DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No. 26886; Notice No. 92-6]

RIN: 2120-AE27

Air Traffic Control Radar Beacon System and Mode S Transponder Requirements in the National Airspace System

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: The FAA proposes to rescind the Mode S transponder requirement for aircraft operating under part 91 of the Federal Aviation Regulations. The Mode S ground sensors, the bulwark of the Mode S system, are not expected to be fully operational until late 1995. Therefore, requiring all aircraft to have Mode S transponders at this time is not essential for a safe and efficient National Airspace System. Additionally, the Air Traffic Subcommittee, an entity of the Aviation Rulemaking Advisory Committee, has recommended that the FAA further study the Mode S transponder requirements for general aviation operators. Until the installation of the Mode S ground sensors and the recommended studies are completed, the FAA has determined that it is not in the public interest to require that any transponder newly installed in an aircraft after July 1, 1992, be a Mode S transponder.

DATES: Comments must be submitted on or before June 29, 1992. Because of the impending effective date of July 1, 1992, for § 91.215(a), the FAA will not be able to entertain requests for extensions of the comment period. However, late-filed comments will be considered to the extent practicable.

ADDRESSES: Comments on this notice should be mailed, in triplicate, to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket (AGC-10), Docket No. 26886, 800 Independence Avenue, SW., Washington, DC 20591. Comments delivered must be marked Docket No. 26886. Comments may be examined in room 915G weekdays between 8:30 a.m. and 5 p.m., except on Federal holidays.

FOR FURTHER INFORMATION CONTACT: Mr. Aaron I. Boxer, Air Traffic Rules Branch, ATP-230, Airspace Rules and Aeronautical Information Division, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone (202) 267-8783.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting proposal in this notice are also invited. Substantive comments should be accompanied by cost estimates. Comments should identify the regulatory docket or notice number and should be submitted in triplicate to the Rules Docket address specified above. All comments received, as well as a report summarizing any substantive public contact with the Federal Aviation Administration (FAA) personnel on this rulemaking, will be filed in the docket. The docket is available for public inspection before and after the comment closing date.

Before taking final action on the proposal, the Administrator will consider comments made on or before the comment closing date. The proposal may be changed in light of the comments received.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. 26886." The postcard will be date stamped and mailed to the commenter.

Availability of NPRMs

Any person may obtain a copy of this NPRM by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Inquiry Center, APA-430, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267-3484. Communications must identify the notice number of this NPRM.

Persons interested in being placed on the mailing list for future NPRMs should request from the above office a copy of Advisory Circular No. 11-2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

Definitions

The Mode A transponder consists of a radio receiver/transmitter that responds to radar pulses from radar ground sensors. It forms one component of the radar system used in air traffic control. The Mode A transponder can be set to transmit one of 4,096 distinct radar codes in response to a radar pulse sent by a radar ground sensor. The ground sensor receives the distinct transmission and an amplified return indicates the aircraft's position on the controller's radar scope.

The Mode S transponder is an advanced version of the Mode A transponder. In addition to providing the reliability of solid state circuitry, Mode S transponders can transmit a discrete set of radio pulses (codes) from each aircraft. In conjunction with Mode S ground sensors, a system of nearly interference-free radar transmission and reception will exist. The Mode S transponder is completely interoperative and compatible with existing ground sensors. The Mode A transponder is similarly compatible with Mode S ground sensors.

The Mode S Rule

In 1982 the FAA announced a comprehensive plan to modernize and improve air traffic control and airway facilities. One part of the comprehensive plan included introducing the Mode S system. In an advanced notice of proposed Rulemaking (48 FR 48364, October 18, 1983), the FAA stated that improved surveillance reliability and accuracy would be a central objective of the Mode S system. Mode S transponders were considered an integral link in the system, furnishing accurate, reliable and positive air traffic control information on aircraft identity, position, and altitude. At that time, the first 137 Mode S ground sensors were expected to be on-line by 1991. Therefore, the Mode S transponder requirement was promulgated with a final rule published February 3, 1987 (Amendment No. 91-198; 52 FR 3380). This final rule required that any transponder newly installed in a general aviation aircraft before January 1, 1992, could be a Mode A or Mode S transponder, provided the transponder was manufactured prior to January 1, 1990. After January 1, 1992, only Mode S transponders could be newly installed in general aviation aircraft.

Due to difficulties in manufacturing Mode S transponders, the FAA amended the installation and manufacturing cutoff dates to July 1, 1992, and January 1, 1991, respectively (Amendment No. 91-210; 54 FR 25681, June 16, 1989). On January 4, 1991, the FAA removed the manufacturing cutoff date associated with the Mode S transponder requirement in response to inventory shortfalls reported by transponder manufacturers (Amendment No. 91-221; 56 FR 467). The testing and installation

schedule of Mode S ground sensors was also experiencing delays.

Section 91.215(a) of the FAR currently provides, in part, that any transponder installed in a U.S.-registered civil general aviation aircraft up to and including July 1, 1992, must meet the performance and environmental requirements of any class of the following technical standard orders (TSOs): TSO–C74b (Mode A) or TSO–C74c (Mode A with altitude reporting capability), as appropriate, or the appropriate class of TSO–C112 (Mode S). Any transponder newly installed in an aircraft after July 1, 1992, must meet the standard of the appropriate class of TSO–C112 (Mode S).

Discussion

The Mode S system is designed to alleviate deficiencies in the current radar system. The deficiencies include synchronous garble, loss of target and altitude integrity, and beacon code requirements approaching the limitations of the existing technology. Of the two components in the Mode S system (i.e., the ground sensor and the transponder), the ground sensor is more critical in alleviating these deficiencies.

Synchronous garble occurs when the ground sensor interrogating two aircraft near one another cannot distinguish between their respective signals. The system then does not display information, or displays erroneous information, on the air traffic controller radar scope. This condition is most likely to hamper air traffic services in areas of high density aircraft activity such as Terminal Control Areas and Airport Radar Service Areas. The latest studies do not indicate to what degree this problem will be eliminated by Mode S ground sensors alone as compared to Mode S ground sensors combined with Mode S transponders. The FAA will analyze results from a study of the first operational Mode S ground sensor to determine, in a system environment, the improvements attributable solely to the new sensor in surveillance integrity and controller workload.

Target and altitude integrity expresses the ability of the radar system to distinguish between transmissions received from two different aircraft. The radar system transmits interrogation signals, and all transponder-equipped aircraft receiving the signal reply with a distinct code and, if so equipped, report the aircraft's altitude. As described earlier, the ability of the current system to distinguish between two signals is affected by the proximity of aircraft to each other. Terrain, signal strength of the aircraft transponder equipment, and environmental factors can also derogate the ability of the ground sensor to determine the position and altitude of an aircraft. A 1977 FAA sponsored study determined that the existing radar ground sensors provided an overall target and altitude integrity of 82 to 87 percent. The same study indicated that, due to a narrower, more focused interrogation signal, use of Mode S ground sensors with Mode A transponder equipment could improve integrity to 96 percent.

A homogeneous Mode S system, consisting of both Mode S ground sensors and transponders, will vastly improve accuracy in the surveillance of aircraft position and reduce interference in identity reports transmitted to air traffic controllers. The range accuracy of existing sensors is 729 feet. In other words, when two aircraft are on the same bearing from an existing sensor and are less than 729 feet apart, one of the targets might not be displayed on the controller's radar scope. When the Mode S system is fully implemented, the targets of those aircraft can be expected to be displayed separately on the controller's radar scope even when those aircraft are only 25 feet apart. Similarly, azimuth accuracy will improve with the Mode S system. To illustrate, when two aircraft are equal distances from a sensor in the existing system, they must be at least .23 degrees of azimuth apart before both targets would be displayed. With the Mode S system, those same aircraft need only be apart by .06 degrees of azimuth. The 1976 study postulated that a homogeneous Mode S environment (Mode S ground sensors and transponders) would increase integrity to more than 99 percent. Recent FAA tests of the Mode S ground sensors have verified these figures. The study to be performed following installation of the first ground sensor will confirm the degree of integrity and accuracy of Mode S ground sensors in an on-line system environment of Mode A and Mode S transponders.

As the number of aircraft being handled in the National Airspace System increases, the number of codes required will eventually exceed the current limit of 4,096 discreet codes. The controllers assign radar codes, used to track aircraft position and altitude, to aircraft receiving air traffic services. The Mode S transponder is not limited to 4,096 possible codes. A Mode S transponder allows air traffic control to assign, transmit, and receive a radar code for each individual aircraft. Since commercial aircraft, requiring approximately 75 percent of the discreet codes assigned, are already installing Mode S transponders, the strain on the current transponder technology limits will be mitigated when the individually assigned radar code feature of Mode S is utilized.

Need for Rulemaking

The FAA has contracted to buy 137 Mode S ground sensors, which are crucial elements of the Mode S system. Because the sensors are not expected to be fully operational until late 1995 or early 1996, the more costly Mode S transponder equipment is not yet necessary for general aviation aircraft. As the Mode S ground sensors become operational and the vast majority of the commercial fleet becomes equipped with Mode S transponders, the need for general aviation aircraft to use Mode S transponders may be further diminished. Future testing, as Mode S ground sensors come on-line, will confirm the extent of this need.

The FAA has also received recommendations for further study of the Mode S transponder requirement. On January 22, 1991, the Aviation Rulemaking Advisory Committee (ARAC) was established (56 FR 2190). The ARAC consists of 59 aviation related organizations brought together to advise the FAA on various regulatory issues. The FAA asked the Air Traffic Subcommittee, an element of the ARAC, to examine the current Mode S requirements for aircraft operating under part 91. The Air Traffic Subcommittee recommended that the FAA: (1) Change the requirements of § 91.215 of the FAR to require installation of Mode S transponders on newly manufactured, type certificated aircraft after July 1, 1996; (2) exempt balloons, gliders, and other aircraft with electrical limitations from the rule; (3) conduct a study of the first Mode S ground sensor installed to determine the extent of benefits derived from the ground sensor alone; (4) publish a progress report within six months after the commissioning of the ground sensor, giving an expected completion date of the study; and (5) examine the costs and benefits of requiring Mode S transponder equipage in specific airspace areas needing such treatment.

The FAA agrees with the ARAC's suggestion that the requirement to install Mode S transponders in general aviation aircraft after July 1, 1992, may exceed the minimum requirements of the present and immediate future for a safe and efficient National Airspace System. While areas of high density aircraft activity might benefit from the improved target and altitude integrity of the Mode S system, many portions of airspace over the country might not require a

homogeneous Mode S environment before the next century. The recommended study, which the FAA is about to undertake, will show whether the problems that would be solved by a homogeneous Mode S environment are significant enough to warrant mandatory general aviation equipage for operation in all airspace.

The Proposal

Until the FAA completes the study to reevaluate the specific need and benefit of Mode S transponder equipage on general aviation aircraft, it proposes to rescind the Mode S transponder requirement for aircraft operating under Part 91 of the Federal Aviation Regulations.

Regulatory Evaluation Summary

This section summarizes the regulatory evaluation prepared by the FAA. The regulatory evaluation provides more detailed information on estimates of the potential economic consequences of this proposal. This summary and the evaluation quantify, to the extent practicable, the estimated costs of the proposal to the private sector, consumers, and Federal, State, and local governments, and also the anticipated benefits.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual effect on the economy of $100 million or more, a major increase in consumer costs, or a significant adverse effect on competition.

The FAA has determined that this proposal is not "major" as defined in the executive order. Therefore, a full regulatory impact analysis, which includes the identification and evaluation of cost-reducing alternatives to the proposal, has not been prepared. Instead, the Agency has prepared a more concise document termed a "regulatory evaluation," which analyzes only this proposed rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains an initial regulatory flexibility determination required by the Regulatory Flexibility Act of 1980 (P.L. 96-354) and an international trade impact assessment. For more detailed economic information than this summary contains, the reader should consult the regulatory evaluation contained in the docket.

Benefits

The proposed rule would generate benefits in the form of cost relief to part 91 operators who would be required to install Mode S transponders in their aircraft after July 1, 1992. These benefits are estimated to range from $31 million to $63 million (discounted, 1991 dollars). The methodology used to derive this range of potential benefits is discussed below.

This evaluation employed two steps to derive the potential benefits of the proposed rule. First, it was necessary to determine the number of general aviation aircraft operators who would be impacted and the extent they would be impacted. This information was obtained by contacting a number of industry representatives (i.e., transponder manufacturers, fixed based operators (FBOs), and trade associations). The General Aviation Manufacturers Association (GAMA) was contacted for information related to the number of transponders purchased annually by general aviation operators (namely, those operators with small, single-engine, piston aircraft). Based largely on information prepared by GAMA, the FAA estimates that sales of transponders (such as ATCRBS) to general aviation operators averaged about 4,000 per year between 1983 and 1987.

From 1988 to 1991, transponder sales to general aviation aircraft operators averaged approximately 7,700 per year. Sales of these transponders peaked at approximately 8,900 units in 1989. For the purpose of this evaluation, sales of these transponders only up to 4,000 between 1988 and 1991 will be counted to exclude sales attributable solely to the Mode C rule. The number of transponders sold between 1983 and 1987 is considered to be more indicative of normal sales. Therefore, the estimate of 4,000 has been used as a means of projecting the number of annual transponders sales between 1992 and 2006. This estimate represents the number of new transponders installed annually by general aviation aircraft operators. Over the next 15 years, an estimated 58,000 transponders could be purchased primarily by small general aviation aircraft operators. However, not all of these transponders would be purchased by general aviation operators after July 1, 1992. The FAA contends that at least half of these general aviation operators would elect to have their existing transponders repaired for under $500 rather than pay five or six times this price for a newly installed Mode S transponder. The current Mode S rule will only impact operators who plan to install any type of new transponder, after July 1, 1992.

Because of the lack of precision associated with this assessment, the FAA estimates that 29,000 to 58,000 Mode S transponder purchases would be affected by the proposed rule over the next 15 years.

The low end of this range represents a scenario that assumes demand for Mode S transponders would drop by at least 50 percent after July 1, 1992. This assessment is based largely on information received from GAMA and conversations with general aviation pilots, who were asked, "In view of the fact that Mode S ground sensor sites will not be in place before late 1995 or early 1996, coupled with the fact that the Mode S rule for general aviation operators takes effect on July 1, 1992, what would be the impact on the annual sales of transponders?" All respondents indicated that the demand for Mode S transponders would drop by 50 to 75 percent for those reasons stated earlier. The high end of this range represents a scenario that assumes demand for transponders would not change from the historical annual sales average of 4,000 units.

The next step in deriving an estimate of potential benefits involved contacting a number of Mode S transponder manufacturers and FBOs. These industry representatives were contacted for the purpose of obtaining cost estimates of acquiring and installing Mode S transponders (without data link capability). According to these industry representatives, the average price (including installation) of a panel mounted Mode S transponder (without data link capability) for a small general aviation aircraft is $3,500 compared to $1,300 to $1,800 for a Mode A or Mode C transponder (in 1991 dollars). The average difference between a Mode T and a Mode A or C transponder is estimated to be $2,000. The representatives also indicated that the cost for biennial maintenance for a Mode S transponder is estimated to be the same as that for a Mode A transponder (ATCRBS). The biennial maintenance cost estimate for a Mode A transponder is about $60.

Since general aviation aircraft operators are expected to purchase an estimated 4,000 ATCRBS transponders (with and without Mode C capability) annually, over the next 15 years, at an estimated average price of $1,500, the incremental cost of compliance with the current Mode S rule is expected to be

$2,000 ($3,500 less $1,500). This evaluation assumes that general aviation aircraft operators would purchase these ATCRBS transponders in the absence of the current Mode S rule. Therefore, rescinding the Mode S requirement for Part 91 operators would save them an estimated $2,000 each time they replace their existing ATCRBS transponder with a new one.

From July 1, 1992 to December 30, 2006, the proposed rule is expected to generate potential cost relief benefits ranging from estimates of $58 million (29,000 × $2,000) to $116 million (58,000 × $2,000). Discounted over this 15-year period (using an interest rate of 10 percent), benefits could range from an estimated $31 million to $63 million.

Costs

The proposed rule is not expected to impose any costs (monetary or safety) on either Mode S transponder manufacturers or society. This assessment is based on rationale contained in the following sections.

Cost Impact on Mode S Transponder Manufacturers

The proposed rule would only rescind the Mode S rule requirements for Part 91 operators, and it would not impose any future requirements or costs on manufacturers of panel mounted Mode S transponders. However, some of these manufacturers have incurred costs for developing panel mounted Model S transponders in response to the existing Mode S rule. Such costs, which range from $2 million to $4 million (undiscounted), are sunk. Once an investment is made and cannot be altered, it is referred to as sunk costs. In rulemaking, the economic evaluation considers only future costs as opposed to sunk costs (or passed costs). Even though some manufacturers of panel mounted Mode S transponders cannot recover their development costs, the FAA has determined that the net benefit of the proposed rule is in the interest of the public.

Cost Impact on Society

The proposed rule would not impose societal costs in the form of an unacceptable decrease in aviation safety. An integral part of the Mode S rule is the ground sensor. These sensors, when combined with aircraft equipped with Mode S transponders, better enable Air Traffic Control to track aircraft positions and provide more interference-free identity reports of targets. This situation would enhance aviation safety by reducing the likelihood of mid-air collisions as the result of having more accurate target information. Since the first phase of 137 ground sensors will not be operational until either late 1995 or early 1996, the full potential benefits of Mode S transponders will not be realized before then. Mode S transponders do, however, complement the traffic alert and collision avoidance system (TCAS) in a manner similar to Mode A transponders. However, without the ground sensors in place, Mode S transponders provide no more benefits than advanced solid state Mode A transponders. Thus, there would not be an unacceptable reduction in aviation safety as the result of the proposed rule. In fact, in some instances, the proposed rule could enhance aviation by allowing the equipage of Mode C transponders rather than the equipage of Mode S transponder with only a Mode A transponder (lacking altitude encoding) capability.

Once the radar ground sensors are in place, aviation safety is expected to be improved by approximately 10 percent over the current radar sensor system. This assessment is based on a 1977 FAA sponsored study which determined that the current radar ground sensors provide an overall target and altitude integrity of 82 to 87 percent. The study also indicated that with Mode S ground sensors and current aircraft transponder equipment (namely, either Mode A or Mode C transponders), integrity would improve to 96 percent. The study went on to postulate that with a homogeneous Mode S environment, consisting of Mode S ground sensors and transponders, integrity would exceed 99 percent. Thus, Mode S transponders would add another 3 percent of improvement to aviation safety.

The final rules for TCAS and Mode C transponders have already achieved much of the improvement in aviation safety expected from the Mode S transponder requirement in the form of lowering the likelihood of mid-air collisions between low and high performance aircraft. While the current Mode S rule will require newly installed transponders for all aircraft to be Mode S, regardless of airspace used, whether such requirements are warranted beyond terminal control areas and airport radar service areas needs to be further ascertained. The need for Part 91 operators to use Mode S transponders should also be confirmed. These issues will be addressed in a separate study following installation of the Mode S ground sensors.

Comparison of Costs and Benefits

Thus, in view of the estimated zero cost of compliance and the estimated cost relief benefits between $31 million and $63 million (discounted), the FAA has determined that the proposed rule is cost-beneficial.

International Trade Impact Statement

The proposed rule would neither have an effect on the sale of foreign aviation products or services in the United States, nor would it have an effect on the sale of United States products or services in foreign countries. This is because the proposed rule would neither impose costs on aircraft operators or aircraft manufacturers (U.S. or foreign).

Initial Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted to ensure that small entities are not unnecessarily and disproportionately burdened by Government regulations. The RFA requires agencies to review proposed rules which may have "a significant economic impact on a substantial number of small entities." As discussed in the costs section of this evaluation, the proposed rule would not impose costs. Therefore, the proposed rule would not have any significant economic impact on a substantial number of small entities.

Federalism Implications

This proposal would not have substantial direct effects on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Paperwork Reduction Act

This proposal would rescind an agency regulation and does not change any reporting requirements.

Conclusion

For the reasons discussed in the preamble and based on the findings in the Initial Regulatory Flexibility Determination and the International Trade Impact Analysis, the FAA has determined that this proposed regulation is not "major" under Executive Order 12291. In addition, the FAA certifies that this proposal, if adopted, would not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This proposal is considered "significant" under DOT Regulatory Policies and Procedures (44 FR 111034; February 26,

1979). A regulatory evaluation of the regulation, including an initial regulatory flexibility determination and international trade impact analysis has been placed in the docket. A copy may be obtained by contacting the person identified under "**FOR FURTHER INFORMATION CONTACT.**"

List of Subjects in 14 CFR Part 91

Air traffic control, Aviation safety.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend part 91 of the Federal Aviation Regulations (14 CFR part 91) as follows:

PART 91—GENERAL OPERATING AND FLIGHT RULES

1. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. app. 1301(7), 1303, 1344, 1348, 1352 through 1355, 1401, 1421 through 1431, 1471, 1472, 1502, 1510, 1522, and 2121 through 2125; articles 12, 29, 31, and 32(a) of the Convention on International Civil Aviation (61 Stat. 1180); 42 U.S.C. 4321 et seq; E.O. 11514, 35 FR 4247, 3 CFR, 1966–1970 Comp., p. 902; 49 U.S.C. 106(g).

2. Section 91.215(a) is revised to read as follows:

§ 91.215 ATC transponder and altitude reporting equipment and use.

(a) *All airspace: U.S.-registered civil aircraft.* For operations not conducted under part 121, 127 or 135 of this chapter, ATC transponder equipment installed must meet the performance and environmental requirements of any class of TSO–C74b or any class of TSO–C74c as appropriate, or the apropriate class of TSO–C112.

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Issued in Washington, DC, on May 26, 1992.

L. Lane Speck,

Director, Air Traffic Rules and Procedures Service.

[FR Doc. 92–12702 Filed 5–27–92; 12:20 pm]

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