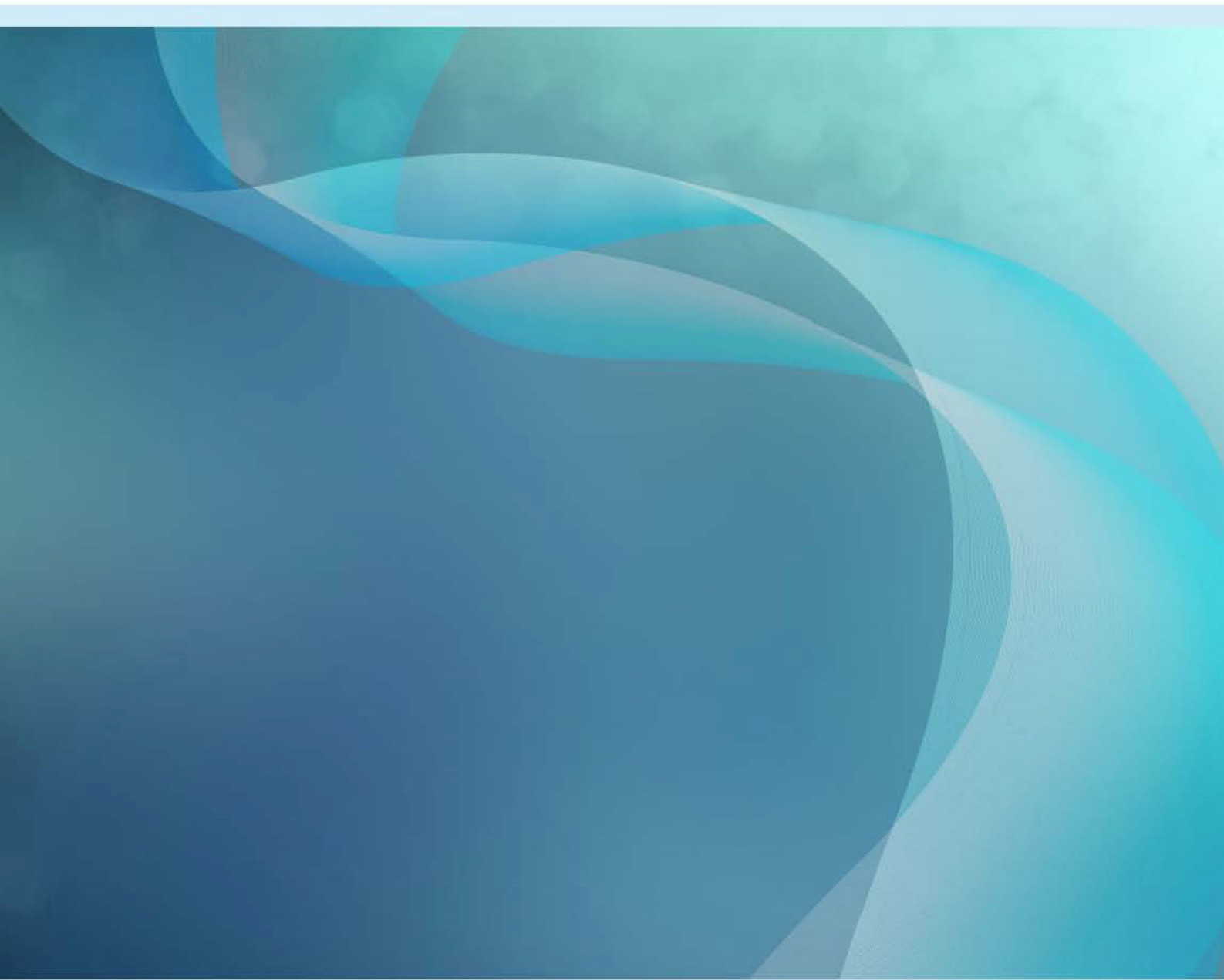




Australian Government
Bureau of Meteorology

Report on the 2012 Major Airports Survey

by Andrew McCrindell, Manager Major Airport Services



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Executive Summary

The Bureau's Major Airports Survey for was conducted over November and December and the results are representative for an estimated population of 25000. The major airports considered were Sydney, Melbourne, Brisbane, Perth, Adelaide, Gold Coast, Cairns, Canberra and Darwin.

Background:

- Respondents 448 of an estimated population of 25000
- Respondents by organisation - Qantas 26%, Airservices Australia 19.5%, Virgin Australia 13.6%, Jetstar 10.1% with good representation from helicopter operators, air freight and the Royal Flying Doctor Service.
- Respondents by role/function – Pilot 77.5%, Air Traffic services 18.5%, Operations 2%.
- There were representative figures for the airports of importance to operations.
- The TAF and TTF were the most important products.

Results:

- Accuracy 78.2% +/- 3.6%
- Conservatism approx 1/3 in each sector – overall Bureau is perceived as neutral.
- Timeliness 79.8% and timeliness of amendment 57.7%
- Alignment TAF and TTF - 39% out of alignment for more than an hour at least once a month.
- Accessibility 95.3% - useful suggestions made for improvements to access.
- Optimisation of payload - 84% indicated payloads were optimised more than 50% of the time.
- Optimisation of air traffic services - 91% indicated air traffic services were enabled more than 50% of time.

Key areas of concern:

- Accuracy thunderstorms including TMA; Sydney, Melbourne, Brisbane, Perth, Darwin.
- Accuracy Fog – highest priority Perth.
- Most common impacts of untimely forecast: Low fuel, stress, holding and delays.
- Most common concerns with untimely forecasts: Lack of fuel, diversions, safety, workload and lack of alternate.

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1 Introduction

The Bureau of Meteorology conducts regular surveys of its products and services to ensure a process of continuous improvement within its ISO 9001 Quality Management System. There are a large number of aviation stakeholders that regularly use aviation meteorological products at the major airports including the major airlines, Airservices personnel, smaller regional operators and general aviation. Feedback from the 2012 survey will be used to identify priority areas for improvement and will assist the Bureau in a better understanding of any changing forecast requirements.

Major airports considered in the survey were Sydney, Brisbane, Melbourne, Perth, Adelaide, Coolangatta, Cairns, Canberra and Darwin. These airports are within the portfolio of the Manager Major Airports and receive a premium forecasting service that includes TAF, TTF¹, Aerodrome briefings and special warnings.

The survey questions were developed in consultation with key industry stakeholders and organised through the Bureau's industry and communications and liaison manager. Previous surveys have had a poor response and were unrepresentative of the stakeholder population. This survey was disseminated through CASA monthly bulletins, the Flight Safety Magazine, the Bureau's aviation website and emails to key industry stakeholders.

The population that use Major Airport Weather Services as an important enabler for their operations was estimated at 25,000 and consists largely of pilots, airline operations in planning and despatch and Airservices controllers.

A good representative sample for any survey is 1-3% of the population and a sample of 4-5% is considered outstanding. The survey had 448 respondents (1.79%) from a diverse operational background.

Statistical margins (Confidence Intervals) for this survey based on a 95% Confidence Level for a 50% survey result is + or – 4.55% and an 80% response is + or – 3.64%². The Confidence Intervals have not been quoted on every statistic in this report.

The descriptive responses in the survey were professional, constructive and provided valuable insight. This report has summarised these responses into similar themes and ideas.

This report describes the results of the survey.

¹ Coolangatta has no TTF service.

² Confidence Intervals were calculated using the statistic tool at <http://www.surveysystem.com/sscalc.htm#one>.

2 Background Information

2.1 Organisation or Group

The respondents to the survey were from most of the key organisations or groups regularly accessing major airport services and their proportions are represented in Table 1 and illustrated by the chart at Figure 1. Qantas provided 26% of the responses, Virgin Australia 13.6% and Jetstar 10.1% with good representation from other airlines including helicopter operators, air freight and the Royal Flying Doctor Service. Airservices Australia provided 19.5% of the responses and is a good sample from that organisation.

Organisation	Count	%
Qantas	116	26.0
Airservices Australia	87	19.5
Virgin Australia	61	13.6
Jetstar	45	10.1
RFDS	17	3.8
Rex	14	3.1
CHC helicopters	14	3.1
Private Operator	13	2.9
General Aviation	9	2.0
Qantaslink	8	1.8
Cobham	7	1.6
Air North	5	1.1
CASA/ATSB	4	0.9
Tiger Airways	4	0.9
Alliance	3	0.7
Toll	3	0.7
Skywest	2	0.4
Executive ops	2	0.4
Others	33	7.4
Total	447	

Table 1: Organisations and Groups of the Survey

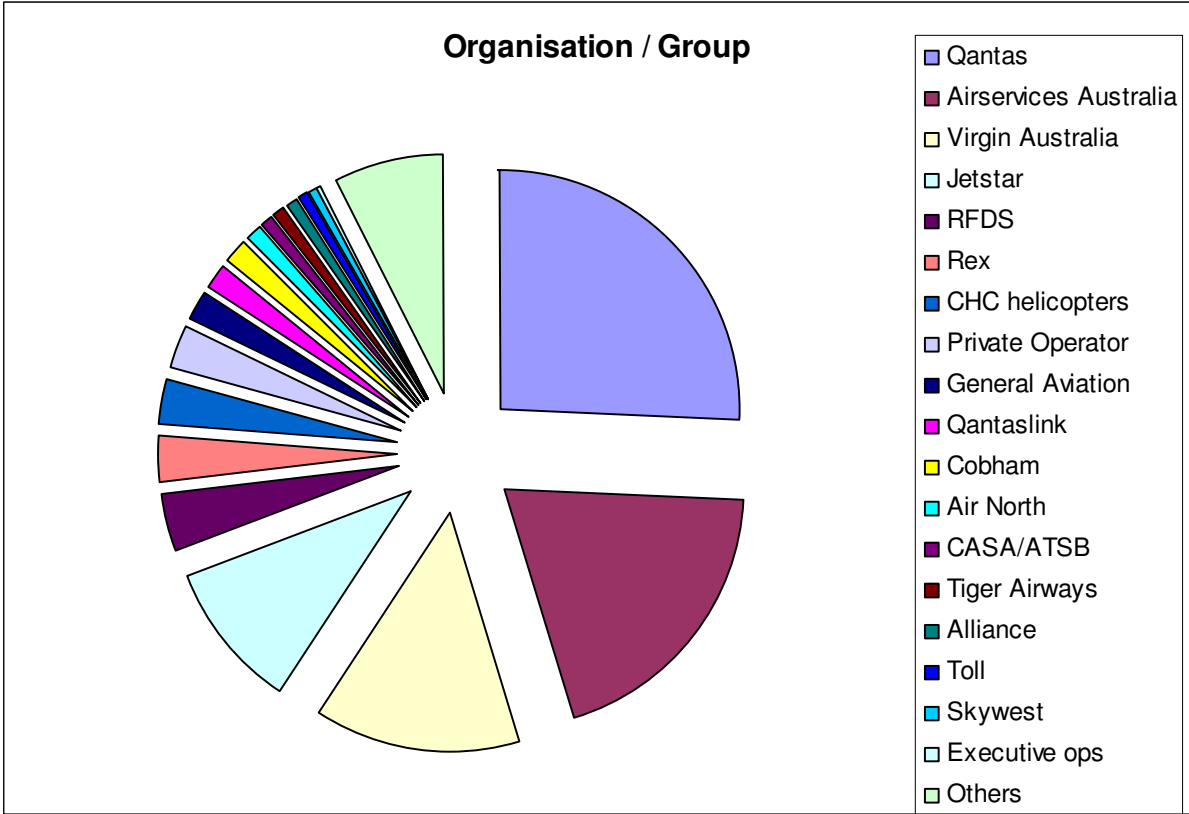


Figure 1: Pie Chart representing the Organisations and Groups

2.2 Role or Function

Roles and functions are at Table 2 and illustrated in the chart at Figure 2. Pilots made up the majority of 77.5% of the respondents, air traffic services 18.5% and operations personnel 2%. These proportions seem reasonable and reflect the importance of meteorological services to those functions.

Role or Function	Count	%
Pilot	347	77.5
Air Traffic Services	83	18.5
Operations	9	2.0
Management	2	0.4
Safety	1	0.2
Ground Crew	1	0.2
Ops Mgr Ballooning	1	0.2
Education	1	0.2
Pilot/Flight Ops inspector	1	0.2
Chief pilot and aviation mgr	1	0.2
Management and pilot	1	0.2
Total	448	

Table 2: Roles and functions of the Survey

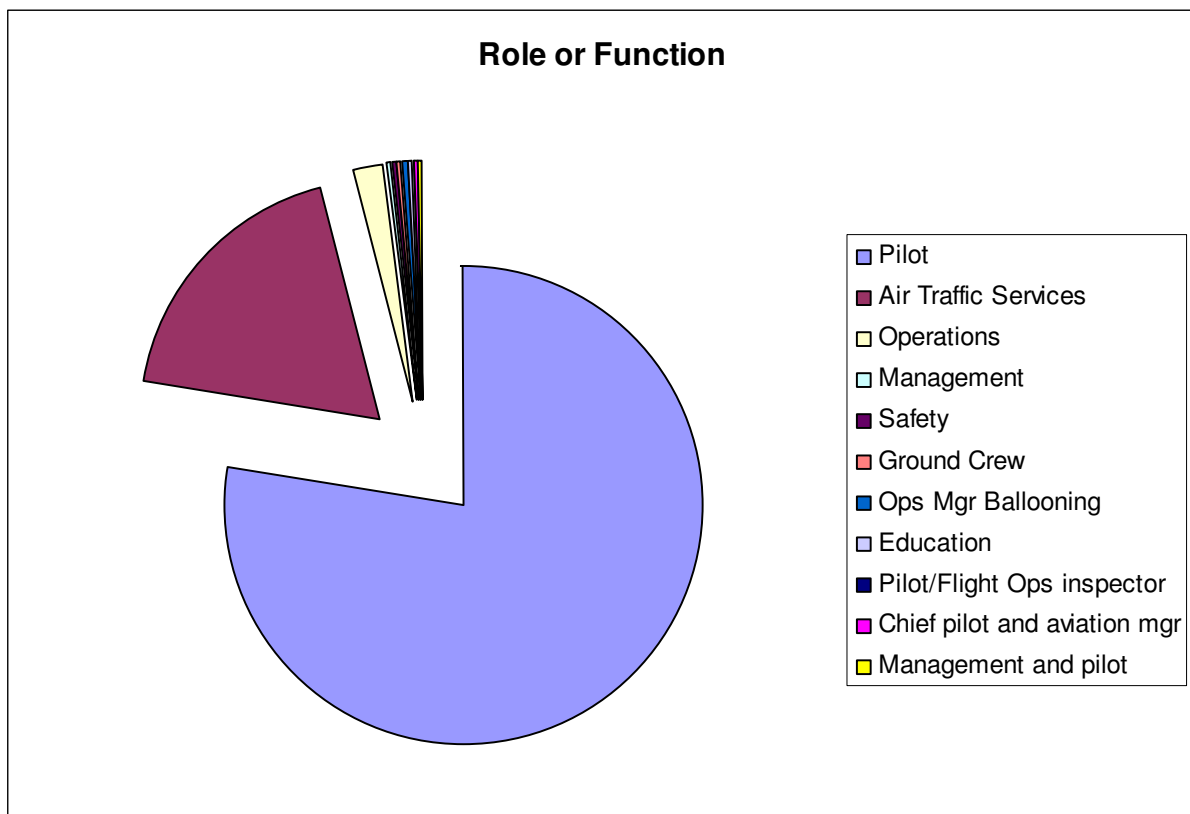


Figure 2: Pie Chart for the roles and functions of respondents in the Survey

2.3 Major airports relevant to the survey respondents

The survey allowed multiple airports to be highlighted with a total count of 2013 indicating that most of the respondents regarded 4 or more major airports as important to their operations. The geographical importance of each airport was representative and is shown in Table 3 and at Figure 3. Table 3 lists the airports in order of passenger numbers for 2011/2012.

Which major airport is relevant to your operation?	Revenue Passenger2011/12 (Millions)	Count	%
Sydney	35.6	297	14.8
Melbourne	27.7	269	13.4
Brisbane	20.5	272	13.5
Perth	11.5	236	11.7
Adelaide	7	211	10.5
Coolangatta	5.2	176	8.7
Cairns	3.9	211	10.5
Canberra	3.2	174	8.6
Darwin	1.8	167	8.3
Total		2013	

Table 3: Relevance of major airports to the survey

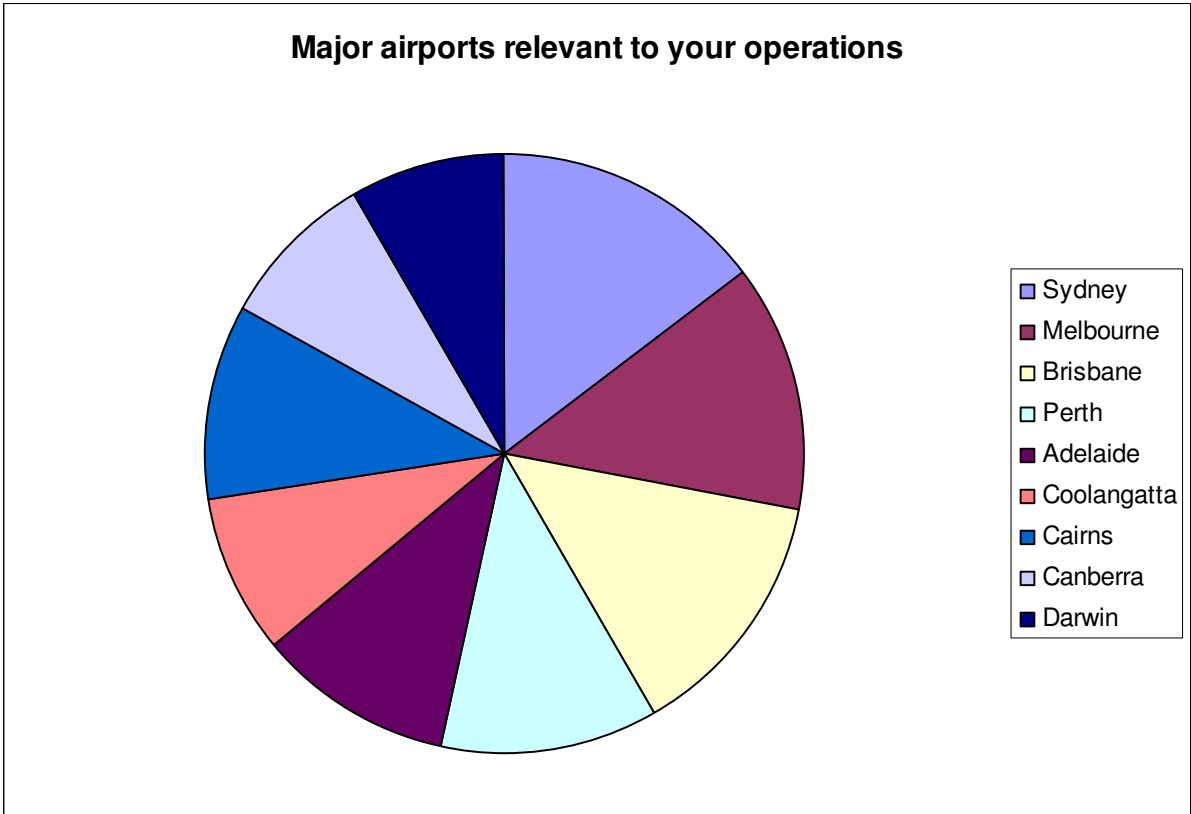


Figure 3: Pie chart of the proportion of major airports relevant to operations

3 Usage of Aviation Products and Services

The monthly usage of Products and Services are illustrated at Figure 4. The numbers in brackets are the total respondents to the question. Dark blue is 10 or more times per month, Green is 5 to 9 times per month and yellow is 1 to 4 times per month. The Code Grey is a product developed for Qantas.

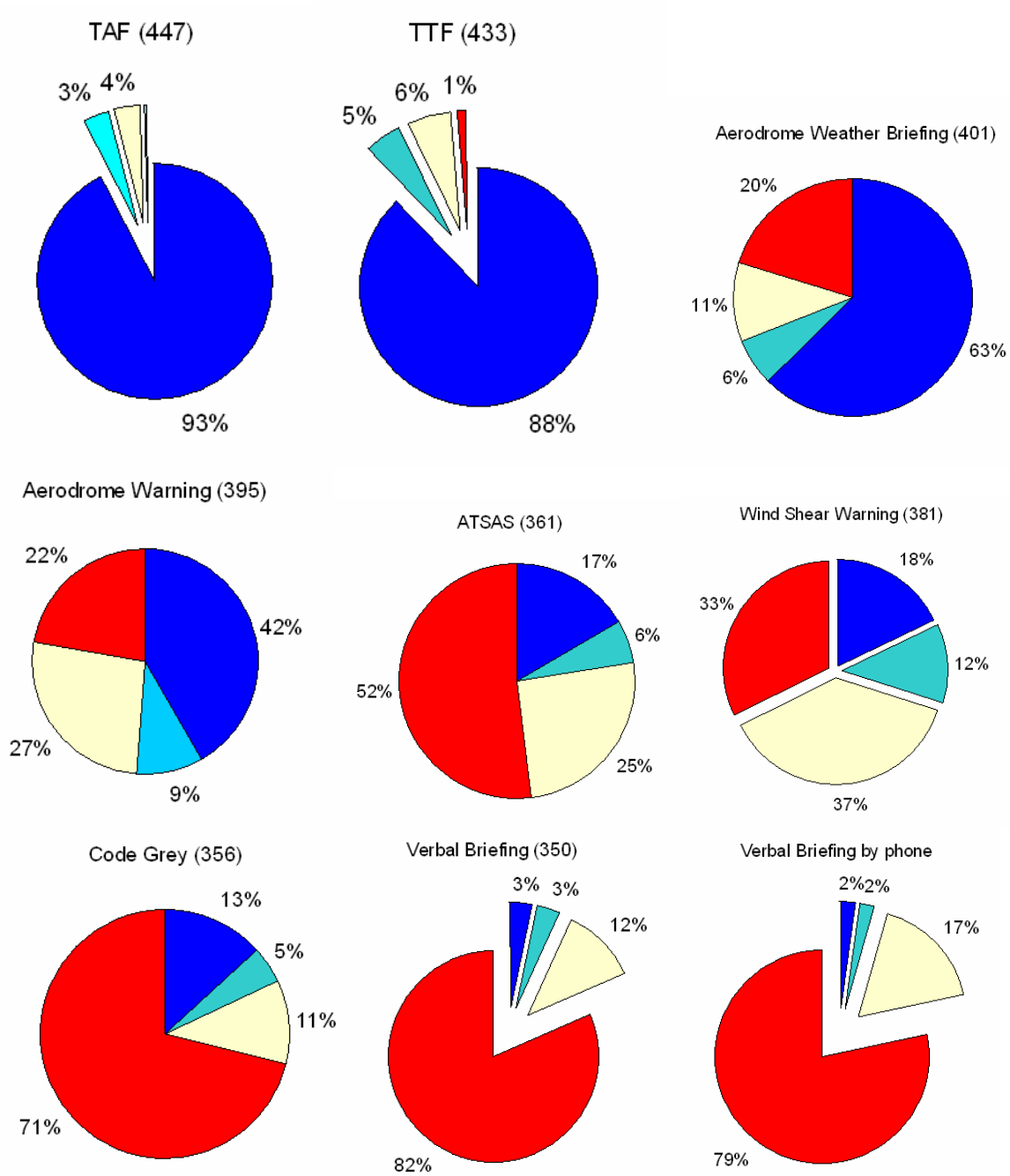
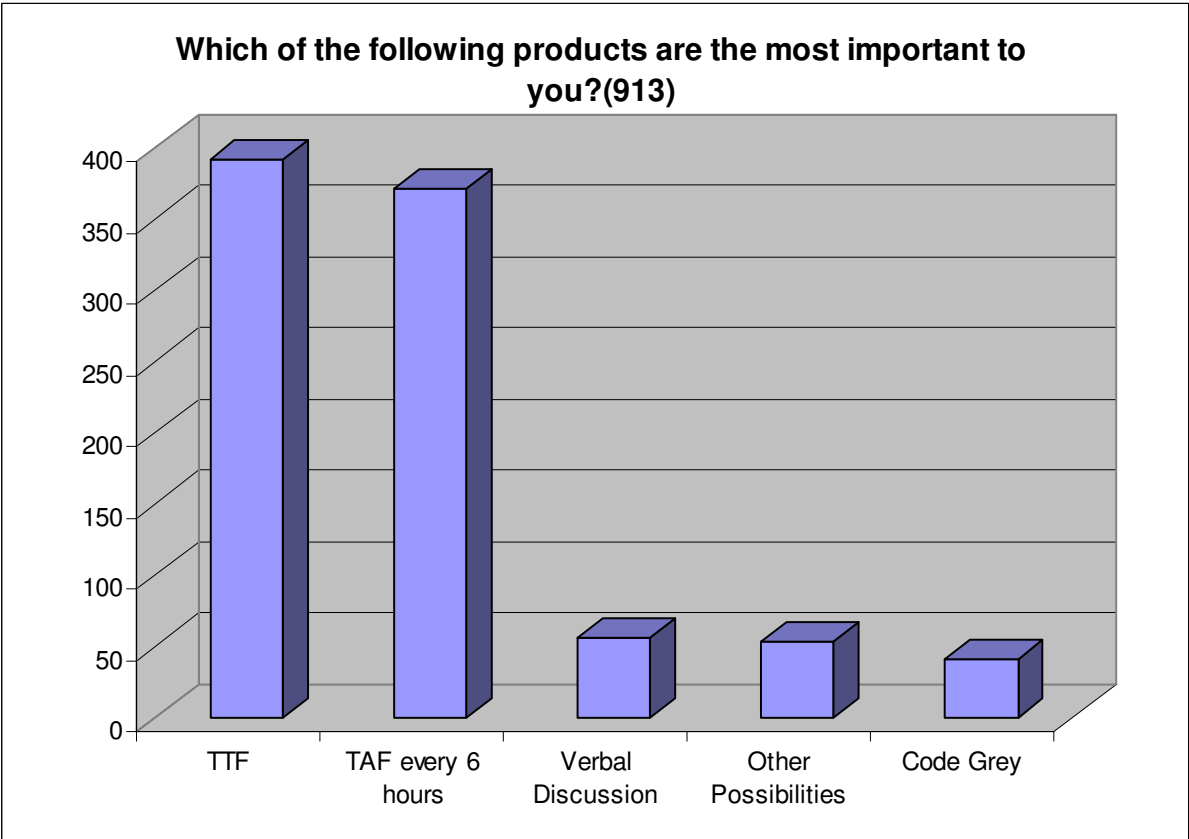


Figure 4: Monthly usage of aviation products. Blue is 10 or more times, Green 5-9, Yellow 1-4 and Red nil.

3.1 Which products are the most important?

The importance of product was raised towards the end of the survey. Respondents could answer more than one of the 5 options. 'Other possibilities' are mentioned in the aerodrome weather briefing product and cover those possibilities that are not published in the TAF or TTF. Similarly Code Greys cover low probability events of operational significance of less than 30%. There were 913 responses with the TTF being the most important even though users referred to the TAF more frequently on a monthly basis.



3.2 Comment on which products are important to you?

There were 58 text responses to the comment on products important to the aviation community and Table 4 summarises these responses. Talking to a forecaster, the requirement for more frequent TAF updates and prevention of misalignment between the TAF and TTF featured highly.

Talking to forecaster - invaluable	7
More updates to TAF required / TAF every 3 hours	7
No misalignment TAF/TTF important	5
Satellite and radar	3
AWIS/ATIS/AWIB	3
TTF more accurate than TAF	3
TAF more accurate than TTF	1
Prefer TTF for fuel calculations but often have to use TAF	2
Code Grey - conservative forecast	2
Forecast wind - RWY changes	2
SIGMET	2
Airport briefings- hedging in the brief unnecessary	1
Area Forecast	1
BOM / AsA websites invaluable	1
Cancel Code Greys	1
ATC updates	1
Airport and Terminal Movement Area overview	1
Perth TTF - fog	1
Experienced forecasters SAMU	1
Cancelling Wx in TTF - timeliness	1
Longer TAF period for Canberra	1
Hazardous Wx updates	1
SIGWX for ATM	1
All are important	1
ATIS and METAR different at same time	1
Occasionally ob has TS followed by NOSIG - 3 hours addl fuel	1
Speedier access to pilot briefings.	1
SPECI	1
Placement of BoM personnel with ATC Centres would improve ATM	1
Shorter TAFs 30hours too long.	1
VOLMETS	1
Well done Perth for assistance with night alternate requirements	1

Table 4: Comments on the most important products to the aviation community

4 Accuracy and Conservatism

4.1 Accuracy

Table 5 and Figure 5 illustrate the results for accuracy. 78.2% of respondents thought forecasts were always or mostly accurate. Given the sample size this figure has a 95% confidence bracket of $\pm 3.6\%$.

Overall Accuracy	Count	%
Always Accurate	19	4.3
2	329	73.9
3	64	14.4
4	30	6.7
Always Inaccurate	3	0.7

Table 5: Responses to overall accuracy.

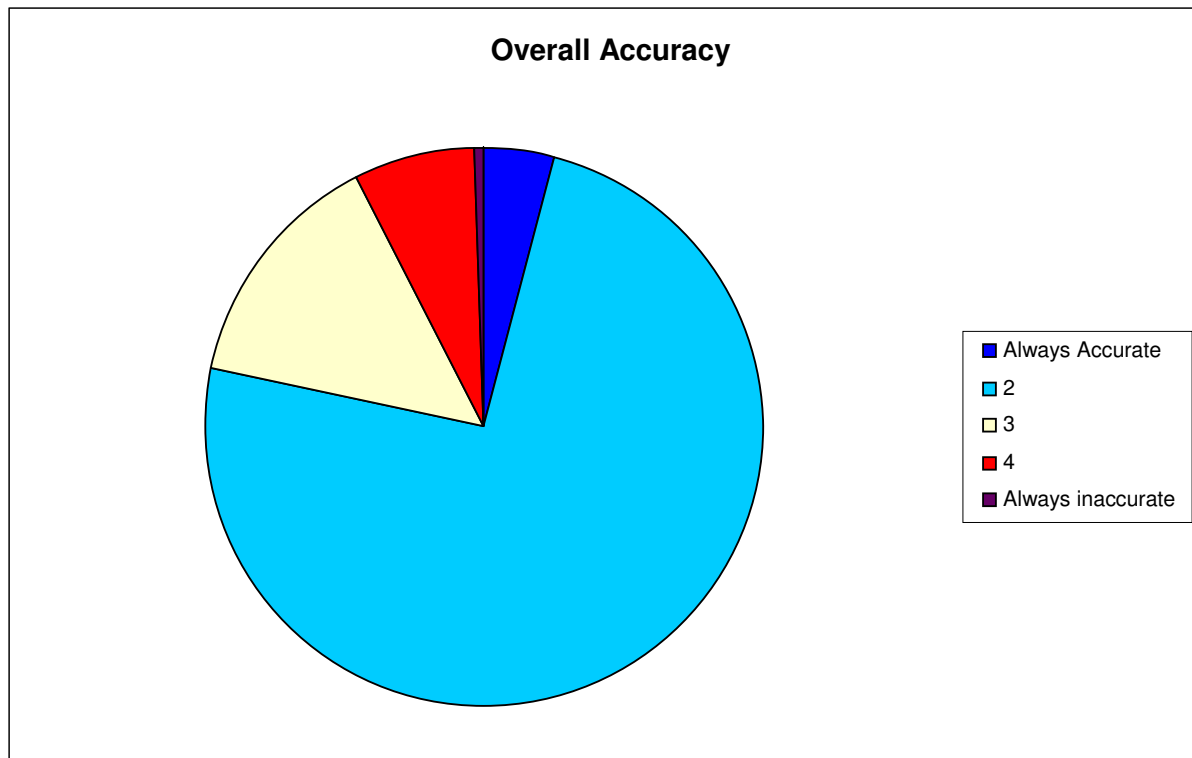


Figure 5: Chart of overall accuracy.

4.2 Comments related to accuracy

The survey asked for geographical locations and phenomena of concern for improved accuracy. Table 6 are the responses for the major airports. Hobart and a number of nearby alternate airports were also mentioned. Figure 6 indicates the climatological frequency of thunderstorms and fog at the major airports and should be compared with Figure 7 for the phenomenon and frequency of response.

Fog forecast accuracy featured highly at the four largest airports with Perth by far the most important for accuracy improvement.

Improved accuracy for thunderstorms is important for all airports with very high frequencies for Sydney, Brisbane, Perth and Darwin.

Surface winds forecasts for Sydney had a relatively high response rate.

Weather Phenomenon	YSSY	YMML	YBBN	YPPH	YPAD	YBCG	YBCS	YSCB	YPDN
Fog	25	24	21	50	15	12	2	20	1
Cloud	6	5	3	5	3	3	5	2	2
Thunderstorms	42	26	39	35	19	23	25	22	30
Wind	13	5	4	5	4	1	3	2	1
INTER/TEMPO/Showers	5	3	3	2	3	2	3	3	4
Passage of fronts	2	2	2	2	2	2	1	2	
Cyclone									1

Table 6: Responses to weather phenomena and major airport requiring improved accuracy.

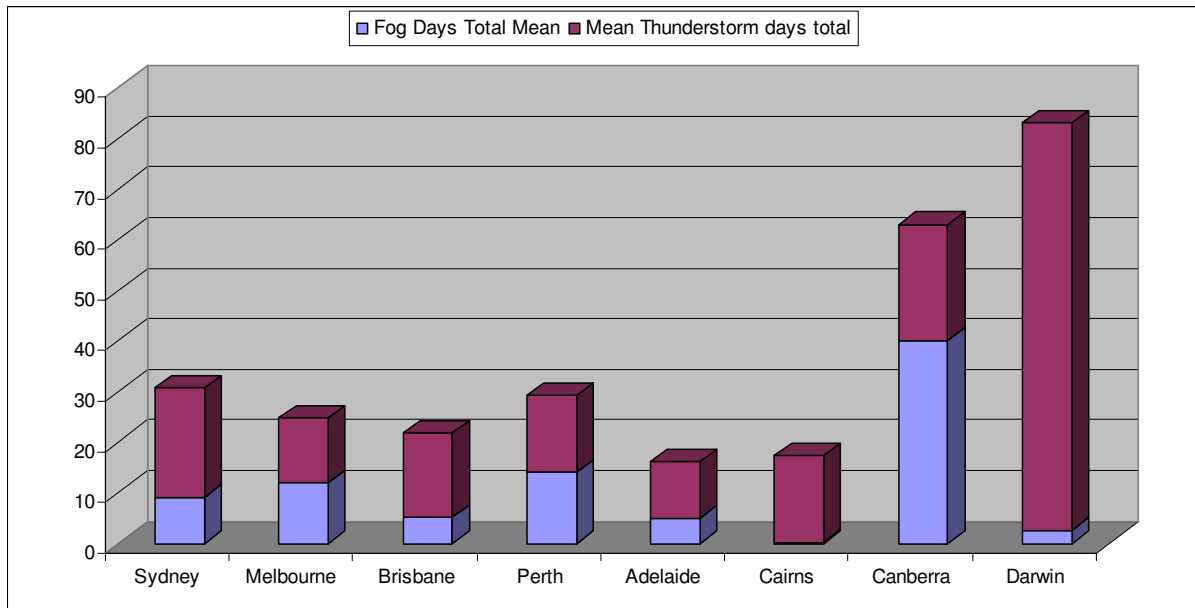


Figure 6: Mean thunderstorm days and fog days at the major airports per year. There are currently no present weather statistics for Gold Coast.

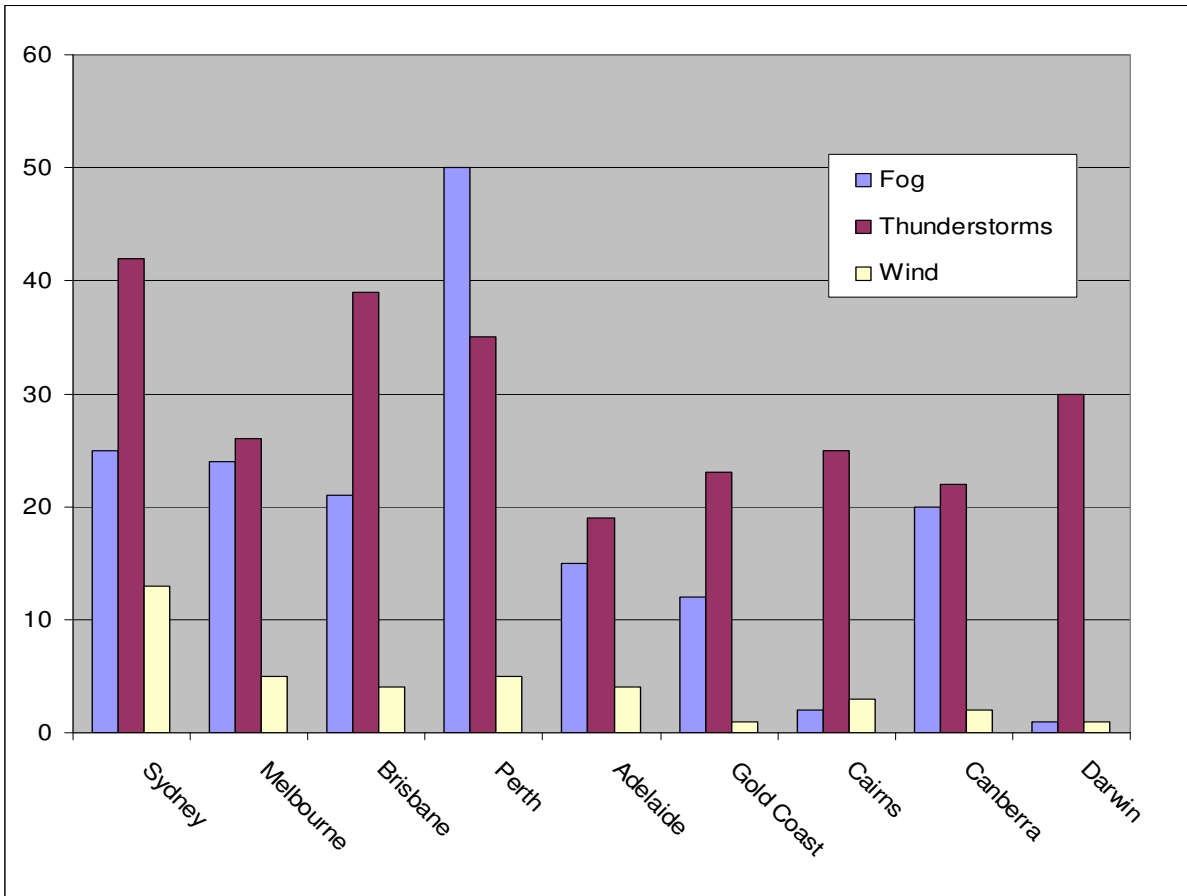


Figure 7: Survey results for the number of respondents, phenomena and location for improvement.

4.3 Are Bureau forecasts too conservative?

Forecast conservatism and the requirement for more or less of it was a feature of many of the text responses in other sections of the survey. Conservatism was defined in the question as:

“Conservative Forecasting is the forecasting of poor conditions that either regularly don’t eventuate or regularly occur over briefer periods than in the forecast.”

The results are shown in Table 7 and illustrated in Figure 8. 31.7% thought they were not conservative or tending that way. 37.3% are in the middle area and 31% tending towards very conservative. There is little overall bias one way or the other.

Are Bureau forecasts too conservative?	Count	%
Not Conservative	20	4.5
2	121	27.2
3	166	37.3
4	98	22.0
Very Conservative	40	9.0

Table 7: Conservatism of Bureau forecasts

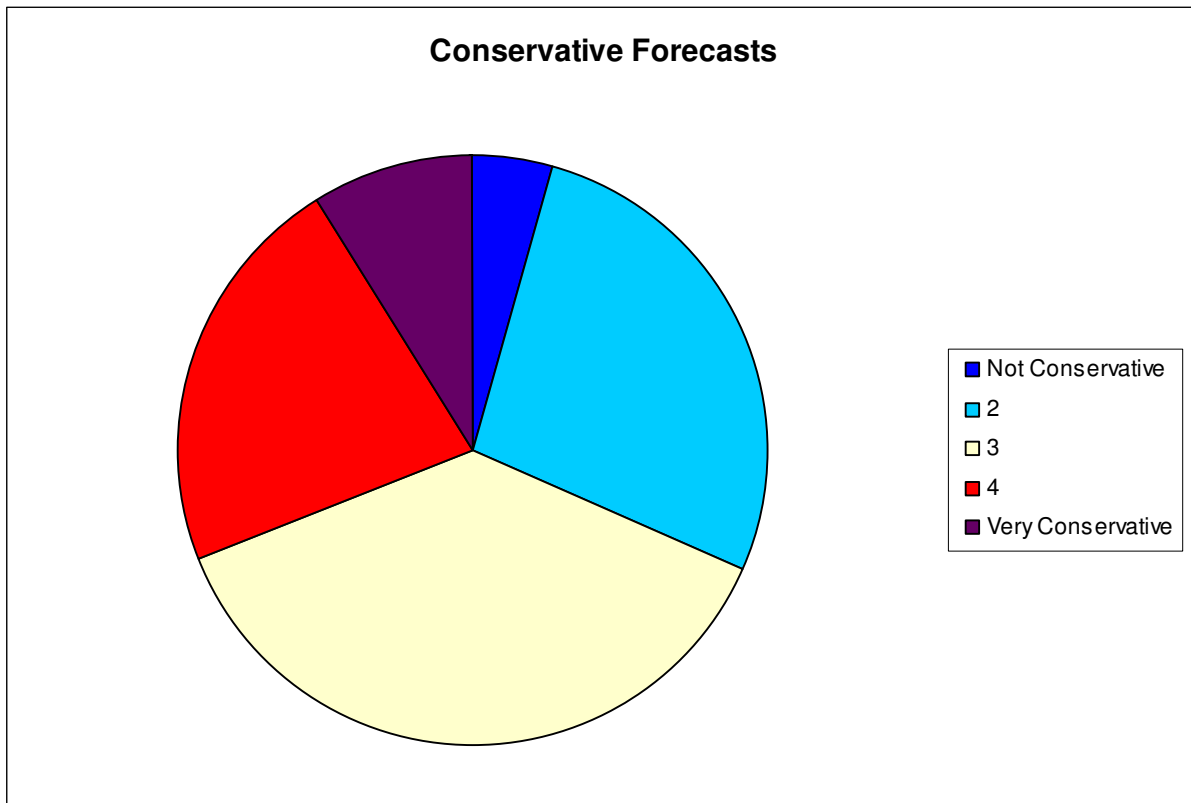


Figure 8: Chart of the conservatism responses. Blue, yellow and red/purple areas are roughly the same in area.

5 Timeliness

Perceptions of timeliness were assessed through a question related to overall timeliness and timeliness of amendment of forecasts. Timeliness responses were qualified by text that indicated that an untimely forecast was considered by the respondents as a forecast that changed operational planning or affected the tactical situation in the air. Overall timeliness is assessed at 79.8% and timeliness of amendment at 57.7%.

Overall Timeliness	Count	%	
Always on time	124	28.1	
	4	228	51.7
	3	70	15.9
	2	14	3.2
Never on time	5	1.1	

Table 8: Overall Timeliness

Always on time	63	14.4	
	4	189	43.3
	3	128	29.4
	2	47	10.8
Never on time	9	2.1	

Table 9: Overall Timeliness of Amendment

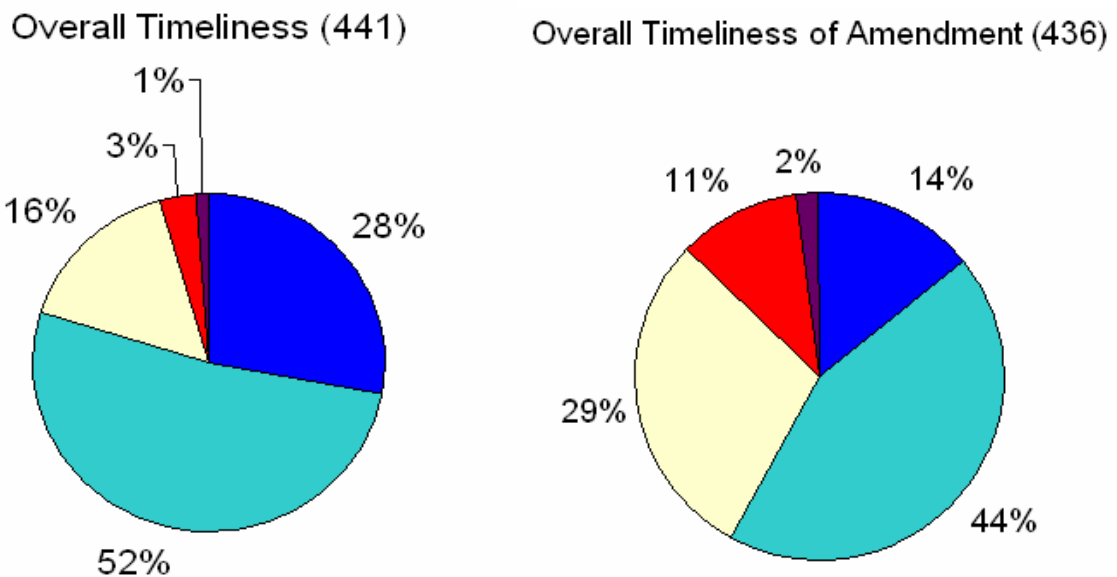


Figure 9: Comparison of Overall Timeliness with Timeliness of Amendment. Dark Blue is 'always on time' and Purple is 'never on time'.

5.1 The importance of timeliness to stakeholders

The sequence of questions associated with timeliness was aimed at deriving further insight into the difficulties of a late forecast. Figure 10 shows that 35.4% of the survey had been affected by a late forecast. The respondents were then asked the following questions:

- Describe an instance when you were affected by a late forecast?
- What weather phenomenon was involved and where?
- What was the impact of late receipt of the forecast?
- What is your greatest concern with receiving late forecasts?

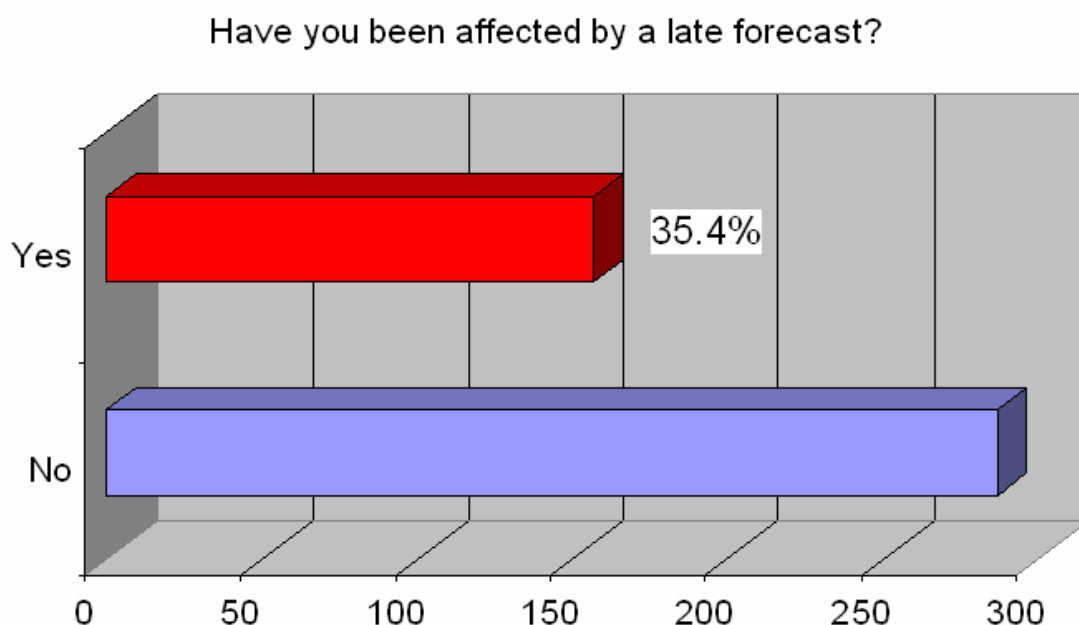


Figure 10: Number of respondents affected by a late forecast

There were a large number of detailed instances were described some were associated with last minute changes to plans prior to departure, others related to airborne decision making and some related to the problems encountered by Airservices personnel. The phenomena involved are at Figure 11 and the locations and phenomena are at Figure 12. Not all respondents provided a location. Untimely thunderstorm forecasts for Sydney and Brisbane featured highly as well as fog forecasts at Perth and Melbourne airports.

Many of the descriptions of thunderstorm events illustrated the importance of forecasting thunderstorms in the Terminal Movement Area (TMA)³ as well as timely provision of Aerodrome Forecast (TAF) updates.

³ The TMA for Sydney is 45nm radius; Brisbane, Melbourne and Perth are 35nm.

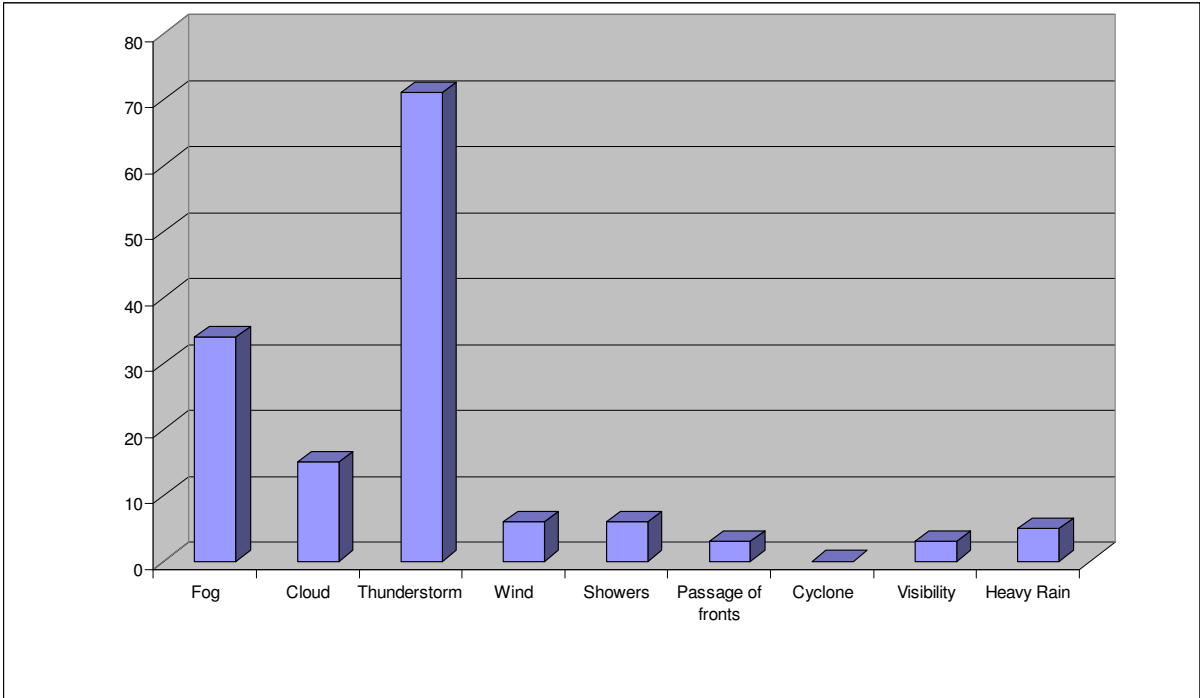


Figure 11: List of phenomena in personal experience.

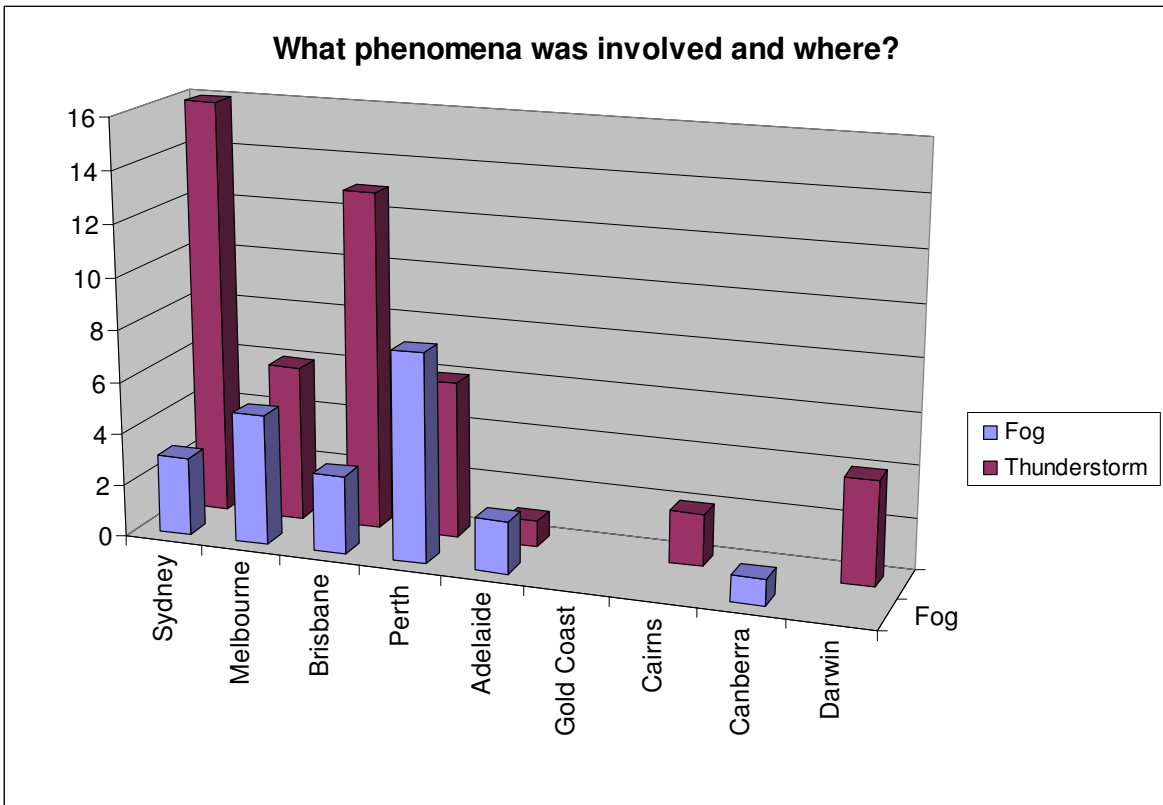


Figure 12: Fog and thunderstorm events by location in personal experience.

The impacts of the late receipt of a forecast have been grouped by theme. Some have been double counted if the response fitted 2 themes. For example if there was insufficient fuel and stress mentioned in the response then both were counted. The greatest impacts were Diversions, Low fuel, Stress (Both in the cockpit and at Airservices) and a significant number of responses indicating discretionary fuel mitigated a difficult situation.

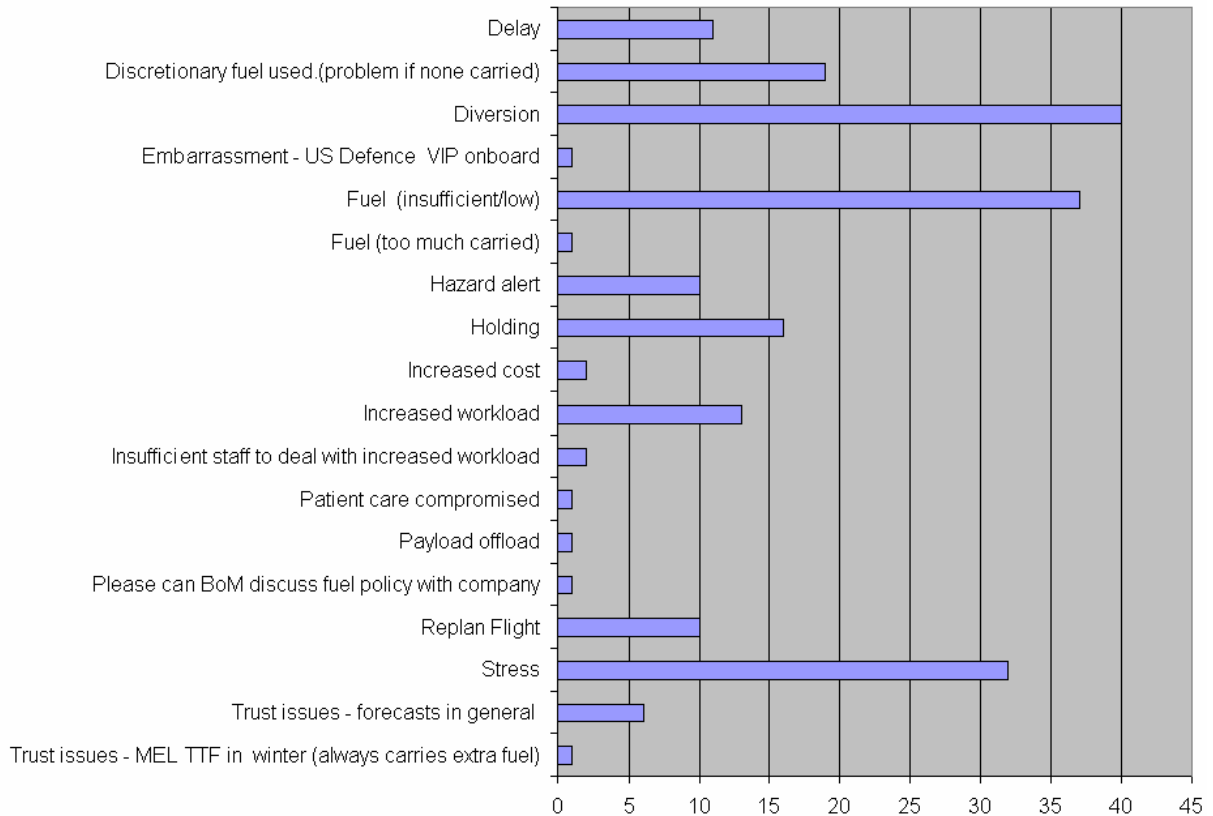


Figure 13: Grouped responses to 'What was the impact of the late receipt of a forecast?'

The greatest concerns were also grouped by theme and are at Figure 14. They were similar to the impacts to the scenarios but with some subtle differences. Safety whilst being implied by many responses in the impact question was more explicit as a consequence in the answers to this question. The more serious themes are highlighted in red and made up 56% of the responses. Insufficient fuel was the greatest concern followed by Diversions, Safety, Workload and Lack of alternate.

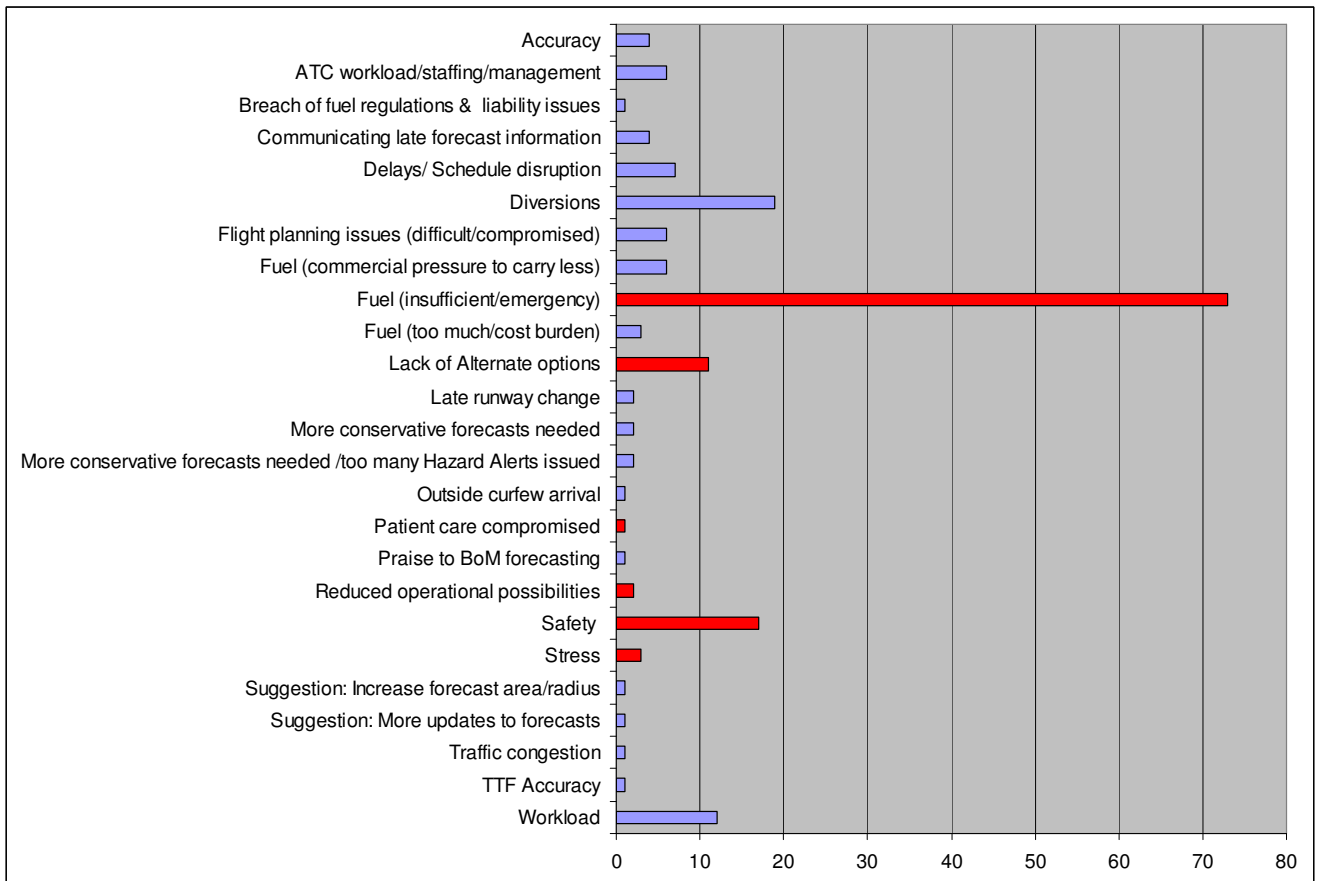


Figure 14: Grouped responses to ‘What is your greatest concern with receiving late forecasts?’

6 Alignment of TAF and TTF

The TAF is used primarily as a planning forecast for an aerodrome and the TTF is the short range landing forecast. Both forecasts are written by the same forecaster with priority given to the TTF. Bureau rules within its Aeronautical Services Handbook allow for a misalignment for up to an hour. The survey indicated that 39% of respondents had noticed the TAF and TTF out of alignment for more than an hour at least once a month.

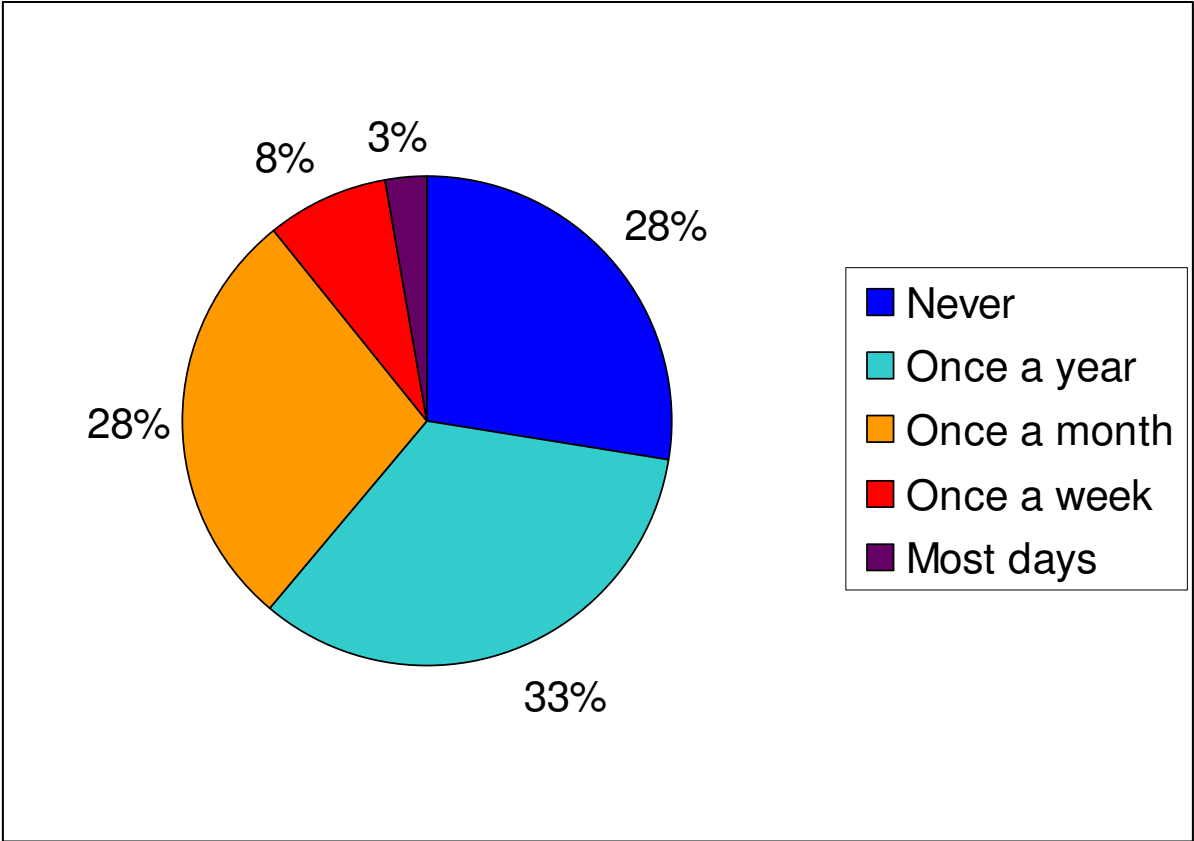


Figure 15: Have you observed the TAF and TTF to be out of alignment for more than 60 minutes? (435 Respondents)

7 Accessibility

Figure 16 illustrates the results for accessibility with the meteorological services always or mostly accessible by 95.3% of the population.

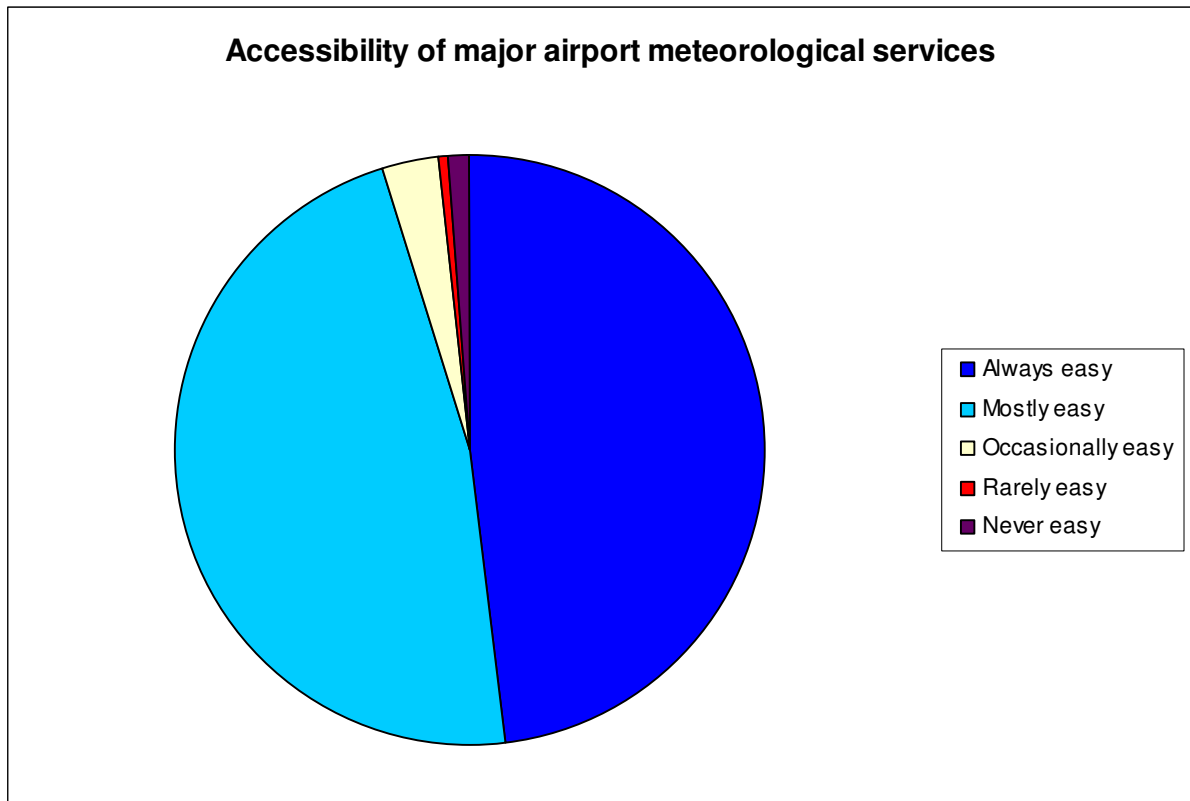


Figure 16: Accessibility of major airport meteorological services. Mostly/Always - 95.3%

The text responses for improvements to Accessibility through the website and via NAIPS (Airservices Australia product) have been grouped together and will be addressed in due course. There were a large number of responses that requested the development of iPad, iPhone or Android applications.

8 Optimisation as a consequence of forecasting

8.1 Optimisation of payload

The optimisation of payload question was aimed at deriving the value of major airport forecasts to commercial aviation. Figure 17 indicates that 84% of respondents thought the forecasts helped optimise their payloads for half the time or more with 26% stating that forecasts always helped optimise the payload.

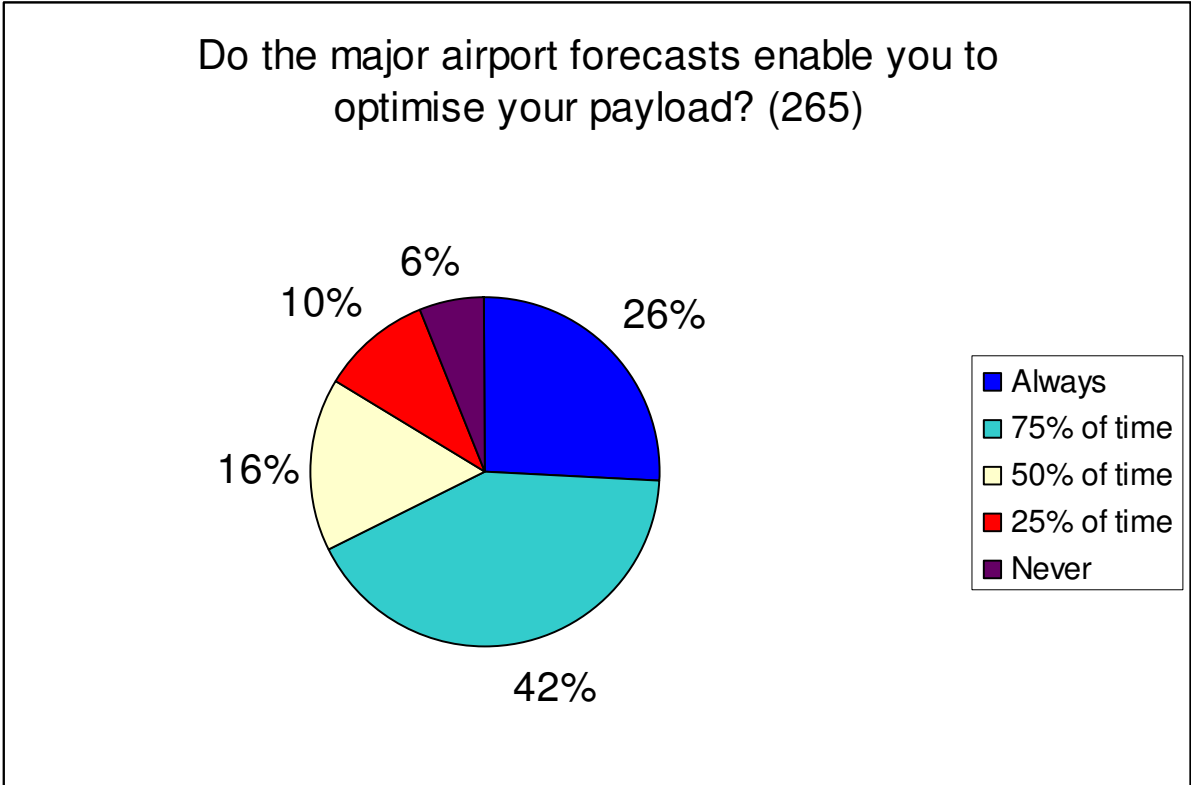


Figure 17: Payload optimisation. 50%, 75% and Always is 84% of the respondents.

There were 58 comments (out of 265) on the payload optimisation question which are grouped by theme at Figure 18. Conservatism, trust of some forecasts at particular locations and the importance of accuracy for Perth fog scenarios were perceived as key areas for better optimisation. Some respondents mentioned that a more frequent TAF update would also be beneficial.

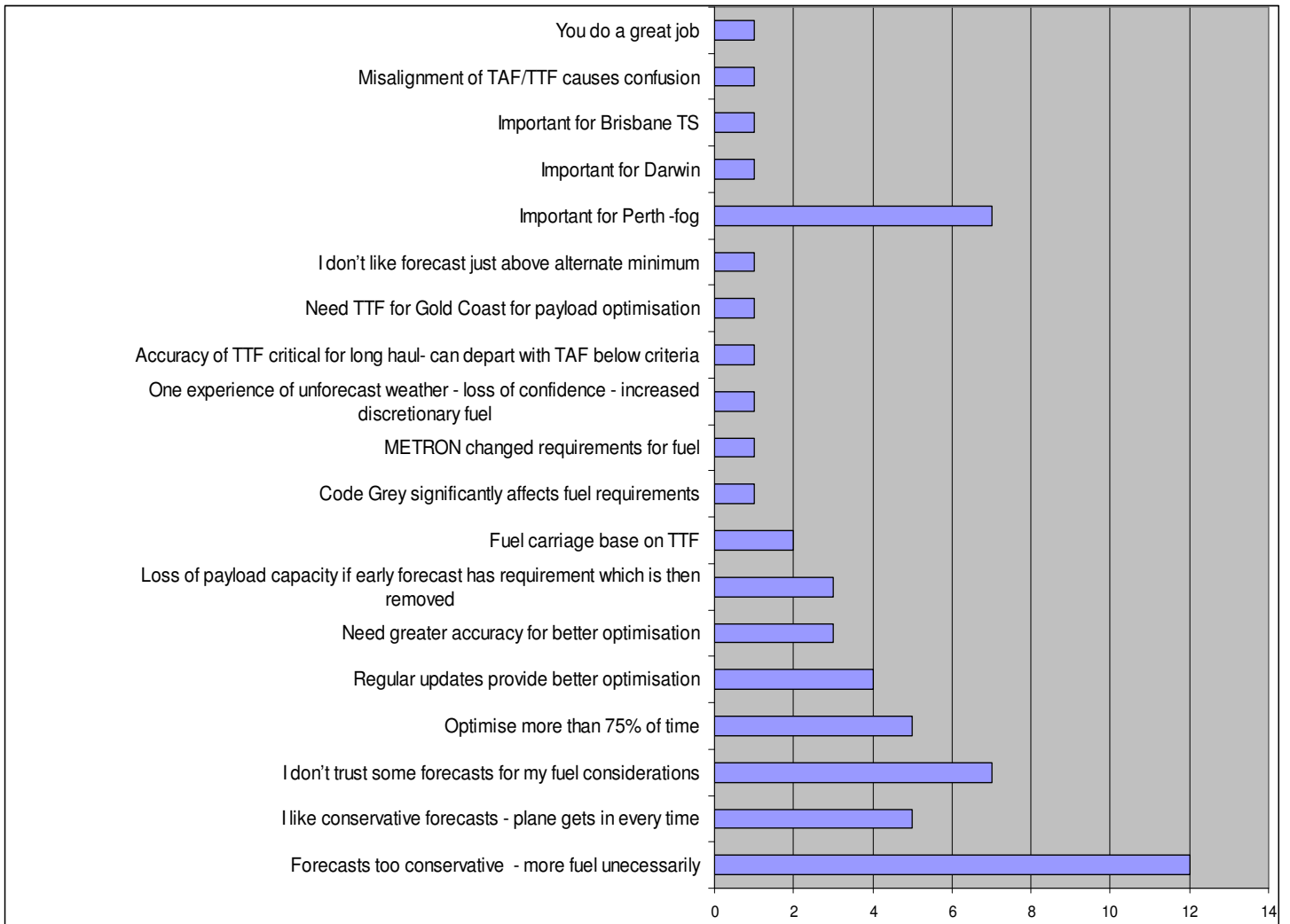


Figure 18: Grouped comments related to optimisation of payload.

8.2 Optimisation of air traffic services

Airservices personnel were asked whether the major airport forecasts optimised air traffic services. Figure 19 shows the response with 91% indicating services were enabled more than 50% of time.

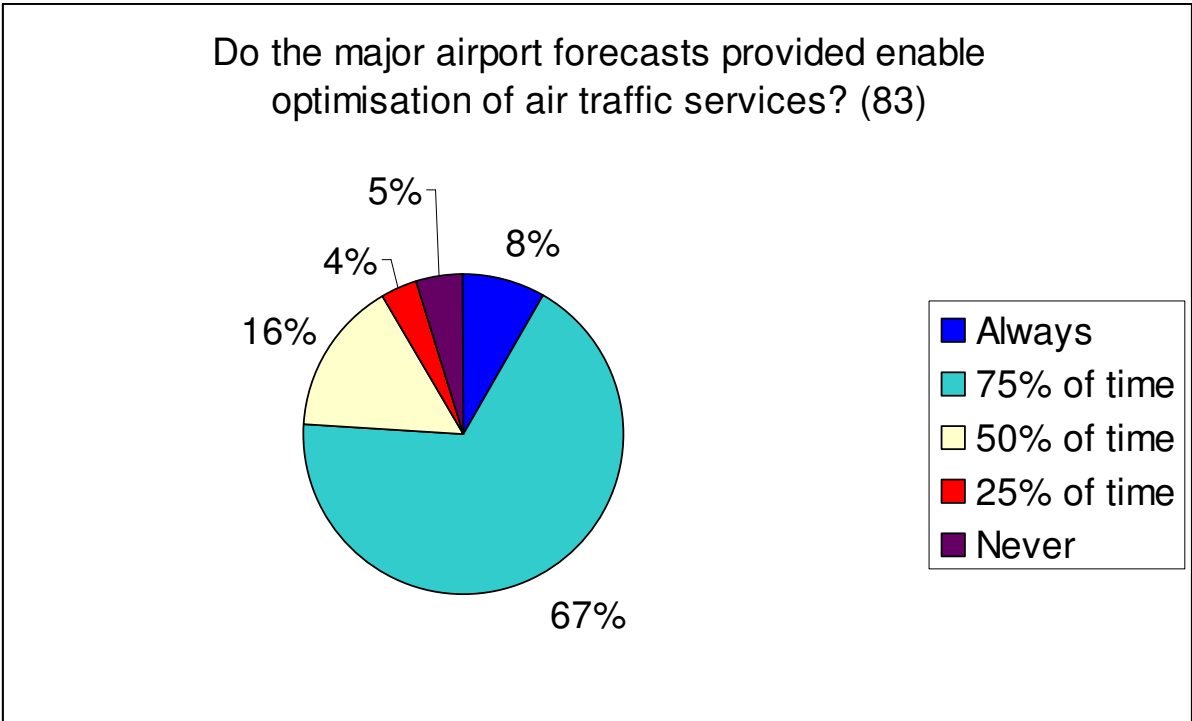


Figure 19: Response from Airservices Australia personnel regarding optimisation.

Comments on the optimisation of air traffic services in Figure 20 had a high representation for improvement in surface wind forecasts at each aerodrome.

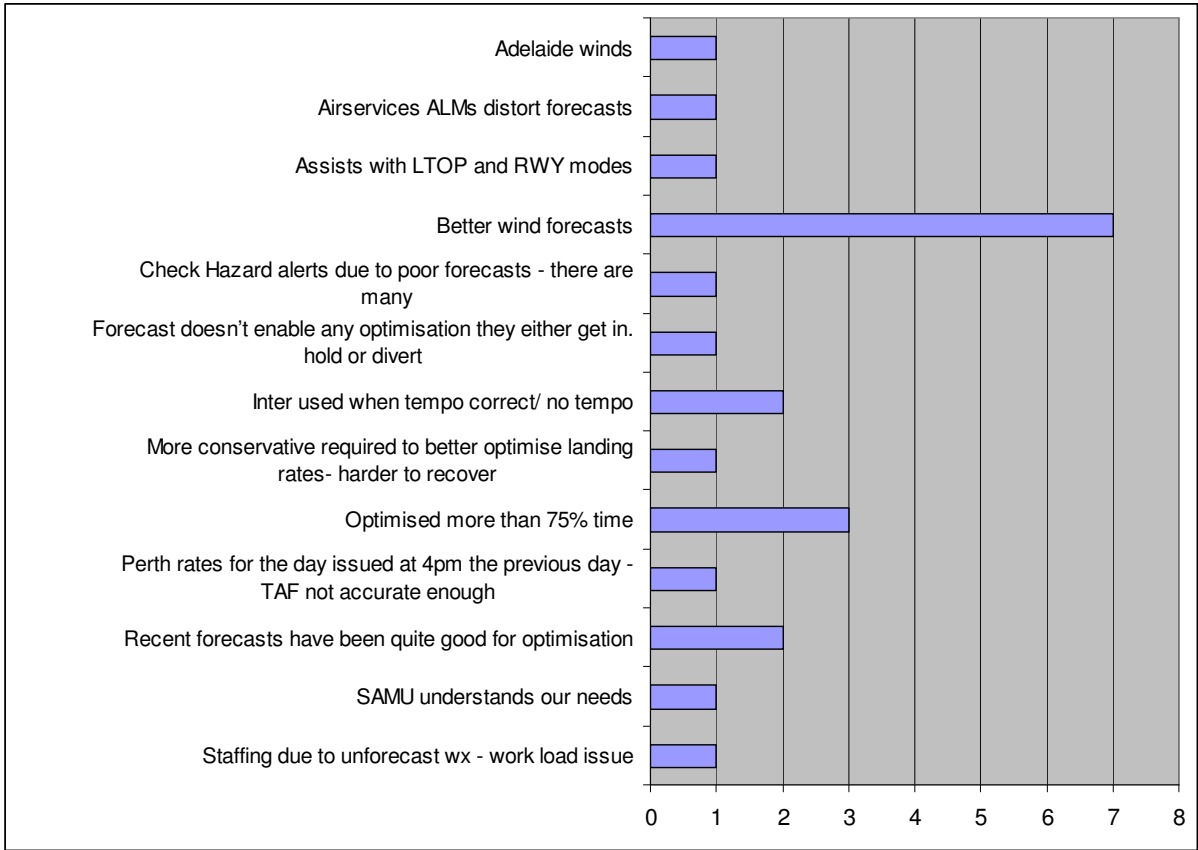


Figure 20: Comments on the optimisation of air traffic services.

9 Additional Feedback

Additional feedback is at Figure 21.

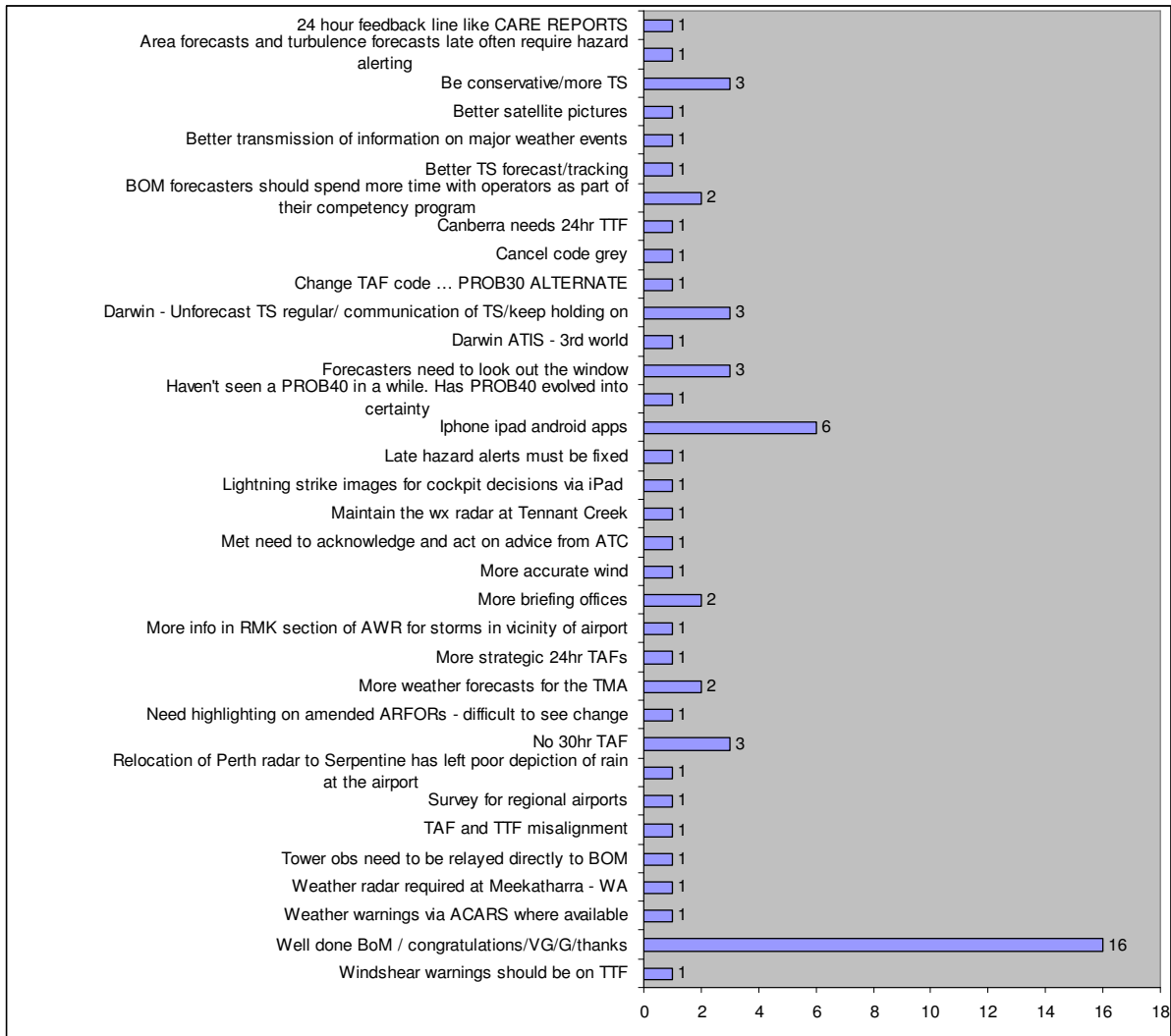


Figure 21: Further comments related to the survey.