Exemption No. 9984

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591

In the matter of the petition of

FEDERAL EXPRESS CORPORATION

for an exemption from § 121.615(b)(2) of Title 14, Code of Federal Regulations

Regulatory Docket No. FAA-2008-0370

GRANT OF EXEMPTION

By letter dated March 21, 2008, and supplemental information dated June 25, 2008, Mr. J. Mark Hansen, Lead Counsel, Federal Express Corporation (FedEx), 362 Hacks Cross Road, Building B, 3rd Floor, Memphis, Tennessee 38125, petitioned the Federal Aviation Administration (FAA) on behalf of FedEx for an exemption from § 121.651(b)(2) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would allow FedEx aircraft properly equipped with an Enhanced Flight Vision System (EFVS) to continue an approach beyond the final approach fix, or to begin the final approach segment of an instrument approach procedure, even if the latest weather report for that airport reports the visibility to be less than the visibility minimums prescribed for that procedure.

The petitioner requests relief from the following regulation:

> Section 121.651(b)(2) states that no pilot may continue an approach past the final approach fix, or where a final approach fix is not used, begin the final approach segment of an instrument approach procedure at airports within the United States and its territories or at U.S. military airports, unless the latest weather report for that airport issued by the U.S. National Weather Service, a source approved by that Service, or a source approved by the Administrator, reports the visibility to be equal to or more than the visibility minimums prescribed for that procedure. For the purpose of this section, the term "U.S. military airports" means airports in foreign countries where flight operations are under the control of U.S. military authority.

The petitioner supports its request with the following information:

FedEx states that the EFVS technology on its aircraft is the first such equipment application by an air carrier. This equipment consists of an infrared sensor which provides real-time video imagery for display on the Heads-Up Display (HUD) to the pilot. The EFVS generates an image that is conformal and aligned with the external view on a HUD. This enables a pilot to acquire a view of the runway environment while still in instrument meteorological conditions (IMC), thus achieving an enhanced situational awareness of aircraft and runway positioning. FedEx contends that this technology can be a safety benefit by improving the pilot's situational awareness in low visibility conditions, improving airport capacity in those same conditions, and reducing delays and diversions due to weather.

The petitioner states that EFVS is designed to detect and image the visual references required by § 91.175(l). These requirements permit a pilot conducting a straight-in instrument approach, other than a Category (CAT) II or III approach, to continue descending below the published decision altitude/minimum descent altitude (DA/MDA) based solely on the sensor image provided by the EFVS. Upon reaching 100 feet above the touchdown zone elevation of the runway of intended landing, the pilot would not continue to descend unless the visual references required by § 91.175(l) were distinctly visible and identifiable using natural vision.

During certain reduced visibility conditions, EFVS imagery would significantly improve the pilot's ability to detect objects, such as approach lights and visual references of the runway environment, that may not be visible during day or night IMC operations. Specifically, for straight-in approach operations below the DA/MDA down to 100 feet above the runway, EFVS imagery displayed on a HUD becomes the approved enhanced flight visibility at the distance not less than the visibility prescribed by the instrument approach procedure being used. This is a marked improvement for the pilot in terms of safety and situational awareness.

The petitioner further states that the approach ban rule relating to required visibility was written many years ago and does not reflect current technological developments. Specific to meteorological circumstances, the existing rule cancels the potential for increased safety and situational awareness that would be gained through the use of EFVS equipment.

FedEx also states that EFVS equipment to be installed on its aircraft goes beyond the equivalent level of safety by improving aircraft situational awareness, providing visual cues to maintain a stabilized approach, and minimizing missed approaches in reduced visibility conditions. Additionally, the EFVS may allow the pilot to observe an obstruction on the runway, such as an aircraft or vehicle, earlier in the approach and observe potential runway incursions during ground operations in reduced visibility conditions. Even in situations where the pilot observes the required flight visibility at

the DA/MDA, EFVS usage will provide added situational awareness that may be impossible without it, particularly in marginal visual meteorological conditions.

A summary of the petition was published in the Federal Register on August 20, 2008 (73 FR 49233). One comment was received from the Air Line Pilots Association (ALPA).

ALPA supports the development of new technologies, including EFVS. However, with an increase in technology, ALPA believes there is an increase in complexity and workload within the flight deck, particularly during its initial stages of introduction. ALPA recommended several restrictions or limitations to the exemption.

The FAA's analysis is as follows:

The FAA has considered the petitioner's request and supporting materials and finds that a grant of exemption would be in the public interest and maintain a level of safety equivalent to that provided by the current regulations. The FAA also considered ALPA's comment and has incorporated many of its recommendations into this grant of exemption.

Currently, part 121 operators benefit very little from equipping with EFVS because they are restricted from continuing an approach past the final approach fix, or where a final approach fix is not used, from beginning the final approach segment of an instrument approach procedure, when the reported visibility, based on natural vision not on enhanced vision, is less than the visibility minimums prescribed for that procedure. This restriction is generally known as the "approach ban." The purpose of the approach ban is to significantly decrease the probability that a missed approach will be conducted at DA/decision height (DH) or the MDA and increase the probability that the approach will be successfully completed.

This restriction greatly reduces the opportunity for EFVS to be used for approach operations under §§ 91.175(l) and 121.651 when, at the minimum runway visual range (RVR) prescribed by an approach procedure, it is likely that the required visual references would be acquired by natural vision prior to DA/DH or MDA. While these regulations provide an added safety margin to approach operations conducted with natural vision, they do not make provision for technological advancements such as EFVS where a real-time image of the external scene is provided by means of a sensor image. EFVSs enable a pilot to see in much lower visibility conditions than he or she would be able to using natural vision alone. These systems provide a means of safely permitting a flightcrew to arrive at a point where they can operate in the visual segment of an instrument approach procedure. The FAA believes that the use of EFVS, subject to the conditions and limitations set forth in this exemption, will provide a level of safety equivalent to the provisions of § 121.651(b)(2).

Section 91.175(l) requires that the enhanced flight visibility provided by an EFVS be not less than the visibility prescribed in the instrument approach procedure. Additionally, § 91.175(l)(4) requires that:

> At 100 feet above the touchdown zone elevation of the runway of intended landing and below that altitude, the flight visibility must be sufficient for the following to be distinctly visible and identifiable to the pilot without reliance on the enhanced flight vision system to continue to a landing:
>
> (i) The lights or markings of the threshold; or
> (ii) The lights or markings of the touchdown zone.

These regulatory requirements ensure that sufficient visibility exists to make a safe approach and landing. In fact, the regulatory requirements for the use of EFVS in § 91.175(l) are analogous to those in § 91.175(c) for operations using natural vision, except that the visual reference requirements for EFVS are more stringent.

Section 91.175(l) permits EFVS to be used for straight-in approaches, which includes precision, lateral performance with vertical guidance, and nonprecision approaches. A straight-in approach may be aligned with the landing runway or may be offset by up to plus or minus 30 degrees of the inbound course for the landing runway for nonprecision approaches.

The FAA has also conducted an analysis of the types of approaches to be flown, approach geometry, and the capabilities/limitation of the EFVS equipment that FedEx will install on its fleet of aircraft. As that portion of the approach conducted at 100 feet above the touchdown zone elevation (TDZE) of the runway and below that altitude must be accomplished using natural vision only, the FAA believes that an RVR of at least 1,000 feet (or visibility not less than ¼ statute mile when RVR is not available) is necessary to ensure that the required natural visibility will be available to ensure that a successful, stabilized landing can be completed. A limitation to specifically address this issue and also to provide for the safety of ground operations in low visibility conditions has been included in this exemption.

Approaches to lower minimums require more precise course alignment as a mitigation of the risk of operations in IMC near the ground. Historically, whenever the FAA has allowed approaches to lower minimums, the mitigation was to require more robust and redundant ground and airborne navigation components. Enhanced vision or EFVS technology has the potential to both increase operational capability into airports during low visibility conditions and improve safety by enhancing pilot situational awareness during those operations.

Application of EFVS technology is a gain to both pilots and to the public. Further, airborne image sensor technology is already in its second generation and will only continue to improve over time. The FAA is aware of the specific limitations of current EFVS technology, but with mitigations such as a robust program to ensure pilot training and checking are effective and restrictions on airborne use, EFVS application will benefit the public while maintaining a level of safety equivalent to that established by § 121.651(b)(2).

The FAA's Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator, Federal Express Corporation is granted an exemption from 14 CFR § 121.651(b)(2) to the extent necessary to allow FedEx aircraft properly equipped with EFVS to continue an approach beyond the final approach fix, or to begin the final approach segment of an instrument approach procedure, if the latest weather report for that airport reports the visibility to be less than the visibility minimums prescribed for that procedure, subject to the conditions and limitations listed below.

Conditions and Limitations

1. This exemption is applicable to FedEx airplanes equipped with an FAA-certified EFVS.

2. This exemption applies only to approaches (except CAT II and CAT III approaches) conducted using line selectable approaches from the aircraft's flight management system database that provide vertical and lateral guidance.

3. Prior to conducting an approach beyond the final approach fix or beginning the final approach segment of an instrument approach procedure, the latest weather reports for the airport must indicate that the RVR for the runway to which the approach will be conducted is at least 1,000 feet (or 1,600 feet if the tower at that airport is closed). If RVR information is not available, the visibility must be at least ¼ sm.

4. The inbound final approach course cannot differ by more than 10 degrees from the actual magnetic alignment of the runway of intended landing.

5. The maximum crosswind component for the landing runway is less than the airplane flight manual's crosswind limitation, or 15 knots or less, whichever is more restrictive.

6. Prior to continuing an approach procedure beyond the final approach fix or beginning the final approach segment of an instrument approach procedure using the visibility minimums set forth in this exemption, the pilot in command of the aircraft must:

    a. have a minimum of 10 hours of actual operational line experience using EFVS; and

    b. have logged four EFVS approaches in actual instrument meteorological conditions.

    After acquiring this initial qualification, the pilot in command must log at least three EFVS approaches in either a simulator or aircraft within the 6 months preceding the conduct of any approach under the provisions of this exemption.

7. FedEx must develop and maintain an approved EFVS training program. This training program must include comprehensive instruction to aid pilots in determining visibilities using EFVS and natural vision at or near the landing (100 feet) "break out" phase of the approach. Specific emphasis must be placed on: EFVS theory, the effects of various weather phenomena on determining measured visibility, and the operational aspects and limitations of HUDs and imaging sensors. The training program must also include 4 hours of full flight simulator training to include specialized training in low altitude missed approaches, special departure procedures, and specifically tailored crew briefs on obstacle clearances inside the missed approach point and below DA/DH or MDA. Specific training must also be provided in determining required flight visibility (without EFVS) and enhanced visibility (with EFVS). Ground training may be provided by video, DVD, or equivalent instructional media. FedEx must also have procedures in place to check that those pilots who have received this training are properly qualified to conduct operations under the provisions of this exemption.

8. FedEx must develop a special section in each aircraft's approved flight manual that will include specific crew callouts while operating under the provisions of this exemption. These callouts should assist the second in command with situational awareness by mirroring what the pilot in command sees or does not see. All pilots conducting approaches under this exemption must receive training on the use of these callouts.

9. For operations conducted at foreign airports, both the conditions and limitations of this exemption and the requirements of the local civil aviation authority apply.

10. FedEx must develop an approved monitoring/feedback program that will permit FedEx and the FAA to monitor the conduct of operations conducted under this exemption. At a minimum, the monitoring/feedback program must report the number of approaches flown using this exemption, the reported visibility, and the

number of missed approaches executed due to the required visual references not being seen at 100 feet above TDZE. The monitoring/feedback program will have the appropriate program tracking reporting subsystem codes so that data points can be developed and monitored.

This exemption terminates on January 31, 2012, unless sooner superseded or rescinded.

Issued in Washington, D.C., on DEC 2 4 2009

John M. Allen
Director, Flight Standards Service