GENERAL AVIATION DATA LINK SURVEY ANALYSIS -
EXPERIMENTAL AIRCRAFT ASSOCIATION

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16. Abstract

The Federal Aviation Administration (FAA) is interested in integrating Data Link communications technology into the General Aviation (GA) community. But, how much does the GA community know about the Data Link concept, the services that are possible, and the advantages of Data Link? This report contains an analysis of a survey that was conducted at the 1992 Experimental Aircraft Association Airshow (Oshkosh).

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EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA) is interested in implementing alternatives to the current voice communication between pilots and air traffic management. One alternative is Data Link. The use of Data Link is expected to enhance flight safety and to decrease pilot workload in commercial, air transport, and General Aviation (GA).

In order to obtain information from the potential end users of the proposed Data Link System, a survey was produced to determine the user's preferences for services that can be presented through Data Link. Information regarding the pilot's experience and type rating was also collected.

The survey was distributed at the 1992 Experimental Aircraft Association (EAA) air show in Oshkosh, Wisconsin. The results of this survey indicate that the GA pilot's current knowledge about Data Link was limited, and therefore, they were unable to determine what services would be useful to them. The wide variation of responses regarding the types of potential services indicates that the GA community is skeptical and reluctant to "buy into" Data Link without a greater understanding of the cost/benefit question.

1.   INTRODUCTION.

The Federal Aviation Administration (FAA) is interested in integrating Data Link communication technology into the General Aviation (GA) community. This interest is driven by a desire to enhance GA flight safety and to decrease pilot workload.

In order to ensure that the Data Link system developed is "needs driven," the FAA went to the user community to obtain input from GA pilots regarding the type of information, either air traffic control (ATC) or related services the GA pilot would like to have presented through Data Link. Potential users of the system were asked to participate in a survey that was developed to collect this information. This survey was directed as an initial step to develop system requirements.

In addition, in order to obtain information regarding the pilot population responding to the survey (background and experience), the survey also requested pilots to provide information regarding their certifications/ratings, flight experience, and current use of ATC and related services.

The survey was conducted during the 1992 Experimental Aircraft Association (EAA) Airshow in Oshkosh, Wisconsin. A copy of the survey is provided in appendix A. This report presents the results of responses to the GA pilot survey. The survey was distributed to 850 pilots attending the Airshow; 110 surveys were completed and returned.

2.   PURPOSE.

The purpose of this paper is to respond to the following:

        a.   What air traffic services GA pilots expect from the FAA over Mode Select (Mode S) Data Link?

        b.   What air traffic services do GA pilots need over Data Link?

        c.   How could these services be presented to the pilot?

3.   METHODOLOGY.

A survey was developed to collect information from GA pilots regarding the type of ATC and related services they would like provided through Data Link. In order to stratify the data, the survey requested respondents to provide data describing: certificates and ratings, flight experience, current involvement in aviation, aircraft ownership, ATC and related services currently utilized, and ATC and related services they would utilize if Data Link were provided. The questionnaire was developed from the input of current and former air-carrier pilots, an air-taxi pilot, flight school student, and a GA pilot.

Draft versions of this survey were distributed to an aviation safety seminar, Fixed Based Operators (FBOs), Aviation Career Academy flight school, and Aircraft Owners and Pilot Association (AOPA) representatives. Revisions based on the data and comments received from these sources were incorporated into the final version of the survey document prior to distribution at EAA.

4.   RESULTS.

Findings are addressed in two areas: quantitative analysis and qualitative analysis. The quantitative analysis section presents the results from pilots responses to questions 1-7 of the survey and a comparative analysis between what ATC and related services pilots currently use and what ATC and related services they would like Data Link to provide. The qualitative analysis section presents comments that pilots provided in the comments section of the survey.

4.1   QUANTITATIVE ANALYSIS.

This section will present an overview of the quantitative survey results. There were a total of 110 pilots that responded to the survey. Questions 1, 2, and 3 present results for the level of pilot certification/rating, flight experience, and their current involvement in aviation. Questions 4, 5, 6, and 7 present results relating to aircraft ownership, current ATC and related services the pilot uses and their desired use of ATC and related services with Data Link, as well as the desired format display type.

Question 1: Requested pilots to provide information regarding their certificates and ratings. The findings were: 58.2 percent private, 33.6 percent commercial, and 8.2 percent airline transport pilots (see figure 1 - appendix C).

The following are the pilots ratings:

> 66.4 percent instrument rated with airplanes
> 1.8 percent instrument rated with helicopters
> 98.2 percent single engine
> 27.3 percent multiengine
> 9.1 percent sea plane
> 3.6 percent rotorcraft
> 0 percent lighter than air.

Student, air carrier, and military pilot categories were included in the survey as a screening mechanism. Individuals that fell into these categories were excluded from the dataset. This was done to ensure that the responses reflected input from the GA pilot population only. There were "two" student pilots, "one" air carrier, and "zero" military pilot surveys that were removed from the dataset prior to analysis.

Question 2: Requested pilots to provide information regarding their flight experience. This question was divided into two parts. The first part requested pilots to provide information regarding their total flight experience. The categories were, in hours 0-300, 301-1000, and 1001+. These categories were recorded to represent low, medium, and high flight experience levels. The results were: 25.4 percent for 0-300 hours or low, 36.4 percent for 301-1000 or medium, and 38.2 percent for 1001-plus or high (see figure 2 - appendix C).

The second part of the question requested pilots to provide the amount of flight time they had logged in the preceding 12 months. Due to the large variance in the response distribution, the best representation of the data is the median (the most frequently occurring score). The median for pilot flight time over the past 12 months is 85 hours. When the total flight time for the preceding 12 months is plotted (see figure 3 - appendix C), the majority of the respondents (approximately 94 percent) flew less than 300 hours in the preceding 12 months. Approximately 65 percent of the respondents flew less than 100 hours in the preceding 12 months. The graph was truncated after the 400- to 500-hour interval because only approximately 5 percent of the respondents flew more than 500 hours.

Question 3: Requested pilots to respond to, "What is the primary area of your current involvement in aviation?" Findings indicated that 68.9 percent pilots fly for personal use, 5.0 percent fly for commercial/flight instruction, and 17.6 percent fly for business (see figure 4 - appendix C). One pilot stated his current involvement was with ATC. There were nine (8.4 percent) pilots that chose to respond to the "other" category. These nine were: traffic survey, aviation journalist, civil air patrol (2), aircraft builder (2), insurance analyst, mechanic, and engineer.

Question 4: Stated, "Are you an aircraft owner?"; 62.7 percent responded yes and 37.3 percent responded no.

Question 5: Requested pilots to check, "Which of the following FAA ATC and related services do you routinely use?" The findings are listed in table 1 below and in figure 5 (see appendix C). Those pilots that responded to the other category indicated that they use Direct User Access Terminals (DUAT).

TABLE 1. ATC AND RELATED SERVICES - ROUTINELY USED

	USE	DON'T USE
VFR to controlled airports	97	13
VFR through controlled airspace	88	22
VFR flight plan filing	58	52
VFR flight watch	59	51
VFR flight following	70	40
Weather briefings	107	3
NOTAMS/PIREPS	94	16
ATIS	106	4
IFR operations	75	35
Other	3	

Question 6: Requested, "If the technology necessary for Data Link communications was available, which of the following ATC and related services would you like Data Link to provide?" The categories were reduced from 5 to 3 (see appendix A for survey) such that, an answer of "strongly like" or "like" was transformed into one category of "like," neutral remained neutral, and "don't like" and "strongly dislike" was transformed into one category of "dislike."

Table 2 (below) and figure 6 (see appendix C) present the percentages for each service listed on the survey.

TABLE 2. ATC AND RELATED SERVICES - DATA LINK

	LIKE	NEUTRAL	DISLIKE
VFR to controlled airports	54	39	17
VFR through controlled airspace	62	35	13
VFR flight plan filing	54	46	10
VFR flight watch	72	30	8
VFR flight following	65	31	14
Weather briefings	88	14	8
NOTAMS/PIREPS	87	20	3
ATIS	93	11	6
IFR operations	56	50	4

Question 7: The last question stated, "What format would you prefer the Data Link information to be displayed?" The responses were:

66.4 percent of the pilots responded that they would prefer to have the information displayed on a cathode ray tube (CRT) (panel display), 16.4 percent preferred printed paper copy, 7.3 percent chose voice synthesizer, and 10 percent of the pilots provided no response to this question. See appendix B, for comments regarding display format.

4.2   COMPARATIVE ASSESSMENT.

A comparative analysis is presented to assess if there is a difference between the number of services that a pilot currently uses without Data Link versus those services that pilots would use with Data Link. Table 3 below represents the findings:

TABLE 3. COMPARATIVE ASSESSMENT

ATC and Related Services	Current System		Data Link System		
	Use	No Use	Like	Neutral	Dislike
VFR to Controlled Airports	97	13	54	39	17
VFR to Controlled Airspace	88	22	62	35	13
VFR Flight Plan	5	52	54	46	10
VFR Flight Flight Watch	59	51	72	30	8
VFR Flight Following	7 0	40	65	31	14
Weather Briefing	107	3	88	14	8
NOTAM/PIREPS	9 4	16	87	20	3
ATIS	106	4	93	11	6
Flight Operations	75	35	56	50	4

It appears that fewer ATC and related services are preferred with Data Link, however, it does not appear that pilots dislike Data Link services. In fact, a consistently large number of neutral values were reported by pilots under Data Link services.

4.3   QUALITATIVE ANALYSIS.

The comments received from both the surveys and discussions, are presented in the following categories: economically justifiable and practically achievable, and merit comments. These are a portion of the comments, the remaining comments can be found in appendix B.

a.   Economically Justifiable:

1. Looks like a good and useful system; be sure it is priced within reach of most GA single engine owners.

2. I am, as a small GA plane owner, deeply concerned about equipment transition costs.

3. Don't make it cost prohibitive. This is why I didn't choose #1. Must be less than $3,000.00 and have weather maps and traffic.

4. This is very promising technology. It will be important to use low cost devices for GA.

5. This would be a very expensive burden. Maybe it has some value for the airlines and military but not for the little guy.

b.   Practically Achievable:

1. As a pilot, how will I transmit my info to flight watch? I still call on frequency and they answer by paper? I have to also speak to advisory/controlled services - should be two-way communication.

2. To add the equipment with this technology in general aviation is unrealistic. In part 121 or 135 maybe - but not in small 150s or 172s.

3. Concerned with more equipment in airplane needed - more weight. Also, if many errors are caused in voice communication, why potentially voice synthesizer? Wouldn't the same errors exist?

4. Regarding instrument flight rules (IFR) operations, we cannot lose ability to know what other aircraft in vicinity are doing.

5. Use of Data Link can't be required. Must still have the current system available.

c.   Merit Comments:

1. Excited about Collision Avoidance System using Data Link. Excited about possible Weather Radar Display using Data Link as demonstrated at FAA Pavilion Oshkosh.

2. I agree strongly in the merit of the Data Link concept.

3. Great idea! Hope it happens soon.

4. Please continue research and implementation in the progressive idea.

5. It has to happen sooner or later-- let's get on with it!

5.   DISCUSSION.

5.1   Quantitative.

The majority of pilots surveyed (58.2 percent) hold private pilots certificates, are instrument (36.7 percent) and single engine (40.2 percent) rated. 68.9 percent fly for personal use and over half (62.7 percent) own their own airplanes. In addition, most pilots surveyed have a medium to high level of flight experience (74.6 percent) and flew less than 100 hours in the preceding 12 months (approximately 2 hours a week).

All of the ATC and related services in the survey are currently used by pilots, however, those that are most frequently used are weather briefings, Automated Terminal Information Service (ATIS) and visual flight rules (VFR) flight to controlled airports. Those most frequently selected ATC and related services that pilots would like Data Link to provide are: ATIS, weather briefing, and pilot report/notices to airmen (PIREPS/NOTAMS).

Weather briefings, ATIS, and VFR flight to controlled airports represent informational data as well as control instructions, whereas, those desired by Data Link represent informational data only. Therefore, GA pilots surveyed want Data Link to provide them informational data only and do not desire aircraft control instructions.

One reason for this distinction by pilots may be that the GA pilot's workload is represented by the amount of information they need to assimilate during a flight, such as weather, ATIS, and, PIREPS/NOTAMS. Data Link would provide pilots with a method of off-loading some of the information from their mental working memory to a system such as Data Link, and thus reducing pilot mental workload. Data Link would enable the pilot to retrieve, store, and recall information upon request.

Control instructions, however, do not need to be maintained in working memory, and therefore, do not increase pilot mental workload. The pilot receives the instruction and follows through with the maneuver. There is no need to maintain the information and retrieve it later, therefore a Data Link system would not be needed for these services.

Another reason may be that pilots are more comfortable obtaining informational data (ATIS, weather briefings, and PIREPS/NOTAMS) from a non-voice communication system. However, when given control instructions from ATC, pilots may prefer the system that they are most familiar with--voice communications, to supply them with the assurance that ATC knows of their location with respect to other aircraft.

Finally, of the three formats that Data Link information can be provided, the majority of pilots surveyed preferred to have Data Link information presented on a CRT/panel display. Perhaps this is due to several pilots' concerns regarding the current high frequency congestion associated with voice communication and the uncoventional presentation method of a printer in the cockpit.

5.2 COMPARATIVE.

The comparative assessment, presented pilot's use of current ATC and related services with the pilot's desire to have these same services provided through Data Link. Overall, there is a decrease between those ATC and related services that pilots currently use and those that they desire to have presented if Data Link was available. However, it does appear that pilots do desire Data Link services. In fact, a consistently large number of neutral values were reported by pilots under Data Link services. This may indicate that pilots are unsure of Data Link technology and whether it would assist them with a safer, more pleasurable flight, or just increase the cost of flying. This may be due to their lack of knowledge of Data Link technology, the cost of the system, and how the system would be implemented and utilized.

5.3 QUALITATIVE.

The qualitative analysis indicated that pilots expressed opinions on two issues, economics and practicality. Both of these issues are important in the design, development, and implementation of a Data Link system to the GA community.

Economics:

The survey indicates that the concerns of the GA pilot are focused largely in part on the potential economic impact of implementing a Data Link system. Since the majority of pilots surveyed fly for personal use, it is likely that they rely on personal income as the source for funding their flying. Assuming that the GA pilot is not gaining economic benefit from flight time, flight time represents a debt cost. The benefit from flying for the GA pilot is achieved solely from the intrinsic pleasure attained.

Conversely, management of a national air trafffic system requires an economic perspective on a larger scale. The air traffic system derives its funding from governmental sources, therefore, there is not the same personal impact on funds as with the GA pilot.

It appears that the GA pilot surveyed balances cost against safety and the intrinsic pleasure gained from flying. Therefore, the GA pilot seeks to gain a personal level of benefit from money spent on flying. Whereas, governmental funding is focusing on producing a product to increase the benefit and safety across an entire sector of the air traffic system.

Practicality:

In addition to economic concerns, the practicality of the system must also be considered. The benefits of integrating the user into the development process is essential to the production of a practical Data Link system. Respondent comments in the survey indicate that a practical system would include: two-way communication in both an audio and visual format, information that can be saved and retrieved when necessary, to maintain voice communication. Comments such as these demonstrate the need for educating pilots on Data Link and the development process. These pilots need to be informed as to what Data Link will change and how, before they can adequately assess a Data Link system.

Other comments made by pilots present issues that need to be addressed that involve actual effects on aircraft and pilot performance. Such as, maintaining situational awareness, knowing what other aircraft in the vicinity are doing, and what their intentions are. In addition, the effect of Data Link equipment on the aircraft weight limitations and performance parameters. Is the plane going to support the equipment or vice versa? Will the plane be capable of housing the equipment?

Pilot's comments also suggested that the capabilities a Data Link system can provide are desirable and they anticipate the development of the system. However, pilots are concerned about the economics and practicality of the system. Specifically, whether or not the system will be designed and developed with the needs of the GA pilot in mind, as noted by a pilot "Don't over engineer this program."

6.   CONCLUSION.

The results of this survey led to the following conclusions:

        a.   What air traffic services do general aviation (GA) pilots expect from the Federal Aviation Administration (FAA) over Mode Select (Mode S) Data Link?

GA pilots do not know what they expect from the FAA regarding Data Link air traffic control (ATC) and related services. The GA community surveyed views the FAA as forcing undesired regulations. Therefore, they are very skeptical regarding this emerging technology and its potential implications.

The majority of the pilots that spoke with surveyors at the Oshkosh Airshow expressed that their knowledge of Data Link was very limited. Pilots will need to be better informed about the Data Link system to know what they expect.

        b.   What services do GA pilots need via Data Link?

GA pilots' needs, with regard to Data Link, would have to be derived from what they desire (like/dislike) due to their low awareness of Data Link technology. GA pilots would like Data Link to provide them with Automated Terminal Information Service (ATIS), weather briefings, and pilot reports/notice to airmen (PIREPS/NOTAMS).

Data Link is perceived as an "emerging technology." The GA community is skeptical or at least reluctant to "buy into" this system without understanding the cost/benefit equation. As an emerging technology, pilots need to be provided with a demonstration of the benefits of this technology.

       c. How will these services be presented to the pilot?

The majority of pilots surveyed would prefer Data Link information presented on a cathode ray tube (CRT)/flat panel display. However, the determination of the hardware type is one small piece of a multifaceted question of how information will be presented to pilots.

7.   RECOMMENDATIONS.

The findings of the survey lend to the following recommendations due to the skeptical attitudes of pilots regarding the emerging technology:

       a. As stated earlier the feedback that was received in the comments section of the surveys and discussions with general aviation (GA) pilots indicate that there is a need to inform pilots on this emerging technology.

First, there is a need for educating the GA pilot about Data Link. Pilots need to be informed about the operational aspects of Data Link; how it works, and how the user is integrated into the system.

Second, the GA community needs a demonstration of technology. Pilots are skeptical or at least reluctant to "buy into" an emerging system without a demonstration of the benefits of this emerging technology.

       b. Comments suggested that a cost/benefit analysis needs to be conducted. Pilots want to know what the cost is to obtain the benefits of this emerging technology.

The focus of the cost/benefit analysis should address what is echoed by the GA pilot "Is it worth it?" In order for pilots to determine whether the system is worth it or not they need to be given information regarding the functionality of the system and the associated cost, so they could make an informed descision.

       c. The GA pilots surveyed would prefer Data Link information presented on a cathode ray tube (CRT)/flat panel display. This is however, a very general requirement. There are a myriad of parameters that need to be determined and specified in order to develop an optimal presentation method.

The determination of the necessary parameters needs to be addressed by the Federal Aviation Administration (FAA), avionics and airplane manufacturers, and the user community working together to ensure the development of an optimal Data Link system. Once an optimal Data Link display device is developed, certification will be necessary to ensure standardization of displays, display formats, and parameter specifications for avionics manufacturers.

       d. There would potentially be greater acceptance of the system if the user were able to contribute in the development process of the system.

A cooperative effort needs to be established between the FAA, avionics and airplane manufacturers, and the user community. There would potentially be greater acceptance of the system if the user were able to contribute in the development process of the system. The GA pilot represents a unique sector of the flying community. Their reasons for flying are different than the

air carrier, consequently their needs and concerns are different as well. The GA pilots expressed that they are made to follow mandated regulations created for the air carriers and their concerns and needs are overlooked. Giving the user the opportunity to provide input in the design and development phases of a system, in addition to the FAA, avionics, and airplane manufacturers, results in a system designed for their needs and could ensure user acceptance.

APPENDIX A

DATA LINK GENERAL AVIATION SURVEY

DATA LINK GENERAL AVIATION SURVEY
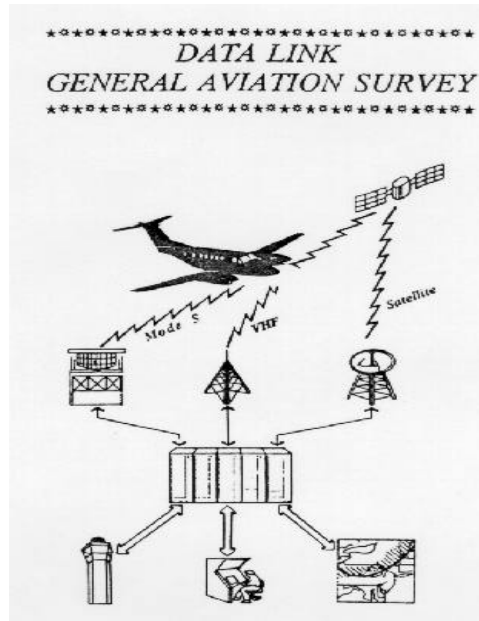
THE FAA TECHNICAL CENTER IS DEVELOPING A DATA BASE OF GENERAL AVIATION PILOTS REQUESTS FOR A NON-VOICE COMMUNICATION SYSTEM (DATA LINK).

DATA LINK PROVIDES TWO-WAY DIGITAL COMMUNICATION BETWEEN THE GROUND AND THE AIRCRAFT.

PLEASE HELP US BY PROVIDING YOUR INPUT ON HOW YOU WOULD USE THIS EMERGING TECHNOLOGY.

C-1

1. Certificates and ratings (Check [√] all applicable responses)

Student pilot   Rotorcraft
Private pilot   Single engine
Commercial pilot   Multi engine
Airline transport pilot   Sea Plane
                                                     Lighter than air

Instrument -- airplanes
 Instrument -- helicopter

2. Flight Experience (check [√] appropriate box)

HOURS   0-300   301-1000   1001-pluS

Total time

Last 12 mos.   _____(approx.)

3. What is the primary area of your <u>current</u> involvement in aviation (check [√] one response)?

GA -Personal Use   Military
GA -Commercial/Flight Instr.   Air Traffic Control
GA -Business   Air Carrier   Other Specify

4. Are you an aircraft owner?   Yes   No

5. Which of the following FAA air traffic control and related services do you routinely use (check [√] all applicable services)?

VFR to Controlled Airports   Weather Briefing
VFR through Controlled Airspace   NOTAMS/PIREPS
VFR Flight Plan Filing   ATIS
VFR Flight Watch   IFR OPERATIONS
VFR Flight Following   Other _____

(OVER)➠

C-2

6. Data link technology allows ATC communications and selected services that are normally transmitted over voice circuits to be digitized. The digitized information is transmitted via ground-based station or satellite to the aircraft, where it is received and stored in a digital format.

Data link facilitates faster transmission of the information, and eliminates many of the errors inherent in voice communication. Information can be stored in receiver memory and retrieved later on a CRT display, printed paper copy, or voice synthesizer.

If the technology necessary for data link communications was available, how would you rate the desirability of obtaining the following air traffic control and related services by data link?

```
        * Rate each item by checking [√] appropriate box, 1 to 5:


1 = strongly  2 = Like  3 = Neutral  4 = Don't  5 = Strongly
    Like                              Like         Dislike

                                  1       2       3       4       5
VFR to Controlled Airports
VFR through Controlled Airspace
VFR Flight Plan Filing
                                  1       2       3       4       5
VFR Flight Watch
VFR Flight Following
Weather Briefing
                                  1       2       3       4       5
NOTAMS/PIREPS
ATIS
IFR Operations
```

7.   What format would you prefer the Data Link information to be displayed (check [√] one response)?

```
   CRT
   Printed paper copy
   Potentially voice synthesizer.
```

8. Comments:

_____

_____

APPENDIX B

PILOT COMMENTS

A)   <u>Format</u>

I would prefer a CRT display with graphics, and the option to print. If only one type is available, I prefer printed copy.

"Have a design contest for the best system. This would make it cheaper, easier, and better for everyone."

B)   <u>Education</u>

The FAA booths at Oshkosh 92 was my first exposure to Data Link. Possibly more education of general aviation community is needed. Note - I appreciate the FAA support at Oshkosh. Good people, display, handouts and education.

I don't really know a whole lot about the Data Link.

C)   <u>Practical</u>

I fly a lot in congested Terminal control Area (TCA) airspace (ORD & EWR/LGA/JFK). I feel that Data Link would help with the severe frequency congestion problem there.

You should also be setting up the hardware/technology to transmit slow-scan video images of two things (at least):
    1. Weather radar images for areas in front of and along the course of en route aircraft.
    2. Aircraft position information for the area an aircraft is operating in. This would include own aircraft plus others in the area. Also provided should be direction, speed, and altitude.

No voice synthesis. There's already way too much competition for a pilot's ear time.

LCD would be lighter and more economical than CRT.

Would like satellite transmission of radar targets in vicinity of aircraft within cockpit display.

Timing is critical. Have ground equipment first and then Mode S.

For collision avoidance, include weight class. To facilitate implementation, make ID by number optional.

Make sure data format is usable by a PC. Also make en route and approach chart updates available through Data Link.

Voice communication keeps you awake sometimes.

I feel having a printer in a small plane would be too distracting as well as costly. Even a voice synthesizer would be beneficial if it could be stored for playback.

Would like to see more on automated weather observation systems and automated surface observation systems.

NO MODE S -- Please do not use Data Link service to sell Mode S to the users. Mode S will quickly overload the system, worse than Mode C, which overloads the system now during times of high density.

D)   Economics

I am, as a small GA plane owner, deeply concerned about equipment transition costs first Mode S, then Data Link.

The government can't make this work and have it be inexpensive. Ideally, it should cost about the same as LORAN or Global Positioning System (GPS) to install.   Don't over-engineer this program. It is, however, exciting to see the FAA consider current technology.

I'd refuse to spend money to buy expensive equipment for Data Link. If the FAA wants it, they should provide it. As a pilot, I also use Flitesoft on my home computer for weather, flight plan filing.

This is another unnecessary expense.

I am suspicious of shifting to a Data Link since the equipment is very costly and who will pay for it? And how? We don't need any more user fees! This direction of reasoning suggests to me that you are attempting to move toward a mandatory Data Link (Mode S) and I am opposed to this concept because of some of the required information in the transponder packet. I like having the information available to me in flight if they desire to obtain it or to participate in a data network.   I appreciate STC assistance and I do think radar transponders serve a useful purpose. The packet required in Mode S is the problem.

Concerned about equipment costs on board. Concerned about weight penalty of equipment.

Cost vs clarity and understandability will be a high leverage measure of merit to me.

I like the idea of Data Link, but not if it is mandatory. There are too many of us who can't afford it.

Keep the cost down.

E)   Merit

When?!

Weather briefing and VFR through controlled airspace is most important to me. Weather (WX) changes so rapidly, briefings are now just a "guesstimate" in my area of flight. Flying VFR through complex controlled airspace would also benefit from Data Link.

APPENDIX C

FIGURES

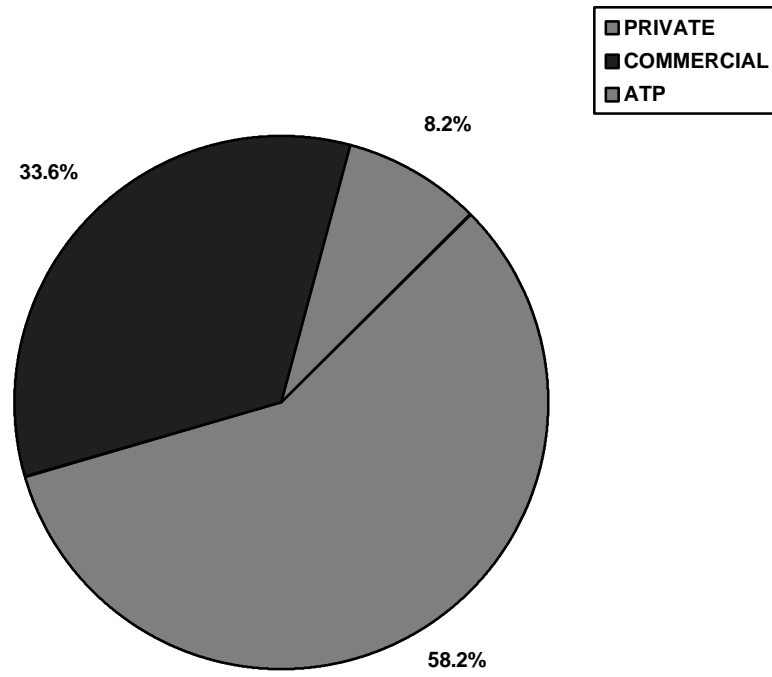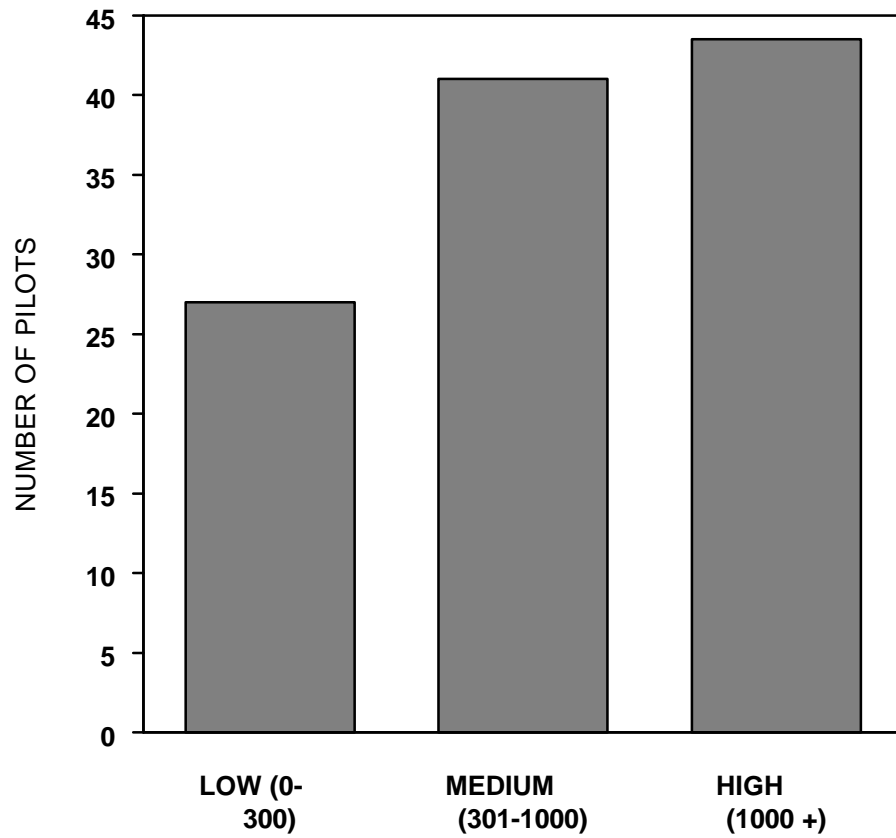**PRIVATE**
COMMERCIAL
ATP

8.2%

33.6%

58.2%

FIGURE 1. PILOT CERTIFICATION

FIGURE 2.   PILOT FLIGHT EXPERIENCE
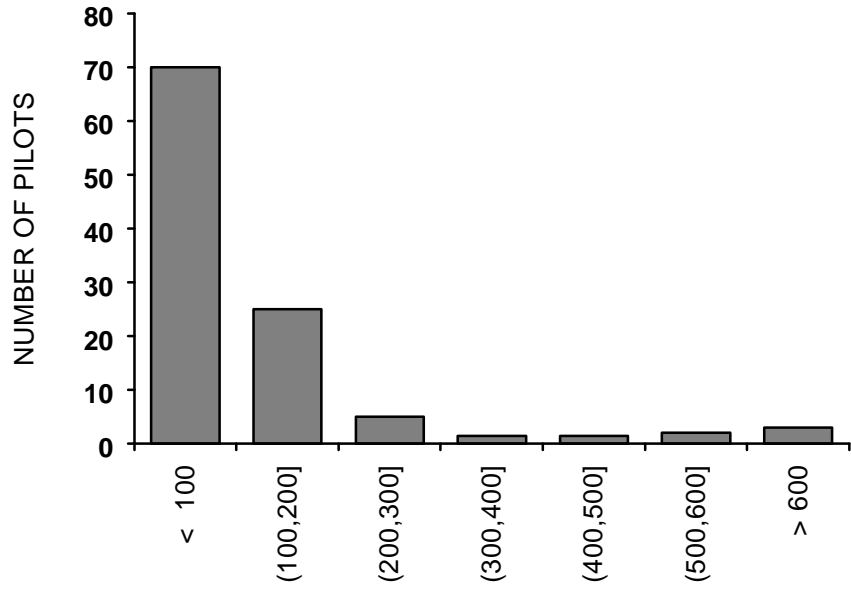
FIGURE 3. FLIGHT TIME DISTRIBUTION

Legend:
- PERSONAL
- FLIGHT INSTRUCTION
- BUSINESS
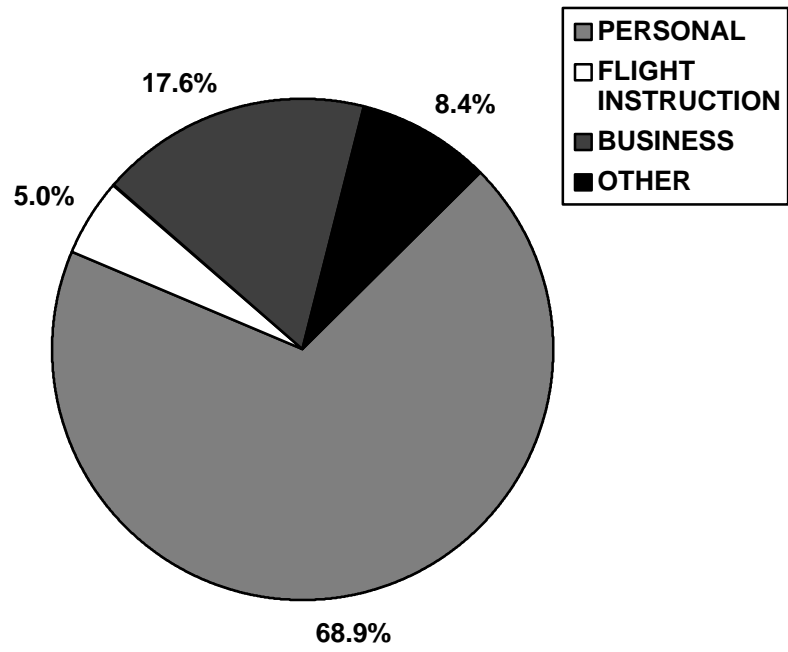- OTHER

17.6%

8.4%

5.0%

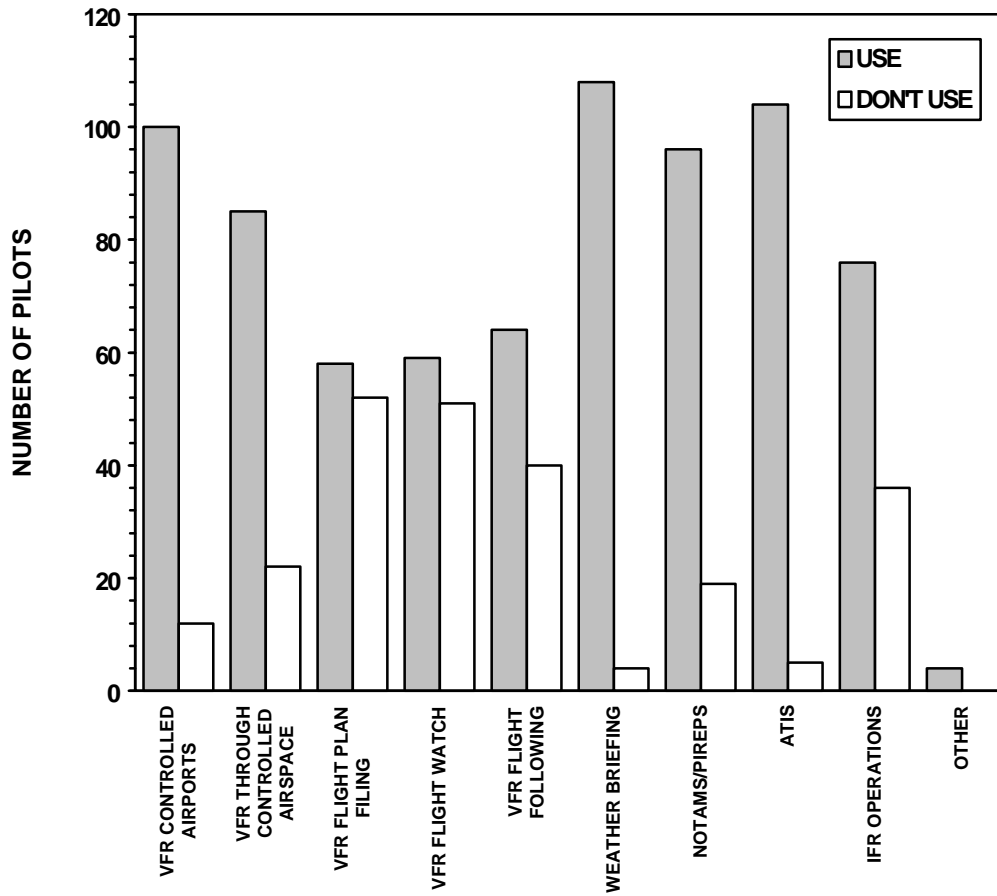68.9%

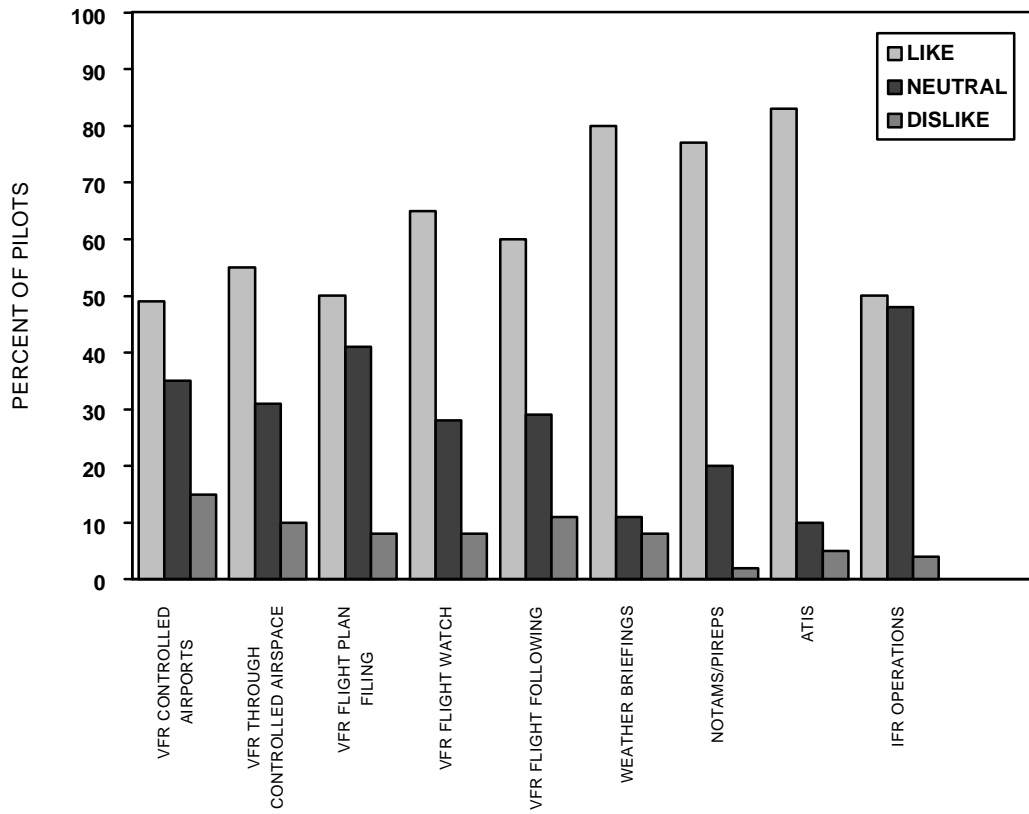FIGURE 4. CURRENT INVOLVEMENT IN AVIATION

FIGURE 5. CURRENT ATC AND RELATED SERVICES

FIGURE 6.   PILOT PREFERENCES FOR DATA LINK