823	2,557.4
<i>Multiplier (BL + FL)</i>	<i>3.54</i>	<i>3.52</i>	<i>4.40</i>	<i>3.85</i>

BL = Backward-linked FL = Forward-linked

Backward linkage impacts via the multipliers are slightly higher than those for AP&CS analysed above. However, after allowing for forward linkages, the multipliers are slightly lower than those for AP&CS.

BACKWARD LINKAGES

The top ten backward-linked sectors are listed with corresponding impacts in Table 9. As expected due to our approach in analysing this activity, *Water & Rail Services* shows up as a closely linked sector reflecting activities such as those of customs agents, freight forwarders etc.

TABLE 9: TOP TEN SUPPLYING SECTORS TO AIRPORT OPERATIONS & SUPPORT YEAR ENDED DECEMBER 2009

REVENUE/OUTPUT				EMPLOYMENT			
Inputs from supplying sectors into AOS				Persons in supplying sectors to AOS			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Air Services	191.94	17.3	1	Air Services	351.04	12.6
2	Water & Rail Services	92.93	8.4	2	Retail Trade	303.16	10.9
3	Equipment Hire	84.51	7.6	3	Water & Rail Services	218.02	7.8
4	Wholesale Trade	69.52	6.2	4	Business Admin Services	161.86	5.8
5	Financial Services	49.57	4.5	5	Equipment Hire	147.47	5.3
6	Communications	46.74	4.2	6	Wholesale Trade	145.91	5.2
7	Business Admin Serv	44.48	4.0	7	Employ & Security Serv	123.05	4.4
8	Retail Trade	42.28	3.8	8	Road Freight	92.85	3.3
9	Other Transport Eq	32.16	2.9	9	Other Transport Equip	90.32	3.2
10	Road Freight	32.13	2.9	10	Computer Services	76.00	2.7
Top 10 supplying sectors		686.26	61.7	Top 10 supplying sectors		1,709.68	61.2
Remaining 102 sectors		426.16	38.3	Remaining 102 sectors		1,082.33	38.8
Total Industrial Linkages		1,112.14	100.0	Total Industrial Linkages		2,792.01	100.0
Consumption Flow-ons		838.64		Consumption Flow-ons		2,220.43	
TOTAL BL Revenue \$ m		1,951.06		TOTAL BL Employment Persons		5,012.44	

AOS = Airport Operations & Support BL = Backward-linked

For AOS, *Water & Rail Services* replaces *Property Services* (Revenue) and *Bars & Restaurants* (Employment) in the top ten lists for backward linkages to AP&CS (Table 6). There are no other changes to the top ten closely linked sectors for AP&CS and AOS although *Air Services* shows lesser percentage links for AOS than for AP&CS.

FORWARD LINKAGES

The top ten most closely forward-linked sectors are show in Table 10.

TABLE 10: TOP TEN USING SECTORS OF AIRPORT OPERATIONS & SUPPORT OUTPUT YEAR ENDED DEC 2009

REVENUE/OUTPUT				EMPLOYMENT			
Using sector revenue dependent on AOS				Using sector employment dependent on AOS			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Wholesale Trade	155.84	13.6	1	Wholesale Trade	327.12	12.0
2	Air Services	154.17	13.4	2	Air Services	281.97	10.3
3	Water & Rail Services	104.46	9.1	3	Retail Trade	247.95	9.1
4	Meat Processing	43.96	3.8	4	Water & Rail Services	245.05	9.0
5	Road Freight	37.66	3.3	5	Road Freight	108.82	4.0
6	Retail Trade	34.58	3.0	6	Bars & Restaurants	89.89	3.3
7	Seafood Processing	23.60	2.0	7	Business Admin Services	75.84	2.8
8	Fishing	17.50	1.5	8	Meat Processing	60.97	2.2
9	Central Government	16.92	1.5	9	Ancillary Services	55.21	2.0
10	Communications	16.75	1.5	10	Central Government	53.34	1.9
Top 10 supplying sectors		605.44	52.7	Top 10 supplying sectors		1,546.16	56.6
Remaining 102 sectors		543.54	47.3	Remaining 102 sectors		1,188.17	43.4
Total Industrial Linkages		1,148.98	100.0	Total Industrial Linkages		2,734.33	100.0
Consumption Flow-ons		1,068.98		Consumption Flow-ons		3,707.22	
TOTAL FL Revenue \$ m		2,217.97		TOTAL FL Employment Persons		6,441.55	

AOS = Airport Operations & Support FL = Forward-linked

Ancillary Services = plumbing, electrical work, roofing etc. in construction services

Fishing replaces *Business Administration Services* for revenue links and *Meat Processing* replaces *Other Sport & Recreation* for employment links in the comparable lists for AP&CS, with no other changes. Both of these replacements are almost certainly due to the use of *Water & Rail Services* as a direct activity in the attempt to more accurately reflect the impacts of Airport Operations & Support within the constraints of the previously constructed 112-sector model. The conclusion can be drawn that, while not strictly accurate in the sectors listed, Airport Operations & Support is a vital activity for NZ's export industries such as meat and fish. As previously noted, high value primary produce for export will be increasingly dependent on regular and cost-effective air cargo operations in the future if NZ is to maintain its current standing as a high-quality food supplier.

The exact meaning of the above figures in Table 10 is the same as previously noted for forward linkages for AM&S above (see Table 4).

PILOT TRAINING

Pilot Training is the most difficult area to analyse of the aircraft and air service related activities. Pilot Training is part of sector 101 in our economic model designated *Other Education*. This sector includes activities such as language schools, police and fire-person training, secretarial schools, hairdressing and other personal services, modelling schools, training of public servants in special programs, various types of school education (e.g. Pre School) as well as driver training and pilot training. As at February 2009, total employment in this sector was estimated by **Statistics NZ** at 15,410. Current estimates of persons involved in Pilot Training in NZ are 700 or just 4.5% of total employment in sector 101. As a result, the technology of this sector in the model is not especially specific to Pilot Training, and the listing of the top ten sectors for example (see Tables 12 and 13 below) reflects this.

There is no alternative but to use sector 101 or *Other Education* as currently configured to estimate economic impacts for NZ from Pilot Training. While the aggregate impacts (especially the backward-linked impacts) will be accurate (all types of training require similar inputs, especially human capital), the forward-linked impacts will reflect the current composition of this sector with only around 4.5% devoted to Pilot Training. To partially mitigate these problems, the sectors *Air Services* and *Agricultural Services* have been added to the top ten sectors since we know these sectors use aircraft and pilots to provide their goods and services to their customers and clients.

TABLE 11: ECONOMIC IMPACT OF PILOT TRAINING ON THE NZ ECONOMY FOR THE YEAR ENDED DECEMBER 2009

SOURCE OF IMPACT	REVENUE \$ MILLIONS	NET HOUSEHOLD INCOME \$ M	EMPLOYMENT PERSONS	VALUE ADDED OR GDP \$ M
Direct impact	53.50	19.60	700	31.13
Backward-linked Flow-ons	81.49	16.47	508	45.08
TOTAL (Direct + BL)	134.99	36.07	1208	76.21
<i>Multiplier (BL only)</i>	<i>2.52</i>	<i>1.84</i>	<i>1.73</i>	<i>2.45</i>
Forward-linked Flow-ons	102.69	16.88	815	56.77
TOTAL (Direct + BL + FL)	237.68	52.95	2023	132.98
<i>Multiplier (BL + FL)</i>	<i>4.44</i>	<i>2.70</i>	<i>2.89</i>	<i>4.27</i>

BL = Backward-linked FL = Forward-linked

The forward-linked flow-ons exceed the backward-linked flow-ons for all four economic impacts. This comes as no surprise since the output of the *Other Education* sector is trained personnel who are then employed in other sectors of the economy providing valuable goods and services in sectors such as *Fire & Police*, *Central Government* and *Personal & Community Services*. It might well be argued that the training of skilled pilots is even more valuable than that of say hairdressers or pre-school teachers (among the predominant categories in sector 101) so that the aggregate forward linkage values above are, if anything, somewhat understated.

BACKWARD LINKAGES

The top ten backward-linked sectors are listed with corresponding impacts in Table 12. *Other Education* shows up as the top-ranked sector reflecting the interfacing between different business units in this sector of the economic model.

TABLE 12: TOP TEN SUPPLYING SECTORS TO PILOT TRAINING YEAR ENDED DECEMBER 2009

REVENUE/OUTPUT				EMPLOYMENT			
Inputs from supplying sectors to <i>Pilot Trng</i>				Persons in supplying sectors to <i>Pilot Training</i>			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Other Education	5.10	13.9	1	Other Education	66.75	25.7
2	Wholesale Trade	2.76	7.5	2	Business Admin Services	19.99	7.7
3	Business Admin Serv	2.62	7.1	3	Employ & Security Serv	14.65	5.6
4	Financial Services	2.52	6.9	4	Retail Trade	14.42	5.5
5	Communications	1.99	5.4	5	Accommodation	12.77	4.9
6	Property Services	1.97	5.4	6	Wholesale Trade	11.65	4.5
7	Electricity	1.49	4.1	7	Financial Services	9.81	3.8
8	Retail Trade	0.96	2.6	8	Pest & Cleaning Services	7.20	2.8
9	Computer Services	0.86	2.3	9	Accounting Services	6.79	2.6
10	Other Business Service	0.83	2.2	10	Communications	6.36	2.4
Top 10 supplying sectors		21.10	57.4	Top 10 supplying sectors		170.39	65.5
Remaining 102 sectors		15.64	42.6	Remaining 102 sectors		89.75	34.5
Total Industrial Linkages		36.74	100.0	Total Industrial Linkages		260.14	100.0
Consumption Flow-ons		44.75		Consumption Flow-ons		248.26	
TOTAL BL Revenue \$ m		81.49		TOTAL BL Employment Persons		508.40	

Pilot Trng = Pilot Training BL = Backward-linked

Note that the Consumption flow-ons exceed the Industrial flow-ons for Revenue. As noted, human capital (i.e. working employees) are a large input in any type of training and as a result, employee spending is a large flow-on from *Other Education* activity. While some capital equipment will be required as in computers, simulators, cars (driver training), human capital is the more valuable input for this activity. Accordingly, salary and wages will form a higher proportion of total input costs than for some of the other (more capital intensive) aircraft related activities. As a result, for the Revenue impact household expenditure (consumption flow-ons) are more important than the industrial flow-ons.

FORWARD LINKAGES

The top ten most closely forward-linked sectors are show in Table 13.

TABLE 13: TOP TEN USING SECTORS OF PILOT TRAINING OUTPUT YEAR ENDED DEC 2009

REVENUE/OUTPUT				EMPLOYMENT			
Using sector revenue dependent on Pilot Tr				Using sector employment dependent on Pilot Tr			
#	Sector	\$ mill	Percent	#	Sector	Persons	Percent
1	Other Education	5.10	8.4	1	Other Education	66.75	13.1
2	Primary & Sec Educat	4.37	7.2	2	Primary & Sec Education	62.24	12.2
3	Personal & Comm Serv	3.91	6.4	3	Personal & Comm Service	45.75	8.9
4	Electricity	3.87	6.4	4	Pre School Education	30.24	5.9
5	Central Government	3.72	6.1	5	Post School Education	25.55	5.0
6	Wholesale Trade	3.32	5.4	6	Central Government	24.55	4.8
7	Accounting Services	2.20	3.6	7	Accounting Services	22.88	4.5
8	Post School Education	2.00	3.3	8	Retail Trade	19.18	3.7
9	Ancillary Services	1.88	3.1	9	Fire & Police	17.96	3.5
10	Fire & Police	1.48	2.4	10	Medical & Dental Service	14.71	2.9
	Air Services	0.92	1.5		Air Services	3.52	0.7
	Agricultural Services	0.22	0.4		Agricultural Services	3.29	0.6
Top 12 supplying sectors		32.99	54.2	Top 12 supplying sectors		336.62	65.8
Remaining 100 sectors		27.90	45.8	Remaining 100 sectors		174.85	34.2
Total Industrial Linkages		60.89	100.0	Total Industrial Linkages		511.47	100.0
Consumption Flow-ons		41.80		Consumption Flow-ons		303.70	
TOTAL FL Revenue \$ m		102.69		TOTAL FL Employment Persons		815.17	

Pilot Tr = Pilot Training FL = Forward-linked

The top ten sectors listed above reflect the fact that Pilot Training is currently only a minor component (around 4.5%) of total activity in the *Other Education* sector. For example, *Ancillary Services* includes output by plumbers, electricians and similar trade services which form a large part of the training activity undertaken in the *Other Education* sector, hence its inclusion in the top ten for the Revenue impact in Table 13. Similarly, it is not surprising that *Accounting Services* shows up as a top ten sector for both Revenue and Employment. To the top ten linked sectors, *Agricultural Services* and *Air Services* have been added with linked revenue and employment values shown since these sectors are currently large users of pilot services. If a dedicated Pilot Training sector were included in the model, flow-on values for these two sectors would be among the highest in the top ten. As noted, use of the *Other Education* sector to model linkages for Pilot Training is the only viable alternative at this time. It is reiterated that while the individual sectors listed above in Table 13 are not the most important forward-linked sectors for Pilot Training, the aggregate values are reasonable approximations and, if anything, are almost certainly understated. Out of all the training and education activities currently included in the *Other Education* sector, Pilot Training would have to be one of the most valuable in terms of salaries received by trainees on completion of their training. High salaries are indicative of the value produced by employees in sectors such as *Air Services*, *Agricultural Services* and tourist-related activities involving aircraft.

The exact meaning of the above figures in Table 13 is the same as previously noted for forward linkages for AM&S above (see Table 4).

The differences between the *Other Education* sector of the economic model and statistics for Pilot Training for the latest year available are shown in Table 14.

TABLE 14: OTHER EDUCATION COMPARED TO PILOT TRAINING

Economic Measure	Other Education*	Pilot Training
Revenue over 12 months \$ millions	\$1321.0	\$53.5
Exports \$ millions	\$15.0	\$15.0
Export Percent of Revenue	1.1%	28.0%
Employees	15,410	700
Gross Salaries & Wages \$ millions	\$665.0	\$28.0
Average Gross Salary \$	\$43,154	\$40,000
Revenue per Employee \$	\$85,724	\$76,429

*Includes Pilot Training in values shown.

As noted, the *Other Education* sector includes Pilot Training and average salary and revenue per employee values are reasonably comparable. The exceptional measures are exports and export percentage. Clearly Pilot Training is a valuable export earner for NZ. Whereas training in other areas carried out by *Other Education* is mainly for NZ business units (with correspondingly high forward linkages as in Table 13), Pilot Training has a high export component of 28% of total revenue. Exports have zero forward linkages for the NZ economy since the goods or services are consumed outside NZ. However, exports are clearly valuable to the NZ economy which continues to suffer continuing balance of payments deficits. Language schools would show a similarly high export percentage of turnover.

The fact that exports for *Other Education* and Pilot Training are the same at \$15 m for the December 2009 year is completely fortuitous. Almost certainly, exports for the *Other Education* sector in aggregate are substantially understated in the economic model utilised in the study. Training in many business sectors (especially for Chinese students) has increased significantly over the six years since 2004, the year for which the technology in the model was established by survey. Pilot Training in particular has shown a significant increase in activity. Since the results in this report are based on direct surveys of aircraft related activity in the 2009 year, the results presented here for the aircraft related sectors can be considered up-to-date.

CONCLUSIONS

Table 15 below shows the aggregate impact of all aircraft related activity as a percentage of total NZ economic activity in the year to December 2009 for the four economic impacts covered in this report.

TABLE 15: TOTAL IMPACTS OF AIRCRAFT RELATED ACTIVITY ON THE NZ ECONOMY YEAR ENDED DEC 2009

AIRCRAFT RELATED ACTIVITY	Revenue or Output \$ m	Net Household Income \$ m	Employment Persons	GDP or Value Added \$ m
Aircraft Manufacture & Servicing	3,406.6	649.1	16,882	1,543.6
Air Passenger & Cargo Services	20,535.5	2,647.5	72,952	8,624.3
Airport Operations & Support	5,808.1	537.3	14,823	2,557.4
Pilot Training	237.7	53.0	2,023	133.0
Total Impacts from Aircraft Activity	29,987.9	3,886.9	106,680	12,858.3
NZ Totals for year ended December 2009	254,061.3	73,993.7	1,919,295*	185,548.9
Percentage Impacts for Aircraft Activity	11.8%	5.3%	5.6%	6.9%

*As at February 2009

The average percentage impact over all four impacts for all sectors works out to be 7.4%. The most important impact is the GDP or value added percentage at 6.9%. Looking forward into the future, high skilled manufacturing and training activity such as Pilot Training are areas where NZ may have a comparative advantage over other countries. English is the language of the air and NZ is relatively uncongested with good airports for training activities. The adaption of aircraft for recreation, agricultural services and similar activities is already highly advanced in NZ and resources should be devoted to preserving and expanding these advantages. Aviation fuels produced in NZ are also recognised as being of exceptional quality. This feature was not analysed in this report, although airplane refuelling is one part of AOS activity. The major revenue component of refuelling would accrue to the oil companies supplying aviation fuels and not to aircraft related production of goods and services.

METHODOLOGY REVIEW OF THE 112-SECTOR ECONOMIC MODELS

This review provides a brief technical description of the 112-sector Input/Output Models used to generate the general equilibrium economic impact (resulting impacts after all reactions to initiating events, industry developments etc. are accounted for) on the New Zealand economy as well as any regional economies (e.g. Waikato Regional Council economy) that may be impacted by the activity being analysed

The economic models were constructed from data originating with **Statistics NZ** for the year ended March 2004. The NZ and all regional economies were categorised into 112 sectors. These comprise the basic farming sectors such as *Dairy Farming*, *Sheep & Beef Farming* as well as *Other Horticulture*, *Mixed Cropping*, *Fruit Growing* and *Services to Agriculture* sectors. There are 18 such primary sectors in the model up to *Oil & Gas Exploration*. Related follow-on sectors from these primary producers that are important for regional rural economies are *Meat Processing*, *Fruit & Vegetable Processing* and 3 sectors related to wood processing. Altogether there are 41 manufacturing sectors including the primary processing sectors above as well as *Agricultural Equipment*, *Other Transport Equipment*, *Other Chemical Products* etc. The 3 utility sectors for *Electricity*, *Gas* and *Water* include the production, distribution and supply of these goods and services. Construction is sub-divided into 4 sectors including *Ancillary Construction* (e.g. paving, swimming pools, roofing, electrical maintenance etc.). The model then uses 46 sectors covering activities such as *Wholesale Trade*, *Retail Trade*, *Accommodation*, 4 transportation sectors, 16 finance and business service sectors, central and local government services as well as separate sectors for *Education*, *Hospitals*, *Aged Accommodation* and *Gaming*. Descriptions of the activities in each of the 112 sectors are listed below. Where a sector description is not obvious, some of the activities covered in that sector are listed in the right-most column.

This comprehensive economic model is one of a class of so-called *general equilibrium* models and is described as an Input/Output model. Each of the 112 sectors in the model quantifies the inputs it receives from all other sectors, such as *Gas*, in order to produce the goods or services sold in a given period (output level in dollars), usually a year. Also quantified are the total inputs of labour and capital goods (depreciation or capital replacement) needed to produce at that output level. The models are constructed for the latest year possible for which NZ GDP data are available. Currently this would mean a model for the year ending December 2009. The economic models provide detailed information concerning:

- The structure of the NZ and/or regional economies as to the most important sectors in terms of employment, profitability, exports out of country/region etc.
- The impact of a change originating in one sector (e.g. *Other Transport Equipment*) and its implications for other related sectors (*Air Services*) and the economy as a whole.
- Consequences for employment and income flowing from major changes to the economy as a result of government policy (e.g. lower taxes, tariffs, free trade agreements etc.)
- The implications for the regional and national environment of significant increases in the output level of any sector or group of sectors.

There are four economic impacts that can be analysed for the regional or national economy as follows:

- Total sales, revenue, turnover or output in dollars.
- Net household income after tax, superannuation and other saving in dollars.
- Value Added for the region (defined below) otherwise known as regional Gross Domestic Product (GDP) or Gross Regional Product (GRP) where the economy in question is a region. GDP is the equivalent national measure for NZ as a whole.
- Employment Count (full and part-time workers).

Although total sales or output best measures the dollar value of total economic activity in a region, it can be inflated by the value of large imports of products or services (e.g. sophisticated engineering design services) into a region like the Waikato from say Auckland or Rotterdam. While such sales figures measure total transaction value, the Value Added measure quantifies the economic value in dollars created within the Waikato region by local business units and their workforces after allowing for any necessary imports of raw materials and other goods and services from outside the region. This is the measure of the addition to gross regional product (GRP) for the Waikato and ultimately to NZ's GDP and best reflects the true gain to the regional or national economy. Total Value Added includes:

- Net after-tax wages and salaries to employees.
- Net after-tax operating surplus but before dividends and interest of business units.
- Capital replacement of plant and equipment used up in current production.
- PAYE, company tax, GST, excise and customs taxes, road user charges and all other taxes paid to central government.

Net after-tax wages and salaries (or household income) is the best measure of available household purchasing power. Strong growth or impact for this measure in a region signals improved prospects for the *Wholesale and Retail Trade* sectors, *Ancillary Construction Services* (e.g. house additions or renovations) and similar sectors.

A wealthy region or country may show acceptable outcomes for the three dollar measures above but may lack the industrial capacity to support good job growth in the region. Employment is therefore an important attribute of regional prosperity and this means economic development within the region is required to expand opportunities for a regional workforce. Such employment is measured as Employment Count and includes full-time and part-time persons. About 24% of regional workforces are currently part-time employees. An important capital intensive facility such as a port may itself need only a moderate workforce for efficient operation. However, through a port's linkages to other sectors, it can ensure profitability in those sectors and facilitate growth in employment in those sectors (e.g. *Other Fruit Growing* which includes asparagus, strawberries for the Waikato region).

The so-called *general equilibrium* nature (includes all reactions to economic stimuli) of the 112-sector Input/Output model is designed to reflect the idea that employment in any one sector generates employment in other sectors of the economy/region being analysed. From employment, related benefits such as income, value added etc. follow. As employees in the initiating sector build houses, educate their families in the general course of living, they create demands for goods and services that must be satisfied by other sectors with their own employees. In turn, these employees create further demands in other sectors and so on and so on. In economic jargon, these successive rounds of impacts are labelled round-by-round effects with some activities down the line requiring yet further services and employment from the initiating sector. The resulting *general equilibrium* impacts (Revenue or Output, Income and Value Added as well as Employment) are estimated by the Input/Output methodology and account for all rounds of economic activity.

Using accurate data from **Statistics NZ**, credible estimates of the economic importance of sectors like *Dairy Farming* for a regional economy like the Waikato can be derived. The household income created within this sector links forward into sectors such *Retail Trade*, *Other Sport & Recreation*, *Personal & Community Services* etc. The inputs required by *Dairy Farming* link backwards into supplying sectors such as *Electricity Supply*, *Agricultural Machinery* and *Road Freight*. The

total of all such flow-on linkages can be estimated and in the case of *Dairy Farming* and *Dairy Processing* constituted 24% of the Waikato R.C. regional economy in terms of GRP for the December 2006 year.

Activities in the 112 Sectors of the ECONOMIC MODELS

1	Other Horticulture	Squash, nurseries, vegetables, floriculture
2	Apple & Pears	
3	Kiwifruit	
4	Other Fruit	Grapes, citrus, berries
5	Mixed Cropping	Wheat, maize, grains
6	Sheep & Beef Farming	
7	Dairy Farming	
8	Other Farming	Pigs, deer, horses, goats etc.
9	Services to Agriculture	Fencing, spraying
10	Forestry	Forest growing
11	Services to Forestry	
12	Logging	
13	Fishing	Ocean and fresh-water fish farming
14	Coal Mining	
15	Services to Mining	
16	Other Mining & Quarrying	
17	Oil & Gas Extraction	
18	Oil & Gas Exploration	
19	Meat Processing	
20	Poultry Processing	
21	Bacon Ham & Smallgoods	
22	Dairy Manufacturing	
23	Fruit & Veg, Oil & Cereal Processing	
24	Bakery & Confectionary	
25	Seafood Processing	
26	Other Food Manufacturing	Animal, bird feed
27	Soft Drink, Cordial, Water	
28	Beer, Wine & Tobacco	
29	Textile Manufacturing	Wool scouring, carpets
30	Clothing Manufacturing	
31	Footwear	
32	Other Leather Products	
33	Sawmilling & Timber Dressing	
34	Other Wood Products	Plywood
35	Paper & Paper Products	Newsprint, pulp, containers, paper bags
36	Printing & Services	
37	Publishing & Recorded Media	
38	Petroleum Refining	
39	Petroleum & Coal Products	
40	Fertilisers	
41	Other Industrial Chemicals	Gases, resins
42	Medicinal, Detergents & Cosmetics	
43	Other Chemical Products	Explosives, paints, pesticides
44	Rubber Manufacturing	
45	Plastic Products	
46	Glass & Ceramics	

47	Other Non-metallic, Mineral Products	Cement, lime, concrete pipes
48	Basic Metal Manufacturing	Iron, steel, tubing
49	Structural, Sheet & Fab Metal Prod	Aluminium, tools, wire, nuts & bolts
50	Motor Vehicles	
51	Ship Building	
52	Other Transport Equipment	Rail, aircraft and related equipment
53	Photographic & Scientific Equipment	
54	Electrical & Appliance Manufacturing	
55	Agricultural Equipment	
56	Other Industrial Machinery	Mining, food processing, pumps, air-conditioning
57	Prefabricated Buildings	
58	Furniture	
59	Other Manufacturing	Toys, jewellery
60	Electricity Generation & Supply	
61	Gas Supply	
62	Water Supply	
63	Residential Building	
64	Non-Residential Building	
65	Non-Building Construction	Roads, earthmoving, irrigation, bridges
66	Ancillary Construction Services	Landscaping, bricklaying, roofing, electrical, plumbing
67	Wholesale Trade	
68	Retail Trade	
69	Accommodation	
70	Restaurants, Cafes, Bars & Clubs	
71	Road Freight	
72	Road Passenger	Buses, taxis, tours
73	Water & Rail Services	Includes operations of Ports, customs & shipping agents
74	Air Services, Transport & Storage	Airport operations, warehousing & storage
75	Communication Services	
76	Finance & Superannuation	
77	Insurance	
78	Services to Finance & Insurance	
79	Property Services	
80	Owner Occupied Housing	Rental value imputed to homeowners
81	Vehicle & Equipment Hiring	
82	Scientific Research	Waikato Innovation Park, NIWA, LandCare
83	Technical Services	Engineering, architects, quantity surveying
84	Computer Services	
85	Legal Services	
86	Accounting Services	
87	Advertising & Marketing Services	
88	Business, Admin. & Mngt. Services	
89	Employment & Security Services	
90	Pest & Cleaning Services	
91	Other Business Services	Packing services, mail-out services, debt collection
92	Central Government	
93	Defence	
94	Fire & Police	
95	Local Government	
96	Pre-School Education	

97	Primary & Secondary Education	
98	Post School Education	University, technical & further education
99	Other Education	Language schools, hairdressing & personal services, pilot training
100	Hospitals	
101	Medical & Dental	
102	Veterinary Services	
103	Child Care	
104	Aged Accommodation	
105	Other Community Services	Residential care services
106	Movies, Radio & TV	
107	Libraries, Museums & Arts	
108	Horse & Dog Racing	
109	Gaming	Lotteries, casinos
110	Other Sport & Recreation	Stadiums, attractions, gardens, golf courses, sky diving
111	Personal & Community Services	Videos, hairdressing, massage, funeral services
112	Waste, Sewer & Drainage	

AUTHOR PROFILE

The author is Cambridge, NZ born and a graduate of the University of Auckland and Indiana University in the USA, where he completed his doctorate in Business Economics and Public Policy in 1970.

Since that time, he has taught in the areas of econometrics, forecasting, financial economics and managerial strategy at The University of New South Wales in Sydney (1970 – 1978) and most recently at The University of Waikato (1978 – 2007). At various times, he has taught in MBA programmes at the University of Florida in Gainesville and in the Graduate School of Management at the University of California at Irvine. At the present time, he works as an independent economic consultant based in Auckland.

The author has published extensively, mainly as single-authored articles in international journals such as *Decision Sciences*, *Theory and Decision*, *The Journal of Business*, *Mathematical & Computer Modelling*, *Environment & Planning*, *Australian Journal of Management*, *Forest Science*, *Australasian Journal of Regional Studies* and, most recently in April 2009, *OMEGA*, the international journal of management science. Other articles on theoretical and applied economics have been published by the author in *NZ Economic Papers* and *Australia's Economic Record*. He is a member of the Advisory Board for the Wiley journal *Managerial and Decision Economics* and maintains a continuing interest in the latest developments in economic theory as it relates to management and business. The author has developed a particular expertise in the area of impact and regional analysis. He was the Editor/Manager of the *Regional Economic Bulletin*, which focused on topical issues relevant to the business and wider communities, mainly but not exclusively, in the Waikato and Bay of Plenty regions. The *Bulletin*, which was a complimentary publication of the University of Waikato, ceased publication in 2008.

The author has acted as a consulting economist for *Alpha Aviation Limited*, *Environment Waikato*, *Carter Holt Harvey Limited*, *Contact Energy*, *Norske Skog Tasman Limited*, *Port of Tauranga Limited*, *Port of Napier*, *Feltex Carpets Limited*, *Man'O War Farm Limited*, *NZ Refining Company Limited*, *Zespri International*, *Waikato Innovation Park*, *Property Council of NZ*, *Creative Napier*, *Katolyst*, *Priority One BOP*, *Vision Manawatu*, *Enterprise Franklin*, *Venture Taranaki*, various District Councils in the Waikato, Bay of Plenty, Hawkes Bay and other regions and for events such as *Tauranga's Montana Jazz Festival*, *Hamilton's Balloons Over Waikato* and *Napier's Art Deco Weekend*.

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