

number of upgrades that improve the quality of TCAS II. Version 7.0 has the advantage of harmonizing with ICAO, improving ATC efficiency, accuracy, and RVSM capability. We believe that it will not be a burden for cargo carriers to buy version 7.0, rather than version 6.04 since they will have to buy one or the other. We researched availability of version 7.0 and are convinced that supplies are sufficient to support this rule.

Based on the comments, the FAA has decided to allow installation of version 6.04A Enhanced until 30 days after the publication of the final rule instead of the proposed 30 days after publication of the NPRM. This provision applies to operators that buy, sell, or lease airplanes with TCAS II version 6.04A Enhanced.

In response to AIA's comment regarding a manufacturer that continues to deliver airplanes with version 6.04A, the rule language only refers to the date the equipment is installed, not when it is delivered. Operators would be responsible for ensuring that its collision avoidance systems were installed before the required compliance date.

#### **Alternative Collision Avoidance Systems and Other Equipment Issues**

##### *Proposed Rule*

To accommodate any future technology that may be equivalent to TCAS I or II, we provided for alternatives in lieu of TCAS I or II in the proposal. An alternative system must be approved by the FAA.

##### *Comments on ADS-B*

One of the most popular issues that commenters addressed was comparing TCAS to ADS-B. Over 135 commenters (most via form letters from cargo pilots) believe that ADS-B eventually will be a "commendable" system, but until it is fully proven, TCAS should be the required collision avoidance system. Approximately 12 commenters indicate that ADS-B is not equivalent to TCAS. Three of those commenters, including Eurocontrol, indicate that this is because ADS-B does not provide conflict resolution capability. ALPA echoes those sentiments stating that "\* \* \* other technologies are under development but lack the potential to operate independently in any part of the world. Any potential equivalent system must function independently from ground-based systems, demonstrate TCAS II capabilities, be interoperable with TCAS and assure the redundancy to perform as the pilots' last resort safety assurance system."

Eurocontrol supports allowing a truly equivalent system that is interoperable with TCAS. It believes ICAO is the appropriate forum to agree on equivalence at the international level; however, it is concerned that there does not currently exist an agreement among aviation authorities as to what constitutes equivalence.

Eurocontrol believes the FAA is overemphasizing the potential of ADS-B and finds FAA's description misleading and confusing. According to Eurocontrol, ADS-B, like Secondary Surveillance Radar (SSR), supports the surveillance infrastructure, which it indicates is more importantly used for separation rather than collision avoidance. Eurocontrol maintains that it is critical to keep distinct and separate the concepts of separation and collision avoidance. Eurocontrol indicates that the "primary use of ADS-B data should be for the provision of separation, and the system employing the data should be constructed to a level of performance and integrity, which would make collision avoidance virtually unnecessary."

Finally, Eurocontrol states that TCAS II provides collision avoidance protection based on an independent measurement of range and ADS-B does not.

ALPA supports the FAA's decision that any potential equivalent system must: (1) Function independently from ground-based systems, (2) demonstrate TCAS II capabilities, (3) be interoperable with TCAS, and (4) assure the redundancy to perform as the pilots' last resort safety assurance system. It adds that the FAA should proceed with a known, proven product.

On the other end of the spectrum are four supporters of ADS-B's potential. They believe that ADS-B is misrepresented in the NPRM and made suggestions for improvement. Many of the criticisms of the proposal stem from perceptions that the rule imposes onerous restrictions on non-TCAS systems, well beyond what Congress mandated.

The CAA states that AIR-21 requires an equivalent level of safety to TCAS II but does not necessarily require interoperability or coordinated maneuvers between any new system and TCAS. It concludes that the legislation was not technology-specific, which opens the door for alternative systems that do not have to be interoperable with TCAS. According to the CAA, the FAA's apparent prejudice against ADS-B violates the spirit of AIR-21.

The CAA asserts that the FAA provides no relevant analysis on the

safety implications of the need for interoperability. It adds that RTCA SC-186, Working Group 1 has studied the issue and has provided alternatives to the "coordinated maneuvers" requirement.

The CAA argues that the FAA does not seriously consider the possibility of an alternative system based on ADS-B technology. It contends that the analysis contains inaccuracies and omissions that could preclude the certification of a system that is more accurate and could provide a significantly safer air transportation system than TCAS. It states that the FAA ignores the potential use of traffic information service-broadcast (TIS-B), which it indicates would allow ADS-B to "see" TCAS-equipped aircraft. The CAA recommends we delete and reexamine our analysis of the potential use of ADS-B to meet Congress's intent of encouraging, not discouraging, innovative solutions to the collision avoidance question.

United Parcel Service Airlines (UPS) supports the deployment of ADS-B as an alternative collision avoidance system and believes that it could address many shortcomings of TCAS. According to UPS, TCAS provides no information regarding target identification, speed, heading, type, or intent, whereas ADS-B does. In addition, it maintains that:

- ADS-B provides accurate target information below 1,000 feet above ground level (AGL) and on the ground,
- ADS-B derives altitude from GPS, thereby making vertical conflict resolution more reliable and less prone to error than TCAS,
- ADS-B displays range greater than 120 miles, whereas TCAS is typically 12 miles, and
- The bearing accuracy of ADS-B can support horizontal conflict resolution, which TCAS cannot.

UPS criticizes the collision avoidance proposal because it believes that it imposes restrictions on non-TCAS systems that prevent an applicant from pursuing an alternative technology. It lists examples of purported errors from the proposed rule that it believes support its claim that the FAA implicitly is requiring only TCAS as a collision avoidance system.

UPS also criticizes the FAA for not outlining standards to measure potential equivalent collision avoidance systems. It adds that the FAA must perform the necessary analysis to produce a uniform measurement of safety. This will allow the comparison of benefits provided by TCAS II and other collision avoidance technologies. UPS argues that in PL 106-181, Congress intended for the FAA