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STATEMENT OF

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BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

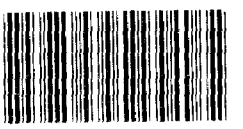
OF THE

HOUSE COMMITTEE ON

PUBLIC WORKS AND TRANSPORTATION

ON

FAA's ROLE IN DEVELOPING A MID-AIR COLLISION-AVOIDANCE SYSTEM



Mr. Chairman and Members of the Subcommittee:

We appreciate this opportunity to share with you today our observations regarding the Federal Aviation Administration's (FAA's) role in developing a viable mid-air collision-avoidance system.

Last week, FAA's Administrator announced his intention to mandate the use of FAA's Traffic Alert and Collision Avoidance System, or TCAS, on all commercial aircraft, possibly as early as 1989. The availability of such a system to help commercial pilots avoid mid-air collisions will culminate an effort started more than 30 years ago.

At Senator Exon's request, we issued a report detailing FAA's role in developing mid-air collision-avoidance systems in April of this year.[1] Our statement today is based on that report and our continuing work on this issue.

Controversy still surrounds FAA's 1976 decision to pursue its own system rather than fund one that was being developed commercially. This controversy remains largely because the technical problems associated with developing FAA's system have proved to be much more complex and time-consuming than originally anticipated. Our work has shown, however, that FAA's decision was supported by the aviation community and that, while a number of technical problems have delayed the commercial availability of FAA's system, these problems have apparently been solved. Significant issues must still be addressed, however, during the testing and certification process before FAA's system is ready for commercial use.

CHRONOLOGY TO DATE OF FAA INVOLVEMENT IN DEVELOPING A MID-AIR COLLISION-AVOIDANCE SYSTEM

The airline industry began searching for a workable mid-air collision-avoidance system in 1955. They believed that such a system was needed to provide an independent back-up to FAA's ground-based air traffic control system and to provide aircraft separation assurance in airspace outside FAA's control.

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[1] Air Safety: Federal Aviation Administration's Role in Developing Mid-Air Collision Avoidance Back-Up Systems (GAO/RCED-86-105FS, April 22, 1986).

By the 1970's private industry was developing several different systems. After testing three, FAA decided that the Honeywell AVOIDS was the most promising, but even it had shortcomings. While the technical problems found with AVOIDS were correctable, the most serious shortcoming in all three systems FAA tested was that converging aircraft would only be warned of each other's proximity if they were both equipped with the system. Since no aircraft had AVOIDS, FAA surmised that a federal mandate would have been required to ensure that the system was installed in enough aircraft to provide an adequate level of protection.

Conversely, commercial aircraft equipped with FAA's system, then called the Beacon Collision Avoidance System, or BCAS, would be warned of the proximity of all other aircraft having a transponder and would receive recommended collision-avoidance maneuvers if the other aircraft had an altitude encoder. Since over 100,000 aircraft, or about 65 percent of the air fleet, already had transponders (required by FAA for flying in certain airspace), FAA believed that its system would offer more immediate protection at less cost to the aviation community and that an adequate level of protection could be obtained without mandating the system's purchase by all aircraft owners. Polls of aircraft owner and user groups in 1976 and 1979 showed that FAA's decision held substantial aviation community support.

Assuming that all commercial air carriers would buy the FAA system and that all other aircraft would purchase and install

altitude-encoding transponders, FAA estimated that BCAS would cost the aviation community $270 million. In contrast, FAA estimated that the Honeywell AVOIDS system would cost $600 million if all aircraft owners were required to buy it.

Honeywell stopped development of its AVOIDS system soon after FAA decided to proceed with BCAS. In the intervening 10 years, FAA has encountered a number of technical problems that have slowed the development of its system, now called TCAS. In June 1981, FAA's Administrator announced that TCAS would be the national standard for mid-air collision avoidance, and that the system would be operational nationwide by mid-1985 at the latest. While this announcement was overly optimistic, it now appears that the known technical problems with the system have been solved. Testing the system in an operational environment and certification are all that remain before at least one model of TCAS can be commercially produced.

FAA's plans currently call for three TCAS models, designated TCAS I, TCAS II, and TCAS III. TCAS I, the least sophisticated model, is to provide traffic-proximity warnings but no recommended collision-avoidance maneuvers. It is designed for use primarily by general aviation aircraft. TCAS II and TCAS III are intended primarily for airline, commuter, and corporate jet aircraft. These systems provide the pilot with the threatening aircraft's position and recommend collision-avoidance maneuvers. TCAS II recommends only vertical (climb or descend) maneuvers while TCAS III recommends both

vertical and horizontal maneuvers. FAA's current price goals for each of the TCAS models are:

--TCAS I, $4,000 to $15,000;

--TCAS II, $50,000 to $60,000; and

--TCAS III, $70,000 to $90,000.

Some program and industry officials feel, however, that actual costs could be higher by the time the TCAS models reach the marketplace.

WHERE IS TCAS TODAY?

FAA plans to limit its development of TCAS I and III to producing the engineering data necessary to develop minimal operational performance specifications that industry will then be able to use to produce equipment that will meet FAA standards. FAA's involvement in the design, development, and testing of these models is scheduled to end in December 1986 and September 1987, respectively.

FAA's primary emphasis has been on complete development and testing of TCAS II for air transport use. The development and testing left to be done on TCAS II is now being conducted by two commercial industry/airline teams (Allied Bendix Corporation with United and Republic Airlines, and Sperry, Dalmo, Victor Corporation with Piedmont Airlines), with the FAA engineering group in a support role.

FAA intends to end its developmental role in TCAS after TCAS II has been tested for operational and engineering acceptability in scheduled airline service, now estimated to be June 1988. Program officials estimate that when the TCAS II program

is complete, FAA will have spent $128 million developing mid-air collision-avoidance systems, $77 million of which was for TCAS.

FAA planned three phases of operational testing for TCAS II. The first phase is completed and involved computer simulations and flight tests that did not include pilot response to the system. The second phase is to test a single unit in an operational environment, including pilot response. The third phase is a limited installation program involving 14 units to be used in operational environments.

TCAS II is entering the second phase of testing in a Piedmont aircraft, but several significant issues remain to be resolved. For example, an unexpected 3-month delay in the start of the second phase of operational testing has occurred because of a dispute about whether FAA should require prior simulator training for pilots who are participating in the test. Both United and Republic have indicated their possible withdrawal from partipating in the third phase operational tests unless signs of satisfactory resolution of the pilot training issue are seen by the end of this month. It is our understanding that FAA and Piedmont are currently pursuing a compromise solution that would involve strengthening the ground-school training for TCAS II in lieu of simulator training.

The second phase testing was originally scheduled to last for a year and was to be completed before the third phase began. The current 3-month delay will mean that either the second phase of testing will have to be shortened or the third phase will have to be delayed.

In addition, the airlines participating in TCAS testing have stated that they view the ability to use TCAS in instrument-flight-rule (IFR) conditions as a primary requirement for the system. And, they believe that IFR certification will have to be obtained for TCAS before the system is acceptable for air transport use. The second phase of testing, however, restricts operations to visual-flight-rule (VFR) conditions only. FAA has not decided whether to approve TCAS for IFR conditions in the third testing phase.

WHAT LIES AHEAD?

The aviation community has recently raised concerns about which TCAS system will best serve its needs and questions regarding FAA's proper role in designing, developing, testing, certifying, and mandating the use of avionics systems, such as TCAS, have also cropped up.

Which TCAS?

The Air Transport Association believes that TCAS II offers the greatest potential for early availability of an acceptable mid-air collision avoidance system. However, the Air Line Pilots Association (ALPA) and the Aircraft Owners and Pilots Association (AOPA) have stated that only TCAS III, with its horizontal and vertical recommended collision-avoidance maneuvers, will adequately meet aviation needs. ALPA would like FAA to shift its emphasis from developing TCAS II to developing TCAS III and continue funding research and development until it is proved suitable for use in scheduled airline service. The

National Business Aircraft Association and one of the airlines participating in TCAS testing have expressed a similar view.

While FAA plans full development and testing only for TCAS II, the House recently included $3 million in FAA's fiscal year 1987 budget specifically for the initiation of TCAS III operational testing. We have been told by program officials that this will provide the initial funding necessary for further development and testing of the computer logic needed for horizontal mid-air collision avoidance maneuvers. However, these program officials also said that another 4 to 5 years and $25 to $30 million would be required before TCAS III would be ready for certification testing.

TCAS II offers the earliest mid-air collision-avoidance protection. On the other hand, there is some concern that TCAS III will never be fully developed if TCAS II becomes commercially available first. While we understand that FAA does not intend to specify whether TCAS II or III is required under its proposed mandate, industry may not be willing to fund $25 to $30 million in development costs for TCAS III if most of the market has already acquired TCAS II. Also, it does not seem likely that airlines will be anxious to re-equip with TCAS III after they have already bought TCAS II unless TCAS III is an easily installed and affordable upgrade to TCAS II.

Will TCAS I ever be available?

TCAS I may face a similar fate. Most mid-air collisions each year involve two general aviation aircraft flying into each

other; and AOPA doubts that a system that does not provide recommended mid-air collision-avoidance maneuvers can adequately meet general aviation needs. TCAS program officials also told us there seems to be little general aviation interest in TCAS I, and industry officials involved in TCAS development and testing doubt that TCAS I will ever become a marketable product. AOPA's vice president for aviation policy said that for general aviation pilots to voluntarily purchase TCAS I, it would have to provide a significant increase in flight safety at a reasonable cost.

FAA's involvement in both R&D and certification may be creating problems

FAA's involvement in TCAS research and development has been unusual in that it has been conducted in-house by FAA's TCAS program engineering group instead of by private industry. Through its Office of Airworthiness, certification of TCAS' effectiveness is also FAA's responsibility.

Some TCAS program officials feel that FAA's involvement in research and development has resulted in over-cautiousness by the Office of Airworthiness in the certification process, and that TCAS is being subjected to much more scrutiny than it otherwise would have been.

Another kind of problem involves product liability. FAA officials told us they are concerned that if a mid-air collision should occur because pilots follow a faulty TCAS resolution advisory, FAA may have to accept responsibility and liability

for the collision. They also think the issue of product liability would have been a major concern for private industry if it had developed the system.

We plan to explore these issues further in our continuing work for Senator Exon.

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This concludes my testimony, Mr. Chairman. I will be happy to answer any questions you may have at this time.