GENERAL AVIATION
DATA IMPROVEMENT TEAM (GADIT)

ACTIVITY-DATA TASK REPORT

June 15, 2001

GADIT Activity Data Task Report

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EXECUTIVE SUMMARY

In 1998 and 1999, under the FAA's Safer Skies initiative, teams of government and industry experts reviewed general aviation accidents stemming from weather and controlled flight into terrain, and recommended equipment, education, training and procedural changes that would prevent these types of accidents in the future. These recommendations are now being implemented. However, these teams reported that their analyses were often hindered by a lack of sufficient detail about the factors leading up to an accident.

To ensure these safety recommendations are having the desired effect when implemented, a decrease in the general aviation accident rate (accidents/100,000 hours flown) was first suggested as an appropriate metric. However, closer examination revealed that current estimates of general aviation hours flown lack sufficient timeliness, detail and accuracy.

Consequently, the General Aviation Data Improvement Team (GADIT) was formed to recommend ways to: (1) improve current measures of general aviation activity; (2) improve the "richness" of data included in general aviation accident and incident reports, and: (3) use alternate metrics for measuring general aviation safety. This report completes the first task of the GADIT.

In order of importance, general aviation activity measures are primarily used to perform safety analyses, evaluate the impact of proposed regulations, and for planning and forecasting. The GADIT identified forty-five activity data needs, including those based on the annual number of hours flown (the most common measure), landings, cross-country flights, and the number of active aircraft. The GADIT also identified the level of detail and frequency of reporting required for each need.

Seventy-one possible solutions were suggested, many of which involved ways to improve the FAA's annual general aviation activity survey, currently the primary source of this information. However, all alternative means of deriving activity data were evaluated. Each possible solution was objectively scored by various measures for its individual effectiveness and feasibility. Only the possible solutions that met a minimum level of effectiveness and feasibility were suggested as recommendations.

The 32 final GADIT recommendations fell into 5 general areas (descriptions of the specific recommendations are presented on page 19):

- **Implement Improvements To The Current General Aviation Survey (23 recommendations).**
- **Enhance The FAA Aircraft Registry (3 recommendations)**
- **Improve Collaboration With Industry In Gathering Activity Data (2 recommendations)**
- **Perform Additional General Aviation Surveys (2 recommendations)**
- **Better Utilize Existing Sources Of Activity Data (2 recommendations)**

INTRODUCTION

In the spring of 1998, the Federal Aviation Administration (FAA) initiated the "Safer Skies Agenda". This program, a partnership with the aviation community, uses a data-driven approach to analyzing aviation accidents in key areas, and recommends specific interventions to reduce general aviation (GA) and commercial (airline) accidents.

Through March of 2001, Safer Skies teams have already analyzed general aviation weather and controlled flight into terrain accidents and incidents, and recommended many intervention strategies. However, both of these teams identified areas where additional details about certain types of general aviation accidents and incidents would have improved their ability to develop interventions. For instance, in its final report on Controlled Flight into Terrain (CFIT) interventions, the Joint Safety Implementation Team (JSIT) stated:

> "The team also recommends improving the investigation and reporting of GA mishaps; especially the human factors aspects. Accurate determination of the root causes of GA mishaps will provide a rich source of information for future data-driven processes."

In some cases, this accident information may already be part of the National Transportation Safety Board's (NTSB) detailed accident reports, but it is not easily accessed because it is not in a format that lends itself to efficient comparisons of a large number of accidents.

In addition, both JSIT teams noted that inadequate or untimely general aviation activity data (hours flown) prevents timely analysis of accident rates and the development of meaningful measurement of the success of the interventions.

BACKGROUND

As recently as November 1998, the General Aviation Coalition (GAC) identified the lack of detailed, sufficiently accurate and timely data on general aviation activity as a significant problem. At that time, the GAC urged the FAA to improve verification of aircraft owner addresses at the FAA Aircraft Registry, develop supplemental data sources to benchmark GA activity measures, and improve understanding of the operators who choose not to respond to the annual General Aviation and Air Taxi Activity (GAATA) Survey.

While FAA initiated several subsequent improvements, the general aviation community still has great reservations about current estimates of general aviation activity. As a result, instead of using a decrease in the annual GA accident rate over time to measure the success of Safer Skies interventions, an annual reduction in the absolute number of fatal accidents was adopted.

The general aviation accident rate is calculated by dividing the number of accidents -- the numerator -- by the number of hours flown (in hundreds of thousands of hours) – the denominator. While the numerator of this equation has a great deal of certainty, the denominator has a great deal of uncertainty.

The average (aggregate) standard error produced by recent general aviation activity surveys is approximately 1.92 percent. A 95 percent confidence interval therefore yields a range of plus or minus 3.84 percent of the hours flown. A 99 percent confidence interval yields a range of plus or minus 5.76 percent. Due to sampling error alone, annual estimates of hours flown can therefore be expected to differ by as much 1.1 to 1.6 million hours. To produce this same amount of variability in the accident rate, the number of total accidents would have to vary by 112, and the number of fatal accidents would have to vary by 12. The GAC believes these uncertainties make current estimates of the general aviation accident rate an unsuitable measure of the success of general aviation's Safer Skies initiatives.

In addition to the issues related to sampling error, lack of sufficient detail in activity estimates prevents their use for some purposes. In 1997 and 1998, for instance, FAA stopped estimating hours flown for specific aircraft make/models and by state[1]. Consequently, the ability to measure the need for, or success of safety interventions targeted at certain aircraft models or in certain states/regions has been seriously degraded.

Finally, estimates of general aviation activity have not typically been available until nine months after the end of the calendar year. In some cases, activity estimates not been available until 15 months after the end of the year. Given the need to quickly identify degradations in the margin of safety and take corrective action, improvements in the timeliness of activity estimates are essential.

To address these issues, the "Safer Skies" General Aviation Joint Steering Committee (JSC), comprised of members of the GAC, FAA and NASA, established the General Aviation Data Improvement Team (GADIT). The team is composed of representatives from the NTSB, FAA and several general aviation organizations.

The Charter for the GADIT (see Appendix C) was developed by the JSC in April of 2000 and called for the NTSB, FAA, and an industry representative to be Co-Chairs. The remainder of the team would consist of appropriate government and industry representatives (see Appendix D). The Charter specified that the GADIT would develop implementation strategies to: (1) Increase detail about factors that have contributed to or caused general aviation accidents and incidents; (2) Improve the quality and timeliness of estimates of general aviation activity and; (3) Suggest alternative and innovative ways to measure the effectiveness of "Safer Skies" interventions for general aviation. At the first meeting of the GADIT, held in late August of 2000, a work plan was formulated for the group's activities.

It was agreed that the work of the GADIT should be broken into four task areas: (1) Activity Data; (2) Accident Data; (3) Incident Data; and (4) Metrics. It was also specified that the task would be conducted sequentially, with each task taking from six to nine months to complete. At the end of each task, a report would be submitted to the GADIT and to the JSC for their approval and endorsement.

The Activity Data Task Group was formed and met for the first time in late September. A task work plan was developed that was based on the JSIT process with the goal being to get the task report completed by early 2001.

[1] One of the factors that lead to FAA's decision to discontinue activity estimates by make/model and by state was the large sampling error of some data, a result of current sampling design (sample frames and sizes).

The FAA, NTSB, and many others in the general aviation industry use estimates of general aviation activity to monitor safety trends. However, estimates of the number of hours flown by general aviation, especially those for make/model groupings, often have such a large margin of error that drawing meaningful conclusions based on accident rates is impossible.

The primary source of general aviation activity data is the FAA's General Aviation and Air Taxi Activity Survey. With information obtained from the survey, FAA monitors the general aviation fleet so that it can implement measures to assure the safe operation of aircraft, anticipate and meet demand for National Airspace System facilities and services, and assess the impact of regulatory changes on the general aviation fleet.

The first general aviation activity survey took place in 1978, collecting data on the 1977 fleet. Prior to the current survey method, the FAA used the Aircraft Registration Eligibility, Identification, and Activity Report, AC Form 8050-73 in its data collection program on general aviation activity and avionics. The form, sent annually to all owners of civil aircraft in the U.S., served two purposes: (1) Part 1 was the mandatory aircraft registration renewal form; (2) Part 2 was voluntary and applied to general aviation aircraft only, asking questions on the owner-discretionary characteristics of the aircraft such as flight hours, avionics equipment, base location, and use. In 1978, the FAA replaced AC Form 8050-73 with a new system: Part 1 was replaced by a triennial registration program; Part 2 was replaced by a General Aviation Activity (GAA) Survey. The survey was conducted annually based on a statistically selected sample of general aviation aircraft, requesting the same type of information as Part 2 of AC Form 8050-73. The projected benefits resulting from the new method of data collection included quicker processing of results, improved data quality, and a considerable savings in time and money to both the public and the Federal Government. Specifically, the public reporting burden was reduced by an estimated 13,000 hours annually, and the cost savings to the public and Government were estimated to be one million dollars annually. In 1993, the name of the GAA was changed to the General Aviation and Air Taxi Activity Survey[2] to reflect that it also estimates the number of active air taxi aircraft and hours flown.

However, the general aviation industry believes that the activity estimates produced by the survey are not sufficiently accurate and sometimes lack the necessary detail. Furthermore, because of the triennial registration, and the fact that some aircraft owners do not report address changes, the accuracy of addresses in the Registry has deteriorated. Thus, one of the goals of the Activity Data Task Group was to evaluate if current GAATA Survey meets data-user's needs, how accurate the data is, and to identify improvements that might be made to the survey. As the survey is very dependent on the accuracy of information in the Aircraft Registry, a review of the Registry was also conducted. Any other means of obtaining activity data was also evaluated.

[2] In recent years, FAA has biennially included questions in the GAATA Survey relating to aircraft avionics equipage. During these years, the annual report is entitled the "General Aviation and Air Taxi Activity and Avionics Survey".

Status of the General Aviation and Air Taxi Activity Survey

The GAATA Survey provides information on the general aviation and air taxi fleet. It excludes commuters. The Statistics and Forecasting Branch, Planning Analysis Division, Office of Aviation Policy and Plans, Federal Aviation Administration conducts the annual survey. The FAA spends approximately $280,000 annually for contractor assistance with this task. The information from the survey enables the FAA to monitor the general aviation and air taxi fleet so that the FAA can, among other activities, anticipate and meet demand for National Airspace System (NAS) facilities and services, assess the impact of regulatory changes on the general aviation and air taxi fleet, and implement measures to ensure the safe operation of all aircraft in the airspace.

Each year the information for the survey is collected using a statistically designed sample selected from all general aviation and air taxi aircraft registered with the FAA. It is a stratified probability sample of all civil aircraft registered with the FAA as of December 31 of the survey year except those operated under Federal Aviation Regulations (FAR) Part 121 as defined in Part 119.

Approximately 30,000 questionnaires are mailed each year and the return rate averages approximately 65 percent. The information collected in the survey is published late the following year in the "General Aviation and Air Taxi Activity Survey" report for the year surveyed. The 1998 report was divided into seven chapters:

Chapter I	Historical General Aviation and Air Taxi Activity Measures
Chapter II	Common General Aviation and Air Taxi Activity Measures
Chapter III	Primary and Actual Use
Chapter IV	Flying Conditions
Chapter V	Fuel Consumption
Chapter VI	Airframe Hours
Chapter VII	Landing Gear Systems

A copy of the 1999 survey form is attached as Appendix E.

METHODOLOGY

When developing the methodology used to analyze general aviation activity data needs, the GADIT used the following guidelines:

- Evaluating data needs would necessarily begin with a subjective analysis by a wide array of topical experts. (This is similar to the "root cause" analysis that is an integral part of each Joint Safety Analysis Team (JSAT)). The GADIT members therefore included recognized activity-data experts from both industry and government.

- To the extent applicable and feasible, the GADIT would employ the objective techniques and processes for analyzing activity data needs as are prescribed for the JSAT/JSIT process when analyzing safety needs.

Prior to conducting its analysis, the GADIT reviewed the current availability, sources and uses of a wide variety of general aviation activity data, including data produced by Department of Transportation, FAA, manufacturers, associations and commercial vendors.

The GADIT - Activity Data methodology consisted of eleven steps (see Figure 1).

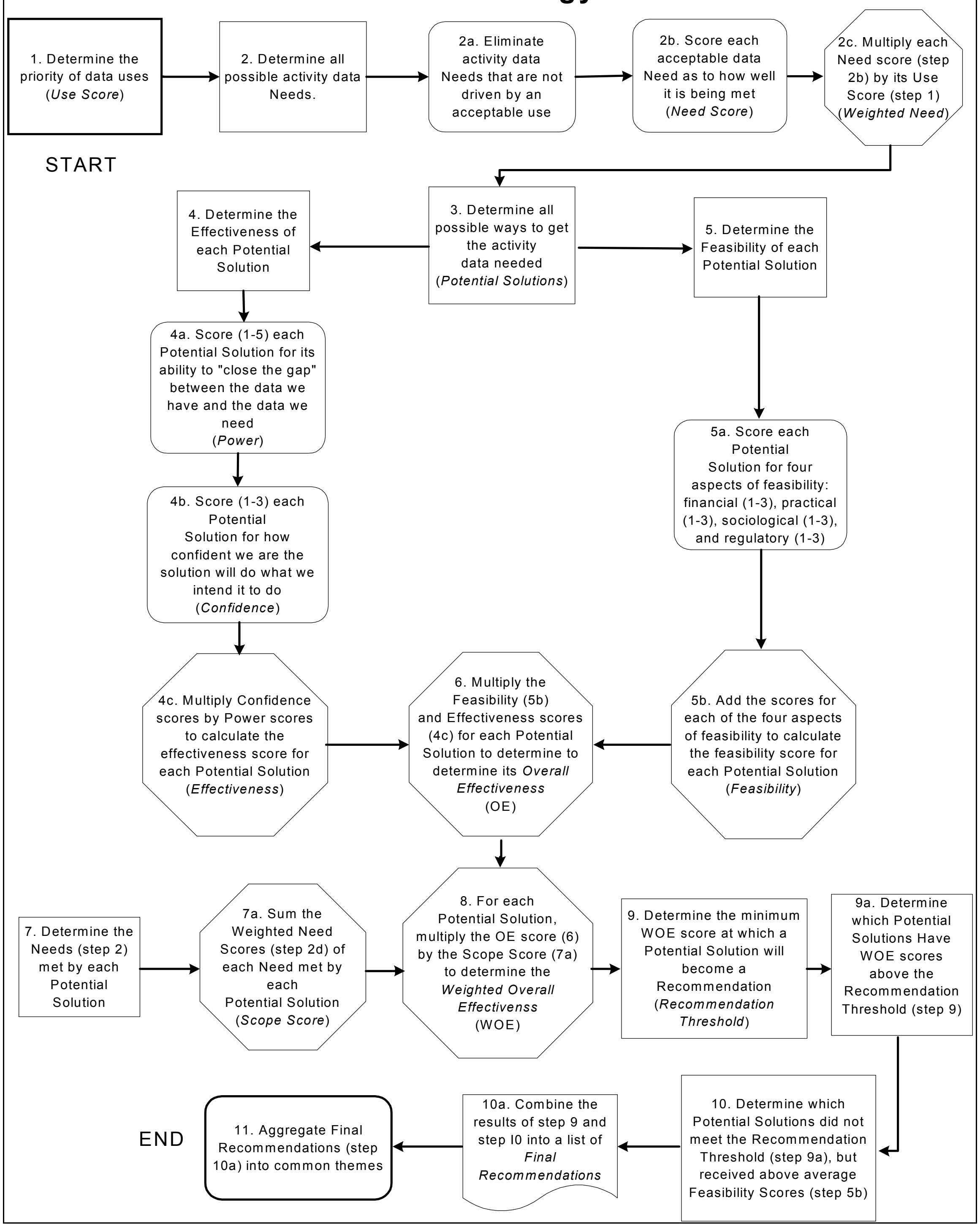
1. <u>Weight the Different Uses of Activity Data</u>. The GADIT began its analysis by identifying the possible uses for general aviation activity measures. These uses were assigned the following weights, or "Use Scores": safety analysis – 3; regulatory analysis – 2; planning/forecasting – 1; other – 0. If the activity data could be used for more than one purpose, which was often the case, it was assigned a single weighting appropriate to its highest use.

2. <u>Identify Activity Data Needs</u>. Next, the GADIT determined what activity measures were desired, termed a "Need". As the GADIT charter requires the team to eventually consider innovative or alternate ways to measure general aviation safety, the team was especially careful to consider any activity measure that might be used as a denominator for calculating the general aviation accident rate – not just hours flown (the traditional measure).

For each measure of activity, (hours flown, landings, approaches, etc.), the GADIT specified the level of detail that was desired (by aircraft type, aircraft make, aircraft model, etc.) and the desired frequency (annually, quarterly, monthly). Identical measures of activity that differed in desired detail or frequency were evaluated as separate Needs.

After the measures of activity were identified and detailed, the GADIT estimated the degree the Need was currently not met. This was termed the "Need Score". Each Need Score was then weighted according to how the data would be used, as determined in step 1. The result was termed the "Weighted Need Score".

Figure 1
General Aviation Data Improvement Team
GA Activity Data Task
Methodology



3. Identify Possible Solutions to Data Needs. The GADIT then identified all solutions that could help close the "gap" between a Need and the data currently available. No solutions were excluded during this analysis. The result was a list of all "Possible Solutions".

4. Determine the Effectiveness of Each Possible Solution. Next, the degree to which each Possible Solution could fulfill a Need was independently scored along two dimensions; how powerful the solution would be when fully implemented (how much it would "close the gap"), scored from 0 to 5, and how confident the Team was that the solution would have the desired affect, scored from 1 to 3. These two scores were then multiplied together to produce a rating of "Effectiveness" for each Possible Solution. At this stage in the GADIT analysis, no consideration was given to the feasibility of any of the Possible Solutions

5. Determine the Feasibility of Each Possible Solution. The feasibility of each Possible Solution was then scored (high=3, medium=2 and low=1) in four dimensions. The solution was assigned a high "financial" feasibility score if the total cost to implement was less than $280,000[3]. The Possible Solution was assigned a high "practical" feasibility score if it did not require extensive changes to an existing practice, procedure or method of collection. The Possible Solution was assigned a high "sociological" feasibility score if implementation would not be heavily opposed by any of the impacted parties. The Possible Solution was assigned a high "regulatory" feasibility score if it did not require a regulatory mandate. For each Possible Solution, these four measures of feasibility were added together to calculate its final "Feasibility" score.

6. Determine the Overall Effectiveness of Each Possible Solution. The Overall Effectiveness (OE) of each Possible Solution was calculated by multiplying its Effectiveness score (step 4) by its Feasibility Score (step 5).

7. Determine the Needs Met by Each Possible Solution. After the list of Potential Solutions was finalized, the GADIT created a list of all the Needs addressed by each Potential Solution. By totaling the Needs Score of all Needs addressed by a single Potential Solution, the GADIT measured the depth and breadth of multiple Needs addressed by a single solution. This was termed the "Scope Score".

8. Weight Each Possible Solution. The GADIT determined that a single Possible Solution could address many Needs, and each of these Needs had a different Need Score. It was therefore essential to weight each Possible Solution according to the degree and number of Needs it addressed. To accomplish this, the GADIT summed the Weighted Need Score (step 2c) for each Need addressed by the Possible Solution, and multiplied this sum by the OE (step 6) for each Possible Solution[4]. This was termed the "Weighted Overall Effectiveness", or WOE.

9. Establish the Criteria for Final Recommendations. After reviewing the WOE scores for all the Possible Solutions, the GADIT determined that it would consider recommending any Possible Solution with a WOE greater than 120 (Recommendation Threshold). Using this criterion, the GADIT compiled the initial list of Final Recommendations.

[3] This benchmark was chosen because it is the approximate cost for the FAA to perform the annual GAATA Survey.

[4] To simplify presentation, the result of this calculation was divided by 1,000 and rounded to 2 decimals.

10. Enhance the List of Final Recommendations. The GADIT noted that several Possible Solutions, while not judged to be particularly effective when implemented in isolation (WOE <120), were still highly feasible and if implemented, would enhance the WOE of another solution. (Many of these solutions involved simply developing or clarifying definitions.) The GADIT decided that if a Possible Solution did not meet the WOE threshold of 120, but had a higher than average Feasibility score (8.0) and would enhance a solution already included in the Recommendation list, it would also be included as a Recommendation.

11. Aggregate the Final Recommendations. Finally, the GADIT noted that for ease of understanding, the full list of Final Recommendations could be summarized into five general areas. (Details of individual Final Recommendations were not lost or combined in this aggregation.)

RESULTS AND CONCLUSIONS

Activity Data Needs Identified. The activity-data team identified 45 needs, presented in Table 1 below.

Table 1
GA Activity Data Needs

#	*Data Need – Detail – Frequency*	*Use*	*Weighted Need Score*
1	Hours Flown - All U.S. - Annual	Safety Analysis	8.58
2	Hours Flown - All U.S. - By Use - Annual	Safety Analysis	8.13
3	Number of Active Aircraft - All U.S. - Annual	Safety Analysis	7.50
4	Number of Active Aircraft - All U.S. - By Make/Model - Annual	Safety Analysis	7.50
5	Hours Flown - All U.S. - By Aircraft Type - Annual	Safety Analysis	7.50
6	Hours Flown - All U.S. - By Make/Model - Annual	Safety Analysis	6.87
7	Aircraft Lifetime Hours - All U.S. - By Make/Model - Annual	Safety Analysis	6.42
8	Hrs Flown Under Fractional Ownership - All U.S. - By Acft Type – Annual	Safety Analysis	6.39
9	Number of Landings - All U.S. - Annual	Safety Analysis	6.00
10	Hours Flown - All U.S. - By 135 Operator - Quarterly	Safety Analysis	5.79
11	EMS Hours - All U.S. - Helicopters - Annual	Safety Analysis	5.79
12	Aircraft Lifetime Hours - All U.S. - By Aircraft Type - Annual	Safety Analysis	5.58
13	Number of Landings - All U.S. - By Use - Annual	Safety Analysis	5.37
14	Hours Flown - All U.S. - By 135 Operator - By - Quarterly	Safety Analysis	5.37
15	Number of Active Aircraft - All U.S. - By Aircraft Type - Annual	Regulatory Analysis	2.57
16	Hunting/Fishing Tour Hours - All U.S. - Annual	Safety Analysis	5.13
17	Hours Flown - All U.S. - Monthly	Safety Analysis	5.13
18	Hours Flown - All U.S. - Part 135 Non-Schedule - Monthly	Safety Analysis	5.13
19	Hours Flown by Visibility - All U.S. - By Use - Annual	Safety Analysis	4.92
20	Total Engine Hours - All U.S. - By Engine Type - Annual	Safety Analysis	4.92
21	Hours Flown by Visibility - All U.S. - By General Acft. Type - Annual	Safety Analysis	4.92
22	Hrs Flown by Daylight Conditions - All U.S. - By General Acft Type – Ann.	Safety Analysis	4.92
23	Hours Flown - Based State - Annual	Safety Analysis	4.92
24	Number of Landings - All U.S. - Part 135 - Monthly	Safety Analysis	4.71
25	Hours Flown by Flight Plan - All U.S. - By General Acft. Type - Annual	Safety Analysis	4.71
26	Hours Flown - All U.S. - By General Acft Type - Monthly	Safety Analysis	4.71
27	Number of Landings - All U.S. - By Aircraft Type - Annual	Safety Analysis	4.62
28	Hours Flown - All U.S. - By Use By Month - Annual	Safety Analysis	4.59
29	Number of Landings - All U.S. - By Make/Model - Annual	Safety Analysis	4.50
30	Number of Landings - All U.S. - 135 Operations, By Op - Quarterly	Safety Analysis	4.50
31	Number of Cross Country Flights - All U.S - Annual	Safety Analysis	4.50
32	Hours Flown by Visibility - All U.S. - Annual	Safety Analysis	4.29
33	Hours Flown by Flight Plan - All U.S. - By Use - Annual	Safety Analysis	4.29
34	Hours Flown by Daylight Conditions - All U.S. - By Use - Annual	Safety Analysis	4.29
35	Number of Landings - All U.S. - Monthly	Safety Analysis	4.08
36	Number of "Cross-Country" Flioghts - All U.S. - By Aircraft Type - Annual	Safety Analysis	4.08
37	Hours Flown by Daylight Conditions - All U.S. - Annual	Safety Analysis	4.08
38	Hours Flown - Based State - By Use - Annual	Safety Analysis	4.08
39	Number of Active Aircraft - All U.S. - Avionics Equipment - Annual	Regulatory Analysis	2.00
40	Number of "Cross-Country" Flights- All U.S. - By Use - Annual	Safety Analysis	3.87
41	Number of "Cross Country" Flights - All U.S. - By Make Model - Annual	Safety Analysis	3.63
42	Hours Flown by Flight Plan - All U.S. - Annual	Safety Analysis	3.63
43	Hours Flown Below 3000 ft - All U.S. - By Aircraft Type - Annual	Regulatory Analysis	1.34
44	Number of Active Aircraft - Based State - Annual	Planning/Forecasting	1.79
45	Number of Instrument Approaches - All U.S. - Annual	Planning/Forecasting	1.43

Possible Solutions Identified. The activity-data team identified 71 possible solutions, presented in Table 2 below[5]. These same solutions are depicted graphically, ranked by their of Weighted Overall Effectiveness in Figure 2, and by their Feasibility Score in Figure 3.

#	Table 2 Possible Solutions	Weighted Overall Effectiveness (WOE)
13	Better collaboration between industry (civil aircraft specialists) and government in designing and implementing survey	174.28
11	Work with associations and other sources (NASA-NAOMS) to promote survey, identify operators, and benchmark data.	153.91
7	Increase sample size for current GA survey	150.67
1	Every three years ask each registered aircraft owner to respond to an address verification request, even if the address has not changed	140.97
4	Make aircraft registration mandatory every three years (1/3 of owners each year), and require completion of the GAATA survey when registration is filed	140.79
8	Survey should go to operators and not financial institutions (voluntary)	136.08
16	Better identify General Aviation universe for survey	122.57
*15	Improve non-response bias check by trying to determine why they did not respond	112.63
*12	Add option to respond to the survey via the internet	111.11
3	Make annual aircraft registration mandatory to include serial #, registration #, owner name and address, hours flown, operator name and address	107.94
6	Change legislation to allow Registry to incorporate address changes received from the Post Office	93.27
*5	Have Registry provide for voluntary revalidation of aircraft registration. 1/3 of population would be revalidated each year	89.97
*14	Increase infrastructure to handle more accurate survey	82.39
9	Develop and institute incentives to increase response rate (e.g. refund fuel taxes)	81.63
19	Create a separate logbook for each aircraft that is similar to a pilot logbook that logs activity, use, flight conditions, etc.. Information from this aircraft log book would provide more accurate data to an owners completing the general aviation survey	62.22
*23	Better define Use categories (consistent with NTSB) so that they do not overlap	53.99
27	Standardize aircraft make/model categories so that information collected over time will be consistent, and so that survey data can be cross-referenced against other aircraft census data	50.1
17	The current general aviation survey uses the FAA's registry database of aircraft owners to generate a list for distributing the survey. Surveying pilots instead of owners might provide more accurate use data.	45.71
*60	Define General Aircraft Type	38.32
*28	Periodically survey larger samples for certain aircraft make/models to improve the accuracy of small categories	35.65
2	Each aircraft with a current and valid Certificate of Airworthiness would be reported by the IA as active including manufacturer, model, serial #, registration, total hours flown when the IA signs off on the annual or equivalent for the aircraft	35.04
*24	Periodically survey 100% of operators within a use categories to determine special characteristics of those operators	32.97
20	Flight data recorders on general aviation aircraft could be used to automatically record flight hours and possibly track some additional operational measures (for example, landings). Handheld global positioning systems that maintain memory of flights conditions could be a source of data.	30.13
30	Define aircraft type categories in a consistent and meaningful way	28.43
*25	Provide guidance to fixed base operators to obtain better data concerning the operational use of their aircraft	24.89
*36	Define landings to exclude touch and go's	15.21
34	Improve capability of control towers to capture number of landings	14.37
*39	Have FAA inspectors collect data from 135 operators	13.65
*61	Define "Cross-Country"	11.54

[5] Solutions in Table 2 marked with an asterisk (*) indicate that the solution was included as a final recommendation based on a Feasibility score greater than 8.0, even though its WOE was less than 120. Notwithstanding the Feasibility score, however, the GADIT determined that solutions #29 and #44 should not be included as recommendations.

*62	Add question to survey to determine number of ""cross-country"" flights	10.79
38	Require DOT report from 135 operators	10.49
37	Require flight plans and collect data from 135 operators	7.75
50	Calculate monthly hours from total hours on aircraft inspection	7.65
40	Obtain 135 data from Aircraft Situational Displays	7.59
49	Sample flight plans to determine monthly hours	6.69
*33	Ask question concerning fractional ownership on current GA survey	6.57
35	Sample activity at non-towered airports	6.43
53	Telephone survey of randomly selected pilots to calculate monthly hours	5.98
18	Tracking aviation gas fuel sales would provide a benchmark to determine if total GA activity was accurately estimated.	5.69
63	Count flight plans that are ""cross-country""	5.61
54	Estimation monthly hours from tower counts / ATC center activity	4.83
*41	Create a separate question on survey that asks Helicopter EMS hours	4.49
58	Get data from state to determine hours flown by based state annually	4.13
56	Telephone callback to surveyed operators to determine hours flown by visibility	3.66
*48	Increase sample size in Alaska to get accurate data on Hunting/Fishing	3.41
55	Telephone survey for 135 operators to determine monthly hours	3.23
45	Define Hunting/Fishing Tours	3.18
*57	Define engine types	3.07
*42	Create a specific helicopter EMS operator survey	3.05
*46	Do a special regional survey or region-specific questions for Hunting/Fishing	3.03
*31	Define the different types of fractional ownership arrangements for aircraft	3.02
47	Have Alaska do a separate survey altogether	2.9
*64	Define avionics categories	2.69
32	Survey fractional operators to determine the variety of fractional ownership arrangements and to determine operator awareness of aircraft Use	2.49
44	Redesign survey question on landings to ask for landings by use	2.40
52	Estimate monthly hours from number of accidents	2.31
*65	Better categorize hand-held devices in the avionics categories	2.13
51	Obtain monthly hour data from Aircraft Situational Displays	1.94
59	Create a mandatory reporting (form 41) for 135 operators to determine number of landings monthly	1.60
66	Gather avionics data at point-of-sale (is equipment being replaced?)	1.28
*70	Define what constitutes an instrument approach	1.07
*67	Ask question on survey for number of hours flown under 3000' AGL	1.00
*71	Estimate the number of instrument approaches from tower activity	0.73
68	Analyze radar data to determine hours flown under 3000' AGL	0.58
*43	Define EMS	0.00
21	Since aircraft registration numbers (N #) for a particular aircraft can change, it would be advisable to survey by serial number instead of 'N' number	0.00
29	Average data over three years (by creating a moving average) to stabilize estimates and smooth out fluctuations by year	0.00

Figure 2
Possible Solutions
Sorted by Weighted Overall Effectiveness

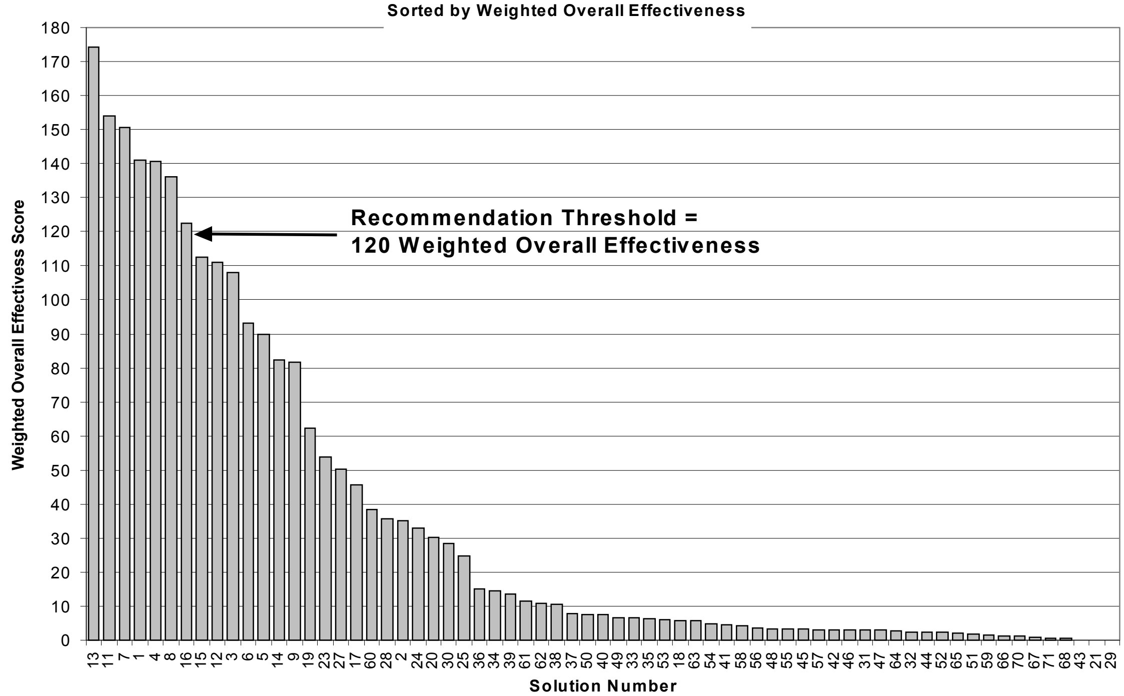
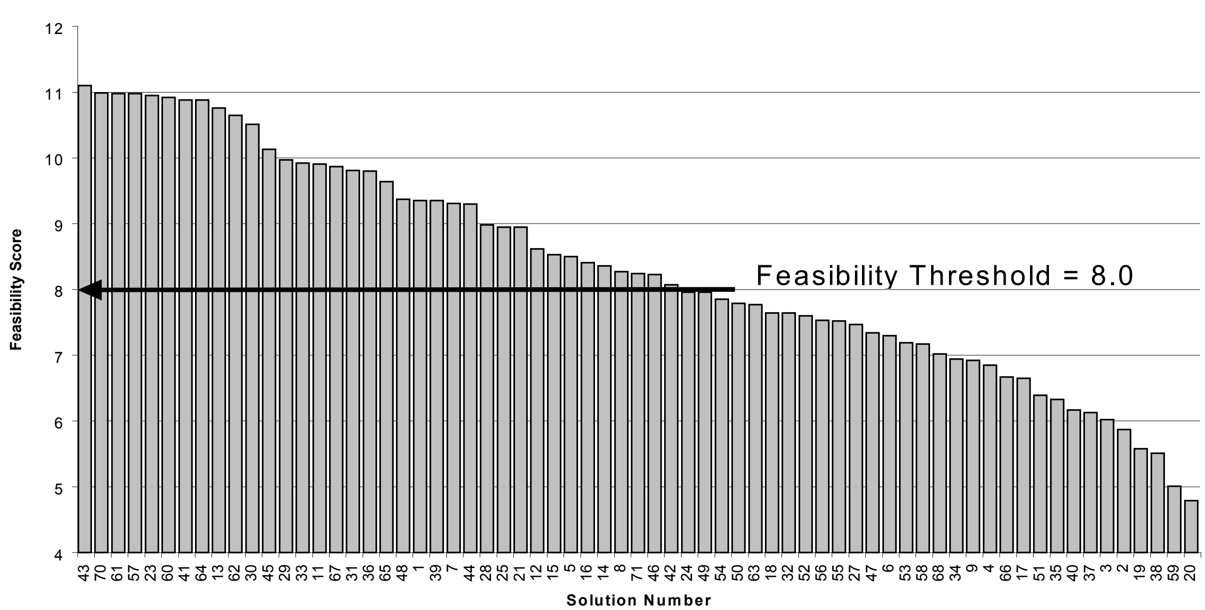


Figure 3
Feasibility of Solutions



GADIT RECOMMENDATIONS

The numerous GADIT solutions were logically grouped into the following categories: implement improvements to the current GA survey; enhance the FAA Aircraft Registry; improve industry collaboration in collecting activity data; perform additional general aviation surveys; better utilize existing sources of activity data; and areas for additional study. These categories represent areas for improving general aviation activity information. Each of these recommendations is discussed in the following sections.

As explained earlier, solutions were generated through brainstorming discussions; consequently, they may be stated at different levels of detail. For example, one solution asks that emergency medical service (EMS) be better defined and included as a separate question on the survey. In another, similar case (definition of fractional ownership and the addition of a question regarding fractional ownership) this was stated as two separate solutions. For the purpose of describing the recommendations, solutions have been combined. The numbers listed at the end of each recommendation identify the associated solutions. Table 3 below lists the final recommendations[6].

I. Implement improvements to the current GA survey (solution 7, 8, 12, 14, 15, 16, 23, 24, 25, 28, 30, 31, 33, 36, 41/43, 48, 57, 60, 61/62, 64, 65, 67, 70)

It is not surprising that a majority of the solutions considered by the GADIT were associated with improving the current method for estimating general aviation and air taxi activity. Central to the survey is the determination of what operational use, or purpose, is associated with aircraft flight hours. The committee discussed alternatives to the survey but concluded that the survey remained the most viable method to determine the distribution of flight hours for different categories of Use. But there were numerous suggestions for improving the survey.

The highest rated solution called for better definition of Use categories. Two important considerations were brought up in the discussion: first and foremost, the list of uses should be mutually exclusive, and second, the survey should be consistent with categories of aircraft use recognized by the NTSB. Use categories have changed some over the years, but in all cases, they combine flying tasks (i.e., instructional, aerial application, aerial observation, external load operations, passenger transport) with flight purposes (i.e., personal, business, corporate, regional/commuter, air tours, sight seeing, public use). When the survey asks for percentage of hours flown by Use, the operator who is paid for agricultural spraying must decide whether to mark "business" or "aerial application". If Use categories are not mutually exclusive, operators could report exposure numbers for activities in several different ways. It was also noted that in order to improve reporting accuracy, better definition of the category of Use was needed (for example, definition of emergency medical service or hunting/fishing tours).

About half of the GADIT solutions associated with improving the current survey called for better definitions. In addition to the clear need to better define Use categories, there was a stated need to better define things related to the aircraft (aircraft type categories, engine types, and avionics categories); methods for counting operations (qualification for counting instrument approaches, touch-and-go landings, or cross-country flights); and definition of fractional ownership.

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[6] When making recommendations, solutions only involving a definition were combined with the related solutions.

Many of the solutions called for additional questions on the survey. The following topics were candidates for additional questions: emergency medical service, number of instrument approaches, number of cross country flights, hours flown under 3000 ft AGL, and fractional ownership.

In the past, annual activity estimates have included large year-to-year fluctuations, there have been large estimated sampling errors for flight hours of particular aircraft types, and there have been concerns over the degree of error in aircraft flight time estimates by aircraft owners. FAA has acknowledged that prior survey methodology did not support the desired level of precision involving flight hours. Given budget constraints, they have attempted to address some of these shortcomings. However, several solutions directly addressed survey process improvements. These included suggestions to: increase the sample size to improve the precision of the estimates; provide better guidance to fixed base operators regarding operational use data; periodically survey all operators within a given Use category to determine special characteristics; periodically survey larger samples of certain aircraft make/models; improve the infrastructure to handle more accurate survey (possibly through incremental; automatic; or electronic reporting); and include an option for survey response via the Internet.

II. Enhance the FAA Aircraft Registry (solution 1, 4, 5)

There is a clear need to better identify general aviation aircraft owners. Inaccurate aircraft registry information degrades the ability of the FAA to survey aircraft owners. The FAA's census of general aviation aircraft is maintained at the Mike Monroney Aeronautical Center in Oklahoma City and this aircraft registry information is used to develop the GA survey mailing list. Depending on how the estimate is calculated, approximately twenty percent of the owner-contact information in the GA aircraft registry is incorrect. This percentage is based on postmaster returns of survey mailings, incomplete information on "aircraft sale reported" or "registration pending", and estimates of incorrect contact information for survey non-respondents. And as not all incorrectly addressed surveys are returned, the actual number of registry address errors is probably higher.

Aircraft owners are currently required to report a change of address to the FAA Registry (FAR Part 47, section 47.51), but there are no consequences to not doing so. Some aircraft owners may simply be unaware or forget that it is required. Consequently many aircraft owners relocate without notifying the FAA Registry. The FAA mails out a Triennial Aircraft Registration Report requesting updates to the owners registry information. Corrections returned to the FAA are then entered into the registry, but follow up action is not taken if forms are not returned by either the addressee or by the post office. (As the registry address is used to generate the triennial registration report, an incorrect address may not necessarily be discovered.)

In an effort to improve the quality of the registry information, the GADIT suggests that every 3 years, the FAA mail address verification requests asking each aircraft owners to respond; owners would be directed to respond with corrections or with confirmation that the information is correct. Or as an alternative, the Registry could provide for voluntary revalidation for one-third of the owners every year on an ongoing basis. Yet a third solution would be to make a triennial response mandatory[7].

[7] There is no apparent benefit to "de-registering" an aircraft simply because of a bad mailing address.

It was also noted that there are many financial institutions listed as aircraft owner and financial institutions are removed from the day-to-day operations of the aircraft. The registry could use the triennial report to determine who is the actual primary operator of the aircraft.

Currently, surveys are mailed to nearly one-tenth of the owners listed in the registry (approximately 30,000 of the 360,000). As one recommended improvement to the current survey is to increase sample size, the GADIT considered a solution that surveyed one-third of all aircraft owners in a given year. Additionally, as a mechanism for improving registry information, owner completion of the GAATA Survey would be required to maintain registration.

III. Improve Industry Collaboration in Collecting Activity Data (solution 11, 13)

The general aviation industry and special interest groups within general aviation can help improve the quality of survey information in two important ways. First, they can and should be consulted about the survey design on a regular basis. Industry groups also maintain a variety of information useful to the survey (address verification, membership activity survey information, equipment purchases, etc.). Industry and membership associations should be involved with actively promoting the survey, they should help identify operators, and their information should be used to benchmark data elements within the survey.

The FAA has, in the past, solicited industry involvement in the survey. For example, they are asked to review proposed questionnaire changes and they announce the survey each year with a written endorsement. However, this collaboration is not formally structured and the team considered that the survey might benefit from a more formal arrangement. Organizing a standing guidance committee with rotating membership composed of industry and interest groups was discussed, though only a more general recommendation for industry collaboration was formulated as a solution.

IV. Perform Additional General Aviation Surveys (solution 42/43, 46/48)

The GADIT suggested two additional surveys that could provide much needed information. These would be supplements, and not replacements of the current national survey. Hunting and fishing tours represent a special case of on-demand air taxi (FAR Part 135) or Part 91 operations. The committee noted that there is a need to clearly define what constitutes hunting/fishing tour operations. Once this has been accomplished, special regional surveys, for example in Alaska, should be conducted. If this is not accomplished as a separate survey, region-specific questions for hunting/fishing could be added to the existing activity survey (as such, this solution would become a specific improvement implemented within recommendation #1).

A second survey specific to helicopter emergency medical operations was also considered as a solution.

As flight operations and aircraft characteristics in the general aviation fleet change, the committee recognized that supplemental surveys addressing specific topics may be required.

V. Better Utilize Existing Sources of Activity Data (solution 39, 71)

The committee recommended two solutions for acquiring activity data that were not survey-based. For the fleet of on-demand, air taxi operators, the FAA inspectors could record and report flight hours that are already tracked by these operators[8]. The feasibility of this arrangement has been recently tested in the Alaska Region with good results.

General aviation activity estimates could also be derived from sampling air traffic control tower activity. The group particularly noted the feasibility of estimating the number of instrument approaches based on FAA reports of tower activity.

V. Additional Study

Conduct a thorough assessment of the feasibility, costs and benefits of a system that would periodically record and report the name of the primary aircraft operator and total airframe hours. Two specific options that should be evaluated are a system that requires repair stations or maintenance technicians with Inspection Authorization to record and report this data when major repairs or inspections are completed on an aircraft, or a system of collecting this data on aircraft registration forms. The evaluation should compare the strengths and weaknesses of any proposed system. If warranted by cost/benefit analysis and resources can be secured, implement such a system.

[8] It should be noted that Part 135 scheduled operators currently have a regular reporting requirement using DOT Form 41.

TABLE 3
FINAL RECOMMENDATIONS
(Ordered by Solution Number)

I. Implement Improvements to the Current GA Survey

7. Increase sample size for current GA survey.
8. Survey should go to operators and not financial institutions (voluntary).
12. Add option to respond to the survey via the internet.
14. Increase infrastructure to handle more accurate survey.
15. Improve non-response bias check by trying to determine why they did not respond.
16. Better identify General Aviation universe for the current GA survey.
23. Better define Use categories (consistent with NTSB) so that they do not overlap.
24. Periodicly survey 100% of operators within a Use categories to determine special characteristics of those operators.
25. Provide guidance to fixed base operators to obtain better data concerning the operational use of their aircraft.
28. Periodically survey larger samples for certain aircraft make/models to improve the accuracy of small categories.
30. Define aircraft type categories in a consistent and meaningful way.
31. Define the different types of fractional ownership arrangements for aircraft.
33. Ask question concerning fractional ownership on current GA survey.
36. Define landings to exclude touch and go's.

41/43. Define EMS, and create a separate question on survey that asks Helicopter EMS hours.

48. Increase sample size in Alaska to get accurate data on hunting/fishing tours.
57. Define engine types.
60. Define General Aircraft Type.

62/61. Define "Cross-Country", and add a question to survey to determine number of "cross-country" flights.

64. Define avionics categories.
65. Better categorize hand-held devices in the avionics categories.
67. Ask question on survey for number of hours flown under 3000' AGL.
70. Define what constitutes an instrument approach and ask a question on the annual activity survey.

II. Enhance the FAA Aircraft Registry

1. Every three years ask each registered aircraft owner to respond to an address verification request, even if the address has not changed.
4. Make aircraft registration mandatory every three years (1/3 of owners each year), and require completion of the GAATA survey when registration is filed
5. Have Registry provide for voluntary revalidation of aircraft registration. 1/3 of population would be revalidated each year.

III. Improve Industry Collaboration

11. Work with associations and other sources (NASA-NAOMS) to promote survey, identify operators, and benchmark data.
13. Better colaboration between industry (civil aircraft specialists) and government in designing and implementing surveys of any type.

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IV. Perform Additional General Aviation Surveys

42/43. Define EMS, and create a specific helicopter EMS survey

46/48. Define Hunting/Fishing tours, and do a special regional survey or region-specific questions for Hunting/Fishing

V. Better Utilize Existing Sources of Activity Data

39. Have FAA inspectors collect and report activity data already tracked by FAR Part 135 operators.
71. Estimate the number of instrument approaches from existing tower activity reports

VI. Additional Study

Further evaluate other systems of gathering the name and addresss of the primary aircraft operator, and the total number of airframe hours.

LIST OF APPENDICES

Appendix A

GLOSSARY OF ACRONYMS

AFS - FAA Flight Standards Service
AGL - Above Ground Level
AOPA - Aircraft Owners and Pilots Association
APO - FAA Office of Aviation Policy and Plans
ASF - Air Safety Foundation
ATC - Air Traffic Control
CFIT - Controlled Flight into Terrain
DOT - U.S. Department of Transportation
EMS - Emergency Medical Services
FAA - U.S. Federal Aviation Administration
FAR - Federal Aviation Regulations
GAA - General Aviation Activity Surevy
GAATA - General Aviation and Air Taxi Activity Survey
GAC - General Aviation Coalition
GADIT - General Aviation Data Improvement Team
GAMA - General Aviation Manufacturers Association
HAI - Helicopter Association International
IA - Inspector Authorization
JSC - (General Aviation Safer Skies) Joint Steering Committee
JSAT - (Safer Skies) Joint Safety Analysis Team
JSIT - (Safer Skies) Joint Safety Implementation Team
NAAA - National Agricultural Aviation Association
NAOMS - National Aviation Operations Monitoring System
NAS - National Airspace System
NASA - National Aeronautics and Space Administration
NATA - National Air Transportation Association
NBAA - National Business Aviation Association
NTSB - National Transportation Safety Board
OE - Overall Effectiveness
WOE - Weighted Overall Effectiveness

Appendix B

DEFINITION OF TERMS

GENERAL AIRCRAFT TYPE – The six major aircraft types used in the current GAATA survey. The categories are:

Fixed Wing – Piston
Fixed Wing – Turboprop
Fixed Wing – Turbojet
Rotorcraft
Other Aircraft
Experimental

AIRCRAFT TYPE – The nineteen categories used in the current GAATA Survey. The categories are:

Fixed Wing – Piston
- 1 Engine: 1-3 Seats
- 1 Engine: 4+ Seats
- 2 Engine: 1-6 Seats
- 2 Engine: 7+ Seats
- Piston: Other

Fixed Wing – Turboprop
- 1 Engine: Total
- 2 Engine: 1-12 Seats
- 2 Engine: 13+ Seats
- Turboprop: Other

Fixed Wing – Turbojet
- 2 Engine
- Turbojet: Other

Rotorcraft
- Piston
- 1 Engine: Turbine
- Multi-Engine: Turbine

Other Aircraft
- Gliders
- Lighter-than-Air

Experimental
- Amateur
- Exhibition
- Other

GAATA "USE" CATEGORIES – There are twelve Use categories specified in the current GAATA survey. (See Survey Form in Appendix E) They are:

Personal/Recreation
Instructional
Business
Corporate/Executive
Air Taxi
Air Tours
Sight-seeing
Public Use
Aerial Observation
Aerial Application
External Load
Other Work Use

NTSB GA ACCIDENT "USE" CATEGORIES – There are eleven "Use" categories specified by the NTSB. They are:

Personal
Business
Instructional
Executive/Corporate
Aerial Application
Aerial Observation
Other Work Use
Ferry
Positioning
Public Use
Specify

PUBLIC USE AIRCRAFT – An aircraft:

A. used only for the United States Government, and operated under the conditions specified by section 40125(b) if owned by the Government

B. owned by the United States Government, operated by any person for reasons related to crew training, equipment development or demonstration, and operated under the conditions specified by section 40125(b)

C. owned and operated by the government of a State, the District of Columbia, a territory or possession of the United States, or a political subdivision of one of these governments, under the conditions specified by section 40125 (c)

D. exclusively leased for at least ninety consecutive days by the government of a State the District of Columbia, a territory or possession of the United States, or a political subdivision of one of these governments, under the conditions specified by section 40125(c)

Appendix C

GADIT CHARTER

"Safer Skies"
GA Joint Steering Committee
Terms of Reference
General Aviation Data Improvement Team (GADIT)

April 20, 2000

Problems:

1. Studies completed by the CFIT and Weather JSATs and JSITs identified insufficient quantity and quality of data about the "root cause" of GA accidents, and an almost total lack of detail about GA incidents, as a hindrance to improving GA safety.

2. The JSC determined that a lack of adequate general aviation exposure data (hours flown) prevents measuring the success of the JSC's "Safer Skies" initiatives by comparing the annual GA accident rate over time. Instead, the JSC was forced to use an annual reduction in the number of accidents as the metric for success. This metric could be distorted if GA activity increases significantly.

The GADIT will:

1. Develop implementation strategies to:
    a. Increase detail about factors that have contributed to or caused general aviation accidents and incidents.
        i. The primary focus should be on accidents or incidents related to weather, CFIT, runway incursions and pilot decision-making.
        ii. Implementation strategies should not recommend modifications to the NTSB's statutory or regulatory responsibilities to investigate accidents and determine probable cause. NTSB's findings must remain the sole determination of probable cause.
    b. Improve the quality and timeliness of estimates of general aviation activity.
        i. Strategies should primarily focus on ways to improve the timeliness and accuracy of the annual FAA survey of GA activity.
        ii. Additionally, strategies should focus on ways to gather activity data through supplemental means and at other intervals.
    c. Suggest alternate and innovative ways to measure the effectiveness of *Safer Skies* interventions for general aviation.

2. Be co-chaired by:
   a. Ron Swanda (GAMA)
   b. (FAA-AFS)
   c. (NTSB)
3. Be composed of:
   a. (AOPA-ASF)
   b. (HAI)
   c. (NBAA)
   d. (FAA-AVI)
   e. (FAA-APO)
   f. (NASA)
   g. (NTSB)
   h. Others

Appendix D

GADIT ACTIVITY TASK GROUP PARTICIPANTS

Ron Swanda	– GAMA	Co-Chair
Brian Poole	– FAA AAI-220	Co-Chair
Deborah Bruce	– NTSB RE-10	Co-Chair
Roger Baker	– FAA AFS-800	
Ben Beets	– FAA ASW-110	
Bob Blouin	– NBAA	
Andrew Broom	- GAMA	
John Carson	- AOPA Air Safety Foundation	
Tom Fulcher	– FAA AIO-300	
Steve Hines	– Cessna Aircraft Co.	
Sarah Hodges-Austin	– FAA AFS-40	
Theresa Payne	– FAA ATX-400	
Dan Perry	– FAA AAL-217	
Dennis Roberts	– AOPA	
Art Salomon	– FAA APO-110	
Doug Smith	– NAAA	
Stan Smith	– NTSB RE-10	
Vivek Sood	– FAA ASY-100	
Bill Timberlake	– FAA ACE-100	
Ray Winton	– NATA	
Richard Wright	- HAI	
John Zimmerman	– AvData Inc.	

Appendix E

THE 1999 GENERAL AVIATION AND AIR TAXI ACTIVITY SURVEY FORM

Federal Aviation Administration
C/O Hagler Bailly Survey Research Center
455 Science Drive
Madison, WI 53711

1999 General Aviation and Air Taxi Activity and Avionics Survey

(As of December 31, 1999)

Instructions:

Aircraft Characteristics:

- Please answer questions for the aircraft shown to the right. If this is not your aircraft, please check this box ☐ and return the survey in the enclosed postage-paid envelope.
- Mark all answers in the spaces provided. Do not write outside the answer spaces or make stray marks on the survey.
- Please fill out the survey as legibly as possible. When entering numbers, use numbers that look like this:

	2	3	4	5	6	7	8	9	0

Submission of this form is voluntary. The information provided will be used only for statistical purposes and will not be published or released in any form that would reveal specific information reported by an individually identifiable respondent.

When reporting aircraft activity, please report for *all* operators of this aircraft. If you do not know the exact information for a particular question, please provide your best estimate.

Q1 In 1999, was this aircraft leased to an air carrier or operated primarily as an air carrier (FAR Part 121 or 129)? *(Check one)*

☐ Yes ⟶ Do not complete the rest of this survey. Please return the form in the enclosed postage-paid envelope.

☐ No ⟶ Please complete the rest of this survey.

Q2 In 1999, was this aircraft leased to a commuter or operated primarily as a commuter (FAR Part 135 operator performing scheduled passenger service)? *(Check one)*

☐ Yes

☐ No

Q3 In what U.S. state or territory was this aircraft based as of December 31, 1999?

☐☐ (Please use 2-character state/territory abbreviation)

Q4 Did you purchase this aircraft on or after January 1, 1999? *(Check one)*

☐ Yes ⟶ Date of purchase: ☐☐ (month) ☐☐ (year)

☐ No

Q5 What were the total lifetime airframe hours as of December 31, 1999?

☐☐☐☐☐☐ (lifetime airframe hours)

Q6 Was this aircraft flown in 1999? *(Check one)*

☐ Yes ⟶ Continue to Q7

☐ No ⟶ **Why was this aircraft inactive? *(Check one)***

☐ Under restoration ☐ Destroyed

☐ Sold ☐ Other

Q7 How many total hours did this aircraft fly in calendar year 1999? *(Include estimated rental and leased hours; if you purchased this aircraft in 1999, only include hours flown since the date of purchase; NOTE: there are 8,760 hours in 1999)*

				Hours

Q8 For what percent of the total hours flown in 1999 was the aircraft rented or leased to others? *(Enter 0 if the aircraft was not rented or leased to others)*

			%

Q9 What percent of the total hours flown by this aircraft in 1999 were flown in each of the following categories? *(Estimate the percentage of total hours flown in 1999 in each of the following categories so that the total equals 100%. Enter 0 if there were no aircraft hours in a category – do not leave any category blank)*

Category	% of Hours Flown			
Personal/Recreation – Flying for personal reasons (excludes business transportation)				%
Instructional – Flying under the supervision of a flight instructor (includes student pilot solo; excludes proficiency flight)				%
Business Transportation – Individual use for business transportation *without* a paid, professional crew				%
Corporate/Executive Transportation – Business transportation *with* a paid, professional crew				%
Regional/Commuter – FAR Part 135 *scheduled* passenger service only				%
Air Taxi – FAR Part 135 *on-demand* passenger and all cargo operations (not scheduled passenger service or air tours)				%
Air Tours – Commercial sight-seeing conducted under FAR Part 135				%
Sight-seeing – Commercial sight-seeing conducted under FAR Part 91				%
Public Use – Federal, state, or local government owner or leased aircraft used for the purpose of fulfilling a governmental function				%
Aerial Observation – Aerial mapping/photography, patrol, search and rescue, hunting, traffic advisory, ranching, surveillance, oil and mineral exploration, etc.				%
Aerial Application in Agriculture and Forestry – Crop and timber production and protection				%
Other Aerial Application – Public health sprayings, cloud seeding, fire fighting including forest fires, etc.				%
External Load – Operation under FAR Part 133, rotorcraft external load operations, examples include: helicopter hoist, hauling logs, etc.				%
Air Medical Services – Air ambulance services, rescue, human organ transportation				%
Other Work Use – Construction work (not FAR Part 135 operation), parachuting, aerial advertising, towing gliders, etc.				%
TOTAL	**1**	**0**	**0**	**%**

Q10 What percent of the total hours flown by this aircraft in 1999 were flown under…

IFR Flight Plans				%
VFR Flight Plans				%
No Flight Plans				%
TOTAL	**1**	**0**	**0**	**%**

Q11 *[If the aircraft was flown under IFR flight plans in 1999]* What percent of IFR flight hours were flown under…

Day Instrument Meteorological Conditions (IMC)				%
Day Visual Meteorological Conditions (VMC)				%
Night Instrument Meteorological Conditions (IMC)				%
Night Visual Meteorological Conditions (VMC)				%
TOTAL	**1**	**0**	**0**	**%**

Q12 *[If the aircraft was flown under VFR flight plans or no flight plans in 1999]* What percent of VFR flight hours were flown under…

Day Visual Meteorological Conditions (VMC)				%
Night Visual Meteorological Conditions (VMC)				%
TOTAL	**1**	**0**	**0**	**%**

Q13 How many landings did this aircraft perform in 1999? *(Include water and touch-and-go landings)*

☐☐☐☐☐ (Number of 1999 landings)

Q14 What type of landing gear system does this aircraft have? *(Check one)*

☐ Fixed
☐ Retractable

Q15 What kind/grade of fuel was primarily used in this aircraft in 1999? *(Check one)*

☐ Jet Fuel
☐ Automotive Gasoline
☐ Propane
☐ Aviation Fuel: 80 Octane
☐ Aviation Fuel: 100 Octane
☐ Aviation Fuel: 100-Low Lead
☐ 82 UL
☐ Other
☐ None

Q16 Has this aircraft been approved for flight into known icing conditions? *(Check one)*

☐ Yes
☐ No

Q17 Does this aircraft have an experimental airworthiness certificate? *(Check one)*

☐ Yes → **As of December 31, 1999, the aircraft was…? *(Check one)***
☐ In the test period ☐ Out of the test period
☐ No

Q18 Is this aircraft certified to operate under instrument flight rules (IFR)? *(Check one)*

☐ Yes
☐ No

Q19 Avionics Equipment: Check *all* boxes below that reflect this aircraft's avionics equipment capabilities as of December 31, 1999: *(Check the first box if the aircraft has only one of any item; check the second box if the aircraft is equipped with more than one of an item)*

General Equipment:	One	More than One
Electrical System	☐	☐
Radar Altimeter	☐	☐
Ground Proximity Warning System	☐	☐
Terrain Awareness Warning System (TAWS)	☐	☐
Flight Data Recorder	☐	☐
Cockpit Voice Recorder	☐	☐
MFD Multi-functional Displays	☐	☐
Ice Protection System	☐	☐
Laptop computer (not in panel)	☐	☐
Navigation Equipment:		
Global Positioning System (GPS):		
Hand-held, not IFR approved	☐	☐
Panel-mounted, not IFR approved	☐	☐
Panel-mounted, IFR-approved for en route operation only	☐	☐
Panel-mounted, IFR-approved for non-precision approach operation	☐	☐
Moving map capability	☐	☐
LORAN C: VFR only	☐	☐
LORAN C: IFR en route-approved	☐	☐
Other Area Navigation equipment (VOR, DME)	☐	☐
100 channel VOR Receiver:		
Hand-held	☐	☐
Panel-mounted	☐	☐
200 channel VOR Receiver:		
Hand-held	☐	☐
Panel-mounted	☐	☐
Automatic Direction Finder	☐	☐
Other navigation equipment (Doppler, INS)	☐	☐
Approach Equipment:		
Localizer	☐	☐
Marker Beacon	☐	☐
Glide Slope	☐	☐

Guidance and Control Equipment:	One	More than One
Flight Management System	☐	☐
Flight Director	☐	☐
Electronic Flight Instrument System (EFIS)	☐	☐
Autopilot-Axis Controls:		
Wing Leveler	☐	☐
Altitude Hold	☐	☐
Lateral Guidance	☐	☐
Approach Mode (vertical guidance)	☐	☐
Autoland	☐	☐
Transponder Equipment:		
Mode A Transponder (TSO-c75-b/c)	☐	☐
Mode C (Altitude Encoding)	☐	☐
Mode S Transponder (TSO-c112)	☐	☐
Collision Avoidance (TCAS or TCAD)	☐	☐
Communications Equipment:		
360 channel (50kHz channel spacing):		
Hand-held	☐	☐
Panel-mounted	☐	☐
720 channel (25kHz channel spacing):		
Hand-held	☐	☐
Panel-mounted	☐	☐
760 channel (25kHz channel spacing):		
Hand-held	☐	☐
Panel-mounted	☐	☐
2280 channel (8.33kHz channel spacing):		
Hand-held	☐	☐
Panel-mounted	☐	☐
HF Radio	☐	☐
Datalink (SATCOM, ACARS)	☐	☐
Weather Equipment:		
Weather Radio	☐	☐
Thunderstorm Detection Equipment	☐	☐

Appendix F

Minority Comments / Response

The FAA's Alaska Region submitted the following comments about the GA Survey methodology and associated problems with the Aircraft Registry. They do not necessarily reflect the views of the GADIT. To balance this minority opinion, FAA's Office of Policy and Plans' response to these comments are also included.

Opinions of Dan Perry of FAA Alaska Region
In consultation with Dr. Matt Berman, University of Alaska

The annual GAATA Survey is currently the only systematic source of information on general aviation activity. A number of issues affect the perceived validity of any survey. By its nature, a survey collects data from only a portion of the population, so there will always be some uncertainty about how well the responses represent the population as a whole. From a technical standpoint, however, the answers to the following two questions largely determine the survey's usefulness for policy, planning, and research:

1. How well do the respondents represent the population?
2. What is the margin of error?

The first question refers to potential bias in the results because the people responding to the survey differ in important respects from the target population. One can evaluate the potential for bias according to the following three criteria:

a. Is the survey method scientific?

The GAATA Survey is a mail-based survey based on a random sample of registered aircraft, stratified by aircraft type. This is a valid survey method that can produce valid results if the response rate is high enough.

b. Is the response rate high enough?

When a survey population is a fixed set of individuals with dated address/contact information, such as the GAATA Survey, it is always more difficult to locate individuals who frequently change addresses than individuals -- or corporations -- that stay in one place. And more mobile individuals could are likely to differ significantly in many ways from less mobile individuals. Clearly, the higher the response rate to such a survey, the less bias is likely in the results. One way to overcome this bias is to increase the sample size and/or the response rate. While there is no fixed rule to determine the minimum acceptable response rate, a basic guideline is that a survey like the GA/AT survey should achieve at least a 60 percent response rate. This goal has not been achieved in any recent GAATA Survey. The response rate in 1999 was 42 percent (see figure below).

c. Is there an alternate survey method available to check for response bias?

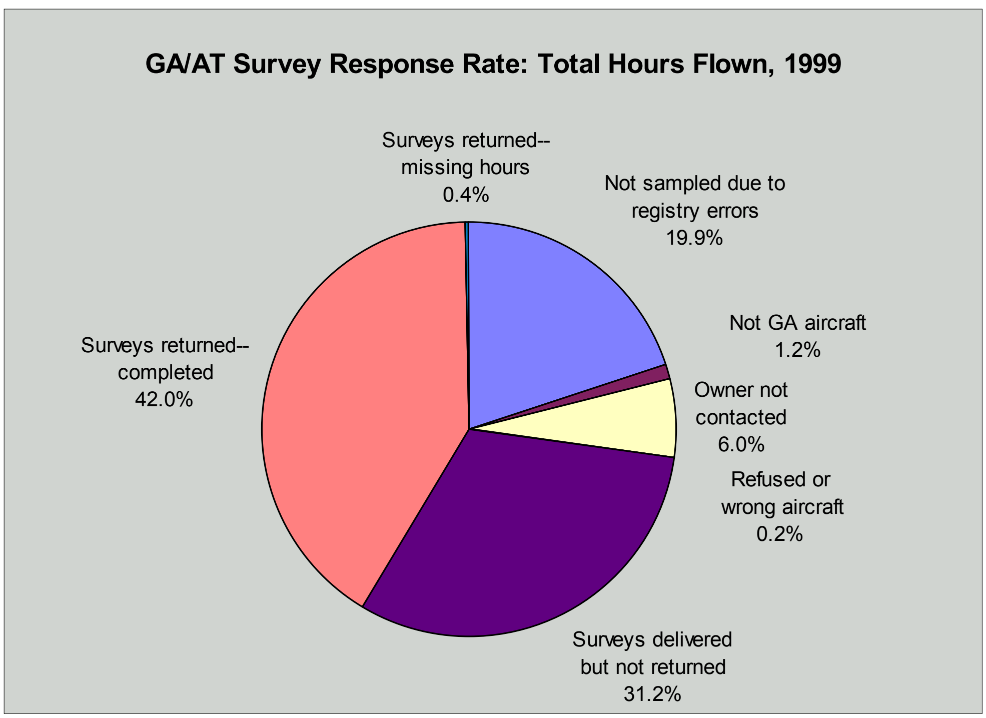
In recent years, the FAA has used a telephone survey of non-respondents to the mail survey to check for response bias. The biggest source of non-response is inadequate contact information; so most mail non-respondents cannot be contacted by telephone, either. Therefore, these surveys are unsuccessful in resolving the concerns about whether the sample truly represents the population. The response rate to the mail survey is therefore critical for obtaining a representative survey.

The second question refers to the precision of the results, generally measured as a percentage margin of error or a percentage confidence interval. The precision depends on two factors: the size of the sample and the percentage of invalid or missing responses to individual survey questions. The 1999 and 2000 surveys have achieved an acceptable and well-documented level of precision. The reduction in the rate of missing data on completed surveys is particularly noteworthy. However, this level of precision is not automatic, and requires continued diligence on the part of the contractor as well as adequate financial support from the FAA

Response rate

The figure below depicts the response rate for the 1999 GAATA Survey, along with the various categories of non-response. The sample involved 30,064 aircraft, which is 11.7 percent of that portion of the GA fleet available for sampling. However, due to erroneous or incomplete information in the registry, an additional 63,812 aircraft -- 19.9 percent of all registered aircraft -- were considered potentially part of the GA fleet but not available for the survey. These included 4,412 with missing name, number, or aircraft type, 28,267 with a sale reported or registration pending, and 31,133 where a previous mail contact attempt was returned by the postmaster. As they are part of the target population but cannot be contacted, these 19.9 percent of GA aircraft should be considered non-respondents to the survey. The pie chart shows what the response rate would be if all eligible aircraft had been sampled. Applying the 11.7 percent sampling fraction to all eligible aircraft would increase the 1999 sample size from 30,064 to 37,539.

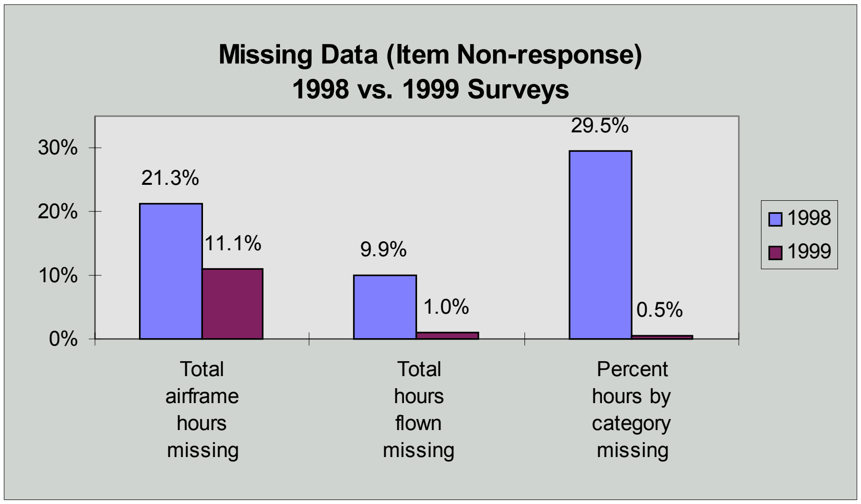
Respondents to the mail survey totaled 15,533, or 42.4 percent of 37,539. (As the 42.4 percent applies to all eligible aircraft, not just those without known registry errors, it is lower than the reported 52.5 percent return rate.) One percent of those responding did not provide total hours, so most of their activity information was unusable. This leaves the 42.0 percent with valid hours data -- the most appropriate overall response rate for the survey.



While the 2000 survey response rate is not available, indications are that problems with erroneous and incomplete information in the registry continue. A valid GAATA Survey requires a substantially higher response rate than can be achieved with the address information contained in the current registry. Because of the high number of bad addresses in the registry, many of the surveys delivered by the postmaster (but not returned) probably never reached the intended respondent (owner of the sampled aircraft) and were simply discarded

FAA's contractor has estimated that 40 percent of the registry names or addresses are incorrect, and some believe this may be conservative).Any attempt to improve the survey that does not start with an improved registry will achieve little improvement in the survey's ability to represent the GA fleet.

Precision



The precision of the 1999 GAATA Survey is well documented. The completed sample size, given the survey design and response rate, is largely a matter of financial resources committed to the survey. Stratification allows optimal use of those resources to achieve a higher precision for certain sub populations of interest, such as Alaska-based aircraft. (A review by statisticians in Alaska concluded that the precision of the 2000 GAATA survey is adequate for Alaska research needs.)

The completed sample size alone, however, is not the only component of precision. Missing or invalid data for individual questions further increase the margin of error for specific questions. The chart below compares the rates of missing data (item non-response) for selected questions in the 1998 and 1999 surveys. For most items, the rate of missing data in returned questionnaires is less than two percent in the 1999 survey. The exception is total airframe hours, which remains at 11 percent in 1999. However, the contrast from 1998 is striking. In that year, few questions had less than 9 percent rate of missing data; for some questions, item non-response exceeded 40 percent.

The implication of the high rate of missing data in the 1998 (and presumably earlier) surveys is that the precision reported in the published reports for these surveys is substantially overstated when applied to specific survey questions. The correct adjustment factor for the margin of error is to divide it by the square root of one minus the percentage missing for that question. For example, a reported survey margin or error of 5.0 percent, with 36 percent missing for a specific question has an actual margin or error of .05/.8 = 6.25 percent. It is commendable that the item non-response rate has been reduced to modest levels through redesign of the survey instrument.

Summary of Problem Areas of the GAATA Survey

The GAATA Survey remains the only systematic source of information on the activity of the general aviation sector. In order to be considered valid, the response rate for the GAATA Survey must increase substantially. However, the quality of addresses in the aircraft registry presents a barrier to any significant improvement in the response rate. Other major issues with reliability have been resolved by the FAA. However, the fact that 40 percent of the registry names or addresses are incorrect remains a major challenge. Attempts to further improve the GAATA Survey that do not start with an improved registry will achieve little. The wisdom of the fourth highest ranked Overall Effectiveness solution -- to use an address verification request to improve the registry-- should be reconsidered.

FAA Office of Aviation Policy and Plans (APO)
Response to Opinions of Dan Perry, FAA Alaska Region

We agree with the memo's assertion that the GA survey could greatly benefit from better address information on the Civil Aviation Registry and endorse all efforts in this regard. At the same time we would like to highlight the progress that the FAA Office of Aviation Policy and Plans (APO) and the PA Consulting Group (PA) have made in improving the reliability and scope of the GA survey. Furthermore, continued progress is expected as a result of advances that have been planned.

The survey redesign effort completed for the calendar year 1999 GA survey greatly reduced item non-response. For example, the item non-response for the "key" design variable – reported hours flown – decreased from approximately 10% in the 1998 GA survey to approximately 1% in the 1999 GA survey. The improvement for several other questions was even more dramatic. The question concerning categories of aircraft use saw its item non-response decrease from approximately 30% for the calendar year 1998 survey to less than 1% for the calendar year 1999 survey. This improvement has resulted in greater precision of survey estimates.

Starting with the calendar year 1999 survey the precision of the estimates has also been improved by using optimization techniques to more efficiently allocate the sample given the constraint on the sample size to approximately 30,000 GA aircraft. The sample frame was stratified by FAA region and aircraft type – as opposed to state and aircraft type or state by manufacturer (make/model/series) as had been done in previous survey years. This had the effect of reducing the number of empty cells in the sampling frame and allowing for larger samples to be selected from each cell. In addition, estimates of hours flown from the previous survey year are used to increase the efficiency of the sample allocation and to improve the precision of the hours flown estimates.

An Internet option was added for the calendar year 2000 GA survey. While preliminary results do not show that the addition of the Internet option has resulted in an increased response rate, there is reason to believe that the Internet option may improve the response rate in future years as more people gain easy Internet access. In the future it expected that modules will be added to the Internet survey design to allow for more effective tailoring of survey questions based on aircraft type, aircraft utilization, or category(ies) of aircraft use – i.e., in addition to answering the questions in the current mail survey, the respondent would be directed to a specific module or set of modules based on aircraft type.

The FAA Office of Aviation Policy and Plans has supported the PA Consulting Group's efforts to improve address information despite this activity being outside the original approach to the study. For the calendar year 2000 GA survey these address improvement activities we specifically added to the statement of work for the study. The PA Consulting Group - with the support of APO - is working with GA associations to improve address information of aircraft owners and operators.

Although this activity is currently underway and statistics are not yet available concerning the resulting improvement(s) this effort will achieve, there is every reason to believe it will have significant impact – especially in the case(s) of aircraft which are owned by financial or aircraft leasing companies, but operated by individuals or corporations. (It is the operators of the aircraft or anyone who has knowledge of the aircraft usage who should be completing the survey because the questions on the survey relate to aircraft usage and equipage. The FAA Office of Policy and Plans is committed to supporting the PA's continuing efforts to improve address information in future survey years.

The GA survey response rate of over 50% is a very strong response rate for a mail survey, especially in light of the continuing deterioration of the address information on the Civil Aviation Aircraft Registry. If there were better address information for all general aviation aircraft – including address information for operators of leased aircraft or aircraft owned by financial institutions – the response would likely be considerably higher because the survey questionnaires would be going directly to the individuals who either operate the aircraft themselves or have knowledge of the aircraft's activity and use. The criticism of the General Aviation and Air Taxi Activity Survey is unwarranted and largely misplaced and needs to be redirected at the underlying problems and their causes.

The memorandum "Validity of the General Aviation/Air Taxi Survey" (sic) suggests that the actual response rate for the GA survey is 42.4% because 11.7% of Civil Aircraft Registry records were excluded from the sampling frame due to the fact that they were denoted "Postmaster Returns" (PMR) on the Registry. One problem with this approach is that it assumes that all records designated PMR on the Registry are still part of the GA fleet. Another problem with this approach is that it misses the reasons for computing response rate – which are to measure the effectiveness of the survey process and to use the response rate to help determine how much to "oversample" in a cell so as to assure that there an adequate number of responses to achieve the desired levels of precision. The actual response rate for the calendar year 1999 GA survey is 52.5% as calculated to standards and guidelines of the American Association of Public Opinion Research (AAPOR).

It is also important to clarify the relation between response rate and bias. The memo states that the survey is biased because those aircraft operators classified as PMR that do not respond to the survey or that are not included in the sampling frame are more mobile than other aircraft operators. The memo asserts that these non-respondents or those excluded from the sampling frame are inherently different from those who respond. There is no evidence of this difference or that those aircraft owners use their aircraft differently from those who respond. It is the aircraft activity and use which are of concern, not the characteristics of the aircraft owners. Bias is introduced only if this perceived mobility affects the activity and use of the aircraft. This issue – how an owner/operator's "mobility" affects his or her use of the aircraft – has not been adequately researched. The conclusion or assumption of bias is not supported by evidence. While it is true that higher response rates would be better, the main improvement(s) would be in reduction in the size of the cell standard errors; hence, an improvement in both cell precision and overall survey precision. There is no evidence that this would have any effect on bias – were it to exist.

Besides, even if there were 100% response to the survey and all questions on each survey instrument were answered, there may still be bias. Bias may result if respondents answer questions in such as way as to systematically affect the resulting statistics. Since individuals tend to underestimate how much they weigh and tend to overestimate the value of their homes, surveys inquiring about these items will likely have biased results even if there is 100% response – even if the survey is a census (sample with 100% sampling rate).

Finally, the memo states that applying the (overall) "11.7 percent sampling fraction to all eligible aircraft would increase the 1999 sample size from 30,064 to 37,539." This statement is completely erroneous and demonstrates a lack of understanding of the GA survey - its design and its constraints. The GA survey is currently limited to approximately 30,000 sampling units. The idea is to optimize survey results by allocating the 30,000 units as efficiently and effectively as possible. Mailing survey questionnaire packages to addresses which are known to be incorrect for the aircraft in question is just wasting sample size, wasting money, and wasting staff resources, and it has the effect of reducing the response rate because the survey package is certain to returned by the postmaster without ever being seen by the intended aircraft owner or operator.