U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Enhanced Flight Vision System Operations

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Initiated by: AFS-400 **Change:**

On December 13, 2016, the Federal Aviation Administration (FAA) published the final rule 81 FR 90126, Revisions to Operational Requirements for the Use of Enhanced Flight Vision Systems (EFVS) and to Pilot Compartment View Requirements for Vision Systems. This advisory circular (AC) provides an overview of the EFVS operation to 100 feet above the touchdown zone elevation (TDZE) and the EFVS operation to touchdown and rollout, as well as the EFVS training, checking, and recent flight experience necessary to conduct the operations. In addition, it includes a means for obtaining an EFVS authorization, developing an EFVS training curriculum, and using EFVS operational credit. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

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1 INTRODUCTION.

1.1 Purpose of This Advisory Circular (AC). This AC provides an explanation of enhanced flight vision system (EFVS) operations conducted under Title 14 of the Code of Federal Regulations (14 CFR), guidance for obtaining Operations Specification (OpSpec), Management Specification (MSpec), or Letter of Authorization (LOA) C048, Enhanced Flight Vision System (EFVS) Operations, and information that may facilitate the development of a training curriculum for EFVS operations.

1.1.1 All regulatory references used in this AC are found in 14 CFR unless otherwise indicated. References to part 91 are not inclusive of subpart K (part 91K).

1.1.2 This AC provides information for the use of an EFVS during an EFVS operation and does not provide information for the use of an EFVS for situation awareness during other aircraft operations such as taxi, takeoff, or approach operations that do not require its use.

1.1.3 This AC provides information applicable to the airplane category and does not include information pertaining to authorizations for EFVS operations in the rotorcraft category. Airworthiness criteria, operational procedures, and specific authorizations have not been developed to support rotorcraft EFVS operations.

1.1.4 Requirements for conducting EFVS operations outside the United States may differ from those found in 14 CFR. Specific policies and procedures related to EFVS operations may be published in a State's Aeronautical Information Publication. International Civil Aviation Organization (ICAO) Annex 6, Operation of Aircraft, and Doc 9365, Manual of All-Weather Operations, can be found on the ICAO Publications website at https://www.icao.int/publications/Pages/default.aspx.

1.1.5 The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies. Conformity with the guidance is voluntary only, and nonconformity will not affect rights and obligations under existing statutes and regulations.

1.2 Audience. This AC applies to the following:

1. Persons intending to conduct EFVS operations;
2. Persons responsible for operational control over airplanes conducting EFVS operations; or
3. Persons developing a training curriculum for EFVS operations.

1.3 Where You Can Find This AC. You can find this AC on the FAA's website at https://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

1.4 What This AC Cancels. AC 90-106A CHG 1, Enhanced Flight Vision Systems, dated July 10, 2018, is canceled.

1.5 Terms and Definitions.

1.5.1 Flight Standards Safety Assurance Office. An FAA Flight Standards District Office (FSDO), certificate management office (CMO), International Field Office (IFO), or certificate management unit (CMU) assigned by the FAA to have oversight responsibility for a particular operator.

1.5.2 Pilot Flying (PF). The pilot who is manipulating the controls of the aircraft at any given time, in flight or on the ground.

1.5.3 Pilot Monitoring (PM). A required flight crewmember, other than the PF, who monitors the aircraft state and system status, calls out any perceived or potential deviations from the intended flightpath, and intervenes if necessary.

1.5.4 Curriculum. Subjects comprising a course that may be a part of a larger training program.

1.6 Regulatory Background. Prior to 2004, the only way a pilot could operate below the decision altitude (DA)/decision height (DH) or minimum descent altitude (MDA) of an instrument approach (i.e., the visual segment) was to use natural vision to meet the requirements of part 91, § 91.175. Section 91.176 allows specifically qualified pilots to use an installed aircraft system called an EFVS to operate in the visual segment of an instrument approach when the pilot's natural vision is not sufficient. In addition, other regulations have been amended to make operational credits available to certain EFVS-equipped operators.

2 BASIC CONCEPTS OF THE EFVS OPERATION.

2.1 What Is an EFVS Operation? The official definition of an EFVS operation can be found in part 1, § 1.1, which can be summarized as an operation in which a pilot uses an EFVS during an instrument approach to assess enhanced flight visibility and to identify visual references because the flight visibility using natural vision is not sufficient to do so. There are two types of EFVS operations:

1. EFVS operations to touchdown and rollout (EFVS-TD), regulated under § 91.176(a); and
2. EFVS operations to 100 feet above the touchdown zone elevation (TDZE) (EFVS-100), regulated under § 91.176(b).

2.2 What Is an Enhanced Flight Vision System (EFVS)? An EFVS is defined in § 1.1 as "an installed aircraft system which uses an electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to forward-looking infrared, millimeter wave radiometry, millimeter wave radar, or low-light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls."

2.2.1 An EFVS approved to be used to conduct an EFVS operation provides an enhanced real-time image on a Head-Up Display (HUD) or equivalent display along with the applicable aircraft information and flight symbology. These equipment requirements are specified in § 91.176(a)(1) and (b)(1).

2.2.2 A pilot conducting an EFVS operation uses an EFVS to provide the enhanced visibility to perform the approach or landing, determine the enhanced flight visibility, identify the visual references for the runway of intended landing before they are visible naturally out the windscreen, or conduct the rollout. Infrared, a common type of EFVS imaging technology, differentiates objects by their thermal signature (see Figure 1 below).

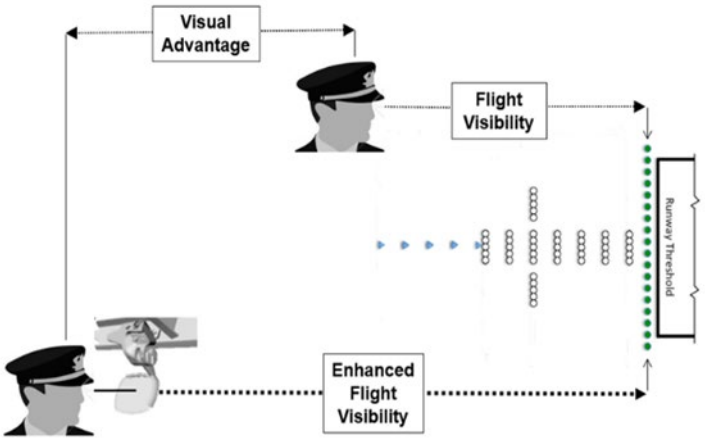
Figure 1. View During an Approach

Images courtesy of the National Aeronautics and Space Administration Langley Research Center.

2.3 What Is Enhanced Flight Visibility? Enhanced flight visibility is defined in § 1.1 as "the average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent topographical objects may be clearly distinguished and identified by day or night by a pilot using an enhanced flight vision system." During an EFVS operation, a pilot may use the enhanced flight visibility provided by an EFVS to meet the visibility minimums published for the approach.

2.4 What Is Visual Advantage? Visual advantage is the difference between the distance a pilot can see using an EFVS compared to the distance the pilot can see without the use of the EFVS. (See Figure 2, Visual Advantage.) The visual advantage of an EFVS sensor is typically quantified during the EFVS certification process to support operational concepts for determining performance-based operational credit for EFVS users under parts 121, 125, 129, and 135. An EFVS that demonstrates a greater visual advantage may be eligible for an EFVS operational credit that allows use in lower reported visibilities.

Figure 2. Visual Advantage



3 EFVS OPERATIONS TO TOUCHDOWN AND ROLLOUT—§ 91.176(a).

3.1 General Description. During an EFVS-TD operation (see Figure 3, EFVS Operation to Touchdown and Rollout), the pilot uses enhanced vision imagery provided by an EFVS to descend from a DA/DH to touchdown and rollout when the flight visibility is not sufficient to conduct the approach with natural vision under § 91.175(c). The pilot conducts the entire visual segment of the instrument approach, including the landing and rollout, using the EFVS to comply with the enhanced flight visibility and visual reference requirements of § 91.176(a)(3).

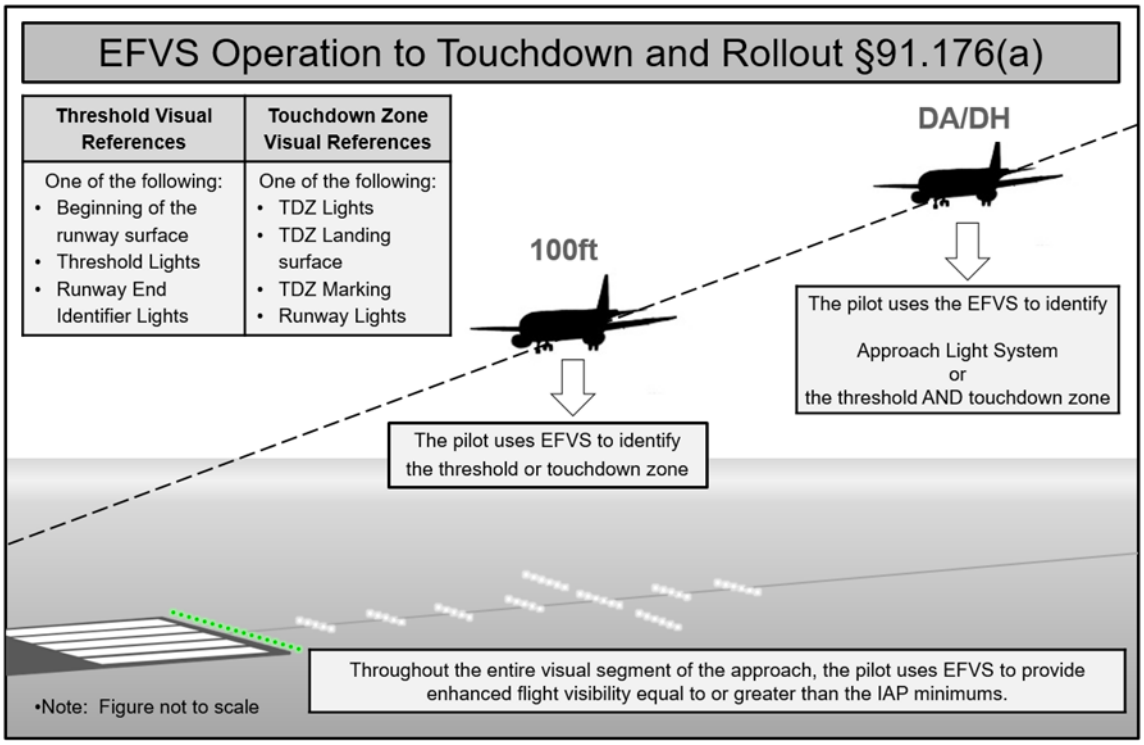
3.2 Approaches for EFVS Operations to Touchdown and Rollout. A pilot may conduct an EFVS-TD operation on:

1. Any straight-in Category I instrument approach procedure (IAP) with a DA or DH.
2. A straight-in nonprecision approach with an MDA if the operator is authorized in OpSpec/MSpec/LOA C073, Vertical Navigation (VNAV) Instrument Approach Procedures (IAP) Using Minimum Descent Altitude (MDA) as a Decision Altitude (DA)/Decision Height (DH), to use a DA in lieu of MDA for that approach.

Note: Operators authorized to conduct EFVS-TD operations may use the EFVS in lieu of natural vision to verify that the airplane will touchdown in the touchdown zone during an authorized Category II or III IAP.

3.3 The Use of the PM Display. During an EFVS-TD operation, a display of the enhanced image is provided to the pilot monitoring the approach. This display enables the PM to assess the safe conduct of the approach, landing, and rollout, and intervene if necessary in visibilities where natural vision may not be sufficient.

Figure 3. EFVS Operation to Touchdown and Rollout



3.4 Limitations and Conditions That Apply to EFVS Operations to Touchdown and Rollout. In accordance with § 91.176(a)(4), the FAA has prescribed conditions and limitations for the use of EFVS in an operator's OpSpec/MSpec/LOA. Authorizations limit visibilities for conducting EFVS operations based on the suitability of a specific system, the demonstrated sensor performance, or the conditions in which the EFVS operations are conducted. In addition, EFVS-TD operations are limited to airports that have weather reporting facilities, since it may not be possible to ensure the approach is conducted in visibilities for which the system is suitable.

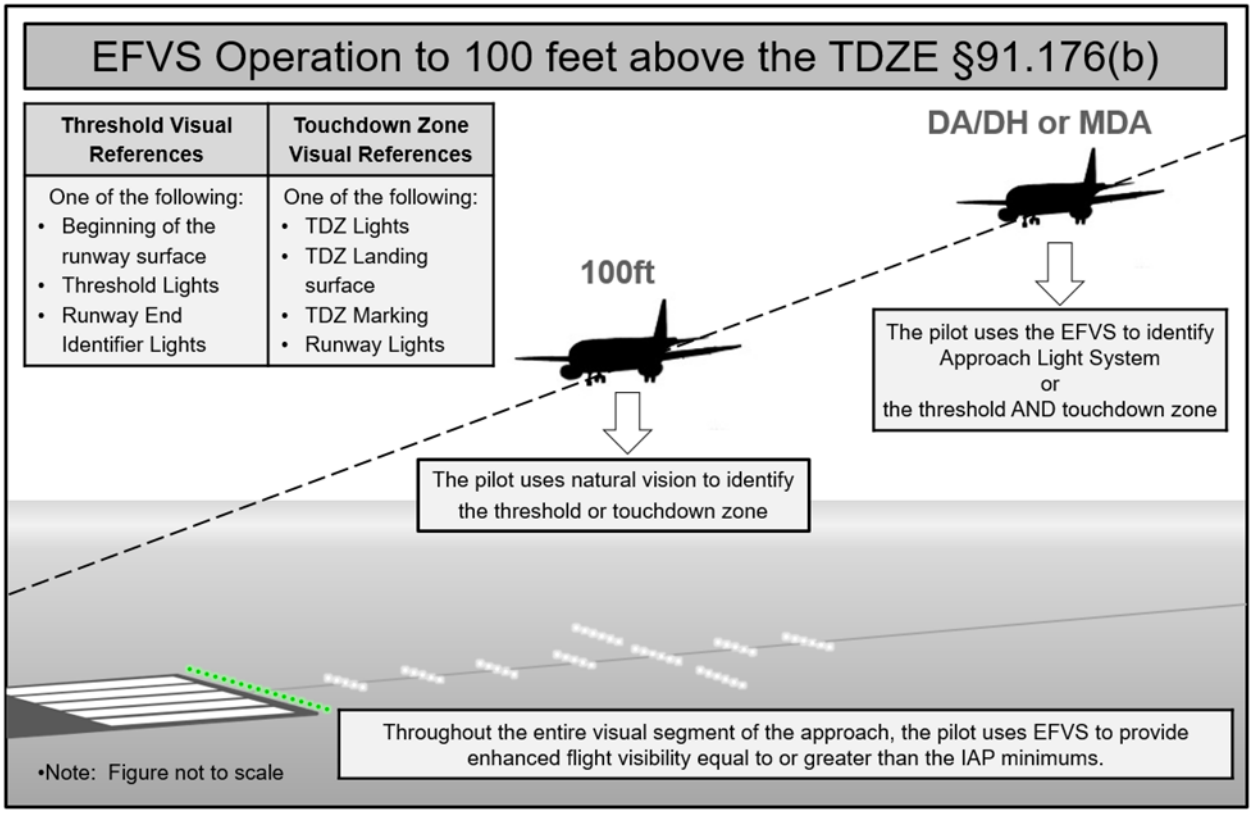
3.5 Go-Around. In the event that the enhanced flight visibility or visual references cannot be maintained or a failure of any EFVS component (image or symbology) occurs in the visual segment prior to touchdown, a go-around should be initiated. This does not preclude a pilot's authority to continue an approach if continuation is considered to be a safer course of action.

4 EFVS OPERATIONS TO 100 FEET ABOVE THE TDZE—§ 91.176(b).

4.1 General Description. During an EFVS-100 operation (see Figure 4 below), the pilot uses a combination of enhanced vision imagery provided by an EFVS and natural vision to descend from a DA/DH or MDA to landing when the flight visibility is not sufficient to conduct the approach with natural vision under § 91.175(c) and (d). The pilot begins the visual segment using the EFVS to comply with the enhanced flight visibility requirements in § 91.176(b)(3)(i) and the visual reference requirements in § 91.176(b)(3)(ii). The pilot continues the visual segment below 100 feet through landing

and rollout using the EFVS to comply with the enhanced flight visibility requirements in § 91.176(b)(3)(i) and concurrently using natural vision to comply with the visual reference requirements in § 91.176(b)(3)(iii).

Figure 4. EFVS Operation to 100 Feet Above the Touchdown Zone Elevation



4.2 Approaches for EFVS Operations to 100 Feet Above the TDZE. A pilot may conduct an EFVS-100 operation on any straight-in Category I precision or nonprecision IAP. This includes nonprecision approaches that may have final segments offset by as much as 30 degrees.

4.3 Identifying Visual References at 100 Feet. At 100 feet above the TDZE, pilots are also required by § 91.176(b)(3)(iii) to have sufficient natural visibility to see the threshold or the touchdown zone in order to continue. In order to remain in compliance with § 91.176(b)(3)(i), pilots should not turn off the EFVS image at any time during an EFVS operation.

4.4 Go-Around. In the event that the enhanced flight visibility or visual references cannot be maintained or a failure of any EFVS component (image or symbology) occurs in the visual segment prior to touchdown, a go-around should be initiated. This does not preclude a pilot's authority to continue an approach if continuation is considered to be a safer course of action.

5 AIRCRAFT QUALIFICATIONS FOR EFVS OPERATIONS.

5.1 Aircraft Qualifications for U.S.-Registered Aircraft. As required in § 91.176(a)(1) and (b)(1), an EFVS installed on a U.S.-registered aircraft intended for use in EFVS operations must be approved in accordance with an FAA type design approval (e.g., type certificate, amended type certificate, or supplemental type certificate). The current version of AC 20-167, Airworthiness Approval of Enhanced Vision System, Synthetic Vision System, Combined Vision System, and Enhanced Flight Vision System Equipment, contains guidance for obtaining airworthiness approvals for EFVS.

5.1.1 EFVS-TD Capability. An EFVS that meets the applicable airworthiness criteria for use in EFVS-TD operations may be described in an Airplane Flight Manual or its supplement (AFM(S)) as:

1. An EFVS Landing System;
2. Eligible for operations under § 91.176(a); or
3. Eligible for EFVS operations to touchdown and rollout.

Note: An EFVS landing system is approved for use in EFVS-100 operations.

5.1.2 EFVS-100 Capability. An EFVS that meets the applicable airworthiness criteria for use in EFVS-100 operations may be described in an AFM(S) as:

1. An EFVS Approach System;
2. Eligible for operations under § 91.176(b);
3. Eligible for EFVS operations to 100 feet above the TDZE; or
4. An AFM that has not been updated may still reference operations under § 91.175(l) or (m).

5.2 Aircraft Qualifications for Foreign-Registered Aircraft. An EFVS installed on a foreign-registered aircraft used to conduct EFVS operations in the United States should be approved by the State of the Operator or the State of Registry to meet the requirements of ICAO Annex 6 and should meet all of the requirements in § 91.176(a)(1)(i) or (b)(1)(i), as applicable.

5.3 Aircraft Qualifications for Experimental Aircraft. Section 91.176(d) provides an exception for aircraft manufacturers and EFVS developers that may have a need to use an EFVS without a type design approval to conduct an EFVS operation for research and development or for a flight test in conjunction with an aircraft certification project.

5.4 Aircraft Qualifications for Public Aircraft Operations. All aircraft used in public aircraft operations, other than the U.S. Military, must meet the EFVS civil certification and airworthiness requirements, per § 91.176(c). This includes the requirement for the EFVS to conform to an FAA type design approval.

6 PILOT TRAINING FOR EFVS OPERATIONS.

6.1 EFVS System Familiarity. As required by § 91.176(a)(2)(ii) and (b)(2)(ii), each pilot must have adequate knowledge of, and familiarity with, the aircraft, the EFVS, and the procedures to be used during an EFVS operation.

6.2 Training for FAA-Certificated Pilots, Pilots Operating Under Part 91K, 121, 125, or 135, or Operating a U.S.-Registered Aircraft. As required by part 61, § 61.66(a)(1)(ii) and (b)(1)(ii), a pilot conducting an EFVS operation must have a logbook or training record endorsement showing satisfactory completion of an FAA-approved ground and flight training program for that EFVS operation and aircraft category.

Note 1: As allowed by § 61.66(f), a military pilot (or former military pilot) in the U.S. Armed Forces may use documentation showing completion of U.S. Armed Forces ground and flight training in EFVS operations to meet the EFVS pilot training requirements.

Note 2: A pilot who can show documentation of satisfactory completion of training on EFVS-100 operations prior to March 13, 2018, is not required to obtain a logbook or training record endorsement for EFVS-100 operations, per § 61.66(h)(4).

6.2.1 Ground Training. Per § 61.66(a)(1), ground training is required for any pilot in command (PIC), any PF, and any PM during an EFVS operation.

6.2.2 Flight Training. Per § 61.66(b)(1), flight training is required for any PIC or any PF during an EFVS operation.

6.2.3 Supplemental and Differences Training. Pilots may utilize training programs that integrate subjects and tasks required for both operations (i.e., EFVS-TD or EFVS-100) or a training curriculum designed to train on the differences between the two EFVS operations when appropriate.

6.2.4 Checking for Parts 91K, 121, 125, and 135. Per §§ 91.1065, 121.441, 125.287, and 135.293, program managers or certificate holders (CH) are required to incorporate EFVS tasks applicable to their operation into their pilot checking. In addition, the FAA recommends that recurrent training provide a sufficient refresher on EFVS subjects and tasks to successfully complete the check.

6.3 Training for Pilots Operating Under Part 129 or Operating Foreign-Registered Aircraft. As required by § 91.176(a)(2)(vii)(B) and (b)(2)(vi)(B), pilots operating under part 129 must be qualified in accordance with the training requirements of the civil aviation authority (CAA) of the State of the Operator.

6.4 Training for Pilots Conducting Public Aircraft Operations. As required by § 91.176(c)(2), pilots conducting public aircraft operations, other than the U.S. Military, must meet the training requirements of § 61.66.

6.5 Training for Pilots Operating Aircraft Issued an Experimental Certificate. As stated in § 61.66(h)(2), pilots conducting EFVS operations for the purpose of research and development or to show compliance with regulations in an aircraft issued an experimental airworthiness certificate may use alternate means of obtaining the subject knowledge and flight experience requirements of § 61.66(a) and (b). The pilot should be able to show compliance with § 61.66(h)(2) and should be able to produce the program letter and application for the experimental certificate upon request.

7 PILOT RECENT FLIGHT EXPERIENCE FOR EFVS OPERATIONS.

7.1 EFVS Recent Flight Experience for Operating Under Part 91. Pilots operating under part 91 must meet the EFVS recent flight experience requirements of § 61.66(d) in order to act as PIC or control the aircraft during an EFVS operation.

7.1.1 A pilot meets the recent flight experience requirements of § 61.66(d) if, within the previous 6 calendar-months preceding the month of the flight:

1. An approved EFVS training course, a military checkride, a part 121 proficiency check, or a part 91K, 125, or 135 competency check was completed; or
2. At least six instrument approaches using the EFVS were logged. The instrument approaches may be conducted during the day or night under any weather conditions. One of the approaches must terminate in a full-stop landing, as required by § 61.66(d)(1).

Note: A Level C or higher full flight simulator (FFS) equipped with an EFVS and qualified by the Air Transportation Division, Training and Simulation Group may be used to meet the recent flight experience requirements, per § 61.66(g). You can find information about the FAA's National Simulator Program (NSP) at https://www.faa.gov/about/initiatives/nsp/.

7.1.2 As required by § 61.66(d), if a pilot's EFVS recent flight experience has lapsed for less than 6 calendar-months:

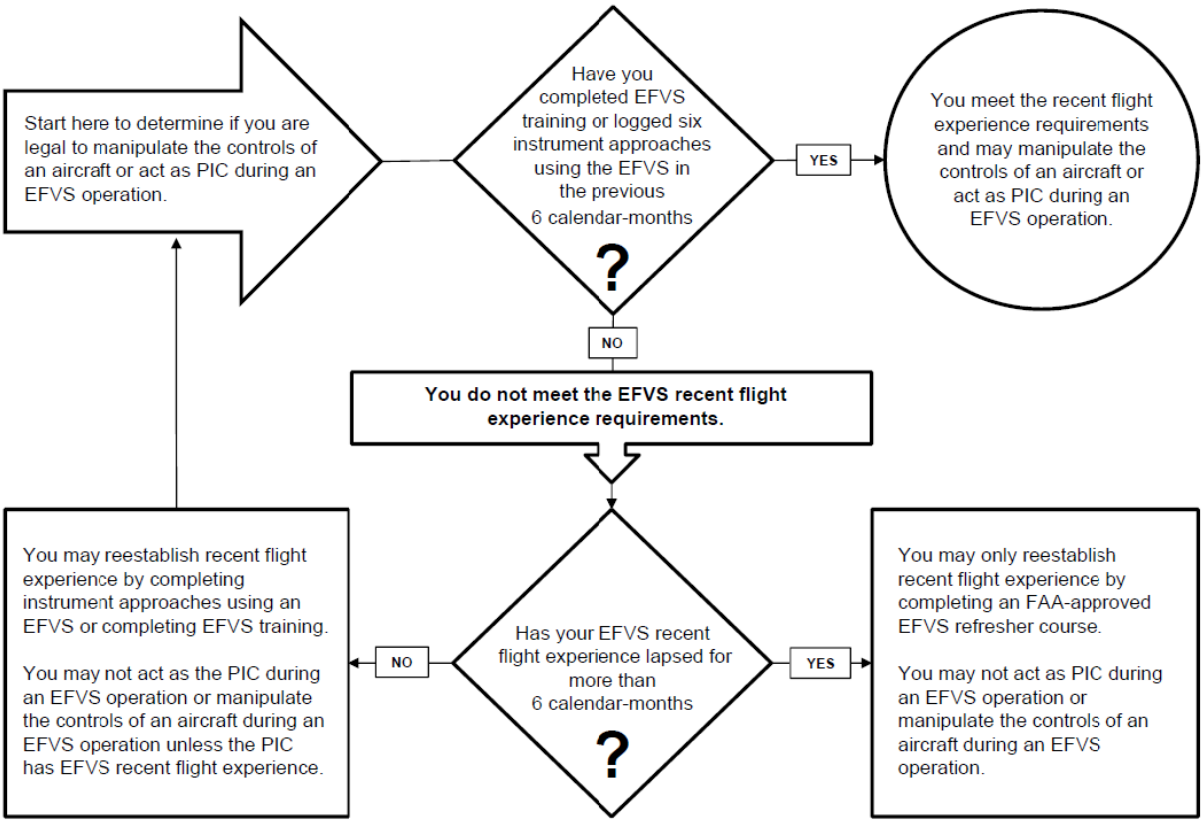
1. The pilot may manipulate the controls during an EFVS operation when under the supervision of a PIC who is qualified and current.
2. The pilot may not act as PIC of an aircraft during an EFVS operation.

Note: Recent flight experience in this timeframe can be reestablished by logging instrument approaches using the EFVS or completing an approved training course, proficiency check, competency check, or military checkride.

7.1.3 When EFVS recent flight experience has lapsed for more than 6 calendar-months, the only way a pilot can reestablish recent flight experience under § 61.66(e) is by completing an FAA-approved EFVS refresher course. Until the course is completed, the pilot cannot conduct an EFVS operation or act as a PIC of an aircraft during an EFVS operation, as stated in § 61.66(e).

7.1.4 For logging approaches for EFVS and instrument recent flight experience, the EFVS recent flight experience requirements under § 61.66(d) were structured to closely resemble the instrument recent flight experience requirements under § 61.57. Although EFVS and instrument recent flight experience are two separate requirements, a single logged instrument approach may count toward both if the instrument approach meets the requirements of both §§ 61.57 and 61.66(d).

Figure 5. Recent Flight Experience Flowchart (§ 61.66(d) and (e))



7.2 Recent Flight Experience for Part 91K, 121, 125, or 135 Operators. Pilots conducting EFVS operations for parts 91K, 121, 125, and 135 maintain recent flight experience through satisfactory completion of EFVS tasks and maneuvers during their recurring proficiency checks or competency checks.

7.3 Recent Flight Experience for Public Aircraft Operators. Public aircraft operators, other than the U.S. Military, must meet the recent flight experience requirements of § 61.66 to conduct EFVS operations, as required by § 91.176(c)(2).

8 EFVS OPERATIONAL CREDIT.

8.1 What Is EFVS Operational Credit? EFVS operational credit is credit for a portion of flight visibility prescribed by the IAP being flown that is satisfied by the enhanced image provided by the EFVS. EFVS operational credit is authorized in FAA OpSpec C048.

8.2 What Is the Purpose of EFVS Operational Credit? EFVS operational credit is used by authorized parts 121, 125, and 135 CHs and part 129 foreign air carriers to determine minimum visibilities to:

1. Dispatch, release, or take off a flight under instrument flight rules (IFR) when the forecast weather at the destination airport is equal to or greater than the authorized minimums for use with an EFVS (refer to §§ 121.613, 125.361, and 135.219); and
2. Begin, execute, or continue an approach when the weather is reported to be equal to or greater than the authorized minimums for use with an EFVS (refer to §§ 121.651, 125.325, 125.381, and 135.225).

8.3 Standard EFVS Credit. The Flight Technologies and Procedures Division evaluates available performance data from numerous sources such as other operational evaluations and Original Equipment Manufacturer (OEM) demonstrations conducted in the type design approval process. A standard credit is recommended for an installed EFVS sensor and is published in the Operational Suitability Report (OSR), Operational Credit for Enhanced Flight Vision Systems (EFVS). An operator applying for EFVS operational credit that elects to use the standard credit would not need to demonstrate system performance; however, this does not restrict an operator from conducting their own performance demonstration to determine operational credit. Industry consensus methodology for performance demonstrations is contained in RTCA DO-390, Test Procedures for Quantified Visual Advantage. The OSR can be found at https://drs.faa.gov/browse/excelExternalWindow/bb448b0f-d979-42a2-8d67-9346707e6d29.

8.4 Minimum Visibility with Use of EFVS.

8.4.1 Minimum Visibility with Use of EFVS for Parts 121, 125, 129, and 135. OpSpec C048 may include authorization to use a credit to reduce the visibility required for operating without the use of the EFVS (see Table 1, Sample Minimum Visibility Table). The credit is based on the demonstrated EFVS sensor performance.

8.4.2 Minimum Visibility with Use of EFVS for Parts 91 and 91K Operators. Parts 91 and 91K operators are not restricted by reported visibility when initiating an instrument approach. However, they may voluntarily elect to use the prescribed minimums of an IAP to determine whether or not to execute an instrument approach. Parts 91 and 91K operators may find some operational benefit using the minimum visibility with the use of EFVS applicable to their installed sensor as described in paragraph 8.4.1 above. The visibility reductions are based on demonstrated performance and should help increase expectations that the EFVS will be able to provide sufficient enhanced visibility at DA, DH, or MDA to successfully complete the approach. The recommended credits for a specific aircraft/EFVS sensor combination and the appropriate visibility reduction table(s) can be found in the EFVS OSR.

Table 1. Sample Minimum Visibility Table

Sample EFVS Performance-Based Visibility Reduction			
Visibility Required Without the Use of EFVS	**25% Reduction Minimum Visibility with the Use of EFVS**	**33% Reduction Minimum Visibility with the Use of EFVS**	**50% Reduction Minimum Visibility with the Use of EFVS**
Runway Visual Range (RVR)			
1800	1400	1200	1000
2400	1800	1600	1200
4000	3000	2700	2000
6000	4500	4000	3000
Prevailing Visibility (sm)			
1/2	3/8	1/4	1/4
3/4	1/2	1/2	3/8
1	3/4	5/8	1/2
1 ¼	1	3/4	5/8

8.5 Considerations for Using EFVS Minimum Visibility. The following are operational considerations when using EFVS operational credit:

8.5.1 Landing Weather Minimums for Recently Upgraded PICs. Recently upgraded PICs are subject to § 121.652, § 125.379, or § 135.225(e), which temporarily raise IAP minimums to afford an extra layer of safety while experience operating as PIC is gained. EFVS minimum visibility should not be used until the requirements of these regulations are met, as this may negate the safety margins intended by these regulations.

8.5.2 Alternate Airport Weather. The use of EFVS minimum visibility is not advised for alternate airport planning. However, once in flight, a pilot may use EFVS minimum visibilities to begin an approach at an alternate airport.

9 DEVELOPING AN EFVS TRAINING CURRICULUM.

9.1 Overview. Properly trained flightcrews, personnel exercising operational control, and maintenance personnel are essential to successful EFVS operations. This section provides information that may be useful in developing an effective EFVS training curriculum.

9.2 Pilot Training Curriculum. A pilot training curriculum can be developed for either EFVS operation (EFVS-TD or EFVS-100), both EFVS operations, or the differences between the EFVS operations using a specific EFVS installation.

9.2.1 HUD Proficiency. The curriculum described in Appendix A, Elements of an EFVS Pilot Training Curriculum, assumes the pilot is proficient in HUD operations. Training providers may choose to require extra training for a pilot without any prior HUD experience.

9.2.2 Ground Training Subjects and Flight Training Tasks. A pilot training curriculum should contain the ground training subjects and flight training tasks outlined in § 61.66(a) and (b). These subjects and tasks are listed in Appendix A.

9.2.3 Recommendations from the OEM. The FAA recommends that the manufacturer's operating procedures and system limitations applicable to an installed EFVS are incorporated into an EFVS pilot training curriculum.

9.2.4 Flight Standardization Board (FSB) Report Recommendations. The FAA recommends that any specific training, checking, and currency items for an installed EFVS specified in an FSB report specific to the aircraft are incorporated into a pilot training curriculum. You can find FSB reports pertaining to EFVS-equipped aircraft at: https://drs.faa.gov/.

9.2.5 Use of FFS. A Level C or higher FFS may be used for EFVS pilot training. The FFS must be evaluated and qualified by the Air Transportation Division, Training and Simulation Group to meet the requirements for EFVS operations, as required by § 61.66(g). You can find information about the FAA's NSP at https://www.faa.gov/about/initiatives/nsp/.

9.2.6 Flight Training in Aircraft. If flight training is to be conducted in an aircraft, the FAA recommends that flight instructors ensure that both the equipment in the aircraft and the visual conditions for the planned training are appropriate for safely conducting and/or supervising the flight. For example, instructors conducting training in low-visibility conditions may prefer a monitoring display in order to have access to the same visual information as the PF.

9.2.7 Considerations for Part 121 Pilot Training Programs. Initial training for part 121 pilots must include the required elements listed in § 61.66(a)(2) and (b)(2). The required elements and suggested methods of meeting said requirements can be found in Appendix A of this AC. Part 121 proficiency checks should also include the tasks listed in part 121 appendix F.

9.2.8 Considerations for Part 91K, 125, or 135 Pilot Training Programs. Initial training for pilots under part 91K, 125, or 135 must include the required elements listed in § 61.66(a)(2) and (b)(2). The required elements and suggested methods of meeting said requirements can be found in Appendix A. Part 91K, 125, or 135 competency checks should include appropriate EFVS tasks.

9.2.9 Considerations for Part 141 Special Operations Courses. The FAA may approve a special operations course for EFVS operations that meets the requirements of § 61.66 and the minimum curriculum requirements in part 141 appendix K.

9.3 Training Curriculum for Dispatchers and Other Persons Exercising Operational Control for EFVS Operations. Dispatchers and other persons exercising operational control should fully understand the capabilities and limitations of the specific EFVS equipment installed in the operator's aircraft. Operators should consider that unique weather conditions can cause variability in how an EFVS sensor performs, as well as exceed the sensor's ability to provide the enhanced flight visibility required to complete the approach and landing. Operational planning and continuous monitoring of weather conditions at the airport of intended landing are especially important under these circumstances. Suggested elements of an effective training curriculum are described in Appendix C, Elements of a Training Curriculum for Dispatchers and Other Persons Authorized to Exercise Operational Control for EFVS Operations.

9.4 Maintenance Personnel Training. It is important that maintenance personnel are knowledgeable of the operator's EFVS program. The FAA recommends that operator and contract maintenance personnel, including mechanics, maintenance controllers, avionics technicians, and inspection/quality assurance personnel receive initial and recurrent training to establish and maintain an effective EFVS maintenance program. Suggested elements of an effective training curriculum are described in Appendix B, EFVS Maintenance Program and Personnel Training.

10 OPERATIONAL AUTHORIZATIONS FOR PART 91.

10.1 Overview. Per § 91.176(a)(2)(viii), part 91 operators require an LOA C048 to conduct EFVS-TD operations. LOA C048 is not required to conduct EFVS-100 operations in the United States, but may be issued on request to satisfy a foreign regulatory authority.

10.2 The Application. Applications for LOA C048 should be submitted to a responsible Flight Standards Safety Assurance office. Although other documentation may be acceptable, the FAA recommends providing the following items in the application to facilitate the review process:

1. Aircraft Capability Documentation. Excerpts from the AFM(S) that identify the EFVS operation(s) for which the system received airworthiness approval.
2. Pilot Training Compliance Documentation. Logbook or training record endorsements that meet the requirements of § 61.66 for EFVS training completed.

10.3 EFVS Operational Demonstration for Part 91 Applications. Plans to observe and evaluate the operator's ability to perform EFVS-TD operations in an aircraft or simulator may be impractical. Tabletop exercises for demonstrating operator knowledge (e.g., operational procedures, system limitations, recent flight experience, maintenance instructions for continued airworthiness (ICA), or minimum equipment list (MEL) relief) and/or operational monitoring may be more appropriate.

11 OPERATIONAL AUTHORIZATIONS FOR PARTS 91K, 121, 125, AND 135.

11.1 Overview. Per § 91.176, parts 121, 125, and 135 CHs require OpSpec C048 to conduct EFVS-100 or EFVS-TD operations, and may include provisions to use EFVS operational credit. Part 91K program managers require MSpec C048 to conduct EFVS-100 or EFVS-TD operations. MSpec C048 does not include provisions to use EFVS operational credit.

11.2 The Application. Applications for OpSpec or MSpec C048 should be submitted to a responsible Flight Standards Safety Assurance office. Although other documentation may be acceptable, the FAA recommends providing the following items in the application to facilitate the review process:

1. Airworthiness Documentation. Excerpts from the AFM(S) that identify the EFVS operation(s) for which the system received airworthiness approval. The FAA recommends incorporating any procedures or operating limitations in the AFM(S) into the approved EFVS training curriculum and operating manuals.
2. Operating Manuals. Applicable sections of operating manuals (e.g., Airplane Operations Manual (AOM), Flight Operations Manual (FOM), pilot's operating handbook (POH), and/or quick reference handbook (QRH)) that contain the operator's procedures or provisions for using an EFVS. These procedures can be incorporated in the operator's approved EFVS training curriculum and in the AFM(S).
3. EFVS Pilot Training Curriculum. A proposed EFVS training curriculum that ensures the pilot meet the requirements of § 61.66. Paragraph 9 and Appendix A contain information for developing a training curriculum to include the required ground training subjects and flight training tasks required by § 61.66(a) and (b). It is acceptable to incorporate a previously approved curriculum provided by a part 141 or 142 school.
4. EFVS Provisions in the MEL. If the applicant is seeking MEL relief for EFVS, they should provide the proposed MEL containing appropriate operations and maintenance procedures that consider all applicable components of the EFVS during MEL submission, review, and approval.
5. Application for Operational Credit. Operators operating under parts 121, 125, and 135 CHs applying for authorization to use EFVS operational credit should provide:
   a. A statement of proposed credit. Operators may propose use of the standard credit published in the EFVS OSR, which is based on previous demonstrations of system visual advantage. When an operator elects to use the standard credit, it is not necessary to demonstrate visual advantage during the operational demonstration. If the applicant elects to perform their own demonstration, AC 20-167 provides methods that can be used to demonstrate quantified visual advantage in the certification process.
   b. EFVS training curriculum for dispatchers or other persons exercising operational control, as described in paragraph 9 and Appendix C.

c. Dispatch procedures manual or a general operations manual, as applicable, containing procedures for using the authorized EFVS operational credit to determine the minimum visibilities for use with EFVS.

6. EFVS Maintenance Procedures. EFVS maintenance procedures or programs as described in Appendix B. If the applicant is responsible for the training of maintenance personnel, the applicant can also provide an EFVS training curriculum for maintenance personnel, as described in paragraph 9 and Appendix B.

11.3 EFVS Operational Demonstration for Parts 91K, 121, 125, and 135 Applications. The FAA's process for approval and acceptance includes observing and evaluating the operator's ability to perform the proposed operation(s) in accordance with the procedures, guidelines, and parameters described in the operator's formal application. The means for meeting the operational demonstration objectives and an appropriate timeline are established through an agreement between the operator and the responsible Flight Standards Safety Assurance office. The are many acceptable means by which an operational demonstration can be accomplished (e.g., tabletop exercises, simulators, classroom observations, observations of line operations, observations of training flights, or any other agreed-upon means). The specifics of the application and the operator's previous experience will define the acceptability of an operational demonstration plan, which can demonstrate the following:

1. Amendments to manuals, procedures, and checklists for EFVS operations are appropriately incorporated and distributed to all applicable personnel;
2. EFVS maintenance practices are conducted in accordance with the MEL, ICA, and other manufacturer's guidance;
3. EFVS training for flightcrews, maintenance personnel, and persons authorized to exercise operational control provides the knowledge, skills, and competency to safely conduct EFVS operations;
4. The ability of qualified flightcrews to conduct EFVS operations in accordance with the regulations, applicable operating conditions or limitations, and the operator's authorization;
5. The ability of persons authorized to exercise operational control of an aircraft (e.g., dispatch, release, etc.) to properly plan and dispatch/release a flight in accordance with the operator's EFVS authorization; and
6. The ability of the installed EFVS to provide a visual advantage to support the operational credit requested. The recommended credit published in the EFVS OSR is based on previously demonstrated performance. If the applicant elects to use the recommendation, no demonstration is required. If the applicant elects to perform their own demonstration, they may want to reference AC 20-167 for the standard methods used to demonstrate quantified visual advantage in the certification process.

12 OPERATIONAL AUTHORIZATIONS FOR PART 129.

12.1 Overview. IFOs are responsible for authorizing operators of foreign-registered aircraft to conduct EFVS operations in the United States. An operational demonstration is not required to obtain FAA authorization C048. EFVS operations conducted under part 129 in U.S.-registered aircraft solely outside the United States in common carriage by a foreign person or a foreign air carrier do not require authorization from the FAA because the United States is not the State of the Operator.

12.2 The Application. The FAA recommends that operators seeking OpSpec C048 submit an application to their responsible IFO. Applications that include the supporting documentation described below for the EFVS operations requested will facilitate the review process.

1. Correspondence clearly summarizing the aircraft, equipment, operations, and provisions for which the applicant is seeking authorization.
2. EFVS operational approval issued by the CAA of the State of the Operator.
3. Airworthiness documentation containing a description of the aircraft and equipment proposed to be used for EFVS operations. AFM excerpts or supplements are acceptable documentation.
4. For U.S.-registered aircraft, MEL approval with any EFVS provisions. For EFVS operations, the foreign operator should take the EFVS and components into consideration during MEL submission, review, and approval, if the foreign operator is seeking MEL relief for EFVS.
5. EFVS training documentation from the CAA of the State of the Operator for the EFVS operation to be conducted.
6. For U.S.-registered aircraft, maintenance program approval, including EFVS provisions. An FAA-approved maintenance program is required for U.S.-registered aircraft, per part 129, § 129.14(a). This maintenance program should contain maintenance provisions for EFVS equipment.
7. Operators applying for authorization to use EFVS operational credit can provide documentation of the demonstrated performance of the installed EFVS sensor. Operators may use the standard credit published in the EFVS OSR, which is based on previous demonstrations of system visual advantage. When an operator elects to use the standard credit, it is not necessary to demonstrate visual advantage during the operational demonstration. Operators may propose a credit based on their own demonstration.

13 AC FEEDBACK FORM.

For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.

APPENDIX A. ELEMENTS OF AN EFVS PILOT TRAINING CURRICULUM

A.1 Purpose. This appendix lists the ground training subjects and flight training tasks that must be included in a pilot training curriculum for EFVS operations under 14 CFR part 61, § 61.66, as well as methods for fulfilling the § 61.66 requirements.

A.2 EFVS Ground Training Subjects. The following provides the regulatory text, a regulatory citation, and relevant subject matter for each ground training subject required under § 61.66(a). It is acceptable to go beyond the minimum subjects provided in § 61.66(a).

A.2.1 Per § 61.66(a)(2)(i), it is necessary for the pilot training curriculum to include regulations that relate to EFVS flight operations and limitations, including EFVS limitations in the Airplane Flight Manual (AFM) or Rotorcraft Flight Manual (RFM). This could be accomplished by including:

1. An overview of the regulations relevant to EFVS operations. A list of the regulations are in Appendix D, Related Regulations and Guidance.
2. An overview of an AFM or its supplement (AFM(S)) or other manufacturer documentation that specifies the type of EFVS operation the EFVS is certified to conduct, specifies performance applicable to the use of operational credit, or defines specific procedures, conditions, or limitations associated with operating the EFVS. In some cases, procedures described in an AFM(S) may be more restrictive than the regulations.

A.2.2 Per § 61.66(a)(2)(ii), it is necessary for the pilot training curriculum to include EFVS sensor imagery, required aircraft flight information, and flight symbology. This could be accomplished by including:

1. An overview of the characteristics of the enhanced imagery provided by an EFVS. An EFVS image must be real-time, conformal, and sensor-based. Imagery that is computer-generated from a database, such as a synthetic image, cannot be used to conduct an EFVS operation.
2. An overview of the symbology and equipment requirements to be used for EFVS operations to touchdown and rollout (EFVS-TD) operations listed under 14 CFR part 91, § 91.176(a)(1).
3. An overview of the symbology and equipment requirements of an EFVS to be used for EFVS operations to 100 feet above the touchdown zone elevation (TDZE) (EFVS-100) operations listed under § 91.176(b)(1).

A.2.3 Per § 61.66(a)(2)(iii), it is necessary for the pilot training curriculum to include EFVS display, controls, modes, features, symbology, annunciations, and associated systems and components. This could be accomplished by including:

1. A description of the controls for the EFVS image to include display brightness, contrast, and image modes.
2. A description of the control for turning the EFVS image on or off. This control is important, because if the sensor imagery were to obscure the pilot's view of the outside scene, the pilot should have a readily available means to immediately remove the sensor imagery from the Head-Up Display (HUD). However, in order to continue an EFVS operation, the pilot should reactivate the image as soon as possible.
3. A description of how computer-generated synthetic elements are presented in the image, if applicable. Some systems may integrate synthetic vision elements into the image displayed on the HUD. A pilot should be able to differentiate between the sensor-based elements and the computer-generated elements.
4. A description of the runway and extended runway centerline symbology presented during the approach phase.
5. A description of the field of view (FOV) of the EFVS display.

A.2.4 Per § 61.66(a)(2)(iv), it is necessary for the pilot training curriculum to include EFVS sensor performance, sensor limitations, scene interpretation, visual anomalies, and other visual effects. This could be accomplished by including:

1. A description of the imaging technology of the EFVS sensor and the related limitations (i.e., light detection, obstacle detection, weather types, and FOV). The AFM(S) may specify any limitations or demonstrated performance applicable to the installed EFVS. An EFVS can display imagery that may significantly improve a pilot's capability to detect approach lights and visual references of the runway environment that may not otherwise be visible using natural vision. Not all EFVS sensors have the same imaging capabilities. Some sensors may image particular materials and some may focus in specific energy spectrums. Some sensor technologies are more affected by certain weather conditions (e.g., obscurations and precipitation). Some systems utilize multiple sensors to combine the benefits from different technologies.
2. An overview on interpreting a sensor-generated scene presented by the EFVS. Images may have characteristics and contain artifacts that are unique to the sensor technology, EFVS image processing software, or display characteristics (i.e., monochrome colors). An external scene generated from infrared technology may be different from a scene generated from another technology or combination of technologies.
3. An overview of image anomalies of the installed EFVS. Anomalies such as "noise," "blooming," parallax, and other visual effects may be more prevalent in different EFVS installations.

A.2.5 Per § 61.66(a)(2)(v), it is necessary for the pilot training curriculum to include preflight planning and operational considerations associated with using EFVS during the taxi, takeoff, climb, cruise, descent, and landing phases of flight, including the use of EFVS for instrument approaches, operating below the decision altitude (DA)/decision height

(DH) or minimum descent altitude (MDA), executing missed approaches, landing, rollout, and balked landings. This could be accomplished by including:

1. An overview of flight planning considerations for sensor performance and limitations.
2. A description of the optimal EFVS settings for different phases of flight and meteorological conditions.
3. An overview of techniques for identifying visual references with natural vision at 100 feet above the TDZE for EFVS-100 operations. There may be several techniques that crews can use to ensure that visual references are seen with natural vision while continuing to use the EFVS image. It is important that these techniques do not reinforce deactivating the EFVS image more than momentarily during the EFVS operation.
4. An overview of considerations for conducting EFVS operations with a limited EFVS FOV. A combination of crosswind correction, approach course offset, and the lateral FOV may result in the inability of the pilot to acquire and maintain visual references.
5. An overview of considerations for executing a go-around below a DA/DH or MDA. Whether a pilot is using an EFVS or natural vision, obstacle clearance should not be assumed when initiating a go-around below a DA/DH or MDA or after the missed approach point. The missed approach procedure should be thoroughly briefed and accurately flown, and may need additional climb performance beyond the standard 200 feet per nautical mile to ensure adequate obstacle clearance.
6. An overview of the considerations for visual segment obstacle clearance. Pilots using an EFVS should be careful not to conclude that the flightpath is free of obstacles because no obstacles are distinctly visible in the EFVS image. The approach procedure should be thoroughly briefed and accurately flown.
7. An overview of the considerations for conducting EFVS operations on special instrument approach procedures (IAP). Operators that have a specific approval from the FAA to conduct instrument approaches using special IAPs should evaluate those instrument procedures to determine their compatibility with EFVS operations. These procedures may have nonstandard features or special conditions that may not be compatible with EFVS operations or the performance of an EFVS sensor.
8. An overview of the considerations for conducting taxi operations after conducting an EFVS operation. Once the EFVS operation is complete, the pilot may have to taxi at an airport with Low-Visibility Operations (LVO)/Surface Movement Guidance and Control System (SMGCS) operations in effect. Although an EFVS may provide some increased situation awareness during taxi operations, natural vision is still essential.

A.2.6 Per § 61.66(a)(2)(vi), it is necessary for the pilot training curriculum to include weather associated with low-visibility conditions and its effect on EFVS performance. This could be accomplished by including:

1. An overview of the effect of obscuration types, precipitation conditions, and low ceilings or cloud layers as contributing factors to the variable and unpredictable characteristics of EFVS sensor performance or EFVS sensor and image quality.

2. An overview of visibility reporting equipment (e.g., Runway Visual Range (RVR), automated surface observing system (ASOS), and Automated Weather Observing System (AWOS)) and their limitations, reporting increments, and relationship to actual flight visibility on the approach.

A.2.7 Per § 61.66(a)(2)(vii), it is necessary for the pilot training curriculum to include normal, abnormal, emergency, and crew coordination procedures when conducting EFVS operations. This could be accomplished by including:

1. A description of the operational concepts and the procedures used in EFVS-TD operations, as applicable.
2. A description of the operational concepts and the procedures used in EFVS-100 operations, as applicable.
3. A description of the following system preflight and in-flight procedures:
   a. An integrity check of the sensor window;
   b. System tests and warmup time;
   c. System control adjustments, to include appropriate setting of EFVS contrast, brightness, and symbology; and
   d. EFVS image alignment procedures with the natural vision image.
4. A description of the following pilot flying (PF) and pilot monitoring (PM) communications:
   a. Callouts for continuing descent below the DA/DH or MDA using the EFVS;
   b. Callouts for transition from enhanced image to natural vision at 100 feet above the TDZE during an EFVS-100 operation;
   c. Callouts to clearly communicate the decision to land or go around; and
   d. Callouts for abnormal EFVS operations.
5. A description of the following items to be briefed prior to initiating an approach using the EFVS:
   a. Expectations of system performance and limitations in reported weather conditions and a minimum visibility for the use of an EFVS (if applicable);
   b. EFVS callouts;
   c. Other approach considerations that may affect EFVS operations such as final approach offsets and ground infrastructure;
   d. Missed approach considerations and procedure; and
   e. The taxi operation considerations in reported weather conditions.
6. A description of the PM use of the repeater display during EFVS-TD operations. The PM uses the display to assess the safe conduct of the approach, landing, and rollout, and intervene if necessary in visibilities where natural vision may not be sufficient.

7. A description of the procedure used for determining minimum visibility for use of EFVS for the purpose of releasing the flight or executing an approach, as applicable.
8. An overview of techniques for identifying EFVS system failures and corresponding procedures. A proper cross-check of the HUD instrumentation presentations against the EFVS sensor image could help recognize malfunctions of the navigation equipment or improper presentation of elements in the visual scene during the approach. In the event any required component fails during an EFVS operation until touchdown, the PF should initiate a go-around. However, this does not preclude a pilot's authority to continue to a landing and rollout if the pilot considers that a safer course of action.

A.2.8 Per § 61.66(a)(2)(viii), it is necessary for the pilot training curriculum to include the interpretation of approach and runway lighting systems and their display characteristics when using an EFVS. This could be accomplished by including an overview of different light sources used in airport and approach lighting systems and the ability of the EFVS to detect them. An EFVS based only on infrared sensor technology may not be capable of imaging light-emitting diode (LED) lighting because energy is not emitted in an infrared spectrum. It is important that pilots are familiar with the potential use of LEDs at their destination and any corresponding limitations of their EFVS. For more information, please refer to Information for Operators (InFO) 11004, Enhanced Flight Vision System (EFVS), Enhanced Vision Systems (EVS), and Night Vision Goggles (NVG) Compatibility with Light-Emitting Diodes (LEDs) at Airports and on Obstacles. You can find InFO 11004 at https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info.

A.3 EFVS Flight Training Tasks. The following provides the regulatory text, a regulatory citation, and relevant suggestions for each flight training task required under § 61.66(b). The flight training tasks should reinforce the lessons taught in the ground training subjects. The suggestions for each regulatory task are not all inclusive and should be included in a pilot training curriculum.

A.3.1 Per § 61.66(b)(2)(i), it is necessary that the flight training curriculum includes preflight and in-flight preparation of EFVS equipment for EFVS operations, including EFVS setup and use of display, controls, modes, and associated systems, and adjustments for brightness and contrast under day and night conditions. It may be beneficial to perform these tasks in the curriculum using either the manufacturer's recommended procedures or procedures applicable to the operator.

A.3.2 Per § 61.66(b)(2)(ii), it is necessary that the flight training curriculum includes proper piloting techniques associated with using EFVS during taxi, takeoff, climb, cruise, descent, landing, and rollout, including missed approaches and balked landings. It may be beneficial for the curriculum to allow pilots to become familiar with the use of installed equipment such as an EFVS in all phases of flight.

A.3.3 Per § 61.66(b)(2)(iii), it is necessary that the flight training curriculum includes proper piloting techniques for the use of EFVS during instrument approaches, to include operations below the DA/DH or MDA as applicable to the EFVS operations to be

conducted, under both day and night conditions. It may be beneficial for the curriculum to help pilots become proficient in piloting techniques using the flight director, flightpath vector cue, and flightpath angle reference cue, as well as using the EFVS during the flare, touchdown, and rollout consistent with EFVS-100 operations or EFVS-TD operations under the following conditions:

1. A sample of approach types for the EFVS operation being trained (e.g., precision and nonprecision, if applicable).
2. A sample of crosswind conditions and offset angles that emphasize the challenges of operating with the limited FOV with an EFVS.
3. EFVS operations in visibilities less than IAP minimum visibilities. This may not be practical if training is conducted in an aircraft. If the training is accomplished in a full flight simulator (FFS), conduct the training with the enhanced visibilities representative of the EFVS sensor performance.

A.3.4 Per § 61.66(b)(2)(iv), it is necessary that the flight training curriculum includes determining enhanced flight visibility. The curriculum can help pilots learn how to determine enhanced flight visibility using techniques and methods similar to the techniques and methods used for determining flight visibility when conducting an approach without an EFVS.

A.3.5 Per § 61.66(b)(2)(v), it is necessary that the flight training curriculum includes identifying required visual references appropriate to EFVS operations. The curriculum can help pilots learn how to identify required visual references using an EFVS with techniques and methods similar to the techniques and methods used for identifying the required visual references when conducting an approach without the use of an EFVS. The PM may use the PM display, if available, to assist the PF in this task.

A.3.6 Per § 61.66(b)(2)(vi), it is necessary that the flight training curriculum includes transitioning from EFVS sensor imagery to natural vision acquisition of required visual references and the runway environment. The curriculum can help pilots learn how to acquire visual references with natural vison at 100 feet during an EFVS-100 operation. There are many acceptable techniques for identifying the visual references with natural vision while the pilot continues using the EFVS to provide the enhanced flight visibility required for the operation.

A.3.7 Per § 61.66(b)(2)(vii), if the person receiving the training will conduct EFVS operations under § 91.176(a), it is necessary that the flight training curriculum includes using EFVS sensor imagery, required aircraft flight information, and flight symbology to touchdown and rollout. The curriculum may want to emphasize completing the operation using enhanced imagery and HUD symbology in conditions applicable to the lowest visibility associated with the EFVS being used.

A.3.8 Per § 61.66(b)(2)(viii), it is necessary that the flight training curriculum includes normal, abnormal, emergency, and crew coordination procedures when using an EFVS. This can be accomplished by including the following in the curriculum:

1. Procedures applicable to the PF and PM, crew briefings, procedures, callouts, and coordination items for EFVS operations, including annunciation of published minimums during operation below the DA/DH or MDA.
2. Procedures at 100 feet during an EFVS-100 operation.
3. EFVS failure procedures (procedures for an EFVS failure or a system degradation during an EFVS operation).

APPENDIX B. EFVS MAINTENANCE PROGRAM AND PERSONNEL TRAINING

B.1 Purpose. This appendix contains guidance for developing maintenance programs and training maintenance personnel that may be addressed in an application to conduct EFVS operations (14 CFR part 91, § 91.1111; part 121, § 121.375; and part 135, § 135.433).

B.2 Guidance for an Application. The FAA recommends that all applications submitted for an FAA authorization include documentation that addresses the following maintenance items supported by the EFVS manufacturer's instructions for continued airworthiness (ICA), as accepted by the FAA, and proposed minimum equipment list (MEL) revisions, if applicable, listing any limitations associated with EFVS operations:

1. An operator's maintenance program may incorporate the EFVS manufacturer's ICA, as accepted by the FAA, and identify the person responsible for the EFVS maintenance program, any special techniques, maintenance/inspection frequencies, and test equipment required to support the continued airworthiness of the system.
2. Indicate whether the EFVS maintenance program, or equivalent, is integrated into an existing approved maintenance program (e.g., lower landing minimums program) or a separate program.
3. Identify how maintenance personnel will be trained and qualified on the EFVS and the method to record and maintain their qualifications.
4. Identify the procedure for EFVS software distribution and loading if not specified by the manufacturer's ICAs.
5. Identify procedures used to maintain system configuration control, including parts pooling and borrowing.
6. Identify procedures for EFVS discrepancy reporting and recording.
7. Identify procedures for the MEL and logbook pertaining to upgrade/downgrade/deferral of the EFVS. An EFVS may have a discrepancy that prohibits it from being used for EFVS operations to touchdown, but not from being used for EFVS operations to 100 feet above the touchdown zone elevation (TDZE) (EFVS-100) operations.
8. Identify procedures for the MEL (e.g., remarks section, limitations, upgrade/downgrade, etc.) that ensure the EFVS status is placarded properly and clearly documented in the aircraft logbook per § 91.213(d)(3).
9. Identify procedures for notification between maintenance control, engineering, flight operations, and dispatch, or equivalent, when an aircraft's EFVS status changes.
10. Identify procedures to ensure the downgrade of an aircraft's EFVS status, if applicable, when maintenance was performed on the EFVS by nonqualified persons.
11. Identify procedures to monitor and identify aircraft with chronic EFVS discrepancies and restrict the aircraft from EFVS operations until appropriate corrective action and tests have been performed.

12. Identify procedures for return to service of an EFVS following routine/nonroutine maintenance or completion of corrective action, such as:
    - Tests for return to service;
    - Operational check flight items;
    - Component mount or rack removal/installation; and
    - Structural damage or modification affecting EFVS optical alignment or system performance.
13. Indicate the EFVS program is integrated into the operator's Continuing Analysis and Surveillance System (CASS) or reliability programs to monitor total system performance that includes sampling.
14. The FAA recommends that maintenance personnel be familiar with the operator's approved EFVS program (or equivalent), their individual responsibilities with respect to that program, and the availability of any resources within or outside of the maintenance organization necessary to ensure program effectiveness.
15. If applicable, maintenance personnel training listed in paragraph B.3 can be addressed.

B.3 Maintenance Personnel Training for EFVS Operations. This paragraph contains guidance on maintenance personnel training for EFVS operations. The FAA recommends that maintenance personnel be knowledgeable of the operator's EFVS program. Operator and contract maintenance personnel, including mechanics, maintenance controllers, avionics technicians, and inspection/quality assurance personnel can receive initial and recurrent training to establish and maintain an effective EFVS maintenance program. Applications may address the following maintenance training items:

1. Identify the person(s) responsible for ensuring EFVS maintenance and inspection personnel are properly trained, knowledgeable, and current;
2. Identify how the EFVS training will be conducted (i.e., in-house or via an outside training provider);
3. Include policy and procedures that address the qualification of EFVS maintenance and inspection personnel;
4. Identify the methods and techniques used to conduct initial and recurrent training (e.g., instructor-led training, computer-based training (CBT), or on-the-job training (OJT));
5. Identify the procedures used to record and maintain the training for initial and recurrent EFVS qualifications; and
6. Include the EFVS maintenance and inspection training curriculum that addresses the following topics:
    - EFVS system overview;
    - EFVS maintenance and inspection procedures;

- EFVS personnel training and qualification for EFVS-100 operations and EFVS operations to touchdown and rollout (EFVS-TD) operations;
- EFVS-100 operations and EFVS-TD operations upgrade/downgrade procedures, including applicable status change notifications;
- MEL procedures;
- Test equipment and use;
- Return-to-service tests and procedures; and
- EFVS parts handling procedures, including handling of outside vendor parts.

APPENDIX C. ELEMENTS OF A TRAINING CURRICULUM FOR DISPATCHERS AND OTHER PERSONS AUTHORIZED TO EXERCISE OPERATIONAL CONTROL FOR EFVS OPERATIONS

C.1 Purpose. This appendix addresses training for dispatchers and other persons authorized to exercise operational control for EFVS operations.

C.2 Initial Training for Dispatchers and Other Persons Authorized to Exercise Operational Control. To ensure that an approach and landing can be successfully completed using EFVS, it is important that dispatchers and other persons authorized to exercise operational control fully understand the capabilities and limitations of the specific EFVS equipment installed in the operator's aircraft. The FAA recommends that dispatchers and other persons authorized to exercise operational control understand that unique weather conditions can cause variability in how an EFVS sensor performs and that weather conditions can exceed the sensor's ability to provide the enhanced flight visibility required to complete the approach and landing. Operational planning and continuous monitoring of weather conditions at the destination airport are especially important under these circumstances. Initial training for dispatchers and other persons authorized to exercise operational control may consist of the following:

C.2.1 Regulatory requirements applicable to the EFVS operation(s) the operator will conduct (e.g., EFVS operations to 100 feet above the touchdown zone elevation (TDZE) (EFVS-100) operation or EFVS operations to touchdown and rollout (EFVS-TD) operation):

1. Operational concept for EFVS-100 operations or EFVS-TD operations in 14 CFR part 91, § 91.176, appropriate to the operator's authorization to conduct EFVS operations;
2. Applicability of EFVS operations contained in §§ 91.175, 91.176, and 91.189;
3. Regulatory requirements contained in 14 CFR part 121, §§ 121.613 and 121.615; part 125, §§ 125.361 and 125.363; and part 135, § 135.219, as applicable, for dispatch, flight release, or takeoff under instrument flight rules (IFR) with minimums determined for the purpose of conducting an EFVS operation;
4. Exceptions for EFVS operations contained in §§ 121.651, 125.325, 125.381, and 135.225, as applicable, for continuing an approach when the reported visibility is below the minimum visibility prescribed for the instrument approach procedure (IAP) to be flown;
5. The authorization pertinent to the EFVS operation the pilot will conduct; and
6. Exemptions or deviations from the regulations that pertain to the use of EFVS, if any.

C.2.2 Airplane Flight Manual or its supplement (AFM(S)) material pertinent to EFVS operations:

1. Type of EFVS operation the operator's aircraft is certified to conduct; and
2. EFVS system description and operating limitations.

C.2.3 Sensor technology, performance, and limitations:

1. Understanding the specific EFVS sensor technology or technologies installed on the operator's aircraft;
2. EFVS sensor performance in varying weather conditions; and
3. EFVS sensor limitations, including the EFVS sensor's ability to detect or not detect obstacles and specific types of lighting.

C.2.4 Procedures determining minimum visibilities for use with EFVS to flight release.

C.2.5 Procedures for redispatch en route with respect to EFVS operations.

C.2.6 Minimum equipment list (MEL)/Configuration Deviation List (CDL) flight release requirements and considerations.

C.2.7 Operational considerations for use of EFVS associated with:

1. Offset final approach courses;
2. Displaced thresholds;
3. Decision altitude (DA) in a turn;
4. The use of a minimum descent altitude (MDA) as a DA/decision height (DH) in accordance with FAA authorization C073, Vertical Navigation (VNAV) Instrument Approach Procedures (IAP) Using Minimum Descent Altitude (MDA) as a Decision Altitude (DA)/Decision Height (DH);
5. The use of vertical navigation (VNAV) IAPs using MDA as a DA/DH; and
6. Effect of crosswinds and approaches with inbound courses that are offset with the runway centerline when conducting EFVS operations.

C.3 Recurrent and Differences Training for Dispatchers and Other Persons Authorized to Exercise Operational Control. Recurrent training for dispatchers and other persons authorized to exercise operational control may consist of the same subject areas covered by initial training. Differences training for a new EFVS or a new EFVS operation may address the areas specified in this appendix and any additional material pertinent to the EFVS or the EFVS operation to be conducted.

APPENDIX D. RELATED REGULATIONS AND GUIDANCE

D.1 Applicable 14 CFR Regulations:

D.1.1 EFVS Definitions in Part 1, § 1.1.

D.1.2 EFVS Training, Checking, and Currency.

- Part 61, § 61.66.
- Part 91, § 91.1065.
- Part 121, §§ 121.407, 121.409, 121.441, and Appendices F and H.
- Part 125, § 125.287.
- Part 135, § 135.293.

D.1.3 EFVS Operations.

- Section 91.176.
- Section 91.189(d) and (e).

D.1.4 EFVS Begin or Continue an Approach.

- Section 91.1039.
- Section 121.651.
- Sections 125.325 and 125.381.
- Section 135.225.

D.1.5 List of Rules Subject to Waiver.

- Section 91.905.

D.2 Related FAA Advisory Circulars (AC) (current editions).

You can find the following ACs at https://www.faa.gov/regulations_policies/advisory_circulars/:

- AC 20-167, Airworthiness Approval of Enhanced Vision System, Synthetic Vision System, Combined Vision System, and Enhanced Flight Vision System Equipment.
- AC 61-65, Certification: Pilots and Flight and Ground Instructors.
- AC 120-54, Advanced Qualification Program.
- AC 120-57, Surface Movement Guidance and Control System.
- AC 120-71, Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.
- AC 120-118, Criteria for Approval/Authorization of All Weather Operations (AWO) for Takeoff, Landing, and Rollout.

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Flight Technologies and Procedures Division at 9-AWA-AFS400-Coord@faa.gov or the Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 90-106B, Enhanced Flight Vision System Operations

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____