



## **Experience with measuring freight movements in Australia**

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### **Abstract**

This paper will focus on the operational experiences encountered by the Australian Bureau of Statistics (ABS) in conducting the Freight Movements Survey 2000 (FMS 2000). Operational experiences and outcomes are compared with feasibility studies and pre determined performance indicators. The main difficulties encountered by a national statistical agency in collecting detailed road freight data are discussed together with solutions that were adopted to overcome them. Issues discussed include methods used to collect road freight transport data, provider issues encountered and other interesting experiences.

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## **Introduction**

Information to assist in the planning of major infrastructure works and in the efficient distribution of freight is an important requirement of decision makers in government agencies and the private sector alike. The Australian Bureau of Statistics (ABS) has a significant role to play in filling these information needs and has been involved in the collection and publication of freight statistics in one form or another since the 1960's.

During the 1990's there was a strong and growing demand for the ABS to enhance the quality and expand the range of transport statistics it produced. Demand included requirements for information on the size and operational characteristics of the transport task. For freight statistics, the main interest centred on tonnes moved by origin, destination, commodity and mode of transport, with a lesser demand for value based measures.

Australian and international experience has proven that freight surveys are notoriously difficult and expensive to run. The inherent difficulties in designing these surveys include ensuring relevant scope, obtaining a sample framework and methodology which can provide up to date coverage, and minimising reporting load on providers of information (provider load).

The ABS has conducted a number of Freight Movement surveys since the early 1980's, with all suffering some form of methodological problems. The recently completed 2000 Freight Movements Survey (FMS 2000) was a significant step forward by the ABS to overcome those methodological problems. Results were released earlier this year. The FMS 2000 provided estimates of freight moved by road, rail, sea and air for the period 1 April 2000 to 31 March 2001.

The running of such a survey is an expensive undertaking and would not be possible without the assistance of other agencies. The ABS wishes to take this opportunity to acknowledge the Commonwealth and each of the State/Territory Transport Departments for their funding contributions which assisted with the conduct of this survey.

This paper focusses on the road freight movements component of the FMS 2000, including investigations conducted, subsequent development of the survey, and operational experiences encountered by the ABS in conducting the survey. The paper will conclude with an evaluation of the operations of the survey and relevant lessons learnt.

## **History - Before FMS 2000**

Prior to the FMS 2000 the ABS conducted two freight movement collections, the Interstate Freight Movement Survey (IFMS) and the 1994-95 Freight Movements Survey, (FMS 1994-95).

The IFMS, which was conducted from 1980-81 to 1991-92, produced financial year statistics on interstate freight movements by road, rail, sea and air. The scope of the IFMS included enterprise units undertaking 20,000 tonnes or more of interstate road freight movements in a year, either for hire and reward under prime contract arrangements or on own account. Freight moved under sub-contract arrangements were excluded. The survey frame consisted of enterprises in the 1980-81 Census of Interstate Freight Movements that met the scope criteria.

Data produced by the IFMS included tonnage data for capital cities and some more specific areas by origin and destination. There were inherent problems associated with the survey framework, including less than full coverage of all relevant operators and how well the frame reflected the real world (e.g. updates for births and deaths were not always timely). In addition, users required more detailed data than were produced by the IFMS.

In June 1991 the ABS agreed to undertake a study to investigate ways of overcoming problems in the IFMS and to determine the feasibility of collecting an expanded range of information about freight movements in Australia. The ABS completed these investigations, including researching experience of overseas statistical agencies and research organisations, and subsequently conducted pilot studies during 1993 to evaluate the methodology.

The new methodology was implemented in a quarterly survey of rail, sea, air and road freight movements in Australia from June quarter 1994 to September quarter 1995 (FMS 1994-95). Prime contract movements undertaken by businesses which were the registered owners of rigid and articulated trucks with a gross vehicle mass or gross combination mass of 3.5 tonnes or more, respectively, were included. In order to avoid double counting, freight moved under subcontractual arrangements was attempted to be excluded as it was covered under the prime contract. The framework relied on using motor vehicle registrations to subsequently create notional businesses (a process called "fleeting up") which then constituted the survey frame.

Estimates from the FMS 1994-95 were labelled experimental because initial results raised concerns over their quality and the underlying methodology of the road component. Major limitations included:

- coverage of the survey framework;
- the small sample size relative to the population size leading to estimates with large relative standard errors (RSEs), and
- the use of sub-quarterly (two weeks in the middle of the quarter) reporting periods to represent the quarter.
- some freight moved under subcontractual arrangements was included although subcontractors were not supposed to report it

As a result of concerns over the quality of estimates, while the rail, sea and air freight movements continued to be collected and released, the road survey was discontinued following collection and processing of data for the June quarter 1996.

The ABS continued further investigations to overcome data quality problems inherent in the FMS 1994-95. The investigations undertaken recommended a vehicle based methodology with fortnightly collection periods to produce output of suitable quality and detail to satisfy user needs. The ABS 1995 Survey of Motor Vehicle Use (1995 SMVU) indicated that articulated vehicles were a relatively small portion of the truck population (about 15%) but contributed about 85% of the estimated non-urban tonne-kilometres travelled by heavy vehicles. In addition, they contributed about 75% of total tonne-kilometres and most of the long haul interstate movements (95% of interstate tonne-kilometres). Research into user needs indicated that tonne-kilometres and interstate freight movements were high priority demand. This research, together with the need to minimise provider load and survey costs, resulted in the decision to include only registered articulated vehicles in the survey.

Development work commenced during 1997 and included:

- a Record Keeping Practices (RKP) study;
- pilot tests of the new methodology for a Survey of Articulated Vehicles (SAV) in late 1997;
- a SAV Post Enumeration Study in early 1998;
- a SAV Dress Rehearsal in mid 1998;
- analytical and forms design work; and
- detailed analysis of RSEs, response rates, operational feasibility and costs

The results of this work culminated in the ABS undertaking a new survey, the 2000 Freight Movements Survey (FMS 2000) which measured freight and commodity flows between regions in Australia. The new collection used a two-

*Experience with measuring freight movements in Australia*

week diary for each selected vehicle with 26 fortnightly dispatches in the year and an overall sample size of approximately 14,000 vehicles.

## **The FMS 2000**

After a reasonably lengthy development phase the FMS 2000 was implemented with a reference period of 1 April 2000 to 31 March 2001. This section outlines the operational details of the FMS 2000.

### User requirements

Levins and Ockwell (2000) stated that Australia had one of the highest growth rates (119%) amongst OECD countries in road freight volume between 1980 and the mid 90's, together with Korea (288%) and Turkey (229%). Levins and Ockwell state that "70% of freight travels by road transport at some point from production to final consumer". As freight traffic contributes significantly to road damage, and as a large proportion of the total road infrastructure budget can be allocated to road maintenance in some industrialised countries, it is not difficult to understand the degree of interest planning bodies have in accurate road freight movement information.

A number of ABS studies confirmed that key statistics relating to freight flows between geographic areas (whether they be inter-regional or intra-urban) were a high priority unmet need. Departments of transport and related agencies at the Commonwealth and State/Territory levels are the main clients requiring the data for policy and planning purposes. In addition, government agencies and corporations involved in supplying transport services, and many other more broadly based agencies including economic planning and development departments, have a strong interest in the FMS 2000 output.

In discussion with key clients, ABS identified the major user needs as:

- tonne-kilometres travelled and tonnes carried;
- movement between regions (Statistical Division or lower);
- intra urban freight movements;
- broad commodity dissection;
- method of transportation (e.g. container, bulk);
- mode of transport (i.e. road, rail, sea, air);
- for road, freight moved by type of vehicle (e.g. articulated truck, rigid truck); and
- information on an annual basis

## Scope and coverage

### *Scope*

Priority user requirements for freight movements between regions made the eligibility for all relevant transport operators to be selected in the survey essential. Exclusion of some segments of the road freight operator population, as in some overseas surveys and previous ABS freight surveys, would not provide a fully representative sample of the relevant vehicle population. The FMS 2000 statistics therefore relate to freight movements by all industries and sectors of the Australian economy, whether goods were carried by transport operators for hire or reward or moved by ancillary operators (i.e. manufacturers, retailers, wholesalers, etc. on their own account). Freight carried under subcontractual arrangements was included as there was no danger of double counting since the vehicles themselves were the selection units. The FMS 2000 includes movements within and between urban areas. In common with the FMS 1994–95, international freight is excluded.

### *Coverage*

The coverage of the road component of the survey was all freight moved by articulated trucks that were registered with a motor vehicle authority for road use at some stage during the 12 months ended 31 March 2001. Freight moved by rigid trucks and light commercial vehicles was excluded from the survey. Non-freight carrying vehicles and vehicles belonging to the defence services were also excluded from the survey.

### *Data items collected*

The resources required to collect and disseminate all the information required by a diverse range of users would have been exceedingly high. In addition, investigations indicated that the reporting burden placed on the industry to provide such a large amount of information was unacceptable. Therefore, in determining the content of the FMS 2000, the ABS had to balance user needs with the limitations of the budget and provider load considerations. Thus, all data items required by users were not included in the survey. Studies of overseas collections indicated that Australia was not alone in this situation, with the range of data items collected being limited and either supplemented by other less frequent surveys or not collected at all.

### *Origin/destination*

Origin/Destination has been classified to the Statistical Sub-Division(SSD) level. As data at this level of disaggregation would be subject to high RSE's the standard data release was at the Statistical Division (SD) level (there are currently 65 SDs

Australia wide). Data at the SSD level is available as a special data service, but it comes with appropriate warnings about the high RSE's.

### *Commodity*

One of the difficulties experienced in many freight surveys is how best to collect and classify commodities. The sheer volume of different commodities carried makes data capture and compilation difficult and expensive. More importantly, when combined with the large number of origin/destination pairs, it can result in significant sampling error. Overseas freight survey experience confirmed that balancing the number of commodities required by users and keeping provider load and RSEs within acceptable limits was critical to the success of the survey.

To deliver the major commodities information needed by users, the ABS had to optimise how this data item was compiled and classified. In the FMS 1994–95, commodities were classified according to the 1 to 3 digit level codes of the Australian Transport Freight Commodity Classification (ATFCC) and Australian Pack Classification (APC). Information was aggregated and made available for 32 broad commodity descriptions. At this time the ABS was developing a new classification, the Australian and New Zealand Standard Commodity Classification (ANZSCC), covering all goods and services. The ABS made the decision to continue to use the ATFCC and the APC to classify the commodity details collected in the FMS 2000 as the transport industry was more familiar with this classification. The number of broad commodity descriptions available was reduced to 21 to reduce both provider load and sampling error.

In addition, providers were asked to report details of freight carried which were classified as dangerous or hazardous based on the Australian Dangerous Goods Code.

A significant problem in accurately identifying and classifying commodities carried was encountered when carriers moving containers were unaware of the commodities being moved in those containers. This resulted in a large figure of freight classified as "general freight".

### *Method of transportation*

In addition to classifying whether the freight carried was dangerous or hazardous, a more detailed method of transportation classification was included. The classification included identification of solid bulk, liquid bulk, or containerised goods and whether the freight carried was refrigerated.



## **Survey design**

### Framework for sample selection

Previous road freight surveys conducted by the ABS were "business based" (i.e. statistics were compiled from data provided by a sample of transport operators and other private and government-owned organisations involved in moving freight by road within Australia). The major difficulties encountered with this type of framework selection were:

- the ABS business register used as the framework at the time was a list of businesses which employed wage and salary earners, therefore self-employed owner operators (who make up a significant component of the industry) were not listed;
- there is no way to measure transport activity of businesses which are predominantly non-transport, but which still have extensive transport activities; and
- the lag between commencement of business operations and inclusion on the register was a problem because of a high turnover in numbers of interstate road freight operators. There were also difficulties encountered due to the existence of defunct units on the register and its limited ability to reflect changes in location.

These difficulties with the business based framework selection method and comparisons with overseas freight surveys which used alternate methods, were pivotal in the ABS's decision to use a vehicle based frame selection method for the FMS 2000.

The population frame for FMS 2000 was drawn from the ABS Motor Vehicle Census (MVC) which comprised approximately 63,000 articulated vehicles registered with State/Territory motor vehicle registries (MVRs) at 31 October 1999. Whilst the FMS 2000 moved to a vehicle based selection, there were still some inherent difficulties with this frame selection method which are briefly discussed below:

- a better quality sample frame was achieved as a result of improvements to registry data following introduction of the National Heavy Vehicle Scheme and closer liaison with the MVRs to improve the quality of name and address information supplied;
- while the MVC frame lacked information specifically related to the output classifications from the survey, it contained some information useful for improving the efficiency of the sample design. The frame was stratified within each State/Territory according to the vehicle description recorded by the registration authority. The population frame was further stratified by

characteristics which take into account different usage patterns. For most States/Territories these characteristics were: area of registration (capital city or rest of state); age (up to and including 1989 and 1990 onwards); and vehicle size (based on Gross Combination Mass); and

- the quality of the MVC data available was variable and the frame quickly became out of date due to the dynamic nature of the transport vehicle population. Discussions with registration authorities attempted to improve data quality received and intensive editing was performed by the ABS to correctly classify the records once they were entered into the ABS systems. To help correct for under coverage on the population frame, new articulated vehicles registered after 31 October 1999 were progressively added to the population frame during the enumeration period and supplementary samples drawn. These samples were drawn each quarter from the now defunct New Motor Vehicle Registrations (NMVR) collection. Adjustments were also made to the estimation process to account for new and re-registered articulated vehicles not given a chance of selection in the survey.

### Sample size

Since estimates of freight moved by road are based on a sample survey, rather than a complete enumeration, the data are subject to sampling variability. That is, they may differ from results that would have been obtained had all articulated vehicles been included. Determination of an adequate sample size, whilst keeping provider load to a minimum, was critical. For the FMS 2000, a sample of approximately 14,000 articulated vehicles was selected to report over 26 fortnightly periods within the reference year. This equated to a sample of approximately 500 selections in each fortnight. The sample size was chosen to give an acceptable level of precision for total distance travelled, tonnes carried and tonne-kilometres travelled at the State/Territory of registration level.

Estimates produced at the Australian level for tonnes and tonne-kilometres have RSE's below 3%. The majority of estimates at the State/Territory level have RSE's of less than 10%. The exceptions are the Northern Territory and ACT with RSE's above this level (both still under 17%) due to the smaller sample sizes for these territories. With only two exceptions, tonne-kilometres estimates for both origin and destination at SD level had RSEs of 25% or less.

These results were well within the initial predictions. The RSE analysis of Dress Rehearsal data indicated that an annual SAV would produce publishable estimates of tonnes carried, kilometres travelled and tonnes-kilometres for origins and destinations at the Statistical Division (SD) level. Estimates at the Australian level would have RSEs below 3%, and the majority at the State/Territory level would have RSE's of less than 10%.

## **Data collection**

The record keeping survey conducted during the survey redevelopment phase indicated that more than 60% of businesses with articulated vehicles had freight records which 'always' identify individual vehicles and that most businesses retained their records for more than twelve months. However, a significant proportion of 'own account' operators (i.e. carrying their own goods) (39%) retained their records for less than three months. All types of operators perceived seasonal differences in commodities carried, origin and destinations and volumes, making it necessary to obtain data for every time period (i.e. the 26 two week intervals). Similar developments were made in overseas freight surveys to reduce provider load. For example, the US reduced the four reporting periods for each sampled establishment from two weeks in the 1993 survey to one week in 1997.

## **Strategies to assist providers**

The ABS made major efforts to make the reporting task as easy as possible for providers and to promote a cooperative approach between the ABS and the industry.

Significant efforts were made before the commencement of the FMS 2000 to fully inform all road freight transport industry stakeholders of the importance and uses of the survey and the requirements this would place on industry providers. ABS representatives attended and addressed numerous industry conferences, seminars and conventions leading up to the implementation of the FMS 2000. Advertisements were placed in trucking and other related magazines, and in newspapers. Additionally, letters of advice were dispatched to large road freight transport companies.

## *Fleets*

The nature of the survey was such that the larger road freight companies owning many vehicles would be likely to be selected more often than an individual operator with only one or two vehicles. A dedicated ABS fleet contact officer was appointed before and during the survey. The fleet officer was responsible for identifying the large businesses likely to be selected (using sources such as trucking magazines, Yellow Pages and local industry knowledge) and then matching them up against the frame. The businesses were contacted and advised in advance that the survey was to be conducted, that they were likely to have a large number of vehicles selected and offering ABS assistance to set up reporting systems and discussion of any concerns. A contact person in the company (usually administrative/office staff) was identified for all communications about the survey. This person received the relevant fortnightly survey questionnaires for selected vehicles and coordinated the collection of information

from drivers of the vehicles. The large companies were advised in advance of the vehicles that were to be selected for each fortnight in the following 6 months. Some difficulties were experienced if the office contact had to chase up the driver for more details. Results were dependant on how well and how quickly the drivers were followed up. On a small number of occasions, where there were difficulties experienced by companies because of the large number of vehicles selected, causing workload problems for the administrative staff, a representative from the respective ABS State/Territory regional office visited the company and assisted with the manual extraction of information. These strategies, whilst resource intensive for the ABS, were extremely successful in improving the accuracy of information received and survey response rates.

#### *Small business and owner operators*

Smaller operators generally did not have the administrative resources of the larger businesses. The paperwork was performed either by the driver or their spouse, or in the case of a medium sized business by a part-time administrative assistant. These people were obviously busy with competing daily demands on their time. Difficulties experienced by the ABS in collecting information were experienced in proportion to the amount and detail of records kept and the availability of the person most able to provide the information required for the survey. If the driver's partner or spouse kept the accounts then the information was generally available, as they were usually responsible for filling out the fuel docketts which had most of the required information. However, often both the partner or spouse and the driver had to be contacted to get the full record details. If detailed records were not available, the driver was often the only person able to assist. A small number of drivers experienced difficulty filling out written forms and did not return them to the ABS. ABS staff provided extra assistance to these individuals over the phone to collect the information required.

Another common difficulty was actually getting a contact phone number. More often than not, the driver was on the road and only contactable by mobile phone. Pre-advice form information (see below), which supplied a home phone number, was of little use and tracking down numbers and drivers was resource intensive. The most successful method to obtain information was often to get it over the phone rather than wait for the survey form to be filled out and returned.

#### *Pre advice forms*

In order to encourage record keeping, confirm ownership and to update contact details, owners of articulated vehicles selected in the survey received early advice about their inclusion in the survey. Providers were contacted one month prior to the beginning of the reporting period for which their vehicle was selected. At this time providers were asked to return a questionnaire reporting selected vehicle characteristics. Providers were also advised that they would receive a follow up

questionnaire during the next month seeking details about the use of the vehicle over a specific two week reporting period. Examples of the main items requested in the second questionnaire were included, together with an information sheet about the survey.

## Questionnaires

A Post Enumeration Survey (PES) was conducted on the pilot test for the SAV during January 1998 to identify deficiencies in the questionnaire design, particularly the trip record and instruction booklet sections, and short-comings in the dispatch and collection control procedures. A final questionnaire was designed using this valuable information.

All registered owners of selected articulated vehicles were asked to report on freight movements over a two week period within the reference year. Providers recorded details of each trip (loaded or empty) made in the trip record book. The data items reported for each trip were:

- date of trip;
- state and suburb/town of origin and destination;
- major routes used (for trips over 200kms only);
- number of trips made empty or loaded;
- total kms travelled empty or loaded;
- description of main goods carried (based on ATFCC and APC classifications) - a list of the categories was supplied in the trip record booklet;
- weight of goods in tonnes;
- method of transportation (solid bulk, liquid bulk, containerised, other freight);
- dangerous or hazardous goods; and
- refrigerated goods.

When the questionnaires for each reporting period were returned to the ABS they were checked for completeness and accuracy and, where possible, follow-up contact was made with owners to resolve reporting problems. Missing data items were clerically imputed. Where the selected vehicle owner had not owned the vehicle for the whole fortnightly survey period, the details provided for the period of ownership were adjusted to give a two week equivalent, unless the vehicle was deregistered, in which case only the use up to deregistration was included.

Many businesses conducted some or all of their work by having round trips where goods were picked up and dropped off at various stops along the route. These trips were extremely difficult to document and queries, call backs and follow up of these trips proved resource intensive.

### Trip distance

Trip distance information was needed to calculate estimates of both total kilometres and total tonne-kilometres figures for the road survey. The most accurate way to record distance travelled is to record the odometer readings of the vehicle at the beginning and end of each trip. However, many providers made large numbers of trips in a fortnight, and the ABS considered their reporting burden would be greatly increased if they were asked to supply these details. As a result, the trip log only asked providers to supply the number of kilometres travelled for each trip.

To further reduce provider load, a Geographic Information System (GIS) component was used during data processing. The GIS system computed distance based on the origin and destination information supplied, allowing the ABS to reduce the number of follow up calls to query data reported on the forms. Experience from the FMS 2000 showed that without odometer reading reporting, an estimated 10% to 15% of forms had little or no trip distance details. Follow up with providers identified that for many, recall of trip distances was sketchy.

### Response to data collection

#### *Response rates*

A potentially important factor relating to non-sampling error, and thus the reliability of the estimates is the response rate achieved by a survey. The response rate for the road component of the FMS 2000 was 78%. The original estimate of the response rate during redevelopment of the survey was between 65% and 70%. The ABS went to considerable efforts to maximise response rates. (e.g. where appropriate, mail reminders and telephone follow-up were used to attempt to contact vehicle owners who were initially non-responding. Non-response to the road component of the FMS 2000 occurred predominately because the ABS was unable to trace the selected vehicle or the form was not able to be completed.

#### *Industry response to the survey*

In general, the effort put in to promote the survey and to prepare and equip providers to be able to report the required information was worthwhile. The information gathering activities of the survey were generally well received by providers. Larger companies had received forewarning and were prepared. Many smaller operators had either received the information through trade connections or had personally read about it in the promotional material placed in trade journals and newspapers.

Refusals to comply with the ABS's requests for data were virtually non-existent in earlier cycles of the survey. The incidence of complaints of provider load rose as

the number of cycles increased and if providers were selected repeatedly, however, extra liaison and assistance generally reaped positive results. There were opportunities during the collection process for providers to respond to reminder letters and phone calls to supply the necessary figures. A great deal of effort was put into assisting providers who had difficulties providing the relevant information. This approach resulted in cooperation and good relations with most providers. Other regional offices of the ABS also assisted in phone calls and visits to providers experiencing difficulty.

Confidentiality of the information being requested for the survey was a concern to some providers, as some road freight businesses were the sole operators or one of a very few operators who transported a particular commodity. There were also concerns about revealing routes and weights of goods consigned because of safety issues. Commodities such as gold or explosive materials were often freighted under strict safety and secrecy measures, and the ABS had to explain the strict confidentiality rules which prevented release of information which could identify any individual or individual business.

### **Data quality**

Estimates were produced for each of the 26 fortnightly reporting periods. These estimates were then aggregated to produce final estimates of freight movements for the survey reference period. Generally speaking, the reported data was of high quality, although there were a couple of major areas of concern. These concerns are broadly outlined below.

#### Data quality investigations

The ABS was concerned that preliminary estimates of tonnes, kilometres and tonne-kilometres from the FMS 2000 were consistently 10%-20% lower than those from the Survey of Motor Vehicle Usage 2000 (SMVU 2000). As the ABS aims to publish the most accurate set of statistics for its collections that accord broadly with user needs, the decision was made to defer release of the results until the data had been examined more closely. ABS statisticians and methodologists conducted extensive investigations into several aspects surrounding the generation of estimates. Two of the more significant investigations covered possible non-response bias and under-reporting of trips made during week 2 of the fortnightly cycles.

#### *Non-response bias*

Non-response bias occurs if the usage patterns of the non-responding vehicles differ significantly from the usage patterns of the responding vehicles. A large non-response increases the potential for non-response bias. As the FMS 2000

had a response rate of 78%, the potential for non-response bias was a concern. There are many reasons for the high level of non-response to this survey. These include high numbers of deregistered vehicles, vehicle ownership changes, inability to contact owners during intensive follow up (IFU), out of scope vehicles and the complexity of the form. Due to the difficulty in collecting information about the characteristics of non-respondent vehicles, it was not possible to prove whether the estimates suffered from non-response bias. While there was no hard evidence either way, all investigatory work into the issue indicated that there was no reason to assume the existence of significant non-response bias. Survey development investigatory work indicated the distributions of respondent and non-respondent vehicles were very similar across a number of categories and PES work, though limited, did not support the contention that non-respondents were different in their characteristics from respondents.

For the FMS 2000, post collection investigations were conducted and adjustments were applied at the stratum level to the 'weights' (the factors which expand the sample data to obtain estimates for the population) to allow for differing levels of non-responding vehicles. There was little difference between the original estimates and those produced on the adjusted basis.

#### *Possible under-reporting of trips*

Early feasibility studies indicated that even a two week reporting period may have presented significant difficulties for some providers. FMS 2000 was a diary survey and as such has the potential to miss trips. ABS investigations indicated that providers had under-reported trips made during the second week of the reporting period. Subsequent methodological adjustments to the estimates to compensate for this under-reporting were an increase of 5.09% to tonnes and 5.32% to tonne-kilometres (laden distance travelled). Whilst under-reporting in week 2 was adjusted for, no mechanism was available to scale up for under-reporting which might have existed in week 1.

The ABS has produced an extensive report of these investigations for the 25th ATRF conference, see "Features of Seasonality and its Effects on the Road Freight Transport Task".



## **Conclusion**

This paper has presented the sequence of events and research conducted by the ABS that went into the development and running of the FMS 2000. Issues encountered during the running of the survey and the ensuing data quality concerns highlight the complexity and difficulties involved in conducting road freight movement surveys.

There have been many lessons learnt from the conduct of the FMS 2000 which will provide valuable input to any future development of similar types of surveys. Particular issues that would need to be addressed are:

- allocating sufficient resources for the development and operations of the survey;
- importance of improving provider contact to increase response rates;
- importance of building into the testing and final design the ability to measure non-response bias;
- improving the measurement of distance travelled, including the use of odometer readings at for the beginning and end of the period;
- need to investigate further options to reduce the under-reporting of trips; and
- improving the identification of commodities carried to reduce the amount reported as general freight.

The survey's results have provided information that is in high demand by planning and policy bodies throughout Australia. The ABS will continue to evaluate results from the FMS 2000, including user feedback, to assist in determining future directions in the collection and supply of road freight data. Decisions about the nature and frequency of future freight surveys will be made within the context of ABS's aim to continue to enhance its ability to support the more complex needs of key clients.

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