

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,

400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Privacy: We will post all comments we receive, without change, to <http://dms.dot.gov>, including any personal information you provide. For more information, see the Privacy Act discussion in the **SUPPLEMENTARY INFORMATION** section of this document.

Docket: To read background documents or comments received, go to <http://dms.dot.gov> at any time or to Room PL-401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Ida Klepper, Office of Rulemaking, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, (202) 267-9677, email: [Ida.Klepper@faa.gov](mailto:Ida.Klepper@faa.gov).

**SUPPLEMENTARY INFORMATION:**

**Background**

Concurrent with the publication of this notice and in a separate part of this **Federal Register** publication, the FAA announces that it is withdrawing Notice No. 96-5, a Notice of Proposed Rulemaking to rescind the Mode S transponder requirements for aircraft operating under Title 14 of the Code of Federal Regulation (CFR) part 135 and aircraft operating under Part 121 that are not required to have Traffic Alert and Collision Avoidance Systems (TCAS) II.

Since Notice 96-5 was published in May 1996, the FAA has granted a number of exemptions to the above referenced sections as the agency progressed toward removing this equipment requirement from all aircraft

except those aircraft operated under Part 121 that have TCAS II. As the agency has revised its long-term plan for Mode S and is retaining this equipment requirement, we want to provide a reasonable timeframe for the exemptions to terminate and for affected operators to comply with the applicable regulations.

**Proposed Termination Date of Exemptions**

We propose that all FAA authorized exemptions of 14 CFR 121.345(c) and 135.143(c) terminate no later than March 1, 2007. Until that date, the FAA will review on a case-by-case basis requests to extend current exemptions to that date. The FAA, however, would not be granting any new exemptions after March 1, 2007. This proposed date would provide affected operators with approximately 18 months to install a Mode S transponder if necessary under §§ 121.345(c) and 135.143(c).

Under paragraphs (c) of §§ 121.345 and 135.143, after January 1, 1992, only Mode S transponders may be newly installed in U.S. registered civil aircraft. Under these regulations, the term "installation" does not include: (1) Temporary installation of a Mode C transponder or substitute equipment as appropriate, during maintenance of the permanent equipment; (2) reinstallation of equipment after temporary removal for maintenance; or (3) for fleet operations, installation of equipment in a fleet aircraft after removal of the equipment for maintenance from another aircraft in the same operator's fleet.

Consequently, the FAA proposes that effective March 1, 2007, if a transponder needs to be permanently replaced it

must be replaced with a Mode S transponder. This does not mean that effective March 1, 2007, operators are required to install Mode S transponders, if they have an operable and appropriate Mode C or Mode A transponder in the aircraft. The current regulation only requires the replacement of a Mode A or C transponder with Mode S when the existing transponder can no longer be repaired. In addition, the FAA notes that if you were (or are) issued an exemption before March 1, 2007, allowing you to install a Mode C transponder on your aircraft, you may use that transponder until it no longer can be repaired and must be replaced with a Mode S. Therefore, if you hold an exemption, any Mode A or C transponder that is installed on or before March 1, 2007, may remain in your aircraft and may continue to be repaired after March 1, 2007. When that Mode A or C transponder can no longer be repaired, it must be replaced with a Mode S transponder. After March 1, 2007, you will not receive an exemption to allow the installation of a Mode A or C transponder to replace a Mode A or C transponder that cannot be repaired.

The FAA invites all affected operators to comment on the proposed date of March 1, 2007, as the latest termination date for authorized exemptions from §§ 121.345(c) and 135.143(c). After that date, any transponder newly installed in U.S. registered aircraft must be Mode S.

Issued in Washington, DC on September 27, 2005.

**Anthony Fazio,**

*Director of Rulemaking.*

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