

**Helicopter Safety Enhancement (H-SE) 91:
Enhanced Helicopter Vision Systems**

<p>Safety Enhancement Action:</p>	<p>FAA and industry to research, develop, and promote the use of enhanced helicopter vision systems (EHVS) technologies (e.g. Night Vision Goggles, Enhanced Vision Systems, Synthetic Vision Systems, Combined Vision Systems, etc.) to assist in recognizing and preventing unplanned flight into degraded visibility conditions due to weather and to increase safety during planned flight at night.</p>
<p>Expected Implementers:</p>	<ul style="list-style-type: none"> • FAA – AFS-250, 400, 800 • FAA – AIR, Policy & Innovation Div, Rotorcraft Standards Staff • FAA – Civil Aerospace Medical Institute (CAMI) • Helicopter Association International (HAI) • Association of Air Medical Services (AAMS) • Air Medical Operators Association (AMOA) • National EMS Pilots Association (NEMSPA) • HeliOffshore • Helicopter Safety Advisory Conference (HSAC) • Industry Vision Systems Manufacturers • Airborne Law Enforcement Association (ALEA) • Helicopter manufacturers (GAMA to coordinate)
<p>Statement of Work:</p>	<p>In the analysis of the 52 fatal accidents from 2009–2013, the USHST working group observed cases where either night conditions or deteriorating weather influenced the fatal outcome. These cases led to the recommendation for increased use of vision-enhancing technologies. The technology would have particular usefulness during night flight and during situations where unexpected degraded visibility from adverse weather is encountered.</p> <p>This H-SE has the potential to be misapplied and the result could be a decrease rather than an increase in safety. In development of this H-SE, the intent of the USHST working group was <u>NOT</u> to equip pilots to fly in worse weather. Instead, the intent was to provide pilots with</p>

	<p>better tools that can contribute to more informed and proactive decision making as related to visibility.</p> <p>An underlying assumption in this H-SE is that low-visibility conditions are more hazardous than high-visibility conditions. Use of NVGs has become more common among helicopter operators as one way to address the hazards of low visibility at night. Full enhanced/synthetic vision systems could follow a similar path for night operations and also for better avoiding low visibility conditions either during the night or the day.</p> <p>Project:</p> <ol style="list-style-type: none"> 1. FAA to research and evaluate helicopter vision-enhancing technologies and operational concepts for advanced vision systems. This will require communication with existing industry vision system manufacturers to get a well-informed perspective of currently available technology. 2. FAA to develop policy changes to allow for the use of vision-enhancing technologies (Update FAA Order 8260.42B Advisory Circulars 90-80B, 90-106A, and FSIMS 8900.1). Review 14 C.F.R. § 91.175/176 and decide whether a regulatory revision through rulemaking would be necessary for the H-SE to be implemented. 3. Industry and FAA to develop and conduct outreach program to promote use of vision-enhancing technologies. <p>The following fatal accidents prompted this safety enhancement: WPR10FA055 CEN13FA096</p>
<p>Relation to Current Aviation Community Initiatives:</p>	<ul style="list-style-type: none"> • FAA Helicopter Advanced Vision Systems Research • EUROCAE Working Group 79 • RTCA Special Committee 213 • HAI Land & Live • SAE G-10/A-4 Committee on Enhanced/Synthetic Vision • 14 C.F.R. § 91.175/91.176
<p>Performance Goal Indicators:</p>	<ul style="list-style-type: none"> • List of current vision systems enhancing technologies available and their compatibility with rotorcraft. • If necessary due to lack of compatible vision systems enhancing technologies currently available, a report on

	<p>operational concepts for utilization of helicopter vision-enhancing systems.</p> <ul style="list-style-type: none"> • Policy/guidance changed to encourage installation/use of vision systems enhancing technologies. • Effective promotion, including education on the use, of vision systems enhancing technologies to industry. 																				
Key Milestones:	<table border="1"> <thead> <tr> <th></th> <th><u>Total Months</u></th> <th><u>Start Date</u></th> <th><u>End Date</u></th> </tr> </thead> <tbody> <tr> <td>Output 1:</td> <td>12</td> <td>Feb. 1, 2018</td> <td>Feb. 1, 2019</td> </tr> <tr> <td>Output 2:</td> <td>24 – 36</td> <td>Feb. 1, 2019</td> <td>Feb. 1, 2022</td> </tr> <tr> <td>Output 3:</td> <td>12</td> <td>Feb. 1, 2022</td> <td>Feb. 1, 2023</td> </tr> <tr> <td>Completion:</td> <td>48–60 months</td> <td></td> <td></td> </tr> </tbody> </table>		<u>Total Months</u>	<u>Start Date</u>	<u>End Date</u>	Output 1:	12	Feb. 1, 2018	Feb. 1, 2019	Output 2:	24 – 36	Feb. 1, 2019	Feb. 1, 2022	Output 3:	12	Feb. 1, 2022	Feb. 1, 2023	Completion:	48–60 months		
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Potential Obstacles:	Regulatory Obstacles (Operational Approval and Certification), technology obstacles, cost versus benefit.																				
Detailed Implementation Plan Notes:	<p>Significant dates to consider related to outreach would be 2018 HELI-EXPO (Feb 26 – Mar 01). Other mass industry conventions and gatherings should also be considered.</p> <p>This H-SE also relates to components of the following intervention strategies developed by the USHST working group that scored below the Mendoza Line:</p> <ol style="list-style-type: none"> IS 88, Technology/Equipment: Industry to develop a means to provide pilots with horizontal warning indication to maintain a safe distance from obstacles. The intent is to alert pilots of reduced horizontal separation in order to avoid a collision with obstacles. (Brainstorming ideas: geofencing ideas) IS 89, Technology/Equipment: Industry develop smart cockpit technology that would assist in pilot decision making for landing guidance provided to the pilot color-based (i.e. like HTAWS), pilot-worn (panel-mount, EFB, or HWD), also aural alerting. IS 96, Technology/Equipment: Industry continue to develop more accurate, low cost, lightweight wire detection systems for installation on the aircraft. IS 151, Research: FAA and Industry partner to examine use of vision system technologies to display and alert for air borne hazards; <i>i.e.</i>, wires, sensors, or data base. 																				

	This H-SE also has some relation to the GA-JSC’s SCF-PP working group SE 49 Outreach-Topic Eight: Enhanced Vision Systems. CAST SE-113 is also related to this effort.
CICTT Code:	LOC-I, UIMC
Output 1:	
Description:	Research and evaluate helicopter vision-enhancing technologies and operational concepts for advanced vision systems.
Lead Organization:	FAA –ANG-E2 (Aviation Research Division)
Supporting Organizations:	<ul style="list-style-type: none"> • FAA – AFS-400 (Flight Technologies and Procedures Division), AFS-800; AIR – Policy & Innovation Division, Rotorcraft Standards Staff; CAMI • Industry Vision Systems Manufacturers • Avionics Manufacturers • Helicopter OEMs
Actions:	<ol style="list-style-type: none"> 1. FAA – ANG-E2 should engage with industry to review the current vision systems enhancing technologies available and how compatible they may be with rotorcraft. A survey of industry vision systems manufacturers may be necessary as part of this effort. FAA – ANG-E2 should compile the results of this review in support of the FAA internal discussion described in Step 2. 2. FAA – ANG-E2, AFS-400, AFS-800, and AIR-Rotorcraft Standards Staff should meet to discuss any existing operational and certification barriers (regulation, policy, guidance) that may have either discouraged or prohibited use of already available advanced vision technologies. These will be issues the FAA should resolve in Output 2. 3. Following the FAA discussion from Step 2, if there are currently available vision systems enhancing technologies that could be accepted and installed by the rotorcraft community without significant action necessary by the FAA, this type of technology should be promoted immediately and not delayed by further study (skip to Output 3, “promotion”). However, if options are limited and further study is required, FAA – ANG-E2 should do the following: <ol style="list-style-type: none"> a. Conduct a study on pilot performance and human factors aspects of vision-enhancing system displays via flight testing.

	<p>b. Conduct a study on vision systems' sensor technologies and performance via flight and ground testing.</p> <p>c. Examine obstacle-detection capabilities with vision systems technologies (<i>i.e.</i>, wire detection with FLIR, LIDAR, MMWIR, etc.).</p> <p>4. At the conclusion of this output, FAA- ANG-E2 should develop a report on operational concepts for utilization of helicopter vision-enhancing systems in low-visibility operations (<i>i.e.</i>, night, IMC, etc.) and enhanced VFR.</p>
Output Notes:	This will require communication with existing industry vision system manufacturers to get a well-informed perspective of currently available technology.
Time Line:	12 months
Target Completion Date:	Feb. 1, 2019
Output 2:	
Description:	Develop policy and operational changes to allow for the use of vision-enhancing technologies (Update FAA Order 8260.42B Advisory Circulars 90-80B, 90-106A, and FSIMS 8900.1). Review 14 C.F.R. § 91.175/176 and decide whether a regulatory revision through rulemaking would be necessary for the H-SE to be implemented.
Lead Organization:	FAA AFS-400
Supporting Organizations:	<ul style="list-style-type: none"> • FAA – AIR – Policy & Innovation Division • Rotorcraft Standards Staff • CAMI
Actions:	<p>The recommended approach is for the FAA to pursue the least arduous path to allow availability of some level of vision-enhancing technologies. Preferably, this approach would be no more complex than a revision to policy or guidance. The following represents a potential list of policy and guidance that would require either development or update. There is also one regulatory reference listed also included. Given that rulemaking is a slow, time consuming process, pursuing regulatory change could jeopardize implementation of this H-SE ever occurring and should be pursued only as a last resort, and certainly only if absolutely necessary.</p> <ol style="list-style-type: none"> 1. Update FAA Order 8260.42B. 2. Update FAA Advisory Circular 9080-C. 3. Revise FSIMS 8900.1. 4. Update FAA Advisory Circular 90-106A (or create a new Advisory Circular specific to helicopters).

	<p>5. Review § 91.175/176. Consider whether rulemaking is necessary and pursue this path only if necessary for successful implementation of the H-SE.</p> <p>6. Implement resolution to any issues identified as FAA barriers in Step 2 of Output 1.</p>
Output Notes:	Stay true to the intent of the H-SE. Do not allow “add-on” revisions to policy and/or guidance to delay this H-SE progressing.
Time Line:	24 – 36 months (several years longer if rulemaking is needed).
Target Completion Date:	Feb. 1, 2022
Output 3:	
Description:	Develop and conduct outreach program to promote training on and use of vision-enhancing technologies.
Lead Organization:	USHST Outreach Team
Supporting Organizations:	<ul style="list-style-type: none"> • FAAST • HAI – Safety Committee • AMOA • AAMS • HSAC • HeliOffshore • NEMSPA
Actions:	<ol style="list-style-type: none"> 1. Develop outreach program (includes materials such as videos, mobile applications, trifolds, brochures, slogans/messaging, etc.). 2. Conduct outreach with industry trade associations, at industry forums/conferences, and through other targeted methods for specific mission segments. 3. Measure progress by how many operators were equipped with Vision Systems technology before and after outreach.
Output Notes:	
Time Line:	12 months (<i>for initial outreach effort; would be ongoing even after 12 months</i>)
Target Completion Date:	Feb. 1, 2023