Transitioning from radar to ADS-B in all controlled airspace: rules, facilitation, and guidance for a new surveillance system

Summary of submissions

February 2020

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Introduction

Purpose of the consultation

New Zealand's aviation surveillance radar infrastructure will reach the end of its operational life in 2021. Automatic Dependent Surveillance-Broadcast (ADS-B) will become the main source of surveillance information for air traffic management in New Zealand.

This change will affect all aircraft owners and operators who fly in controlled airspace in New Zealand.

The purpose of the consultation was to understand the impact of this proposal on operators flying in controlled airspace below flight level 245 (approximately 24,500 feet).

We used the information received through the consultation to:

- assess the impact of a rule change that would mandate ADS-B OUT for all aircraft operating in all controlled airspace in the New Zealand flight information region from 31 December 2021
- identify actions that would best support aircraft owners and operators to move to ADS-B before the mandate comes into force
- ensure that aviation safety is, at a minimum, maintained during and after the transition period to ADS-B.

Methodology

Our consultation on the introduction of ADS-B was open for four weeks. It ran from 28 February until 5 April 2019.

We provided a discussion document covering the policy proposal, and the costs and benefits of the move to ADS-B OUT. The document included 24 questions aimed at understanding the impact of the change. People could respond to the consultation through an online questionnaire or send us their submissions through email or post.

The consultation was supported by 18 roadshows around the country, with a total of 325 attendees. At the roadshow events we encouraged participants to provide as much detail as possible in their submissions regarding how the proposal affects them.

The consultation and roadshow events were advertised on the CAA and New Southern Sky Programme (NSS) websites. We directly emailed over 10,000 participants[1] about the consultation,

[1] Part 146 organisations, Part 66 license holders, Part 145 organisations, registered aircraft owners, Part 137 operators, Part 61 pilots, Part 149 organizations, General Aviation organisations.

with a very good email opening rate of 48 percent. Subscribers to changes[2] on our website also received an email notification about the consultation.

Question by question analysis of the online questionnaire

We received 233 responses to the online questionnaire.

We analysed the responses to the online questionnaire question by question, showing the response data in tables. Where comments were provided, we identified and reported on the key themes.

Respondents to the online questionnaire could select more than one option for most questions, and therefore the number of responses in the tables add up to more than the number of respondents, and percentages do not equal 100 percent. Questions were not compulsory, and therefore the number of responses for each question varies.

Summary of roadshow feedback

We reviewed our notes from the roadshows and reported on the key themes raised, including themes that were particular to certain regions.

Summary of written responses

We received 803 submissions by email or letter.

We reviewed all submissions individually, noting that some responses were from organisations representing large membership bases. These submissions did not follow the question by question format, therefore we analysed and reported on key themes separately to the online questionnaire. This group of responses included 651 identical submissions. We have referred to these responses throughout the document as 'proforma responses'.

Each written submission was counted separately. Where we have reported the percentage of respondents referring to a theme, we included all 651 proforma responses in that calculation. We have also provided the percentage of respondents referring to each theme excluding the proforma responses to provide a clear picture of what respondents were saying.[3]

Next steps

The information provided through this consultation process has helped us better understand the impact of the proposed mandate, and identify how we can best support aircraft owners in the move towards ADS-B OUT. It formed part of our impact assessment, and will help to shape wider decision on how ADS-B OUT will be implemented.

A Notice of Proposed Rulemaking on this proposal was released on 19 December 2019 - https://www.aviation.govt.nz/rules/rule-development-and-change/nprms-open-for-submission/

[2] Changes regarding NSS, Part 91, Part 135, Part 125, Part 66, 145, 146, what's new, and A to Z

[3] Where we excluded proforma responses, we counted the proforma as one response rather than 651 individual responses.

Respondent profile

Those who responded to the online survey were asked a range of questions to help us understand the profile of the respondent group.

Most respondents (86.4 percent) described themselves as a recreational pilot or owner. The other main respondent groups were commercial pilots and owners (20.6 percent), General Aviation (GA) organisations (10.1 percent) and Part 66 Licensed Aircraft Maintenance Engineer (LAME) (9.6 percent).

Are you a...	**Response**	**Percentage**
Commercial pilot/owner	47	20.6
Recreational pilot/owner	197	86.4
Part 66 LAME	22	9.6
Part 145 organisation	4	1.8
Part 146 organisation	1	0.4
Part 149 organisation	15	6.6
Part 137 operator	5	2.2
General Aviation Organisation	23	10.1
Number of respondents who answered this question	**228**	

Most respondents (79.3 percent) said they work or fly Visual Flight Rules (VFR) aircraft. 18.5 percent work or fly on both VFR and Instrument Flight Rules (IFR) aircraft, and only three percent of respondents exclusively work or fly IFR aircraft.

Do you fly/work on...	**Response**	**Percentage**
VFR aircraft	184	79.3
IFR aircraft	7	3
Both	43	18.5
Number of respondents who answered this question	**232**	

Nearly half of all respondents (48 percent) fly in controlled airspace at least once a month. Less than three percent never fly in controlled airspace.

Do you fly in controlled airspace now?	**Response**	**Percentage**
Yes, frequently – at least once a month all year, or when I'm flying (e.g., in the summer months)	111	48
Sometimes – once every two or three months	47	20.3
Occasionally – less than once every two months	67	29
No, never	6	2.6
Total	**231**	

Most of those who responded by sending us an email or letter did not provide profile information. This means that we are unable to clearly identify the respondent profile for this group. In reading through the submissions, it appears they broadly reflect the respondent profile of the online questionnaire. The majority of submissions were from general aviation operators, and a small number were from organisations that responded of behalf of their members.

Summary of the key themes from the submissions

Limited support for the proposal

Most of the respondents were recreational pilots, and the costs involved for them created a barrier to their support for the proposal. For example, one respondent said: 'I think the concept of ADS B is a good one, but at the moment the cost and accessibility is prohibitive.'

While many respondents could identify benefits, they were perceived to not be enough to justify the costs. 9.9 percent of the online respondents said they supported the proposed mandate and a further 37.3 percent support the proposed mandate but have concerns about costs. However, a further 54.5 percent would support the proposed mandate if there were measures to reduce the costs.[4]

Despite the barriers, 30.1 percent of respondents to the online questionnaire said that they would equip in time for the mandate in order to continue flying in controlled airspace.[5]

Respondents to the online questionnaire indicated the most important benefits are: the potential for improved information to support search and rescue; flight following; and improved situation awareness (with ADS-B IN).[6] Respondents were evenly split on whether they would consider installing ADS-B IN, with 51.1 percent saying they would consider ADS-B IN as well as OUT.[7] However submitters also mentioned that they use other products such as Spidertracks to provide search and rescue and flight following services.

Cost for operators

The overwhelming feedback from the consultation was the high costs of the equipment compared to the perceived limited benefit of ADS-B OUT for GA operators. Most of those who identified benefits still felt that cost was a significant barrier. Close to 90 percent of respondents to the online questionnaire said that cost was a major concern for them and only 4 respondents said they weren't concerned about the cost.[8] A further 99 percent of respondents said cost was an important barrier for them.[9]

Respondents felt that ADS-B was intended to benefit Airways New Zealand (Airways), commercial operators and IFR aircraft. They identified little benefit for themselves, and felt they were being forced to pay for a system to benefit others and save money for Airways. For example, one respondent said: 'The savings are gained by airways yet the cost falls to GA aircraft.'

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[4] Question 1

[5] Question 2

[6] Question 4

[7] Question 10

[8] Question 9

[9] Question 11

Many said that the costs were too high compared to the value of their aircraft. One glider operator said: 'As a recreational glider pilot, the costs quoted exceeds the insured value of the aircraft.' Several respondents noted that they were unable to recoup or pass on costs, unlike commercial operators. Those who agreed with the proposal and were less concerned with the personal costs incurred, were still concerned about the cost barrier leading to reduced uptake amongst other operators, and therefore limiting the benefits of the system for all users and creating safety risks.

We acknowledged that the costs of equipping would vary between aircraft depending on the type of aircraft, transponder and complexity of the installation. However, we estimated that the cost of equipping would be between $5,000-13,000 including installation. Roughly half of the online respondents agreed with our cost estimates for equipment and installation.[10] Most of those who disagreed felt we had underestimated the costs, particularly around installation. Many of those who disagreed believed the costs were more in the region of $7,000 to $14,000.

A number of respondents had already installed ADS-B and were able to share their costs with us.

Suggested funding options

Closely related to costs was the matter of who should pay for the equipment and installation. While we did not ask a specific question in the online consultation, however many respondents commented on this theme across all the free text sections, as well as in their emails responses.

Many respondents felt that the savings made by Airways in installing ADS-B OUT rather than maintaining the existing system should be used to fund ADS-B OUT for GA operators. Respondents pointed to precedents for rebates and subsidies both in New Zealand and internationally. 54.5 percent of respondents to the online questionnaire said they would support the proposal if there were measures to reduce the costs.[11]

The proforma response from submitters said ADS-B OUT '…should be costed into the entire system as part of the basic infrastructure to ensure safety for all users', and respondents would not agree to the mandate or fit ADS-B OUT unless the Air Navigation Service Provider (ANSP) pays for industry standard equipment. Submitters recognised that the 'installation costs will vary significantly from aircraft to aircraft [and] these will be at my/the aircraft owners cost.'

Other barriers

While cost was the primary barrier cited by respondents, they also identified several other barriers that were important to them. This included lack of time to comply and lack suitable equipment for their aircraft (particularly gliders, microlights or vintage aircraft). We specifically asked about some barriers other than cost in our online questionnaire:

- 38.8 percent selected being able to fit equipment that best suits their aircraft
- 25.9 percent selected access to acceptable technical data (ATD) for my ADS-B equipment for my aircraft

[10] Questions 5 to 8

[11] Question 1

- 22.3 percent selected access to a qualified Part 66 LAME or Part 145 organisation. [12]

When specifically asked whether obtaining ATD was a barrier to equipping their aircraft, 33.5 percent agreed that it was (and a further 39.2 didn't know).[13]

Alternative options and the international picture

A common theme throughout the free text comments and emails was the need to look at the international picture and consider accepting alternative options (including those accepted overseas). Respondents pointed to options available in the US and Australia, and noted that there may be more options becoming available in Europe in the next few years. These options were felt to be cheaper and better suited to some aircraft (lightweight and low power).

In our online questionnaire, 82.5 percent of respondents said they would consider installing a cheaper alternative option if it could be safely used in New Zealand.[14] One respondent said: 'A lot of aircraft would already be compliant if these devices were accepted in NZ, and likely without requesting subsidy.' Another said: 'Given their wide acceptance overseas, I would be bewildered if NZ does not accept them.' There were some concerns that if cheaper alternatives were accepted, there might be less chance of obtaining a subsidy.

Increased safety risks due to avoiding controlled airspace or flying without a transponder

A theme coming through all response methods was a concern that there might be an increased safety risk due to operators avoiding controlled airspace or flying without a transponder and therefore being 'invisible'. One respondent said: 'Many GA aircraft will be flying without transponders and this will increase the risks associated with aviation'.

41.8 percent of respondents to the online questionnaire said they would not fly in controlled airspace if the mandate comes into effect.[15] Some respondents were worried about operators using more risky routes to avoid controlled airspace – going further out over water, over difficult terrain or flying at an unsuitable altitude.

Impacts on aviation businesses

A small number of respondents highlighted an impact on aviation businesses – such those working in aircraft maintenance (if their maintenance facilities were within controlled airspace) and hangar owners. Some respondents said they would need to change their maintenance facility as it was located within controlled airspace at an airport. One respondent said that the proposal '…will affect the likes of various businesses eg LAME's, Hanger owners, Airport operators, owners not being able sell their aircraft for a fair market price'.

There are also concerns, particularly amongst aero clubs, that the changes may force some flight training schools to close. One aero club said that the amount training schools can charge for a Diploma in Aviation Studies is controlled by NZQA and so they have limited ability to absorb extra

[12] Question 11

[13] Question 13

[14] Question 15

[15] Question 2

costs. One organisation said that the financial pressure could contribute to the '…failure of some clubs reducing the already stressed flight training sector numbers.' Another respondent said '…the current cost proposal will close our Microlight Training School'.

Impacts on aviation more generally

13.8 percent of respondents to our online questionnaire said they would retire or sell their aircraft.[16] This reflected a few email responses concerned that the costs related to aviation were becoming too prohibitive and as a result recreational aviation was in decline, and fewer younger participants were joining. One respondent said 'Recreational aviation is dying due to escalating costs. This is leading to less young people being attracted into commercial aviation which has wide ramifications to commercial aviation and the economy.' Another said the proposal '…will ultimately impact the future professional pilots coming through.'

Timeframes for implementation

A number of respondents (particularly glider organisations) want a longer implementation timeframe. Reasons for this included the view that more time was required for compliance, for the development of suitable systems and equipment, and for the resolution of outstanding issues. Respondents said that fitting ADS-B to all GA aircraft will take time and therefore a decision on funding is required early in the process, as many operators are waiting to hear about funding before making a decision.

Need for clarity

The consultation highlighted that there was some confusion amongst a small number of respondents and that further work is required to provide clarity on the proposal. This included:

- the purpose of controlled airspace and how controllers operate
- the difference between navigation and surveillance
- the rationale for different equipment requirements in New Zealand compared to other countries, such as Australia and USA.

[16] Question 2

Annex 1: Question by question analysis of the online questionnaire

Question 1: What do you think about mandating ADS-B in all controlled airspace?

Response options	Response	Percentage
I support the proposal to mandate ADS-B OUT	23	9.9
I support the proposal but have concerns about the cost to me / operators below flight level 245	87	37.3
I do not support the proposal because of the costs to me / operators below flight level 245	90	38.6
I would support the proposal if there were measures to reduce the costs	127	54.5
The proposal won't make any difference to me	4	1.7
Other: please briefly explain	28	12
Number of respondents who answered this question	**233**	

Over half of the respondents to this question said they would support the proposals if there were measures to reduce the costs.

28 respondents selected 'other'. Over half of those who selected 'other' commented on the costs of ADS-B for GA pilots, including the need for subsidies. Three respondents agreed with the proposal for safety reasons, and another three said we should look at cheaper alternatives. Two respondents stated they had already fitted ADS-B.

Question 2: What difference will the proposed mandate have on the way you fly?

Response options	Response	Percentage
It will not make any difference to me	28	14.3
I will not fly in controlled airspace if the mandate comes into effect	82	41.8
I will equip in time for the mandate in order to continue flying in controlled airspace	59	30.1
I will retire or sell my aircraft	27	13.8
Other: please briefly explain	72	36.7
Number of respondents who answered this question	**196**	

Over 40 percent of respondents said they would not fly in controlled airspace if the mandate comes into effect, and 30 percent said they would equip in time to continue flying in controlled airspace.

72 respondents selected 'other'. 23 provided comments relating to costs and funding options. Nine respondents felt they simply had no option – they can't afford to install ADS-B but they can't fly where they are located without it. Four respondents considered flying without a transponder: 'I will fly where I want to fly'.

Five respondents identified safety risks in avoiding controlled space, or access to controlled space in an emergency or due to weather. Another four respondents said they would avoid controlled airspace, but may need to access it in an emergency.

Three respondents explained that they hire their aircraft from a club so they will need to wait and see what the club decides. Another three said they would wait until closer to the time to decide, or delay their decision as long as possible. Two felt the timeframes would not be achievable.

Question 3: Do you think that section 2 describes the need for a mandate and the associated issues? If not, what have we missed?

137 respondents provided comments. This was a free text, open question.

26 respondents agreed that section 2 describes the need for a mandate and the associated issues. A further nine respondents agreed, but also voiced concerns about costs. Three respondents stated 'no' and provided no further comment. Seven respondents said they were confused by the question or couldn't see any section two text. Three respondents felt that section 2 was one-sided or biased towards commercial aircraft.

High costs v low benefits for GA operators

23 respondents commented on who would benefit from the proposal. Many respondents perceived Airways and commercial airlines to be the main beneficiaries of ADS-B – they would benefit from the new technology, and from the savings made in not maintaining the old radar technology. On the other hand, they felt GA operators would derive limited benefit from the new technology yet have to pay the same amount for the equipment. 'The savings are gained by airways yet the cost falls to GA aircraft'

A lack of benefits for GA operators was linked to arguments around cost and who should pay for the new equipment. 38 respondents commented on costs, noting:

- The high costs in general: 'Without financial support, this mandate will be of huge detriment to GA.'
- Airways and commercial operators gain all the benefit, and this should be reflected in who covers the cost: 'The "need" is all Airways and they should pay for what is essentially half of their capital investment.'
- That the costs did not justify the benefits for GA operators: 'the benefits to VFR operators are minimal compared to the cost of equipping.'
- The impact of costs on overall take-up of ADS-B: 'It could improve safety if taken up by a large percentage of GA. At the proposed costs this is highly unlikely to occur.'

A small number of respondents who agreed with the proposal were also concerned about the costs.

Of those who commented on the costs, 11 made recommendations in relation to funding, including subsidies, bulk discounts, cost-spreading and CAA/Airways/the Ministry of Transport paying the full amount.

Consideration of other options and the international picture

Some respondents urged us to look at alternative, lower cost options (such as TABS conspicuity devices or UAT). One respondent said 'the fact an Alternative equipment Study is being carried out gives me hope that some types of GNSS receivers currently not allowed may be approved. However this means I cannot make an educated decision on what models to install in my aircraft until this is announced.' A small number of respondents also questioned whether there was a contingency or backup if GPS coverage was lost – and whether that system could continue for GA operators.

Four respondents referred to examples of implementation in other countries. 'The international picture is entirely missing. Comparison to the US, Europe and Australia and the scenarios they are working with is absent…'

Increased safety risks

Three respondents noted the safety risk of operators flying without a transponder, and two respondents contended that ADS-B needs to be installed on all aircraft to be effective. There were two main concerns related to safety. Firstly, operators may fly without transponders due to the cost of installing ADS-B. 'Many GA aircraft will be flying without transponders and this will increase the risks associated with aviation'.

Secondly, operators may use more risky routes to avoid controlled airspace: '…being able to use controlled airspace offers safety, routing and other advantages. Having to choose a route based on avoiding controlled airspace can reduce flight safety as the alternative route may involve routing over water for longer or difficult terrain, etc.'

Question 4: Which of the benefits of ADS-B described in section 2.3 are the most important to you?

Response options	**Response**	**Percentage**
System modernisation: replacing old technology with new	66	34.4
The increased coverage of ADS-B compared to radar	85	44.3
Potential for improved information to support search and rescue efforts	112	58.3
The opportunity to install and use ADS-B IN: improved situational awareness	93	48.4
Flight following	99	51.6
Number of respondents who answered this question	**192**	

This question did not have a free text response option. A range of respondents recognised *multiple* benefits as most important to them, with search and rescue benefits the most commonly selected.

Question 5: Do you agree that the costs of equipping an aircraft with an existing Mode ES [extended squitter] Transponder that can be upgraded to ADS-B with applicable ATD is NZ$5,500 including installation?

Response options	Response	Percentage
Yes	71	33.6
No, these costs look different from what I expect/I have already paid.	85	40.3
Not relevant to me	55	26
Number of respondents who answered this question	**211**	

94 respondents provided further explanation. One of those respondents said they expect the cost to be lower (but made clear they did not support the proposal): 'I believe the cost to me will be less - I have a Dynon Skyview system that should only be a simple swap of a component.'

12 respondents agreed the cost could be approximately $5,500. However, they made clear that that would be a minimum, and would only include equipment and not other factors such as installation. One respondent said: 'I have on order but not paid for and that cost is $5,064.60 for Garmin GTX335 not including installation'.

36 respondents said they expected the costs to be higher than $5,500, and most said it would cost between $7,000 and $20,000. Some respondents shared quotes or actual costs with us. It was not always clear if the examples provided related to the cost of equipment only, or included the cost of installation.

- 'Have been quoted by a large firm's avionics section that the average cost to me for my fleet wold be $7,500 to $8,000 each as a job lot.'
- 'Cost quoted is closer to $7000 due to installation costs.'
- 'The quote I have had from my Lamie is $7,300 installed.'

Five respondents said they were not sure about the costs.

Five respondents said that costs would vary depending on the type of aircraft, transponder and complexity of installation: 'Installation costs will differ considerably depending on aircraft type and present equipment installed'.

17 respondents highlighted the need to include additional factors in the costs, such as

- installation
- a certified GPS as some will only have portable ones
- battery upgrade for non-powered aircraft such as gliders
- certification and approval
- panel reconfiguration where there is no space.

Five respondents said they do not have a Mode ES transponder, or their transponder cannot be upgraded, and so they would require a new installation.

Six respondents commented that costs were unreasonably high, and a further six encouraged cheaper options.

Question 6: Do you agree that the cost of equipping an aircraft where the aircraft does not have a Mode ES Transponder using ATD is NZ$9000 (including $500-$1500 for installation)?

Response options	Response	Percentage
Yes	96	45.5
No, these costs look different from what I expect/I have already paid.	70	33.2
Not relevant to me	45	21.3
Number of respondents who answered this question	**211**	

70 respondents provided further explanation. As with Question 5, it's not always clear if respondents are referring to costs including or excluding installation and other factors. Four respondents agreed with the costings as a minimum estimate. Three respondents weren't sure about the costs. One of those respondents noted that suitable equipment for his glider does not yet exist.

Five respondents expected the costs to be lower or had theirs installed for less. For example, one respondent said: 'I have installed an ADSB Out Transponder in my Glider for around $6,000.'

22 respondents said that our costings were too low. For example: 'Have been quoted higher by two suppliers'; 'I have been quoted various from $10,000 to $15,000'; and 'My installed cost for a c172M was circa $10.5k (equipment cost GTX 335 $5600, install inc mech $4800).' Eight respondents said that installation costs would be more, with one respondent estimating that '9-15k would be more in the ball park'.

Additional factors that would impact costs were mentioned by five respondents. This included the cost of a certified GPS, Load analysis, maintenance approval and panel reconfiguration.

Six respondents commented on costs more generally – that they are too high and unacceptable, and higher than US-based costings.

Question 7: Do you agree that the cost of equipping an aircraft with an existing Mode ES transponder but no ATD is approximately NZ$11,000?

Response options	Response	Percentage
Yes	60	29.4
No, these costs look different from what I expect/I have already paid.	59	28.9
Not relevant to me	85	41.7
Number of respondents who answered this question	**204**	

47 respondents provided further explanation. Three respondents said the costs could be right but were a minimum estimate. Five respondents said they weren't sure or hadn't costed it yet. Two respondents thought the costings were too high.

12 respondents said the costings were too low. For example, one respondent said: 'In a perfect world you might manage $11K but from experience with getting modifications/ATD approved I would be provisioning $15K for this scenario.'

Three respondents said we needed to take into account other factors, such as downtime while the aircraft is inspected and assessed during the creation of an ADT.

Question 8: Do you agree that the cost of equipping an aircraft with an aircraft with no Mode-ES transponder and no equipment with ATD to that aircraft is approx. $13,000?

This could break down into:
- **$7,000-8,000 for lightweight unit suitable for installation in aircraft without an STC**
- **$1,000-2,000 for installation**
- **$3,000-5,000 for certification**

Response options	**Response**	**Percentage**
Yes	91	44.2
No, these costs look different from what I expect/I have already paid.	61	29.6
Not relevant to me	54	26.2
Number of respondents who answered this question	**206**	

53 respondents provided additional information. Of them, five noted that our costings are an estimate and that they 'maybe' or 'possibly' reflect the cost. One respondent confirmed that this was approximate cost of their installation. A further six respondents said they weren't sure about the cost. One respondent felt the costs were too high.

Seven responded felt the costing was an underestimate, although two thought $15,000 and another thought an extra $1,500 for installation and certification would be right.

Five respondents commented on installation, estimating it would cost more but recognising it would vary. For example, one respondent said his aircraft was very small and installation would be difficult due to limited panel space and limited access. Five commented that certification could cost more. One respondent said: 'Equipment cost looks about right, the installation is likely to be unique so I would be budgeting $5K, the certification is going to be expensive because of uniqueness so I would be budgeting $5K to $10K'. Another respondent said: 'You seem to be missing the point - the panel is full - I have to start again'.

Ten respondents commented on the cost more generally, that it was too expensive for GA operators. One respondent highlighted that the FAA appears to have provisions in their rules to cater for gliders and balloons.

Question 9: How big of a concern is the cost of equipment to you? (choose one)

Response options	Response	Percentage
I am not concerned about the cost	4	1.8
The mandate won't apply to me	3	1.3
I am somewhat concerned about the cost	16	7
The cost is a major concern for me	205	89.9
Number of respondents who answered this question	**228**	

52 respondents provided further comments. Most of those comments were related to the financial impact on GA operators. 13 respondents said the cost was unaffordable and some mentioned that would need to stop flying. One respondent hired his aircraft from a club and was concerned about his costs increasing. Another respondent was concerned about the future of clubs and youth in aviation. Three respondents said they would not upgrade to ADS-B.

Ten respondents said the cost was significantly high when compared to the value of their aircraft. One respondent said: 'For a microlight like a bantam b22 the ADS-B would cost as much as the purchase price.' A further five respondents said the cost was too high compared to their use of controlled airspace, with one saying they enter controlled airspace only two or three times per year.

Six respondents commented that the proposal benefits Airways or commercial operators, with little benefit to GA operators. These comments were closely related to comments on funding for ADS-B; respondents said the main benefactor should 'bear the brunt of the cost', costs should be covered by 'off road rebates', and the issue of retrospective funding for early adopters. One respondent said: 'I am aware of organisations saying some of the cost should be picked up by Airways, however would be against this as I would be concerned with their charges increasing as opposed to an increase in my mileage as a way of cost recovery.' Two respondents commented that it's not this expensive overseas.

Two respondents were concerned that the cost would prevent others from equipping. Another respondent said that safety must be considered, even if it means a few people will become non-participants in the industry.

Question 10: Would you consider equipping with ADS-B IN as well as OUT?

Response options	Response	Percentage
Yes, I will consider adding ADS-B IN	115	51.1
No, I wouldn't consider ADS-B IN	110	48.9
Number of respondents who answered this question	**225**	

Respondents were evenly split on whether they would equip with ADS-B IN as well as OUT.

113 respondents explained their answer. 19 respondents commented on the benefits of ADS-B IN in relation to added safety, and one questioned why it wasn't mandatory. Many of these respondents felt ADS-B IN was more beneficial to GA operators than ADS-B OUT. However, there was concern that it was only beneficial if there was sufficient uptake, and given the costs they doubted there would be high enough uptake. For example, one respondent said: 'This is where the main benefit is for GA users outside of a search and rescue scenario, provided the mandate can be implemented in the correct manor that sees a high percentage of uptake.'

A small number of respondents indicated that they would consider ADS-B IN depending on the cost, whether it would be subsidised and what features or services would be available.

Some respondents said they already had this technology, either ADS-B IN or an alternative such as FLARM or an iPad with an app. 15 respondents said that there are alternatives that serve this purpose and are affordable.

34 respondents said it was too expensive, and a further six said they could not install it in their aircraft due to lack of space or power source. One respondent was not sure, and another said they would only install if it was mandatory.

22 respondents felt ADS-B IN has little benefit to them or is not needed. Some of these respondents pointed out that others won't have it, and therefore it will have little purpose. Many of these respondents highlighted the need for VFR operators to keep their 'eyes outside' and 'see and avoid'.

Question 11: Which of the barriers in section 2.5 are the most important for you?

Response options	Response	Percentage
Cost of equipment and installation	222	99.1
Access to ATD for my ADS-B equipment for my aircraft	58	25.9
Being able to fit equipment that best suits my aircraft	87	38.8
Access to a qualified Part 66 LAME or Part 145 organisation	50	22.3
Number of respondents who answered this question	**224**	

Question 12: Is your aircraft covered by an STC or other Acceptable Technical Data for ADS-B OUT system installation?

Response options	Response	Percentage
Yes	60	26.3
No	93	40.8
I don't know	75	32.9
Number of respondents who answered this question	**228**	

Question 13: Is obtaining ATD a barrier to equipping your aircraft with ADS-B OUT?

Response options	Response	Percentage
No, my aircraft is covered by applicable ATD	39	17.2
I don't have ATD for my aircraft but I don't see this as a barrier	23	10.1
I don't have ATD for my aircraft and I see this as a barrier	76	33.5
I don't know	89	39.2
Number of respondents who answered this question	**227**	

Question 14: What would make the most difference to you with regard to access to ATD?

Response options	Response	Percentage
Access to an ATD for ADS-B OUT for my aircraft	79	46.2
Information about which aircraft are covered by STCs	67	39.2
Ability to use AC43-14 to fit ADS-B OUT to my aircraft	79	46.2
OEM issues a design solution for my light sport aircraft	38	22.2
Number of respondents who answered this question	**171**	

39 respondents provided further comments. Three respondents did not understand the question, two re-iterated the answer they selected, and another nine said they weren't sure, the question wasn't applicable to them, or they 'don't need it in the first place'.

Seven respondents said the cost would make the most difference to them. Another six respondents said a simpler way of approving, such as minor change approvals and a generic installation for gliders.

Four respondents would like more choice of equipment or for the CAA to accept an overseas manufactures certification. One respondent said: 'There is only one unit/system that has my aircraft type as an approved model. This is a very expensive unit compared to other units out there. I want to have the ability to choose the system that suits my aircraft and not just install this one system because that's it.'

Five respondents commented on challenges such as no longer having an Original Equipment Manufacturer (OEM) or technical support, or their plane being amateur built or unique. For example: 'My aircraft is 45 years old. There is NO OEM any more.'

Question 15: If alternative equipment options (e.g., TABs or uncertified equipment could be safely used in New Zealand, would you consider installing it? (choose all that are relevant)

Response options	Response	Percentage
Yes, provided it is a cheap option	179	82.5
Yes, provided it is a lightweight option	96	44.2
Yes, provided it is a low power solution	81	37.3

No, I will be installing standard TSO equipment	33	15.2
Number of respondents who answered this question	**217**	

34 respondents provided further comments. Seven respondents agreed there should be alternative equipment options, and pointed to overseas acceptance. For example, one respondent said: 'A lot of aircraft would already be compliant if these devices were accepted in NZ, and likely without requesting subsidy.' Another noted: 'Given their wide acceptance overseas, I would be bewildered if NZ does not accept them.'

Another five respondents agreed but only if Airways or CAA pay for the equipment. They are concerned that if cheaper alternative options are accepted, it may reduce the argument for a rebate or subsidy. One respondent said: 'no unless the cost is met in full by Airways NZ'.

Six respondents have already installed equipment, including non-TSO. One respondent noted: 'I have already installed such a system at risk.'

Four respondents are looking for light and low power solutions for gliders and microlights. Another four mentioned costs – such as ongoing service costs and GPS costs.

Three respondents required or favoured TSO equipment, for example: 'would prefer standard TSO equipment -subject to cost.'

Question 16: What information about ADS-B would be the most helpful for you? Please tick all that apply

Response options	Response	Percentage
Do I need ADS-B OUT?	39	21.2
Choosing an ADS-B OUT system	95	51.6
ATD for ADS-B OUT	69	37.5
Planning and budgeting for ADS-B OUT installation	104	56.5
The installation process: what you need to know	94	51.1
Operating ADS-B OUT	51	27.7
ADS-B IN	50	27.2
Number of respondents who answered this question	**184**	

46 respondents provided further comments. Seven respondents confirmed that they have received enough information and are fully informed.

11 respondents commented on the approval of specific solutions or had technical questions. Most asked for a list of solutions that met our requirements, and two asked for solutions for gliders or light sport aircraft. One respondent asked for a database of transponders to quantify scope of roll out and costs of implementation

15 respondents asked for further information about costs – a subsidy or who will pay for the new equipment.

Two respondents wanted confirmation they will have access to controlled airspace.

There were a small number of comments around providing more clarity, the additional value of ADS-B for GA operators and a request for the requirements in a timely manner (with a least two years for operators to prepare).

Question 17: What would be the best ways for CAA to provide this information to you? Please tick all that apply

Response options	Response	Percentage
Websites: NSS, CAA	105	50
Direct emails	91	43.3
Seminars delivering information in a meeting format	53	25.2
Training on installing, testing, operating ADS-B OUT systems	42	20
Written material: booklets, brochures	96	45.7
Posters or other display material that many people can see	15	7.1
Vector magazine articles	136	64.8
Number of respondents who answered this question	**210**	

22 respondents provided additional comments. Suggestions included:

- a webinar
- Gliding NZ via the Soaring magazine
- Clear information on the types of units that can be fitted,
- an information sheet of suppliers who produce kit acceptable under AC 43-14 for aircraft not otherwise covered by ATD
- a portal on the CAA website for all ADS-B information
- information specifically on issues concerning small composite aircraft.

One respondent recommended not using Vector as the information is too aircraft specific, and another did not want any more seminars. One respondent asked for clear and unambiguous information.

Five respondents took the opportunity to comment on costs.

Question 18: Please tick all that apply: are you a...

Response options	Response	Percentage
Commercial pilot/owner	47	20.6
Recreational pilot/owner	197	86.4
Part 66 LAME	22	9.6
Part 145 organisation	4	1.8
Part 146 organisation	1	0.4
Part 149 organisation	15	6.6
Part 137 operator	5	2.2
General Aviation Organisation	23	10.1
Number of respondents who answered this question	**228**	

19 respondents who selected 'other' (in their own words):

- Glider or microlight owner/operator (10 respondents)
- PPL (2 respondents)
- PPL & RPL and Instrument rating
- Vintage aircraft operator
- Part 43 Maintenance Provider
- Commercial pilot non owner
- RPL and Manager of a gliding club
- Homebuilt a/c with low power budget
- Maintenance approval for aircraft (owner Built)
- Currently re-building a PA22/20, working towards PPL, and will be a Part 66 LAME in very near future

Question 19: Would you like to be contacted about your feedback? If yes please fill in the details below

107 respondents provided contact details.

Question 20: Do you fly/work on: Choose one

Response options	**Response**	**Percentage**
VFR aircraft	184	79.3
IFR aircraft	7	3
Both	43	18.5
Number of respondents who answered this question	**232**	

Question 21: Do you fly in controlled airspace now? Choose one

Do you fly in controlled airspace now?	**Response**	**Percentage**
Yes, frequently – at least once a month all year, or when I'm flying (e.g., in the summer months)	111	48
Sometimes – once every two or three months	47	20.3
Occasionally – less than once every two months	67	29
No, never	6	2.6
Number of respondents who answered this question	**231**	

Question 22: What type of aircraft do you fly, and does it / do they have ADS-B?

209 respondents provided information about their aircraft and whether they had ADS-B installed (and if so which ADS-B system).

Question 23: If you do not have ADS-B OUT, what transponder do you have on your aircraft?

19 respondents said they had no transponder. 183 respondents described their current transponder.

Question 24: Is there anything else you would like to add to your comments on the proposal to mandate ADS-B OUT below flight level 245?

153 respondents took the opportunity to provide further comments.

Costs and subsidies

Many respondents provided comments in relation to the costs of the proposal. 52 respondents commented on the costs more generally – stating that the proposal was unfair and perceived that Airways was saving money and putting the cost onto owners. For example, one respondent said: 'I am concerned about the shifting of infrastructure costs from Airways to the users of airspace, without any consideration of the financial burden that that will place on the users.' They highlighted that, unlike commercial operators, they were unable to absorb costs, and that many could simply not afford to upgrade.

25 respondents compared the costs of the proposal to the benefits. Most of these felt the costs were very high and that they gained little or no benefit from ADS-B. They felt the proposal was for the benefit of Airways and commercial operators. For example, one respondent said: 'Cost of equipment is high for a negligible personal benefit', and another noted: 'Huge expense for Absolutely zero benefit to me.'

Eight respondents specifically commented on the cost of the proposals compared to the value of their aircraft, and some said the costs of the equipment and installation exceeded the value of their aircraft. One glider operator said: 'As a recreational glider pilot, the costs quoted exceeds the insured value of the aircraft.'

65 respondents made suggestions in relation to how the implementation of ADS-B should be funded. Suggestions included:

- airways to cover the full costs
- the overall system upgrade cost to include the supply of equipment to all aircraft
- spreading the cost across all users or beneficiaries of the system
- a subsidy or rebate system
- a reduction in other charges to compensate for this expense
- one organisation to ensure that supply of the equipment at discounted bulk price
- organise a rebate quickly to ensure there is still time for installation across all aircraft.

One respondent has already installed ADS-B in anticipation of a rebate of the actual cost of a minimum installation and said that: 'Anything less is a betrayal of trust and responsibility.'

Comments in support of the proposal

One respondent said ADS-B OUT should be everywhere to help separation of aircraft. A further 14 respondents qualified their support of the proposal. They agreed with the proposal from a safety point of view, but also commented on the significant barriers – mainly the cost implications. For example, one respondent said: 'I think the concept of ADS B is a good one, but at the moment the cost and accessibility is prohibitive.' Another respondent said: 'Having said that I absolutely support the technology and would love to see a high uptake allowing everyone from the CAA and Airways down to recreational pilots benefiting from the benefits of ADS-B.'

Alternative options and the international picture

28 respondents commented on other potential options, including approaches taken by other countries. They felt that the only approved equipment in NZ is the most expensive equipment. Respondents are not clear why the CAA has not accepted devices that other regulators in the UK, US and Australia have approved. Some pointed out that the devices accepted in other countries have a larger market and are therefore cheaper. Some respondents (particularly gliders and microlight operators) are waiting to see if cheaper reliable equipment becomes available in Europe, and approved in New Zealand.

Alternatives suggested by respondents include:

- light weight and low powered options for gliders and microlights
- lower-cost versions specifically for flights below a certain altitude, such as
    - UAT
    - Skybeacon
    - Dynon SV-XPNDR-261 coupled with Dynon SV-GPS-2020
    - non-TSO equipment/TABS
    - Spidertracks
- units that are better able to help with search and rescue
- make visual entry to and departure from controlled airports a normal procedure for ATC staff
- non-transponder access procedures for controlled aerodromes where control towers can visually monitor aircraft

Increased safety risks

14 respondents were concerned about increased safety risks and made the following comments.

- Operators will not fit ADS-B and continue to operate in controlled airspace with their transponders off and be 'invisible'.
- ATC will not see any non-equipped aircraft. Currently most GA aircraft are Mode A/C equipped and visible to ATC even in uncontrolled airspace.
- Non-equipped aircraft will have to operate in areas of unsuitable terrain and weather or unsafe altitudes to avoid controlled airspace.
- An overreliance on equipment makes the 'see and avoid' rule more difficult.

By possibly pushing these operators out and excluding them from controlled airspace is increasing the risk elsewhere.

Controlled airspace

13 respondents commented on controlled airspace. Some operators said they currently have trouble getting clearance to enter controlled airspace, and they are concerned that even if they equip, access to controlled airspace may not become easier, and therefore the benefits of ADS-B reduce. Some were also concerned that controlled airspace will expand and so aircraft that currently don't use controlled airspace will have to equip in future. One respondent said: 'Control zones that operate successfully now which are not transponder mandatory will change and require all aircraft that have to enter the zone to be ADS-B equipped.' Access to maintenance facilities within controlled airspace was also mentioned.

Timeframes for implementation

Eight respondents commented on timeframes. This included concerns that there is not enough time to comply (although one thought the implementation timeframe was too long). Others wanted to delay to coincide with the chance to European standards, which they believe will lead to cheaper and more suitable options. One mentioned a delay to the off-peak winter season.

Annex 2: Summary of roadshow feedback

We organised 18 roadshows around New Zealand, with Airways alongside at some locations, where we engaged with 325 operators. This was an opportunity to present and discuss the proposals with operators, hear feedback and promote our consultation. The feedback provided by participants reflects the feedback we received through our online questionnaire.

Attendance at the roadshow events

Location	**Attendees**	**Location**	**Attendees**
Whangarei	**15**	Christchurch	**7**
Stratford	**14**	Christchurch	**13**
Hawkes Bay	**22**	NorthShore	**25**
Palmerston North	**6**	Ardmore	**26**
Kapiti	**29**	Tauranga	**41**
Dunedin	**28**	Greymouth	**5**
Queenstown	**10**	Hamilton	**16**
Invercargill	**3**	Marlborough	**30**
Omarama	**18**	Nelson	**17**
Total number of attendees: 325			

Airways and Airlines

Airways supports the proposal and outlined their view as part of their presentation. They recognise that sufficient uptake is required from all users to ensure that they can manage the system. Their view is that a backup secondary surveillance system is not considered feasible as this cost would need to be recovered from the industry through Airways Fees. The majority of Airways' income comes from airlines, and the major airlines are already paying for the ADS-B and contingency ground infrastructure. Airlines are unlikely to be willing to pay the fees to cover the costs of a backup secondary surveillance system, as it would not be of any benefit to them.

Main Themes from General Aviation (GA)

Cost of equipment

A common theme throughout the sessions were that the costs are a significant barrier. Participants sought more information on uncertified options and whether those options could reduce costs. Most participants said that they would equip if the government or Airways paid, or if there was a sufficient rebate.

Clubs and owners of multiple aircraft said they could not justify the cost of equipping. Some participants accepted that their existing transponder may need to be replaced in a few years' time, but they didn't want to be throwing out working equipment in the meantime. Operators wanted at least some compensation if they were to be throwing out working equipment. Some participants also mentioned that given that their aircraft is only worth $40,000, equipment of $10,000 is very high in comparison.

Alternative suggestions to reduce costs were also raised during the roadshow events. These included a bulk buy at a national level to get a discount and a loan to buy scheme. Others suggested that in airspace where there is a contingency SSR system (such as Auckland) ADS-B should not be required.

Many mentioned a precedent for the government/Airways helping with the financial costs when the Mode A/C transponders were mandated. Another participant questioned whether New Zealand Government had been spending money in the Pacific on ADS-B.

Many participants felt that uncertified equipment and portable LPAT equipment could reduce the costs for some operators and clubs. They also would prefer to get additional services such as weather information.

Participants thought that New Zealand should consider the Australian model where ADS-B OUT is mandated only for IFR aircraft.

Concerns relating to timeframes

Participants wanted the CAA to make decisions as soon as possible regarding the way forward, so that operators had sufficient time to be able to equip before the proposed mandate.

Capacity of avionic shops to fit all aircraft before the mandate was a concern. There was also concern about the need for a Group 3 LAME to be required to test the equipment. The equipment does the work and so anyone with the test equipment should be able to do it, otherwise there could be further bottlenecks.

Some participants from the gliding fraternity suggested that the mandate should be middle of winter rather than the middle of the busy flying season.

Other concerns about the proposal

- Some participants thought they might illegally enter controlled airspace without a transponder. This would raise additional safety risks as the aircraft without a transponder would be effectively invisible to air traffic control (ATC). One participant even suggested he might take his A/C transponder out for weight reasons if the mandate goes ahead. This could be less safe.

- Operators based at uncontrolled aerodromes may not equip and only come into controlled airspace a couple of times a year.

- There was concern that participants would spend significant amounts of money on ADS-B equipment and would then find it was not required due to changes to airspace designations or Airways refusing to give them access to controlled airspace even when they are equipped.

- Many participants raised privacy and security concerns with data. Participants were concerned that the additional coverage information could be used as part of enforcement action and queried whether the CAA has a policy on mining data to find poor behaviour.
- Some participants raised the issue of technology creep – that they will need to pay for this equipment and then another type of equipment once technology evolves further. This is expensive for operators.
- There were some concerns about other air management matters such as ATC staffing shortages, and whether there would be changes to controlled airspace areas.
- Some participants said that the proposal does not recognise the benefits of GA as a pathway into aviation for pilots, and that GA also provides contribution to tourism. Some uncontrolled areas (such as Greymouth) may not have ADS-B equipped aircraft for flight training and this would not be ideal.
- VFR transit lanes may get busier as GA avoid controlled airspace to get around the mandate.

Benefits of the Proposal

Some GA participants did accept that there was a small amount of benefit to them, but not sufficient benefits to justify the cost. Some also suggested that ADS-B OUT should be mandatory in all airspace to improve the benefits for operators who chose to equip with ADS-B IN. However, other GA participants did not believe that there was any benefit in the additional coverage and they would not use ADS-B IN.

There was support for AC43.14 changes. However some participants felt that it did not go far enough and should also include some trig two piece ADS-B systems to minimise the costs for more operators, particularly operators who already have an existing Mode S transponder and/or have weight, space and power limitations.

Some participants noted that ADS-B equipment has lower power requirements than current Mode A/C transponders, which is better for gliders, balloons and aircraft that use batteries.

One participant provided an example of the benefits of ADS-B in search and rescue - a light aircraft crashed and friends used Flight Radar 24 to find the site. It was three metres from the last reported position, and other searchers were not close.

What would help

The following suggestions were raised as possible to help general aviation operators to equip:

- A Government contribution to the costs of equipping.
- Guidance on how to fit equipment and for LAMEs how to demonstrate compliance.
- A list of ADS-B transponders that can used and a rebate/subsidy to go with them.
- A guarantee to be able to enter controlled airspace if properly equipped and guidance on Airways policy for allowing non-equipped aircraft in.
- Recognition of the disproportionate impact on GA VFR.

Impact on controlled aerodrome users

Participants in Tauranga, Blenheim and Nelson felt the proposal had a significant impact on them because they only fly in controlled airspace to access a controlled aerodrome. These participants were interested in potential options for allowing access to the aerodrome without a certified solution if the controller can 'see them out the window'. There was also concern about what impact of proposal on maintenance providers at the controlled aerodrome.

The participants questioned what guidance Airways provides controllers for allowing dispensations from the rules. They did not understand the reasoning behind Airways declining them access when there were no airlines in the vicinity and they just wanted to quickly access the aerodrome. In Nelson participants noted that they currently have a procedural approach control service and that there is no surveillance coverage below 7500ft. The Nelson general aviation aircraft are not currently seen by the ATC. They are seen visually by other pilots and by the Airborne Collision Avoidance Systems (ACAS) on the airlines. The participants questioned why they needed an ADS-B transponder to be seen by Air Traffic Control or whether an alternative technology/process could be sufficient.

Concerns related to particular types of aircraft

Hot Air Balloons[17]

Most hot air balloonists do not fly in controlled airspace and therefore do not need to equip. There are three hot air balloon operators that have existing Mode S transponders. Although they had some concerns about costs, they did not see any technical issues with needing to upgrade to ADS-B if they had access to appropriate ATD. One of the benefits of ADS-B for gliders and balloons is that ADS-B OUT equipment uses less power than a Mode A/C transponder which is great for low power aircraft.

Gliders

Gliders are standard category aircraft that require ATD. Gliders are interested in uncertified options. They require low power equipment that is small in size and an 'all in one' option may not be suitable or affordable. There is a need for information from Gliding NZ on how these types of operators should equip. Some gliders pilots suggested using the GPS in the FLARM system. However, there is a new system being developed in Germany that many gliders were interested in.

Warbirds

These operators were also concerned about low power restrictions and whether there is a suitable option for their aircraft.

Microlights

There is a need for further guidance and information on what is required. RAANZ is starting to provide this information.

Agricultural Aircraft

Agricultural aircraft fly low like drones and their aircraft are very dusty and so the equipment may not last very long.

[17] Feedback from Hot Air Balloon sector was from Balloons over Hamilton at the same time as the roadshow.

Annex 3: Summary of written responses

We received 803 responses via email or letter. We don't have respondent profile data for this group of respondents. It's clear that most individual responses were from recreational operators. 12 responses were from organisations, some of whom stated that they were responding on behalf of their membership. Those organisations included:

- Gliding New Zealand
- Regional gliding clubs and organisations
- Regional aero clubs which include some flight training organisations (one of which forwarded a submission from Flying New Zealand)
- New Zealand Warbirds Association
- Aviation New Zealand
- Sport Aircraft Association New Zealand
- The General Aviation Advocacy Network

A submission was also received from Air New Zealand and its subsidiaries as well as a number of smaller commercial operators. A submission was also received from the New Zealand Defence Force.

The New Zealand Aviation Federation organised a co-ordinated response. We received 651 of these identical responses, and many more responses were based on this 'pro-forma' response.

We reviewed each response separately and reported on key themes. The themes in these responses strongly reflect the feedback received through the online questionnaire and the roadshows.

Each written submission was counted separately. Where we have reported the percentage of respondents referring to a theme, we included all 651 proforma responses in that calculation. We have also provided the percentage of respondents referring to each theme counting only one proforma response to provide a clear picture of what respondents were saying.[18]

Support for the proposal qualified by the cost barrier

Some respondents supported the proposal and identified a range of safety benefits. They felt that safety was the utmost priority, and some said that ADS-B should be mandatory for all aircraft. However, most of these respondents qualified their support with comments on cost – it's too expensive, the costs are falling on the wrong parties, they will have to stop flying or only fly outside controlled airspace.

One respondent said: 'I am not in a position to afford that at this stage, and as I am retired, I would require an unexpected windfall to be able to do so. On the other hand it is still my desire to operate a fully compliant aircraft.' Another said: 'I agree that this should be done and do not wish to share the airways with aircraft that I cannot "see". I would like everyone to do this. – but without subsidy no one else will install.'

Another respondent said: 'I am not opposed to the proposed ADS-B mandate, and support the enhanced area of surveillance coverage and potential improved safety, but am opposed to the cost

[18] Where we excluded proforma responses, we counted the proforma as one response rather than 651 individual responses.

burden placed on me as an aircraft owner. The costs on the VFR GA community seem disproportionate to the benefits they receive.'

An airline who supported the proposal and already had equipped aircraft were concerned because 'it could result in less equipage and therefore either non-equipped aircraft operating outside but close to controlled airspace or inadvertent operations by non-equipped aircraft inside controlled airspace.'

A number of respondents felt the benefits of ADS-B would only be realised if all aircraft were equipped. One respondent said: 'I believe that the system will only work to its full potential if there is widespread installation in the whole NZ fleet including GA and all Sport and Recreational aircraft on the register. We need 100% coverage for the system to be truly useful.'

Costs

Costs in general

The majority of comments (96.6 percent including the proforma responses)[19] related to the cost involved for GA operators.

Most respondents commented on the significant costs involved in purchasing, installing and maintaining the new equipment. Many highlighted the high capital costs compared to the value of their aircraft: 'The cost to me to install the equipment for this is almost prohibitive relative to the cost of the aircraft.' Some respondents estimated the costs to be over half the value of their aircraft.

A small number of respondents had already installed ADS-B in anticipation of the change and were able to provide information on the cost (for example, one respondent said they spent $6,000 on equipment and a further $7,000 on installation). Another respondent who had been through this change in Australia found the costs to be more than stated in our consultation, and highlighted the cost of ongoing maintenance and testing.

Several respondents made the point that GA operators could not recover any of these costs, unlike commercial operators. One respondent said: 'Imposing the majority of the cost of this mandated equipment upgrade on a group that cannot generate revenue is unfair.'

Costs v benefits

Many respondents (92.6 percent including the proforma responses)[20] felt there was little or no benefit for them in installing ADS-B: 'While the new technology is a step in the right direction, there are no new advantages to the aircraft owner / pilot regarding entry to airspace from what we currently have.

They felt the costs were significantly disproportionate to the amount of times they used controlled airspace and that there were alternative options to enable them to do this safely without the high cost. Some only used controlled airspace occasionally or to enter and exit an airport, access their hangar or their maintenance facility: 'And in my case operating out of a club airfield I only visit

[19] 82 percent counting one proforma response

[20] 60.9 percent counting one proforma response

controlled airfields about three or four times a year, yet I am expected to spend up to ten thousand dollars for this privilege.'

Who should pay?

96.1 percent of respondents (including the proforma responses)[21] commented on who they thought should cover the costs of the proposal to GA operators.

Most respondents thought that Government (CAA/Airways/Ministry of Transport) should cover some or all the costs. Many respondents believe that Airways will save money in upgrading to ADS-B rather than maintaining the existing system, and that money should be used to cover or contribute to GA operator costs. For example, one respondent said: 'Airways will be saving a considerable amount of money with the replacement of SSR with an ADS-B system. Some of these savings should be used to assist GA with the purchase of appropriate transponders.'

Respondents also said Government should cover the cost because they felt the new system would only benefit Airways and airlines. Many respondents used the example that at some airports (Tauranga was the most common example) 'the airspace reverts to Class G when the last commercial flight has arrived/departed.'

In the pro forma response, respondents said: 'this should be costed into the entire system as part of the basic infrastructure to ensure safety for all users.' They would not fit a new transponder with ADS-B 'unless the Air Navigation Service Provider (ANSP) pays at least the cost of a standard, all in one unit, based on an industry standard like an Appareo or Garmin unit which has a current equipment cost of $2995.00 USD.' However, they also agreed that 'as the installation costs will vary significantly from aircraft to aircraft these will be at my/the aircraft owners cost.'

One organisation representing a large number of GA operators said: '[the] CAA should be a key partner with Airways and the Ministry of Transport in securing some of/a major portion of the costs the be incurred by GA.' They highlighted that we need a 'Government: Industry partnership approach'. Flying New Zealand said they would 'welcome a dialogue with Airways to find common ground and a compromise solution.'

Respondents suggested the following options for covering the costs.

- The Government (CAA/Airways/Ministry of Transport) covering the full cost (ideally with the savings that Airways will make in upgrading rather than maintaining the existing system).
- The Government (CAA/Airways/Ministry of Transport) covering the full cost of the equipment, and operators covering the cost of installation (the option included in the pro-forma).
- The Government (CAA/Airways/Ministry of Transport) could pay for the equipment, and users then pay fees to use the equipment in their aircraft.
- The Government (CAA/Airways/Ministry of Transport) to negotiate a bulk purchase price directly with the manufacturer and pay for the equipment. (Flying NZ and some aero clubs put forward a proposal involving consulting with aero clubs on an acceptable unit, and Airways negotiating a bulk purchase).

[21] 79.5 percent including one proforma response.

- Rebates for some or all costs incurred, including retrospective rebates for those who have already installed ADS-B in anticipation of the change.
- A trade-in service and discount for the soon to be redundant non-ADSB transponders.
- A deferred payment spread over several years (one respondent noted that when radar was first introduced, transponders were funded by a deferred loan system through Airways).
- Insurance discounts for recreational operators with ADS-B, or a surcharge for those not operating with a transponder (particularly in relation to search and rescue costs).
- The use of various tax or fees already being paid by GA operators (such as avgas) to provide a subsidy to GA aircraft.
- The cost be spread across all users or beneficiaries of ADS-B (including passengers who benefit from the safety).

Precedents were provided in relation to subsidising the cost, such as incentives offered in the USA and the assistance provided when the SSR system was introduced.

Impacts of costs on pilot training flights

Some respondents highlighted their inability to pass on these costs. One respondent said that they would need to pass on costs by increasing their fees for pilot training flights. However, the amount that training schools can charge for a Diploma in Aviation Studies is controlled by NZQA and so they have limited ability to absorb extra costs. Another respondent said that the cost of the proposal will close their microlight training school: 'However, for the Government to expect flight schools like our organisation to find an additional capital of $100k is a significant concern to us.'

Impacts of costs on recreational flying

Several respondents highlighted the increase in people leaving flying due to the costs. They believe that fees keep increasing across the board, for example: 'increased landing and radio fees and a continuous stream of required checks'. One said it was the last straw for them and many others.

One aero club explained how they could not absorb the cost of upgrading and will need to pass the cost on to their members through increased fees to hire aircraft. However, they recognised that may result in reduced flight hours.

Drones

A small number of respondents questioned why drone operators were getting a 'free ride' given that they cause safety concerns but pay no fee to participate in the aviation industry.

Timeframes

16 respondents provided comments in relation to the implementation timeframes. Some respondents said that the decision on Government funding in 2020 is too late and wouldn't provide enough time for compliance. Fitting ADS-B to all GA aircraft will take time and therefore a decision on funding is required early in the process – many operators are waiting to hear about funding before making a decision.

A few respondents recommended a longer transition time and highlighted CASA's decision to make uptake voluntary for the first five years. Some agreed with the timeframe in relation to IFR aircraft, but sought a delay for VFR aircraft. Glider operators in particular recommended allowing more time as there is currently no fully compliant ADS-B equipment suitable for installation into gliders. A delay may allow for more suitable systems to be developed.

Some respondents also said that more time would enable outstanding issues to be resolved and allow for further consultation. Some said there is '…uncertainty around appropriate systems and the certification or "proving" of those sources'.

Alternative systems should be considered

29 respondents provided information on alternative systems they thought would work better and cost less for GA pilots. A selection of examples is set out below.

- Operate both a secondary radar system and ADS-B in parallel (one respondent said this is how the US operates).
- Continue with existing transponders for GA pilots for the specific purpose of entry into control zones, particularly for those whose nearest maintenance shop is at a controlled airfield.
- Identify a way for non-ADS-B aircraft to land at controlled aerodromes, such as extending transit lanes.
- A portable ADS-B transponder, with a SD slot for a card that could be encoded for multiple aircraft and shared amongst a fleet of aircraft that do not fly simultaneously. (Such a device has yet to be brought to market and certified).
- Allow VFR aircraft to fly in controlled space provided they have an adequate position reporting system, such as TABs.
- Accept the Trig TN72 for at least gliders if not all GA aircraft for flying under FL245.
- Each ATC could get a local ground based TCAS system installed that enables ATC to have real-time positional and altitude information for all the existing mode A/C transponders. Low usage GA owners could collectively fund one ground based TCAS installation for their local airport rather than all equipping their aircraft with ADS-B.
- Creation of a special category for 'normal category' vintage and historic aircraft as they have very limited electrical capability and no generators or alternators. One respondent said there was no Supplemental Type Certificate available to fit ADS-B to their aircraft and suspected that would be the case for most vintage, warbird and classic aircraft.
- An exemption for flights below a certain altitude.
- Airways should maintain the existing system.
- Make installation and certification requirements easier and less expensive.
- Reduce the technical standards, such as the GPS source requirements.

Glider operators highlighted the lack of equipment suitable for their aircraft. Glider operators have said that the equipment deemed acceptable are too big and require too much power for a glider.

One operator and business owner did not support the proposal due to cost and 'the restrictions to Gliders that will become non-compliant into the foreseeable future due to non-availability of suitable equipment.'

Increased safety risks

15 respondents commented on what they viewed as increased safety risks related to the proposal(s).

Some of these respondents said there was a risk of unequipped aircraft seeking to avoid controlled airspace and taking unsuitable routes - such as flying far out to sea, over mountainous areas inland, or at unsuitable altitudes. A number of these respondents commented especially on crossing the Cook Straight. One respondent noted: 'for instance, tracking past the Napier CTR means either flying at least 10nm out to sea or over hill country where cloud bases or turbulence that have no consequence in the vicinity of Napier aerodrome can potentially make flying uncomfortable, dangerous or impossible.'

Some respondents felt that other operators may not equip and still fly in controlled airspace 'invisible'. A very small number admitted they might be tempted to enter controlled airspace without ADS-B. One respondent said: 'the whole system will be compromised if people continue to fly without fitting the new ADSB transponders. For many owners, the cost will be prohibitive, and the danger is that people will continue fly without ADSB transponders.'

Some respondents felt the system will become less safe, and that ADS-B will only work if everyone has it. One respondent said 'Without a high uptake of ADS-B Out transponders the traffic awareness safety enhancements will not be realised.' Another said 'Once the existing systems are gone, as planned, the whole system becomes entirely dependent on aircraft owners fitting ADS-B and turning it on. Otherwise nobody will have a clue where anyone is.'

Respondents urged us to ensure there was a subsidy to ensure high uptake - 'My question to the CAA is: do you consider ADSB a safety matter? If so, then everything possible should be done to get as high a percentage uptake of ADSB as possible.'

One respondent wondered whether there was a wider risk in removing radar coverage. 'At the moment it is comforting to know all our coast and territorial waters are being watched and monitored by Radar 24 hours a day. (With the exception of the South Coast of the South Island) People involved in illegal activities soon know where they won't be seen. I believe any reduction in our Radar monitoring would be a threat to our National Security.'

Operators unable to access maintenance company or hangar

11 respondents raised concerns about access their maintenance company or hangar. For example, one respondent said 'Although I fly from an uncontrolled aerodrome and fly 99% in uncontrolled airspace the maintenance bases I use are both located inside control zones. The ADS-B mandate is potentially going to force me to change maintenance providers or I will have to fit ADS-B.' Another respondent said they suspect there will be a 'noticeable effect on Maintenance Providers based at controlled airfields if GA can't access them due to not being ADSB compliant.'

Some respondents fly in uncontrolled airspace but their hangar is located in controlled airspace and therefore they will only require ADS-B for entry and exit. For example, one respondent said they are 'caught by this proposed mandate because it is (their aircraft) hangered at Nelson Airport. My only

other option is to relocate the aircraft outside controlled airspace and be restricted to uncontrolled airspace forever.’