

This section discusses how sensitive the benefit estimate is to changes in the expected number of accidents.

The above discussion uses a 0.5 expected number of accidents throughout. Earlier in the Pre-TCAS II Accident Rate section the FAA outlined four different methods to establish a reasonable expected number of midair collisions involving a cargo airplane. If the cargo accident rate equaled that of the passenger airplane rate used in the FAA 1988 regulatory analysis of TCAS on passenger airplanes, the expected number of midair collisions involving a cargo airplane was 2.67 accidents over 20 years. The FAA believes that figure is too high, nevertheless 2.67 was the high estimate. The lower bound estimate of 0.1 was based on total cargo departures.

If the accident rate equals 2.67 accidents, instead of 0.5, then the expected benefits increase from \$10 million to \$53.4 million. On the other hand if the accident rate is 0.1 the expected benefits decrease to \$2.0 million.

To further develop the sensitivity range, the expected benefit is based just on a cargo airplane colliding with just one of the three possible airplane types. If the number of expected accidents is 2.67 and the cargo airplane collides with an average passenger airplane, the expected benefit is \$370.5 million. If the number of expected accidents are 0.5 and the collision occurs between two cargo airplanes, the expected benefit is \$4.9 million. If the expected accidents are 0.1 and the air cargo airplane collides with a general aviation airplane, the expected benefit is \$1.1 million.

The sensitivity analysis reveals that various conservative changes to key parameters lower the expected benefits, but these values are relatively close to the base case of \$10 million. On the other hand, changing the parameters to the high end of the range results in substantial increases in estimated benefits. Even though the FAA believes the higher estimates are not likely, the decision risk here is not to underestimate key parameters.

Number of Near Mid Air Collisions (NMAC's)

Unfortunately, the risk of a MAC as measured by NMACs has not declined. Table V-2 in the full Regulatory Evaluation shows the reported number of NMAC's involving at least one cargo plane during the ten year period 1992 through 2001. During this period, there has been a total of 28 NMAC's, or about 3 NMAC's per year. The number of NMAC's has ranged from a low of zero

in 1993 and 1995 to a high of six in 2001. Six NMAC's is particularly troubling given the most recent MAC and the 1999 NMAC with the DC-10 and L1011 cargo airplanes where an eyewitness said that the airplanes were 50 to 100 feet apart.

Summary of Benefits

This final rule requires that all part 121, 125, and 129 airplanes with a MCTOW greater than 33,000 pounds, operating in the U.S. airspace be equipped with a collision avoidance system. The rule will provide an airspace where virtually all large airplanes are protected by Collision Avoidance Systems which, in turn, reduces the risk of mid-air collisions involving at least one cargo airplane. Further, this reduction in risk could avert an accident with a cost savings many times the greater than the cost of compliance. The recent midair collision in Europe is a sad reminder that reductions in probability and associated benefit estimates pale next to the human and monetary costs of an actual tragedy.

This final rule also responds to a Congressional mandate, responds to the petition for rulemaking from the Independent Pilots Association, responds to NTSB Safety Recommendations, and responds to the hundreds of professional airline pilots who commented on the NPRM requesting that this rule be implemented as soon as possible.

Costs of the Final Rule

Part 121 All-Cargo Operator Costs

The estimated part 121 cargo operator compliance costs include equipment, installation, additional maintenance and operating costs, and pilot training costs. After reviewing the information received from manufacturers and carriers, the FAA concluded that the original unit cost data used in the NPRM are still valid. However, since the NPRM was published, the affected fleet has changed and in the final rule the FAA extended and revised the compliance date from 3 years to an estimated 2 years October 31, 2003, to December 31, 2004. Therefore, the total cost of the final rule differs from that of the NPRM because of the change in the number of affected airplanes and the reduction in the compliance time.

The three TCAS II manufacturers reported that the average cost of TCAS II elements, as described above, for a transport category cargo airplane is between \$130,000 and \$200,000. One company indicated that if purchased in quantity, the cost of a TCAS II system would be between \$80,000 to \$145,000

per airplane. The manufacturers also estimated that it would cost between \$50,000 and \$70,000 (depending upon the specific airplane model) to install a TCAS II unit on an existing airplane. This resulted in a possible range of prices for a TCAS II system installed in an existing airplane of \$130,000 to \$270,000, or an average of \$200,000. The actual price would depend on a number of factors, including: (1) The type of unit installed, (2) the number of units ordered, and (3) whether or not it was necessary to include a display unit in the purchase price. Some airplanes may not need a separate TCAS display unit because the TCAS information can be displayed on an airplane's existing EFIS (Electronic Flight Information Display System).

Based on these reported costs, for cost calculating purposes, the FAA used \$211,000 for the initial costs of installing a TCAS II system into an existing airplane. This figure is estimated to include the necessary spare parts inventory.

To calculate the total discounted present value of the compliance costs of this final rule, the FAA assumed that, given a 2-year time period to install TCAS for the first time, the cargo air carrier would minimize its airplane's time out-of-service by installing TCAS II during a regularly scheduled major maintenance (C or D) check. The FAA further assumed that equipping the total existing air cargo fleet would be spread evenly over the entire 2-year compliance period due to potential maintenance scheduling conflicts and potential maintenance personnel overtime if every cargo air carrier were to try to schedule this installation in year 2. The FAA estimates that the undiscounted initial capital costs of retrofitting the existing part 121 turbine-powered all-cargo fleet with TCAS II will be approximately \$67,000,000.

The three TCAS II manufacturers reported that the TCAS II element costs would be identical for new and for existing airplanes. The FAA estimates that the initial (equipment plus installation) cost per newly manufactured cargo part 121 turbine-powered airplane will be \$171,000.

Based on 80 newly manufactured cargo airplane purchases over the 20-year analysis period, the FAA has estimated that the total non-discounted initial costs for purchasing and installing TCAS II in newly manufactured part 121 turbine-powered cargo airplanes will be approximately \$14 million.

In addition to the initial costs of the TCAS II units, the air carriers will also incur annual operation and