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14 CFR Parts 121 and 135

Mode S Transponder Requirements in the National Airspace System; Proposed Rules

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 121 and 135

[Docket No. 28586; Notice No. 96–5]

RIN 2120–AE81

Mode S Transponder Requirements in the National Airspace System

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of proposed rulemaking; withdrawal.

SUMMARY: On May 23, 1996, the Federal Aviation Administration (FAA) proposed to rescind the requirement to install a Mode S transponder on all aircraft operating under parts 135 and those aircraft operating under part 121 of Title 14 of the Code of Federal Regulations that are not equipped with Traffic Collision and Alert System (TCAS) II. The FAA has, however, reassessed the need for retaining this requirement and now withdraws that notice.

DATES: Notice No. 96–5 is withdrawn October 7, 2005.

FOR FURTHER INFORMATION CONTACT: Mr. K. Douglas Davis, Avionic Systems Branch, Aircraft Certification Division, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone (202) 385–4636.

SUPPLEMENTARY INFORMATION: You can get an electronic copy of this document by going to our Web page at *http://www.faa.gov/avr/arm/nprm.htm* or by using the search feature of the **Federal Register**'s Web page at *http://www.access.gpo.gov/su_docs*.

You can get a printed copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267–9680. Please identify the docket number of this final rule.

Background

The FAA published a final rule on February 3, 1987 (52 FR 3380), requiring the installation of Mode S transponders on U.S. registered aircraft. The rule provided that any transponder newly installed before January 1, 1992, in aircraft used for operations under parts 121 and 135 of the Federal Aviation Regulations could be a Mode A or Mode C transponder if the transponder was manufactured prior to January 1, 1990. After January 1, 1992, only Mode S transponders could be newly installed in U.S.-registered civil aircraft operated under Parts 121 and 135. The rule also provided that Mode S transponders were required for Part 91 operations in specified designated airspace.

The FAA delayed the rule's effective date for 6 months until July 1992 due to manufacturing difficulties of Mode S transponders. Additionally, the Air Traffic Issues Group of the Aviation Rulemaking Advisory Committee recommended to the FAA that the Mode S requirement for Part 91 was premature and deserved further study. In light of this recommendation, we reviewed the issue and concluded that the requirement was not necessary for Part 91 operators. Specifically, we determined that ''While areas of high density aircraft activity might benefit from the improved target and altitude integrity of the Mode S system, many portions of the airspace over the country might not require a homogenous Mode S environment for several years.'' Subsequently, we rescinded this equipment requirement for Part 91 operations in 1992 (57 FR 34614; August 5, 1992).

On May 23, 1996, the FAA proposed rescinding the Mode S requirement for Part 135 operators and those Part 121 operators not required to have TCAS II (61 FR 26036). The FAA has reassessed the need for Mode S transponder equipage for these operators in today's transportation system.

FAA Assessment and Review

In the May 1996 NPRM (Notice 96–5), we articulated several reasons for proposing to rescind the Mode S transponder requirement because: (1) The FAA's revised strategy of multiple air-ground data links managed through Aeronautical Telecommunications Network would remove the requirements for Mode S transponders;[1] (2) operational experience with Mode S ground sensors has shown that most surveillance enhancements can be achieved by the Mode S ground sensors with the present mixed population of airborne transponders; and (3) the use of Mode S transponders for aircraft, other than those required to have TCAS II, does not offer, nor is it expected to offer, any significant safety advantage in the current or future environment.

Since Notice 96–5 was published, the National Airspace System (NAS) has experienced significant changes that now necessitate retaining the Mode S transponder requirement. The basis for this requirement, however, has changed due to advances in the technological use of Mode S systems, and the continued growth of aviation traffic. Mode S technology has the largest ground and airborne infrastructure in place. Both industry and the FAA have invested in this infrastructure, and as discussed below, new technology and new safety enhancement programs utilize Mode S. Thus, we conclude that Mode S transponders are necessary for part 135 and part 121 operators (those not required to have TCAS II) and provide benefits beyond those considered in 1996.

Mode S avionics now are available for all types of aircraft from general aviation to heavy commercial aircraft. Virtually all commercial aircraft manufactured within the last 10 years have been equipped with Mode S transponders. In addition, over the last decade, the FAA has modernized many ground-based systems with considerable investment placed on Mode S capability—enhancing the operational picture available to aircrews and air traffic control.

The FAA has developed and implemented safety enhancements that either did not exist at the time that Notice 96–5 was published or that perform better with Mode S transponders than with Mode A or Mode C transponders. Airport Surface Detection 3 (ASDE–3), ASDE–X and Airport Movement Area Safety Systems (AMASS) are the core of supporting surveillance services for airport surfaces at approximately 60 of the busiest airports around the United States. These systems were all implemented after 1996.

ASDE–3 was the first surface detection system to become operational, and when used with the AMASS system, it provides a safety alerting service that warns the controllers of possible runway incursions.

ASDE–X is the next generation of surface detection systems and adds multilateration transponder based surveillance, both ground based and airborne, that is used with ASDE–3. The multilateration capability of ASDE–X allows the system to provide much more reliable overall surveillance than the ASDE–3 AMASS system. Increasing use of Mode A or Mode C transponders in lieu of Mode S transponders will weaken the surveillance capability of an ASDE multilateration system (as discussed below) and increase the risk of false or missed alerts.

The multilateration component of these systems uses fixed wide beam antennas when it interacts with transponders, and is thus more susceptible to synchronous garble and

[1] In our review, we determined that this specific rationale was incorrect. Data link capability is not required and moreover, the use of the Mode S transponder only will not provide that data link services.

Frequent Replies to Unwanted Interrogation Transmissions (FRUIT). FRUIT occurs when one system detects replies that match another system's interrogation. When FRUIT replies are received at the same time as the reply that actually matches the system's interrogation, these replies will garble the matching reply. A combination of the timing of the interrogation and its matching reply allows the development of the surveillance data in determining the location and altitude of the aircraft. The garbling of these transmissions corrupts the surveillance data.

Synchronous garble occurs when a ground sensor or a TCAS (airborne) interrogate Mode A or Mode C aircraft and receive replies from more than one aircraft at the same time. Again, the replies garble each other and their corresponding data may be lost. Reducing the number of Mode A and Mode C transponders will reduce the frequency of this garble and corruption of the data. Mode S systems use addressed interrogations where only one Mode S transponder replies at a time.

We also have found that Mode S transponders perform better than Mode C or Mode A transponders with respect to the Traffic Information Service (TIS). TIS avionics is optional and provides pilots with information on nearby traffic. It operates in Mode S radar systems. The Mode S radar system receives requests from TIS avionics through a Mode S transponder onboard an aircraft. The Mode S radar system processes the request from the TIS avionics and transmits basic traffic information to the requesting aircraft for processing and display to the pilot. This information includes distance and bearing to the traffic, for up to eight aircraft. This information also allows the pilot to look out the window and find the aircraft more effectively.

ADS–B is a system where aircraft automatically transmit surveillance data derived from navigation position data, *e.g.*, GPS. ADS–B, when using the 1090 extended squitter application, uses Mode S transponder transmissions. Just as FRUIT garbles regular transponder reply transmissions, FRUIT will garble these transmissions. Excessive FRUIT will lower the capacity of ADS–B and reduce its usefulness, and any related safety and efficiency benefits.

TCAS is a system installed in aircraft to help avoid midair collisions. Mode A and Mode C transponders can affect TCAS in two ways. First, the TCAS may experience FRUIT, synchronous garble or transponder dead time, which results in reduced ability to detect and track aircraft and provide its collision service effectively. Secondly, the presence of Mode A and Mode C transponders may limit the TCAS's range of operation. The fewer Mode A and Mode C transponders operating around TCAS equipped aircraft, the greater the range the TCAS may operate, which maximizes its safety benefit. Decreasing the numbers of Mode A/C transponders decreases the risk of missed alerts and false alerts.

Mode S provides benefits over Mode C or Mode A transponders during interrogation and transponder dead time. ''Dead time'' is when the transponder is busy. The transponder is kept busy when processing interrogations and preparing/transmitting a reply. The transponder also is kept busy with processing interrogations with an indication to suppress and not transmit an unnecessary reply. In systems such as ASDE–X, FRUIT replies from Mode A and/or Mode C aircraft can be received at the same time as the Mode S reply matching the interrogation. These garbling FRUIT replies can cause the loss of the Mode S reply. While the Mode S protocols prevent data corruption, the ASDE–X system will re-interrogate the Mode S transponder again in an effort to get the needed reply. This increases the transponder's dead time through over-interrogation. The Mode S interrogations also include an indication to Mode A and/or Mode C transponders to suppress and not reply. This protects against synchronous garble. Consequently, while the Mode S interrogations are intended primarily for a Mode S transponder, the Mode A and/or Mode C transponders anywhere near the path from the Mode S transponder to the radar or TCAS will see the suppression indication. Again, as with over interrogation, these transponders are also kept more busy than necessary, which increases their dead time as well.

Overall, the selective interrogation and the superior resolution ability of Mode S eliminates synchronous garble; resolves the effects of over interrogation; simplifies aircraft identification; and allows Mode S integration with new technologies designed to improve efficiency in the NAS.

Since the NPRM, the European Union and similar global coalitions have implemented equipage mandates, including Mode S, to operate in their airspace. Consequently, the FAA is working to synchronize and bridge equipage gaps to ensure that the United States' aviation economic interests around the world are maintained.

Published concurrently with this notice, is a separate notice seeking public comment on a proposed date for the equipage of Mode S transponders for aircraft that have been operating under FAA issued exemptions from this requirement.

Withdrawal of the NPRM

Since Mode S transponders can provide improved safety and efficiency in a more densely populated NAS, the FAA has concluded that the Mode S requirement for Part 135 and certain Part 121 operators remains valid. Therefore, the FAA withdraws NPRM 96–5.

Issued in Washington, DC on September 28, 2005.

James J. Ballough,

Director, Flight Standards Service.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 121 and 135

[Docket No. FAA–2005–22593]

Mode S Transponder Requirements in the National Airspace System

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of policy; request for comments.

SUMMARY: This notice of policy announces the FAA's policy concerning current exemptions from the Mode S transponder equipment requirements under Title 14 of the Code of Federal Regulations §§ 121.345(c) and 135.143(c). Additionally, this notice of policy seeks comments from persons currently holding an exemption from the above regulations on a proposed date for which they must comply with the equipment requirements.

DATES: Comments must be filed no later than November 7, 2005.

ADDRESSES: You may send comments to Docket Number 22593 using any of the following methods:

- DOT Docket Web site: Go to *http://dms.dot.gov* and follow the instructions for sending your comments electronically.
- Government-wide rulemaking Web site: Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- Mail: Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL–401, Washington, DC 20590–001.
- Fax: 1–202–493–2251.
- Hand Delivery: Room PL–401 on the plaza level of the Nassif Building,