

**Helicopter Safety Enhancement (H-SE) Number 115/128:
Threat and Error Management for Initial and Recurrent Pilot Training**

Safety Enhancement Action:	Training: FAA and industry to develop best practices for, and promote, the teaching of Threat and Error Management (TEM) as part of initial and recurrent pilot training.
Expected Implementers:	<ul style="list-style-type: none"> • FAA AFS-800, AFS-630 • FAA Safety Team (FAAST) • Helicopter Association International (HAI) Training Committee (TC) • USHST Special Emphasis Area (SEA) Training Team
Statement of Work:	<p>Within the USHST’s LOC-I, UIMC, and LALT dataset from 2009-2013, fourteen (14) out of fifty-two (52) fatal accidents had a recommendation to improve aeronautical decision making (H-SE 115) as the result of pilot decision errors that either caused or contributed to the fatal accident. Another three (3) fatal accidents in the data set recommended increased teaching of TEM (H-SE 128) for the same reason.</p> <p>Whereby traditional decision-making paradigms focus largely on reactive and proactive means of flight crew situation management, TEM focuses on a predictive process to eliminate threats and errors before, during, and after each flight. Since its inception and introduction to airline operations, TEM has, as part of larger safety efforts, drastically reduced total accidents within the world-wide airline community. TEM has evolved since its initial testing during Line Operational Safety Audits between Delta Airlines and the University of Texas Human Factors Research School in 1994. Although TEM generally is taught in conjunction with Cockpit Resources Management (CRM), TEM is actually the latest evolution/iteration of the CRM concept: It is defined as “the process of detecting and responding to threats and errors to ensure that the ensuing outcome is inconsequential, <i>i.e.</i>, the outcome is not an error, further error or an undesired aircraft state.”</p> <p>Although introduced by the airlines into initial and recurrent pilot training, the General Aviation community and regulatory training requirements lack a structured system for teaching TEM. 14 C.F.R. Part 61 has not been updated in accordance with the ICAO requirement to introduced TEM in initial flight training programs (such as the PPL).</p> <p>Project:</p>

	<ol style="list-style-type: none"> 1. FAA, in conjunction with USHST SEA Training Team and HAI TC, to develop recommended practices for incorporating TEM into initial and recurrent helicopter training. 2. FAA to revise Advisory Circular (AC) 60-22, <i>Aeronautical Decision Making</i> (or issue new AC, as appropriate) to incorporate TEM recommendations. 3. FAA to incorporate TEM principles in the Helicopter Flying Handbook (FAA-H-8083-21A), Helicopter Instructor’s Handbook (FAA-H-8083-4), the Aviation Instructor’s Handbook (FAA-H-8083-9A), and Pilot’s Handbook of Aeronautical Knowledge (FAA-H-8083-25B) 4. FAA to incorporate TEM as a recommended component in flight training syllabi under 14 CFR Part 141, <i>Pilot School</i>, through revision of Advisory Circular (AC) 141-1A, <i>Pilot Certification</i>. 5. FAASTeam, HAI TC, and USHST SEA Training Team to provide outreach and guidance to training community for aligning training curricula with recommended practices. <p>The following fatal accidents prompted this safety enhancement:</p> <p>ANC13GA036 ERA09FA417 CEN09PA348 ERA09FA537 CEN10FA019 ERA10FA403 CEN10FA509 ERA12MA122 CEN12FA621 ERA13FA014 CEN13FA003 ERA13FA336 CEN13FA205 ERA13GA046 CEN13FA295 WPR10GA097 WPR12FA282</p>
<p>Relation to Current Aviation Community Initiatives:</p>	<ul style="list-style-type: none"> • ICAO Annex 1, Chapter 2, Section 2.3 - Private Pilot License “Human performance” • ICAO Doc 9683 - Human Factors Training Manual • ICAO Doc 9868 - PANS-TRG (guidance material on the application of Threat and Error Management) • Lufthansa MPL Fixed Wing Training Program • Australian Transport Safety Bureau GAPAN TEM “Train the Trainer” (implementing TEM in basic flying training) • Other USHST H-SEs (37 and 124) also plan to recommend revisions to some of the same FAA Handbooks referenced in H-SE 115_128. Submission of revisions from each H-SE must be

	<p>closely coordinated together to ensure consistency of recommendations. There is a benefit to aligning all of them for a single, collective submission with the goal to have all recommendations incorporated during a single revision cycle of the handbooks.</p>																								
Performance Goal Indicators:	<ul style="list-style-type: none"> • Publication of revised Advisory Circular AC 60-22 (or new AC as applicable) to include mention of TEM and how to introduce in pilot training curricula. • Revision to FAA-8083-4 and FAA-8083-9A Handbooks to include TEM references and implementation guidelines. • Revision of AC 141-1A, as amended, to incorporate TEM in Part 141 training courses. 																								
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>Jan. 1, 2018</td> <td>Jan. 1, 2019</td> </tr> <tr> <td>Output 2:</td> <td>24–36</td> <td>Jan. 1, 2019</td> <td>Jan. 1, 2022</td> </tr> <tr> <td>Output 3:</td> <td>24–36</td> <td>Jan. 1, 2019</td> <td>Jan. 1, 2022</td> </tr> <tr> <td>Output 4:</td> <td>24–36</td> <td>Jan. 1, 2019</td> <td>Jan. 1, 2022</td> </tr> <tr> <td>Output 5:</td> <td>6</td> <td>Jan. 1, 2022</td> <td>July 1, 2022</td> </tr> </tbody> </table> <p>Completion: 42–54 months (if Outputs 2, 3, and 4 are done in parallel)</p>		<u>Total Months</u>	<u>Start Date</u>	<u>End Date</u>	Output 1:	12	Jan. 1, 2018	Jan. 1, 2019	Output 2:	24–36	Jan. 1, 2019	Jan. 1, 2022	Output 3:	24–36	Jan. 1, 2019	Jan. 1, 2022	Output 4:	24–36	Jan. 1, 2019	Jan. 1, 2022	Output 5:	6	Jan. 1, 2022	July 1, 2022
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Potential Obstacles:	<ul style="list-style-type: none"> • Subject matter expert agreement on TEM best practices • FAA approval process for revised ACs and handbooks. 																								
Detailed Implementation Plan Notes:	<p>The focus should be on syllabi related to Flight Instructor courses (“train the trainer”). Information should remain general so current certificated pilots can start to be exposed to the concept. Consider coordination with companies that provide market-ready commercial training course outlines.</p> <p>Although this H-SE does not consider rulemaking, if the project’s scope changes during implementation and measurable outcomes prove validity of the concept, rulemaking perhaps should be considered in the future.</p>																								
CICTT Code:	LALT / LOC-I / UIMC																								

Output 1:

Description:	Develop recommended practices for incorporating TEM into initial and recurrent helicopter training.
Lead Organization:	FAA AFS-800
Supporting Organizations:	<ul style="list-style-type: none"> • HAI TC • USHST SEA Training Team
Actions:	<ol style="list-style-type: none"> 1. FAA, USHST SEA Training Team, and HAI TC to review existing materials on teaching TEM. 2. FAA, USHST SEA Training Team, and HAI TC to develop recommendations for implementing TEM in initial and recurrent helicopter pilot training. In completing this work, the group should examine TEM within the context of the LOC-I, UIMC, and LALT fatal accidents analyzed by the USHST working group to guide their recommendations. 3. FAA, USHST SEA Training Team, and HAI TC to issue recommendations.
Output Notes:	<p>Recommendations should be issued in a form that facilitates use in subsequent outputs.</p> <p>The task of H-SE 30 is to develop and publish ACS for Rotorcraft-Helicopter series to replace the current PTS. Recommendations from Output 1 of H-SE 115_28 should be shared with the individuals engaged in the implementation of H-SE 30 so that TEM is appropriately considered in the ACS for Rotorcraft-Helicopter development.</p>
Time Line:	12 months
Target Completion Date:	Jan. 1, 2019
Output 2:	
Description:	Revise Advisory Circular (AC) 60-22, <i>Aeronautical Decision Making</i> (or issue new AC, as appropriate) to incorporate TEM recommendations.
Lead Organization:	FAA AFS-820
Supporting Organizations:	<ul style="list-style-type: none"> • HAI TC • USHST SEA Training Team
Actions:	FAA to incorporate TEM recommendations in AC 60-22, as appropriate, or issue a new AC.
Output Notes:	FAA should request drafting suggestions from USHST SEA Training Team and HAI TC.

	The priority action for Output 2 is revision to AC 60-22. If there is a parallel opportunity to update the FAA’s Risk Management Handbook (FAA-H-8083-2, as amended) with the TEM recommendations, however, it should be considered.
Time Line:	24–36 months (potentially in parallel with Outputs 3 &4)
Target Completion Date:	January 1, 2022
Output 3:	
Description:	Incorporate TEM principles in the Helicopter Flying Handbook (FAA-H-8083-21A), Helicopter Instructor’s Handbook (FAA-H-8083-4), the Aviation Instructor’s Handbook (FAA-H-8083-9A), and Pilot’s Handbook of Aeronautical Knowledge (FAA-H-8083-25B)
Lead Organization:	FAA AFS-630
Supporting Organizations:	<ul style="list-style-type: none"> • HAI TC • USHST SEA Training Team
Actions:	FAA to incorporate TEM into the Helicopter Flying Handbook, Helicopter Instructor’s Handbook, Aviation Instructor’s Handbook, and Pilot’s Handbook of Aeronautical Knowledge.
Output Notes:	<ol style="list-style-type: none"> 1. FAA should request drafting suggestions from USHST SEA Training Team and HAI TC. 2. The typical revision cycle for the FAA handbooks is 3 to 5 years. Optimally, submission of the TEM principles for inclusion in the handbooks will line up with the revision cycles. If not, there will need to be discussions with the FAA about whether an out of cycle revision is possible. 3. There are other USHST H-SEs that also suggested revisions to the handbooks. For purposes of efficiency and to emphasize the collective urgency associated with these revisions, they should be submitted to the FAA together.
Time Line:	24–36 months (potentially in parallel with Outputs 2 & 4)
Target Completion Date:	Jan. 1, 2022
Output 4:	
Description:	Incorporate TEM as a recommended component in flight training syllabi under 14 C.F.R. Part 141, <i>Pilot School</i> , through revision of Advisory Circular (AC) 141-1A, <i>Pilot Certification</i> .
Lead Organization:	FAA AFS-840
Supporting Organizations:	<ul style="list-style-type: none"> • HAI TC, • USHST SEA Training Team

Actions:	FAA to revise AC 141-1A to incorporate TEM as a recommended component in flight training under Part 141.
Output Notes:	FAA should request drafting suggestions from USHST SEA Training Team and HAI TC. Similar incorporations/revisions should be considered for guidance material related to 14 C.F.R. Part 61, <i>Certification: Pilots, Flight Instructors, and Ground Instructors</i> , as well as 14 C.F.R. Part 142, <i>Training Centers</i> .
Time Line:	24–36 months (potentially in parallel with Outputs 2 & 3)
Target Completion Date:	Jan. 1, 2022
Output 5:	
Description:	Provide outreach and guidance to the training community for aligning training curricula with recommended practices.
Lead Organization:	FAAST
Supporting Organizations:	<ul style="list-style-type: none"> • HAI TC • USHST SEA Training Team
Actions:	<ol style="list-style-type: none"> 1. FAAST to conduct print/video/web outreach regarding TEM recommendations. 2. HAI TC and USHST SEA Training Team to present on recommendations at key helicopter community events, focusing on training-related/CFI events.
Output Notes:	
Time Line:	6 months (for initial outreach; will be ongoing after 6 months).
Target Completion Date:	July 1, 2022