

MEMORANDUM

U.S. Department
of Transportation
**Federal Aviation
Administration**

Subject: INFORMATION: Policy Statement on Guidance for
Demonstrating Compliance with the Proposed
14 CFR § 121.346, "ATC Transponder Operation"

Date: DRAFT

From: Manager, Transport Airplane Directorate
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Reply to ANM-03-111-12
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Regulatory
Reference: § 121.345(c),
Proposed § 121.346

Summary

The purpose of this memorandum is to provide guidance for an acceptable means of showing compliance with the proposed requirements of 14 CFR § 121.346. Section 121.346 would require all airplanes operated under the provisions of 14 CFR Part 121 to have a means of ensuring quick activation and continuous operation of an aircraft transponder in the event of a hijacking.

This memorandum provides a summary of policy that should be applied when certificating the transponder installations pursuant to the proposed rule. Aircraft Certification Offices (ACO) should apply the policy summarized in this memorandum to such new and amended type certificate (TC) and supplemental type certificate (STC) certification programs. This memorandum ensures a standardized approach in certification independent of ACO or Designated Alteration Station (DAS) geographical location.

Proposed 14 CFR § 121.346 ATC Transponder Operation (NPRM 03-02)

- (a) After March 29, 2005, no person may operate an airplane unless that airplane has the capability to allow each flight crewmember to quickly activate the ATC transponder Mode 3A beacon code "7500" through a single action that includes protection from inadvertent activation.
- (b) Upon activation of the ATC transponder Mode 3A beacon code, as described in paragraph (a) of this section:
 - (1) The ATC transponder must continue to report the airplane's altitude;
 - (2) There must be a visual indication to the flightcrew that the activation has occurred; and
 - (3) A person onboard that airplane must not be able, by reasonable means, to disable the transponder or change its code during the remainder of the flight. In this case, the pilot-in-command need not comply with the requirements of § 91.217(a) of this chapter.

Current Regulatory and Advisory Material

Currently there are two primary transponder configurations on transport category airplanes within the US airspace system: (1) dual Mode S installations, and (2) single Mode S with a second TSO C-74 transponder. Either of these installations may be modified in order to show compliance with proposed § 121.346.

Change 1 to the Minimum Operational Performance Standard (MOPS) DO-181C for Mode S Transponders provides a function allowing the transponder to initiate the hijack mode using a single discrete input. Even with implementation of Change 1 to DO-181C, additional changes to the transponder electrical power source and a possible installation of a discrete switch and annunciation in the flight deck may be needed to complete the hardware modification.

Existing Mode S Transponder airworthiness approval (TC or STC) procedures are addressed by Advisory Circular (AC) 20-131A, "Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II) and Mode S Transponders." Mode S transponders being installed in order to fulfill the requirements of proposed § 121.346, are to be installed in accordance with an approved type design change.

An additional method of complying with § 121.346 is the installation of a controlling unit, which upon activation, will remove control of the ATC transponder from the flight deck and maintain continuous operation of the transponder in hijack mode. This controlling unit may be composed of an additional ATC control panel, third ATC transponder, or a new unit performing the desired operating function. The installation of a new controlling unit, electrical wiring changes, and changes to the flight deck are addressed in the section entitled "Installation of new components" below.

Policy

Proposed § 121.346 would require an operator to provide a means to allow for either pilot, and the flight engineer (if required) to immediately and unambiguously initiate continuous activation of the ATC transponder beacon code "7500." The FAA considers that activation of the function by means of a single action, for example a switch or button, as being a preferred means (but not the only means) of immediate activation. In addition, there should be a means to guard against inadvertent operation of this mode. Therefore, lifting a guarded switch or breaking a frangible wire during the process of activation would not be considered a separate action. Upon activation of the hijack mode, the ATC transponder must operate continuously regardless of any reasonable attempt to deactivate the system utilizing means normally available to the airplane crew.

Safety and operational considerations

Deactivation of the ATC transponder through extreme means, such as removal of significant airplane electrical power that would significantly degrade airplane controllability or obtaining access to a part of the airplane normally not accessible in flight, are not considered a reasonable means for purposes of compliance with this regulation.

If either the ATC transponder or components integral to maintaining the hijack mode of transponder operation are mounted in an area of the airplane that can be readily accessed by the crew or a passenger, then this area must be secured in a manner which prevents unauthorized access.

As part of the compliance method for proposed § 121.346, there must be an annunciation that the hijack mode has been initiated, regardless of whether it was initiated intentionally by the crew, or inadvertently through either a system failure or unintentional crew or maintenance action. The purpose of this annunciation is to allow the flightcrew to check system activation status prior to departure or enroute. Returning the transponder installation to normal operation should only be possible through on-ground maintenance activity.

If an additional ATC transponder is installed solely to meet the requirements of § 121.346, only the ATC transponder selected to transmit the required information shall be active in transmitting Radio Frequency (RF) energy. Radio Frequency transmission from other transponders on the airplane must be inhibited.

In accordance with § 25.1309, there should be a system safety assessment of the installation and its operation. The assessment should address possible negative impacts the modification would have on the performance and reliability of the pre-existing ATC transponder installation.

Installation of new components

1. If a specific installation utilizes additional newly installed components (i.e., control boxes and panels), environmental qualification for those components should be in accordance with Radio Technical Commission for Aeronautics (RTCA) DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment" (or other acceptable means of compliance).
2. If the transponder contains software, the software should be developed and assured to the appropriate software level and guidelines of RTCA DO-178B, "Software Considerations in Airborne Systems and Equipment Certification" (or other acceptable means of compliance).
3. If the transponder contains programmed logic devices (PLD) or application-specific integrated circuits, those devices should be developed and assured to the appropriate hardware design assurance level and guidelines.

of RTCA DO-254, "Design Assurance Guidance for Airborne Electronic Hardware" (or other acceptable means of compliance).

Securing the electrical power source for transponder operation

In order to show compliance with proposed § 121.346, the electrical power source for the transponder installation should provide a degree of protection in maintaining power to the transponders upon activation of the hijack mode. One means, but not the only means, would be to transfer electrical power from the flight deck transponder circuit breakers to a location not accessible during flight. Changes to the airplane wire and wiring installation should be consistent with the original airplane manufacturer's wiring and installation practices.

Federal Aviation Administration policy, ANM-01-04, dated July 2, 2001, entitled "System Wiring Policy for Certification of Part 25 Airplanes," should be followed for the submittal of type design data.

Airplane Flight Manual (AFM), operating procedures, training, Master Minimum Equipment List (MMEL), and instructions for continued airworthiness

1. Airplane Flight Manual (AFM): No changes to the AFM would normally be required when implementing the design changes needed to show compliance with proposed § 121.346. Operating procedures identified in paragraph 2 below should be provided in appropriate document(s), which may or may not include the AFM.

2. Operating Procedures: Each operator should establish procedures:

- For system activation
- Following deliberate activation
- Following inadvertent activation
- For system reset

3. Training: Each operator must train maintenance personnel, crewmembers and dispatchers on system architecture, operation and procedures, as applicable. Principal Operations Inspectors should ensure their assigned operators' approved training program addresses this training for crewmembers in the approved emergency training required by 14 CFR § 121.417(b)(3)(v).

4. Deferral of Inoperative System: Dispatch with the transponder (or transponder function) inoperative is not permitted since § 121.346 requires transponder availability. This is consistent with existing MMEL relief policy which states that a transponder may be inoperative provided enroute operations do not require its use.

5. Instruction for Continued Airworthiness (ICAW): The amended TC or STC package must establish ICAW for the system as part of the installation approval process.

Annunciation of hijack mode to flightcrew

Annunciation as to when the hijack mode has been activated is for status only and is not to be used as an alert for crew action.

Annunciation utilized by any particular installation must provide:

- Pre-departure: Allows the flight crewmembers to assess if there has been inadvertent activation of the system on the ground.
- In flight: Allows the flightcrew to verify activation of the hijack mode when initiated by the crew. Allows the flightcrew to check for inadvertent activation if operation is questioned.

Traffic Collision Avoidance System (TCAS) Resolution Advisories (RA)

While in the hijack mode, some of the installations being developed would result in the TCAS defaulting to a Traffic Advisory (TA) only mode. The Resolution Advisories (RA) coordination function may not be supported while the transponder is in hijack mode. If TCAS switches from TA/RA to TA Only mode as a result of activation of the hijack mode, TCAS should provide annunciation of the mode change.

Airplane test requirements

On the assumption that the transponder installation has been shown to meet the existing ATC transponder equipment criteria required by § 121.345(c), the additional functionality introduced by the proposed § 121.346 may be demonstrated by ground testing, using ramp test equipment where appropriate, that verifies system operation.

Effect of Policy

The general policy stated in this document does not constitute a new regulation or create what the courts refer to as a "binding nor." The office that implements policy should follow this policy when applicable to the specified project. Whenever an applicant's proposed method of compliance is outside this established policy, it must be coordinated with the policy issuing office, e.g., through the issue paper process or equivalent.

Applicants should expect that the certificating officials will consider this information when making findings of compliance relevant to new certificate actions, or actions relating to maintenance, alterations, and repairs. Also, as with all advisory material, this policy statement identifies one means, but not the only means, of compliance.

Questions regarding this memorandum should be directed to Mr. Ken Schroer of the Airplane and Flight Crew Interface Branch, ANM-111. Mr. Schroer's telephone number is (425) 227-1154 and his e-mail address is Kenneth.Schroer@faa.gov.

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