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Report to the Chairman, Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate

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AVIATION SAFETY

Changes Needed in FAA's Service Difficulty Reporting Program

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The Honorable Wendell H. Ford, Chairman
The Honorable John McCain, Ranking
Minority Member
Subcommittee on Aviation
Committee on Commerce, Science,
and Transportation
United States Senate

As requested, we have evaluated the effectiveness of the Federal Aviation Administration's (FAA) Service Difficulty Reporting (SDR) program. This program's objective is to help airline and FAA personnel to promptly correct conditions that could adversely affect air safety. It does this by periodically disseminating reports on aircraft malfunctions—primarily to airline and FAA personnel. Because your interest centered on the SDR program's impact on the safety of aging airliners, we limited our review to the portion of the program that handles large, airline-operated aircraft. We did not focus on general aviation (small, private aircraft or commercial aircraft carrying less than 30 passengers). Our evaluation covered

- the usefulness of SDR data to FAA and airline personnel,
- factors affecting the SDR program's usefulness, and
- changes needed to improve the program, if warranted.

Results in Brief

FAA maintains a service difficulty report data base and provides subscribers with a weekly compilation of reports after they have been processed. Subscribers—primarily airlines, FAA inspectors, and FAA engineers—are supposed to use these industrywide malfunction reports to alert them to incipient safety problems with their own aircraft (in the case of airlines) or with aircraft for which they have inspection or certification responsibility (in the case of FAA inspectors and engineers). However, according to FAA and airline personnel, the data are of little value because they virtually are never the first source for identifying safety problems in transport aircraft. In their view, without major improvements, the SDR program should not be continued.

Several factors stemming primarily from FAA's management inattention limit the program's usefulness.

- Information that one airline considers reportable may go unreported by another airline.
- Useful information does not reach subscribers for over 6 weeks because of delays in manual data processing through a paper-based system.
- FAA does not analyze the data, as required by FAA policy, to detect malfunction trends in specific aircraft models or focus the efforts of FAA's inspection work force because of insufficient staff and unreliable data.

In addition to the SDR program, the two major U.S. airframe manufacturers—Boeing and Douglas—collect and maintain aircraft service and safety data that, according to SDR program users, are more useful and timely than SDR data. However, manufacturers' systems have limitations as well because no requirement exists for airlines to report malfunctions or for the manufacturers to analyze the data.

Alternatives exist to FAA's managing of the SDR program. Either the major equipment manufacturers or a private organization could contract with FAA to manage the program. Before choosing an alternative, however, several policy issues regarding cost, liability, and the manufacturers' role in regulating air safety need to be addressed.

Background

As described in FAA Order 8010.2, the objective of FAA's SDR program is to promptly correct conditions adversely affecting aircraft safety. To do this, FAA collects mechanical reliability reports; analyzes the reports; and disseminates trends, problems, and safety alert information to the aviation industry and FAA. Airlines operating large aircraft of more than 30 seats are required to file reports under the Federal Aviation Regulations (FAR) 121.703. The regulations require airlines to report 17 types of in-flight occurrences, such as engine shutdowns, landing gear problems, and other occurrences, that airlines believe could endanger aircraft safety. FAA processes the information into a Service Difficulty Report.

Under FAR 121.703, an airline must report each aircraft malfunction incident within 72 hours to the FAA Flight Standards District Office responsible for that airline. After an initial review, the district office mails reports to FAA's National Safety Data Branch in Oklahoma City, Oklahoma, which screens and enters them into a national computerized data base. From this, FAA compiles summaries of approximately 500 reports, organized by aircraft type, and mails them to FAA, airlines, manufacturers, repair stations, and general aviation. FAA is also responsible

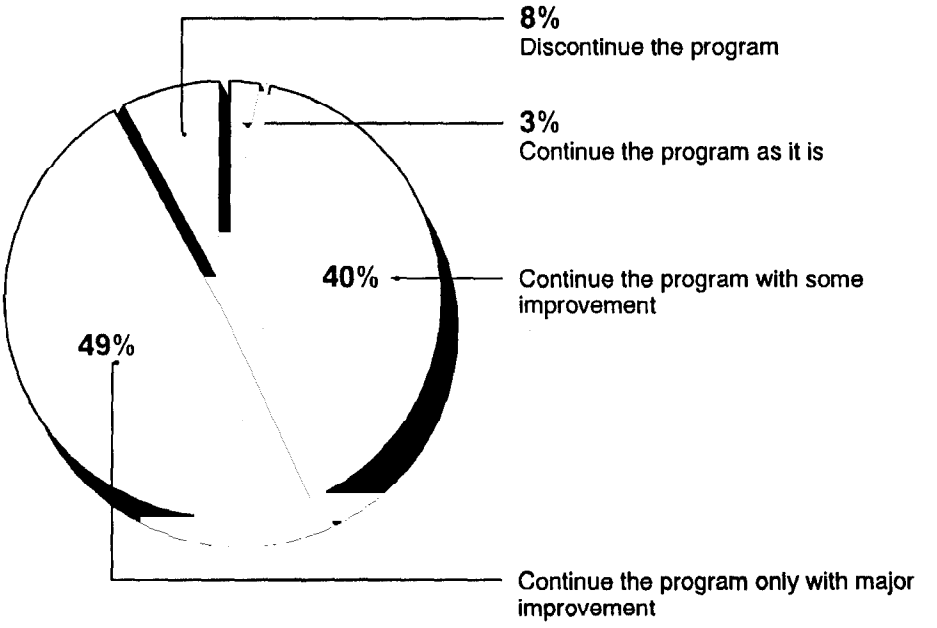
for analyzing the data and disseminating trends, problems, and safety alert information.

In 1989, FAA received 25,036 SDR reports from scheduled and commuter airlines; 9,174 reports from aircraft repair stations; and 3,493 reports from mechanics, air taxis, and other industry sources. We estimate that FAA's annual cost for operating the part of the program pertaining to large aircraft is about $2.5 million; the airlines' cost to submit reports is about $1.6 million annually.

Users Dissatisfied With SDR Program

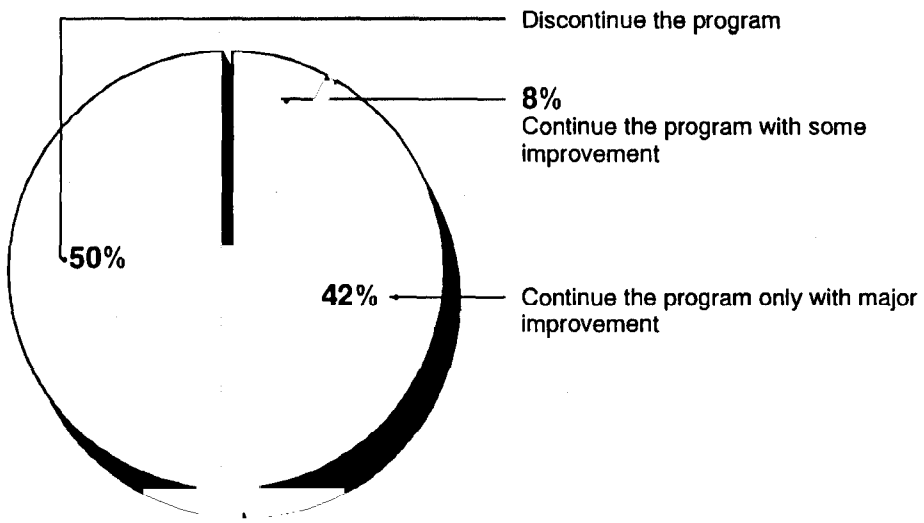
On the basis of discussions with officials of 12 major U.S. airlines, FAA principal maintenance inspectors assigned to these airlines, and FAA certification engineers, we found that the SDR program is not being used to provide the aviation industry with safety alert data. For example, as shown in figures 1 and 2, most airline officials and FAA engineers believe that the program should not be continued unless FAA makes major improvements.

Figure 1: Airline Representatives' Suggestions for the Future of the SDR Program



Respondents were asked to choose one of the four options for continuing the SDR program.

Figure 2: FAA Engineers' Suggestions for the Future of the SDR Program



Respondents were asked to choose one option among the three above as well as the option: "Continue the program as it is." None chose to continue the program as it is.

FAA inspectors told us that they virtually never use the SDR program's output to identify unusual problems that need to be followed up or as a source of information about the in-service operation of aircraft equipment. In addition, 11 of 12 airlines believe that SDR data virtually never help them to identify a problem earlier than they might through other sources. Eleven of the 12 airlines, 42 of 64 FAA engineers (66 percent), and 7 of 12 inspectors believe that eliminating the SDR program in its current form would have little or no impact on aircraft safety.

A primary objective of FAA engineers as they review SDR data is to determine whether corrective action should be required by an Airworthiness Directive (AD). (FAA issues ADs to the airlines to correct a serious safety problem pertaining to an aircraft or component.) Fifty-seven of 64 FAA engineers (89 percent) stated that the SDR data have never alerted them to a safety problem that eventually resulted in an AD. Most of the engineers we spoke with said that problems addressed by ADs are first brought to their attention primarily by aircraft manufacturers.

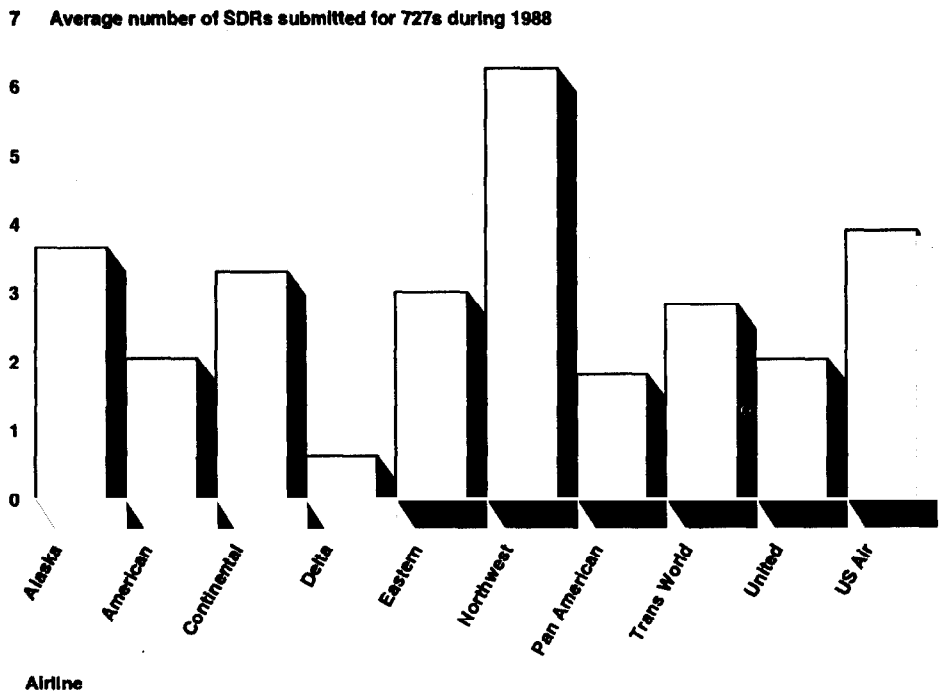
The chief reason that FAA engineers and airline personnel are dissatisfied with the SDR program is that its data are of low quality. We believe that this is due to management's inattention to the program over the last decade. Moreover, instead of SDR data, FAA engineers and airlines rely on

data collected and maintained by Boeing and Douglas, the manufacturers of 98 percent of all large aircraft used by U.S. airlines. This is because the manufacturers' data are more comprehensive, useful, and timely than SDR data, according to FAA and airline personnel.

Airline Reporting Varies

The number of SDRs submitted by airlines operating similar aircraft varies significantly among airlines. For example, among the major airlines operating Boeing 727s, the average number of SDRs reported per aircraft in 1988 ranged from less than one SDR by one airline to more than six SDRs by another. These differences could mean that an airline reporting many SDRs is either conscientiously interpreting and adhering to the regulations or operating excessively malfunctioning aircraft. However, airline officials attribute reporting differences to vague reporting requirements, leading to varying interpretations of what should be reported and to airlines' concerns over the public's access to malfunction reports in accordance with the Freedom of Information Act. Concerned about public disclosure of SDR data, some airlines are reluctant to submit malfunction reports to FAA. Differences among airlines' reporting practices would diminish the quality of the data because they would not reflect the actual occurrence of mechanical malfunctions. Figure 3 shows various differences in airline reporting for 1988.

Figure 3: Airline Malfunction Reports for 727s—Differences in Airline Reporting During 1988



Only 10 airlines are represented in this chart because 2 of the 12 we contacted do not operate Boeing 727s.

Inadequate Data, Poor Timeliness, and Lack of Analysis Result in Low-Quality Information

Many SDR reports lack key information. FAA Order 8010.2 states that FAA's Flight Standards District Offices are responsible for processing complete and accurate reports with enough information for analysis. However, our review of the almost 24,000 SDR reports submitted by scheduled airlines during 1987-89 shows that 41 percent did not have the relevant part number. According to an FAA supervisory engineer, part numbers are essential to correct a problem and conduct analysis, and they are important in developing trend information. FAA engineers gave us examples of other areas where missing information is needed for analysis, including total aircraft flight time, which helps structural engineers evaluate corrosion and fatigue-related problems, and time elapsed since the last overhaul for various components, which is useful in determining how long they have been in service.

Details provided in the SDR summary sheets also are not sufficient, according to 50 of 64 FAA engineers (78 percent). Engineers stated that reports on structural problems are not specific enough to evaluate the

severity of a problem. For example, an FAA supervisory engineer said that SDR data do not provide sufficient details about structural cracking, such as the length, direction, and exact location of a crack. He also said that this type of information is reported in varying degrees of detail among airlines. This would detract from his ability to perform accurate analyses of fleetwide phenomena.

The SDR program's lack of timeliness is a critical flaw in its ability to effectively serve its users. For example, the circumstances surrounding a May 5, 1989, in-flight engine component failure and resulting engine shut-down were communicated by the manufacturers to FAA that same day. FAA, however, did not disseminate similar information through the SDR program for over 6 weeks. Eleven of 12 airlines believe that SDR data virtually never help them initially identify a problem because by the time they receive the SDR data, they already know about the problem from other sources such as airframe and/or engine manufacturers. Further, over half (62 percent) of the 64 FAA engineers stated that SDR data virtually never help FAA identify events earlier than they might otherwise.

The SDR program does not contribute to the timely correction of conditions affecting aircraft safety because, aside from storing data on a computer, it is a paper-based, manual process. It has not been able to efficiently process and disseminate the vast amount of data submitted to it—over 3,100 reports a month. From beginning to end, a single malfunction report will spend approximately 6 weeks in the SDR processing system before becoming available to analysts.

By not analyzing SDR data for potential fleetwide trends or safety alert conditions as required by FAA policy, FAA has further limited the data's usefulness. FAA Order 8010.2 states that the Safety Data Branch should continually review all SDR data and when an adverse situation is noted, a System Analysis Summary Report should be prepared. These reports highlight problems occurring within components of systems and show the rate of problem development. Since 1985, however, FAA has prepared only one such report, according to an FAA official. The Assistant Director for Special Programs in FAA's Flight Standards Service—the FAA headquarters unit responsible for the SDR program—blames FAA's lack of SDR analysis on staffing and budget cuts. And according to the Supervisor of the Safety Data Branch's Safety Analysis Section, SDR staff has been reduced over the years from 17 in 1982 to 7 at present. On the other hand, FAA engineers, who have the capability of transferring SDR

data files from the Safety Data Branch to their personal computers, told us that poor data quality discouraged them from analyzing SDR data.

Management's Inattention Has Contributed to SDR Program Ineffectiveness

In 1978, FAA established policies and procedures in FAA Order 8010.2 to ensure that the SDR program would be effectively and economically managed. In that order, FAA established various tools to help manage the SDR program. But many of them no longer exist. For example, a Service Difficulty Board was to monitor the program's effectiveness and provide guidance, and a Safety Analysis Staff was to be headquarters' point of contact regarding safety data systems and communication with the Safety Data Branch in Oklahoma. Neither of these entities currently exists.

The Acting Director of the Aircraft Maintenance Division in FAA's Flight Standards Service attributed this erosion of SDR management to the more decentralized structure of FAA's operations since the order was approved. He added that as organizational changes have occurred, some functions—such as the SDR board and analysis staff—have been dropped from active use. The acting director noted, however, that in April 1990 FAA began an internal review of the SDR program during which it explored the feasibility of providing safety trend information, interfacing with the industry task force, and exchanging data with carriers through the use of personal computers. The internal review has been completed, and its results currently are under review by Flight Standards management.

Airlines and FAA Rely on the Manufacturers' Data for Safety Information

Aircraft manufacturers provide the airlines with oral and written service advice on malfunction incidents, service problems, and potential solutions that is more timely than SDR data. Moreover, the quantity and variety of data provided to the aviation industry, including FAA engineers, by the manufacturers not only match but far exceed those of the SDR program. Additional types of data provided by the manufacturers include technical information on inspections, modifications and repairs, advice to customers of current events, and tips to simplify troubleshooting and maintenance. All the airlines we contacted agreed that the manufacturers' data are better than SDR data because more events are covered and more details are provided. Further, 11 of 12 airlines agreed that the manufacturers' timeliness is much better than that of the SDR program.

Because manufacturers supply aircraft worldwide, their advice is based on information collected from around the world rather than from the U.S. fleet only, as does the SDR program. The following facts related to a telegraphic airworthiness directive that FAA issued on September 21, 1990, demonstrate the value of global reporting. Four airlines—two U.S. and two foreign—reported the same structural problem (separation of skin on wing slats from underlying structure) occurring to eight different Boeing 757s. The two U.S. airlines reported this problem in late June and early July 1990. All of these instances were reported to Boeing, but only one of the three that occurred to U.S.-operated aircraft was reported as an SDR. Before FAA disseminated this SDR to FAA engineers who might have acted on it, Boeing had reported all eight instances to FAA, and Boeing and FAA engineers had determined the nature of the problem. Moreover, a Supervisory Systems Engineer in FAA's Seattle Aircraft Certification Office who was involved in working with Boeing to develop FAA's AD said that he was not aware of any airline that reported this structural problem to FAA via the SDR program. Thus, only because of airline reports—five of eight from the two foreign carriers—to the manufacturer and subsequently to FAA, was this structural problem, which was deemed critical to safe flight, dealt with expeditiously.

Nevertheless, drawbacks exist to solely relying on the manufacturers' systems. For example, the relationship between the manufacturers and the airlines is informal—airlines are not required to submit data to the manufacturer and no assurance exists that airlines report all problems.

Need to Improve Regulations, Technology, and Management

Because FAA and the aviation industry are concerned that effective airline reporting and FAA analysis of information on safety-related mechanical problems are not occurring, they are planning short- and long-term changes to the current program. They believe that short-term steps should be taken now to enhance the value of the SDR program until long-term actions—which will take at least several years to develop—are implemented.

Proposals for the Short Term

A communications steering committee established by the Airworthiness Assurance Task Force[1] is coordinating an effort to improve the SDR program for the short term by proposing changes to the regulations and reporting format. The committee is recommending that FAA change FAR 121.703 reporting requirements by making them more specific in certain areas. For example, to eliminate insignificant items, the reporting requirements for brake malfunctions would be modified to include specific examples of what need not be reported. Under the proposal, airlines would be required to submit additional information such as total aircraft and engine hours as well as the number of takeoffs and landings. The steering committee also is recommending that FAA change its data entry format to allow airlines to electronically submit SDRs on a real-time basis. The committee believes that this will improve consistency because electronic entry provides a standardized format. Although FAA began work on this recommendation in the summer of 1990, progress has been limited. Of the four airlines that initially were part of the pilot program, one dropped out, and only one had submitted SDR data as of December 1990.

The committee also is recommending that FAA make the data base available to airlines and aircraft manufacturers for data retrieval, thus providing real-time history to the users and creating an information resource for the industry. According to FAA officials, after the agency completes its internal review of the SDR program, it will determine to what extent it will implement the committee's suggestions.

Proposals for the Long Term

For the long term, most of the committee—with the exception of the major airframe manufacturers—supports creating a global safety alert program that would (1) require airlines worldwide to report in a standardized format to the relevant manufacturer; (2) be accessible to FAA and other authorities; and (3) provide safety alerts and analyses on a regular basis to airlines, manufacturers, and regulatory authorities throughout the world. These features are not in place in manufacturers' current systems.

According to officials from FAA's Flight Standards Service and General Counsel, to implement a global, manufacturer-based service difficulty

[1]The task force is a joint aviation industry-government organization established to address the problems posed by aging aircraft after an Aloha Airlines 737 fuselage came apart in April 1988, killing one person.

reporting program, the current FAR 121.703 could be rewritten to stipulate that airlines submit malfunction reports to the manufacturers instead of to FAA. Contractual arrangements would then probably need to be made between FAA and the manufacturers to stipulate the nature and timing of actions that FAA would expect manufacturers to take. According to FAA officials, this rewriting and contracting with manufacturers would pose no legal problems.

In contrast to basing the SDR program within the manufacturer's domain, Boeing has proposed that a private, independent organization maintain the SDR system. Boeing suggests that this would keep the manufacturers from being perceived by the airlines as a regulator, and thus the free flow of data between aircraft operator and manufacturer would not be restricted.

Analysis of Proposals

The pros and cons of three basic alternatives for improving the effectiveness and utility of the SDR program are discussed below.

Continued FAA management of the SDR program. This is attractive because FAA currently recognizes the deficiencies in the program, has begun to address some problems, and plans to correct others. However, under FAA management, the SDR program would continue to draw data from the experiences of U.S. carriers only instead of from all the world's carriers. This reduces the available data by about 50 percent.[2] In addition, over the past 2 decades, FAA has not managed the program effectively. And, although it has begun to address some problems, FAA has shown little evidence of improving the program's usefulness to its users since the internal review began in April 1990.

Develop a manufacturer-based, global reporting system. This alternative would allow a more complete data base to be developed because service difficulties would come from the world's fleet rather than from the U.S. fleet. This option also would enjoy the benefits of in-house technical and product expertise that ensure quicker and more in-depth recognition of the relationship that service difficulties have to safety. The timeliness of reporting would be enhanced by the efficient communications network that manufacturers have established with their airline customers. On the other hand, manufacturers are concerned that their managing of

[2]According to Aviation Data Services, Inc., of 7,334 U.S.-manufactured aircraft in operation, 3,893 (53 percent) were U.S.-registered and 3,441 (47 percent) were registered outside the United States, as of March 1990.

the SDR program would be perceived by the airlines as a regulatory role and could damage the relationship they have with their airline customers and restrict the free flow of data they now enjoy. They also believe that questions of whether they are liable for not acting appropriately on data they obtain from airlines need to be answered before this option can be implemented. In addition, FAA would incur nominal contract costs under this option.

Management of the SDR program by an independent entity. Under this option, the SDR program could be redesigned from scratch and operated under contract to FAA. A greater degree of efficiency could be assumed because of the private sector profit motive. The program could eventually be operated cost-free to the government if timeliness, accuracy, and analysis were sufficient enough for users to pay a fee for the data. However, a global data collection system would still be difficult because obtaining timely and consistent data from foreign air carriers might be problematic. This option would represent a direct cost to FAA unless sufficient user fees could be generated.

Reliable SDR Program Would Be Useful in Other Areas

In addition to alerting the industry to potential safety problems, a reliable malfunction data base could help FAA and the Department of Transportation (DOT) to accomplish other goals. For example, it could assist FAA in assigning its inspection work force to areas where the highest return can be obtained. In the past, we have reported that without agencywide guidance, inspectors throughout the United States were applying different criteria to determine the types of inspections that airlines should receive.[3] To avoid this and to more effectively allocate its limited inspection resources, we previously recommended that the Secretary of Transportation require the development of operational measures of effectiveness to provide the basis for setting program objectives and monitoring performance.[4] An accurate and timely safety alert program should contribute to developing such measures. According to DOT, actions to address this recommendation are underway.

In another area, DOT analysts are reviewing activities within the Department related to airline flight delays and are interested in using the SDR

[3]Aviation Safety: Needed Improvements in FAA's Airline Inspection Program Are Underway (GAO/RCED-87-62, May 19, 1987).

[4]See Department of Transportation: Enhancing Policy and Program Effectiveness Through Improved Management (GAO/RCED-87-3, Apr. 13, 1987), pp. 23 and 34.

program data. One of their interests is in verifying the accuracy of airline reports that flight delays were caused by mechanical problems with aircraft. Reliable, computerized SDR data could add confidence to airline reports of mechanical difficulties.

Conclusions

FAA intended that the SDR program provide the aviation community with a means of warning the industry of safety problems with individual aircraft as well as potential fleetwide problems. Indeed, the general aviation community and a few other users find some benefit from the program. However, most major airlines and FAA engineers and inspectors that we contacted said that it is of little value. The program is ineffective because the information it provides is neither complete, timely, nor useful. These problems can be attributed to ambiguous regulations, airlines' fear of submitting malfunction data to a public data base, the cumbersome nature of the paper-based process, and the lack of SDR data analysis.

Three alternatives for the future of the SDR program have been proposed. FAA believes that it should continue managing the program and can correct its deficiencies by adopting the steering committee's recommendations. The committee, on the other hand, has recognized the advantages of allowing the program to be managed by the major manufacturers to take advantage of the global communication network they have with the operators of their aircraft. And a third alternative would be to have an independent organization manage the SDR program. Several policy issues, including the impact that a manufacturer-managed program would have on the manufacturer-airline relationship and the existence of additional liability for the manufacturer, would need to be further explored before this option could be adopted.

Recommendations

We recommend that the Secretary of Transportation direct the Administrator, FAA, to examine various alternatives for managing the agency's SDR program and to select one that most effectively achieves the program's goals. In addition to the alternative of FAA's continuing to manage the program, the Administrator should consider the feasibility of contracting with either the major engine and airframe manufacturers or a private, independent organization to manage the SDR program.

We also recommend that the Administrator, FAA, report on his decision regarding SDR management alternatives to the Chairman, Subcommittee

on Aviation, Senate Committee on Commerce, Science, and Transportation, no later than August 31, 1991.

Agency's and Others' Comments

We provided a draft of this report to DOT, FAA, the Air Transport Association, the Aerospace Industries Association that represents airframe and engine manufacturers, the Boeing Commercial Airplane Company, and Douglas Aircraft Company. The comments we received generally agreed with our conclusion that the SDR program is not as effective as it should be and that its usefulness is limited. Some of those that commented on the report were concerned, however, with the efficacy of a recommendation in our draft report that the SDR program be operated and managed by the equipment manufacturers and encompass a global data collection effort. For example, FAA believed that its lack of regulatory authority over foreign carriers would not allow it to develop a global program. And manufacturers feared the damage that might be done to the positive relationship they now have with airlines if they assumed a quasi-regulatory role. On the basis of these concerns, we modified our position to recommend that FAA examine several alternative approaches to managing the SDR program and report its findings to the Congress.

To determine the usefulness of the SDR program to FAA and the airlines, we conducted standardized, face-to-face interviews with 64 of the 75 FAA engineers responsible for the certification of large aircraft. The remaining 11 FAA engineers were not available during our interviewing period. We also conducted standardized telephone interviews with airline officials from the 12 largest airlines in terms of passenger revenue and with FAA principal maintenance inspectors assigned to those airlines. We discussed the SDR program's operation and effectiveness with FAA officials from the Aviation Standards National Field Office in Oklahoma City, Oklahoma, and reviewed portions of over 24,000 SDR reports filed with this office during 1987-89.

To obtain the aviation industry's perspective, we interviewed officials from the Boeing Company, Douglas Company, and Airworthiness Assurance Task Force. We conducted our review between July 1989 and December 1990 in accordance with generally accepted government auditing standards.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days from

the date of this letter. At that time, we will send copies to the Secretary of Transportation; the Administrator, FAA; the Director, Office of Management and Budget; and other interested parties. Copies also will be provided to others upon request. Our work was performed under the direction of Kenneth M. Mead, Director of Transportation Issues, (202) 275-1000. Major contributors to this report are listed in appendix I.

J. Dexter Peach
Assistant Comptroller General

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