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APPENDIX: 4

BULLETIN TYPE: Flight Standards Information Bulletin (FSIB)  
for Air Transportation (FSAT)

BULLETIN NUMBER: FSAT 94-06

BULLETIN TITLE: Traffic Alert and Collision Avoidance Systems  
(TCAS II) and Nuisance Resolution Advisories  
(RA): Crossing Resolution Advisories

EFFECTIVE DATE: 04-28-94

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1. PURPOSE. This FSIB expands Industry Alert Bulletin #5 (2-18-94) regarding unnecessary crossing RA's.

2. RELATED MATERIAL. Other information on TCAS may be found in AC 120-55 (as revised), in TCAS Transition Program (TTP) Newsletter issues #1-#22, and in Industry Alert Bulletins #1-#5.

3. BACKGROUND. Over the period that TCAS II has been in use TCAS system logic and pilot operating procedures have been changed and refined to meet various needs.

A. One of the more persistent problems related to TCAS II has been nuisance crossing RA's. Variations on this TCAS "fake-out" have been recorded, but the scenario described below is the most common of those resulting in unnecessary crossing RA's:

(1) Two aircraft converge at or near a common geographical arrival/departure point, one in climb, the other in descent;

(2) Air Traffic Control (ATC) has cleared the departing aircraft to 10,000 feet, and the arriving aircraft to 11,000 -- a 1000-foot separation;

(3) Each aircraft has good vertical performance capability (such as the B-737-300/400/500 and the MD-80 and subsequent series);

(4) Each aircraft is in contact with a different air traffic controller, typically a departure controller and an approach controller;

(5) Each aircraft is equipped with TCAS II; and each has a high vertical speed, causing a combined vertical closure speed greater than 3000 feet per minute (fpm);

(6) TCAS II is unable to know flightpath "intent" or ATC clearance instructions;

(7) TCAS II projects a conflict and solves for the safest avoidance action;

(8) TCAS II issues an RA to the climbing aircraft to continue climb and issues an RA to the descending aircraft to continue descent;

(9) When both aircraft are flown according to those RA's, each flies through its assigned altitude before receiving the "Clear of Conflict" advisory;

(10) Each aircraft is now in the wrong ATC sector and off its clearance.

B. Nineteen such crossing RA's have been recorded and analyzed during the time that TCAS II has been in use. A picture has emerged. Two thirds of those crossing RA's have conformed almost exactly with the description above; more than half have occurred at major hub airports where a "corner post" arrangement of arrival/departure fixes may be in use (3 occurrences at ATL; 2 occurrences at DEN; other occurrences at SEA, SLC, ORD, LAX, and DTW).

C. A software remedy is coming this year in accordance with an Airworthiness Directive (AD). That AD requires that a new TCAS system logic, version 6.04A, be installed in all TCAS II-equipped aircraft by December 30, 1994. Among the features of version 6.04A are changes that will modify the alert thresholds triggering crossing RA's. It is expected that nuisance crossing RA's will be substantially reduced if not eliminated.

Until the installation of version 6.04A, pilots may greatly reduce the likelihood of nuisance crossing RA's by using the following suggested practice.

\*\*\*\*\*  
\*Pilots should limit rates of vertical speed to no more than \*  
\*1500 fpm when within 2000 feet of a target altitude if doing\*  
\*so is safe, consistent with company procedures, and opera- \*  
\*tionally practical, when the following situations occur: \*

- \* (1) The aircraft is departing or arriving at a busy terminal area;
  - \* (2) A developing conflict is depicted on the TCAS display;
  - \* (3) A conflict is otherwise anticipated by the pilot.
  - \* Pilots should respond to subsequent RA's in accordance with approved procedures.
- \*\*\*\*\*

4. ACTION. POI's should ensure that their operators make known to their pilots the causes for nuisance crossing RA's, particularly those arrival/departure occurrences at major hub airports. They should emphasize the preventive value of limiting vertical speeds in accordance with the practice described in this bulletin, pending a permanent revision to TCAS system logic.

5. INQUIRIES. This FSIB was developed by AFS-210. Any comments or suggestions concerning this issue should be addressed to AFS-210 at (202) 267-3718.

6. EXPIRATION DATE. This FSIB will expire on December 31, 1994.

/s/  
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