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METHODOLOGY REPORT
for the
CANADIAN AEROSPACE AND DEFENCE SECTOR SURVEY, 2000

submitted to:

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I. BACKGROUND.

On March 20, 2001, the Small Business and Special Surveys Division (SBSSD) of Statistics Canada agreed to undertake a survey of over 140 of the largest Canadian companies engaged in aerospace and defence manufacturing in Canada on behalf of the Aerospace and Defence Branch of Industry Canada. Industry Canada has, for many years, surveyed and produced an annual report on 80 of the largest Canadian aerospace and defence companies. In each of the last two years, Statistics Canada has conducted a census survey of all companies engaged in aerospace and defence manufacturing in Canada on behalf of Industry Canada.

The objective of the ***Canadian Aerospace and Defence Sector Survey, 2000*** was to produce new statistical information on the revenues, costs, investments, employment and markets of the firms engaged in aerospace and defence manufacturing in Canada. The data from this project will be used by Industry Canada to determine the competitive position of the sector and its needs in terms of federal government policies and programs.

The survey was conducted with the full support of the pertinent federal and provincial government departments and agencies. It was also endorsed by all national and provincial aerospace and defence industry associations including: the Aerospace Industry Association of Canada (AIAC); the Canadian Defence Industry Association (CDIA); the Nova Scotia Aerospace Association (NAA); the Association québécoise de l'aérospatiale (AQA); the Ontario Aerospace Council (OAC); Manitoba Aerospace (MA); the Western Aerospace Alliance (WAA); the Alberta Aerospace Association (AAA); and, the Aerospace Association of British Columbia (AABC).

In order to reduce the burden on respondents and the costs of data collection activities, Statistics Canada entered into an agreement under section 12 of the Statistics Act with Industry Canada to share the information gathered by this survey.

The project was managed by the Small Business and Special Surveys Division and supported by the Business Survey Methods Division (BSMD); and, the Data Access and Control Division (DACS).

The collection of the survey data was also co-ordinated with the Annual Survey of Manufacturers, conducted by the Manufacturing, Construction and Energy Division of Statistics Canada

II. APPROACH USED FOR THE SURVEY

The ***Canadian Aerospace and Defence Sector Survey, 2000*** comprised the following four main tasks:

Task 1. Tracing and development of a survey frame of firms engaged in aerospace and defence production and repair in Canada.

Task 2. Survey questionnaire development.

Task 3. Survey Collection.

Task 4. Data capture, production of micro data file, tabulations and methodology report.

In order to reduce the burden on respondents and conserve costs, unlike the 1998 and 1999 surveys, the 2000 survey targeted only the largest companies in the industry. The results of the 1999 survey were used to model the contribution of the SME firms when producing estimates for 2000.

III. METHODOLOGY FOR THE SURVEY.

Industry Canada provided the survey frame that was used for the ***Canadian Aerospace and Defence Sector Survey, 2000***. The frame provided included companies at both the enterprise level and the establishment level. As a result, respondents reported at both the enterprise level and the establishment level. In order to reflect this and avoid confusion, the rest of this report refers to the 'units' in the survey frame.

On March 26, 2001, Industry Canada provided a list of 143 units identified as being the largest of those involved in the Aerospace and Defence Industry to Statistics Canada.

Table 1 shows the provincial distribution of the units included in the ***Canadian Aerospace and Defence Sector Survey, 2000***:

Table 1: Canadian Aerospace and Defence Sector Survey, 2000	
Province:	**Number of units:**
Newfoundland	3
Prince Edward Island	1
Nova Scotia	5
New Brunswick	1
Quebec	36
Ontario	70
Manitoba	5
Saskatchewan	1
Alberta	8
British Columbia	13
Canada	**143**

Industry Canada approved the final questionnaires on March 15, 2001. Note: Copies of the survey questionnaires are included as an attachment to this report.

The ***Canadian Aerospace and Defence Sector Survey, 2001*** questionnaire contains the following sections:

- Cover page
- Company information (Section A)
- Company sales (Section B)
- Company expenses (Section C)
- Company employment (Section D)
- Company investment (Section E)
- Company inventories and backlogs (Section F)
- Comments
- Contact Person

Industry Canada identified several "Must-questions" as crucial. The "Must-questions" on the survey questionnaire are the following: B1 (2000 Domestic Sales); B2 (2000 Foreign Sales); B3 (2000 Total Sales); B7 (subsector breakout); C1 (2000 Total Expenses); D1 (2000 Total Employment); and, E1 (2000 total investment).

Industry Canada and Statistics Canada jointly drafted an introductory letter to the respondent to explain the use of the data and the data sharing agreement on March 30, 2001. Note: A copy of the covering letter is included as an attachment to this report.

The Data Sharing Agreement between the Deputy Minister of Industry Canada and Statistics Canada for the 1998 survey was still in place, so a new Data Sharing Agreement was not required. The Chief Statistician of Canada signed the existing Data Sharing Agreement on March 9, 1999.

Verification and tracing of telephone numbers and contact persons for the companies included in the survey was carried out by Small Business and Special Surveys Division beginning April 5, 2001. The questionnaires were mailed out April 11, 2001

Small Business and Special Surveys Division also carried out the collection and data capture activities for the project. Given the frame size, content and nature of the project, a questionnaire mailout/mailback collection method was used. The majority of the survey questionnaires were mailed on April 11, 2001. The first follow-up phone calls (to determine if the questionnaire was received) to all 143 Aerospace and Defence companies started on April 24th; subsequent follow-up phone calls (to encourage mail-back, fax back or completion by phone) to non-respondents were carried out between April 24th and June 29th.

Industry Canada was provided with collection status reports on April 30th, May 11th, May 25th, June 8th, June 15th, and June 25th, 2001. On June 15, 2001, there remained a large number of outstanding companies, as only 65 questionnaires out of 143 units had been received.

Therefore, Industry Canada and Statistics Canada met and agreed to extend the follow-up period until July 20, 2001. Statistics Canada and Industry Canada worked together to identify new contacts for outstanding cases.

The response rate at the end of collection was 82.2%. Of the 143 firms targeted, 111 completed the questionnaire, 7 were out-of-scope, 1 was out-of-business and 7 refused to participate in the survey.

A preliminary micro data file was produced on July 23rd, 2001. The final micro data file was produced on December 13, 2001.

IV. SURVEY STATUS REPORT.

The ***Canadian Aerospace and Defence Sector Survey, 2000*** was carried out between April 1st and July 20th, 2001.

Table 2 shows the survey results:

Table 2: Status Report – All (re: Canadian Aerospace and Defence Sector Survey, 2000)	
Status:	**COUNT:**
Completed	111
Out of Scope	7
Out of Business	1
Refusal	7
Unable to locate	2
Non Response	15
Total	**143**

The overall response rate for the ***Canadian Aerospace and Defence Sector Survey, 1999*** was 82.2%.

V. PROCESSING

The processing phase of the survey was for the most part concerned with applying consistency edits to the data reported. For example, one key edit ensured that the sum of total exports plus domestic sales was not greater than the value of total sales. Another key edit checked to see whether the sum of sales to the various subsectors was equal to the value reported for total sales. If a given case failed one or more edits, it was reviewed to correct the problem. For more detailed information on processing edits used, please refer to the following document: Aerospace Edits 2000.doc.

VI. IMPUTATION

Imputation was used whenever a value was missing or inconsistent. Before imputation was performed on any of the variables, the two largest companies were temporarily removed from the sample so that they would not be used in cases where imputation by the mean was used. Imputation was first performed on the sample excluding those two records. They were reinserted in the sample after imputation was done on the remaining companies.

When imputing for missing or inconsistent data, a first rule was to give priority to section totals or sub-totals that had been reported by respondents. Also, priority was given to data reported for the year 2000.

The imputation of missing data was done using two different methods, imputation by the mean and ratio imputation. Imputation by the mean was used only in cases where a section was completely missing. This method of imputation uses the mean of all cases for which there was a value for the variable to be imputed. This mean was then assigned to all cases that required imputation. Therefore, many cases could end up with the same value. This was done for very few cases.

Most of the imputation was done using ratio imputation. It was used when the values of the variables for a record are not all missing. For example, if the data for the year 2000 were present but no values for the projection years 2001 and 2002 were given, a proportion of increase for the projection years for the cases was calculated where all values were present and that proportion was applied to the missing data. Ratio imputation was also used when some values are missing in the subtotal. The proportion of each subtotal variable with respect to the total was calculated for cases where there are no missing data. The proportion was then applied to cases that require imputation.

The average rates of imputation by section were:

Section	Average rate of imputation
Section A1 : Legal Status	0.00%
Section B1 : Domestic Sales	15.65%
Section B2 : Exports	16.49%
Section B3 : Total Sales	11.32%
Section B4 : Sales by Products and Services (%)	9.70%
Section B5 : Civil and Military Sales (%)	5.98%
Section B6 : Regional Sales (%)	9.43%
Section B7 : Sub-sectorial Sales	9.43%
Section C1 : Company Expenses	24.53%
Section C2 : Civil and Military Imports of Supplies (%)	39.78%
Section D1 : Company Employment	16.20%
Section D2 : Regional Employment (%)	9.43%
Section E1 : Company Investment	20.36%
Section F1 : Company Inventories	21.46%
Section F2 : Company Backlogs	21.38%

Note that the imputation rates were slightly higher than for 1999 because historical data was used to impute for 10 larger companies that had failed to complete a questionnaire for the survey.

VII. ESTIMATION

Even though this survey is a census, weights had to be used in calculating the estimates in order to compensate for non-response. Strata were created by regions and by size of units (which is based mostly on the sales in aerospace). Very large companies were assigned a weight of 1 so that they represent only themselves.

Statistics Canada's Generalized Estimation System (GES), which calculates estimates with their respective coefficients of variation (CV), was used to produce two sets of estimates: one for Aerospace and Defence sales and one for Aerospace sales only. The CVs for most estimates were good (<10%). Note however that the CV does not take into account non-sampling errors and errors due to imputation.

Since the initial set of estimates produced with GES represented only the large companies, a boost factor was applied to each estimate to include the contribution of the small and medium sized businesses (SMEs). This factor was derived using the contribution that SMEs made to the estimates in the 1999 survey when all businesses were sampled. Although it varied by question, the contribution of the SMEs generally was in the neighbourhood of 5% of the total.

In order to produce the estimates for the Aerospace and Defence sales and the Aerospace sales only, it was necessary to first define what those sales were. Using the breakdown of sales variables in section B7, as well as the Proportion of sales to Defence sector, a proportion of sales to the Aerospace and Defence sector was obtained. A similar method was used to get a proportion of Aerospace sales only. These proportions were then applied to all the variables throughout the questionnaire to obtain Aerospace and Defence figures as well as Aerospace only figures. This method creates non-sampling errors due to the fact that these proportions may not be representative of all questions.

VIII. PRODUCTS

One output table was created in MS-Excel format. This contains estimates for both the 'Aerospace' sector and the 'Aerospace and Defence' sector.

IX. QUALITY EVALUATION

Overall Data Quality

In this section, it is appropriate to discuss sampling and non-sampling errors. As mentioned earlier, even though this survey was designed as a census survey, non-response makes it look more like a sample survey. The sampling error exists because

not all of the population was observed and because values for the figures of interest had to be estimated. One way to evaluate the impact of sampling error is to calculate the coefficient of variation (CV). As mentioned above in the estimation section, most of the estimates were of good quality (CV<10%).

Non-sampling errors are all other types of errors that alter the estimated values. For example, when respondents only answered some questions, imputation had to be used to compensate for the remaining values. This is particularly the case with the prediction variables for the years 2001 and 2002 throughout the questionnaire. Another problem is that respondents can interpret and answer the questions differently than expected. It can be difficult to identify these types of errors in many cases. Subject matter expertise may be the only way to detect those errors.

Quality Issues

Non Respondents: For 10 of the larger non-responding units, historical data was used to model the contribution to the sector of these companies. This was done because some of these companies were extremely important contributors to certain regions or subsectors. However, there is some risk associated this technique, since it is known that this is a volatile industry which changes quickly.

Forecasts for 2001 and 2002: The forecasts provided by companies for 2001 and 2002 are only projections. These projections are based on contracts that the company expects to receive, based on current information. However, there is a large amount of uncertainty associated with projecting one or two years into the future, especially in an industry that fluctuates as much as the Aerospace and Defence Industries do. Therefore, these figures should be used with extra caution. This is especially true this year, as the data for this survey was collected prior to the events of September 11, 2001. It is believed that the repercussions of those events have had an especially significant impact on these industries, and it is therefore important to note that the environment in which these industries operated when the survey data was collected may be significantly different from the environment these industries currently operate in.

APPENDICES