



# Bowtie Analysis of Pilot Depression and Barrier-Based Risk Management

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16. Abstract <p>The concept of barrier management – implementing and assuring a range of controls to protect against the risk of major losses – is widely used across high-hazard industries such as commercial aviation. While there are varying techniques for evaluating barrier strategies, the bowtie analysis is in widespread and growing. Accordingly, the Federal Aviation Administration (FAA) Office of Aerospace Medicine tasked the MITRE Corporation’s Center for Advanced Aviation System Development (MITRE CAASD) to evaluate the current state of art in barrier management for pilot mental health threats by conducting a bowtie analysis of pilot depression. MITRE first solicited ideas from industry and key stakeholders. Specific activities included problem space exploration, workshops with pilots with mental health conditions, and collaborative/disruptive innovation on managing aeromedical risk. MITRE then developed bowtie risk models and used these models to engage experts in a critical review of barrier effectiveness often presumed to mitigate threats to pilot performance associated with mental health issues. Recommendations included: (1) establish a top-level initiative to de-stigmatize mental health in the aviation industry; (2) convene a multi-stakeholder effort to evaluate risk-based mental health management pathways; (3) expand mental-health peer support programs across all pilot communities; (4) strengthen operational resources available to FAA behavioral health staff; (5) expand research related to pilot health care avoidance behavior; and (6) expand research and development of methods to systematically measure the safety risk associated with pilots' mental health conditions.</p>					
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# Introduction

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In support of the Federal Aviation Administration (FAA) Office of Aerospace Medicine, the MITRE Center for Advanced Aviation System Development evaluated the current state of art in barrier management for pilot mental health threats by conducting a bowtie analysis of pilot depression. The MITRE research team conducted confidential interviews with pilots and consulted with aviation medical and behavioral health experts to identify industry best practices and emerging technologies. The report uses a safety risk management (SRM) model to illustrate system improvement opportunities.

## BRIEF HISTORY

In recent years, there has been heightened scrutiny of issues relating to pilot mental health and well-being. The March 2015 Germanwings Flight 9525 crash was determined to be an intentional act by the copilot, who suffered from severe depression. Two months later, the FAA chartered the Pilot Fitness Aviation Rulemaking Committee, which developed a series of recommendations for industry and regulators to undertake to improve pilots' mental wellness, including education, peer support, and training activities. In July 2023, the Office of Inspector General (OIG) released its report, "FAA Conducts Comprehensive Evaluations of Pilots With Mental Health Challenges, but Opportunities Exist to Further Mitigate Safety Risks."<sup>1</sup> The OIG concluded that the FAA has comprehensive procedures to evaluate pilots' psychological health, but the "ability to mitigate safety risks is limited by pilot's reluctance to disclose mental health conditions." From that perspective, our current project is both timely and germane; we use an SRM approach to detail the specific risks posed by depression and potential strategies to mitigate those risks, improve the well-being of pilots, and maintain a high level of safety for the flying public.

## IMPACT OF LOSS OF CERTIFICATION

Pilots who lose their certification due to substance abuse or a mental health condition must pursue treatment and demonstrate recovery or stable status to regain their certification. In calendar year 2022, the processing time to approve a medical certificate application where the sole condition was a single, new, non-substance use mental health diagnosis was initially 63 days (mean)  $\pm$  93 days (standard deviation). After review of several initially issued and denied applications that were re-worked by AAM, the processing time for these medical certificate applications with a single, newly reported, non-substance use mental health diagnosis increased to 105  $\pm$  119 days. Likewise, the initial processing time to approve a medical certificate application where the sole condition was a substance use diagnose was 84  $\pm$  90 days, which increased to 140  $\pm$  111 days after several of these exams were reworked through AAM. Importantly, these processing times do not include time for treatment and demonstration of recovery/stability.

Pilots with alcohol or substance use disorder are referred to the Human Intervention Motivation Study ([HIMS](#)) program. It is a very structured process that gives pilots a rigorous but predictable pathway to regain their medical certification. Pilots undergo individualized assessment for all psychiatric and behavioral conditions, and the return to certification is considerably less predictable or certain. For pilots with a Class 1 medical certificate, loss of certification can lead to losing employment and a substantial decrease in income. Even for those with disability insurance, the economic hardship can be very difficult to manage for the pilot and their family. These factors contribute to "health care avoidance behavior" as defined by Hoffman and colleagues: "phenomenon where pilots avoid seeking medical care or disclosing health information due to the perceived risk of aeromedical certificate loss."<sup>2</sup> Health care avoidance behavior has been reported to be as high as 56% among pilots in the US and Canada.<sup>3</sup>

Published data on the connection between mental health conditions and aviation safety incidents is limited. Vuorio and colleagues provide a retrospective study of all fatal US aviation accidents in 2015 reported through the National Transportation Safety Board. They found that 5% of these accidents (10 of 202) may be attributed to undisclosed medical issues.<sup>4</sup> Eight were being operated under Part 91 general aviation, and two were commercial flights (one was an air taxi flight, and one was an agricultural flight). Of the 10 incidents, eight or nine were related to substance use or psychiatric problems.

In this analysis, we included concern for pilot health care avoidance behavior as a key factor in considering potential changes to aeromedical screening and pilot health. Our goal is to enable a systematic approach to improving safety for flying passengers and the well-being of pilots.

## Safety Risk Management

### Bowtie Risk Modeling

This report is structured using an SRM paradigm. In particular, we implement bowtie modeling to depict the interaction between elements associated with risk analysis.<sup>5</sup> Figure 1 shows a conceptual bowtie model. Central to the model is the *hazard*—a condition or activity in or around the system that can cause damage. A *top event* is when control over the hazard is lost. *Threats* advance towards top events unless blocked by preventive *barriers*. Similarly, top events progress towards undesired *consequences* unless prevented by recovery barriers.

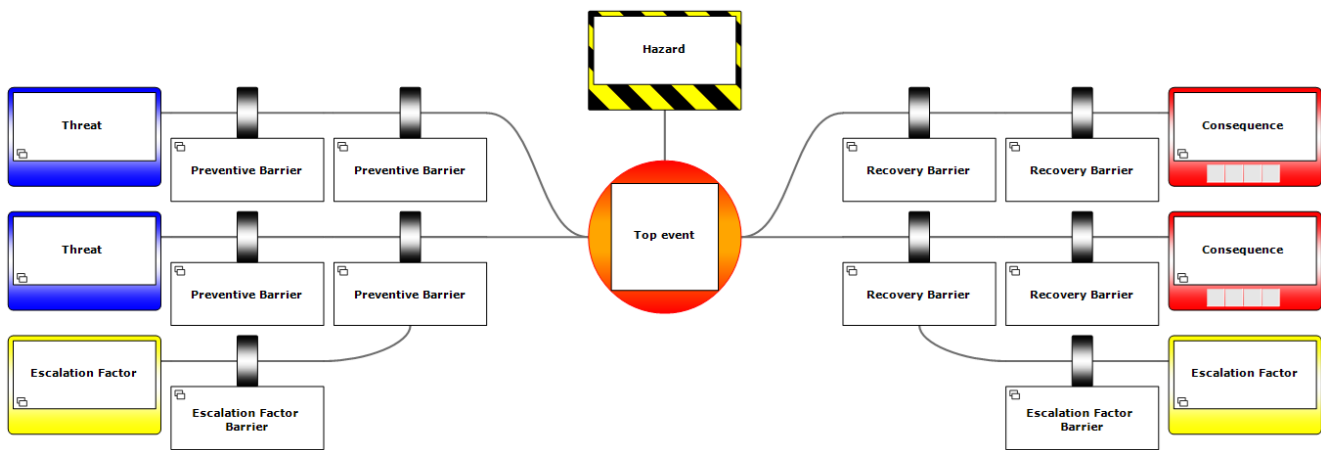


Figure 1. Bowtie Model

In the following sections, we propose a specific application of a bowtie model to address the hazards, threats, and barriers associated with mental health risk analysis. Since bowtie models link together in a hierarchy, we begin with a whole-model (Level 2) view and follow with sections dedicated to each of the four identified threat pathways.

### Bowtie Models of Mental Health Threats to Performance

We have created a bowtie model for an improved mental health certification program. We suggest the evolution of a program focused on flight safety risk assessment rather than a system driven by mental health diagnoses alone. This approach is based on expert opinion that only a small subset of pilots with mental health conditions poses a flight safety risk, and the vast majority could receive guideline-driven treatment and continue to fly safely with limited interruption due to loss of medical certification. A current limitation to these changes is a lack of published research evidence in many areas related to mental health and aviation.

The Bowtie Model level 0 (See Appendix A: Methodology & Approach) is our ultimate goal to avoid the top event of *Loss of Aircraft Control*. Rolling up to this is the Bowtie Model level 1, with its top event of *Failure of barrier dependent on pilot performance* in which one of its threats is *Inadequate or Inappropriate Pilot Performance*.<sup>1</sup> Rolling up to level 1 is the Figure 6: Bowtie Level 2 – *Inadequate Pilot Response (Top Event)*. The next section illustrates the threats from a pilot suffering from depression that could trigger the top event of *Inadequate/Inappropriate Pilot Response*, which in turn is a cause for safety hazard of *Failure of the Barrier Dependent on Pilot Performance*. The threats are summarized as four

<sup>1</sup> Refer to Appendix A for details on Bowtie Model Level 0 and 1 associated with Depression Bowtie Model Level 2.



types: I. Impaired Learning and Memory, II. Executive Dysfunction, Reduced Attention, and Concentration, III. Lower Processing Speed, and IV. Suicidal Ideation.

The model's left side shows the *Preventive Barriers* that could reduce the likelihood of the threats from initiating the top event. The right side lists the *Recovery Barriers* that could mitigate the consequence of a top event from leading to a *Major Operational Safety Event* when the top event occurs. *Escalation Factors* that would degrade a barrier are also listed including the appropriate safeguards if known.

Barriers differ in important ways. Notably, not all barriers are equally effective. We classified barriers through a set of attributes as shown in Table 1. Specific attributes include barrier category, type, effectiveness, the level of evidence available to support the effectiveness rating, and the accountable agents responsible for ensuring that each barrier is in place or implemented.

**Table 1: Barrier Attributes**

<b>Category</b>	<ul style="list-style-type: none"> <li>■</li> <li>◆</li> <li>■</li> </ul>	<p>Barrier already exists. No foreseeable enhancement recommended.</p> <p><i>Barrier already exists; needs enhancements.</i></p> <p><u>New barrier to implement</u></p>
<b>Type</b>	<ul style="list-style-type: none"> <li><b>BEH</b></li> <li><b>ST</b></li> <li><b>A – HW</b></li> <li><b>C – HW</b></li> <li><b>P – HW</b></li> </ul>	<p>Behavioral</p> <p>Sociotechnical</p> <p>Active Hardware</p> <p>Continuous Hardware</p> <p>Passive Hardware</p>
<b>Effectiveness</b>	<ul style="list-style-type: none"> <li><b>++</b></li> <li><b>+</b></li> <li><b>-</b></li> <li><b>--</b></li> <li><b>?</b></li> </ul>	<p>Very Good (≥90%)<sup>2</sup></p> <p>Good (60-89%)</p> <p>Poor (30-59%)</p> <p>Very Poor (&lt;30%)</p> <p>Unknown (0%)</p>
<b>Evidence Level</b>	<ul style="list-style-type: none"> <li><b>A</b></li> <li><b>B</b></li> <li><b>C</b></li> <li><b>I</b></li> </ul>	<p>Strong evidence base</p> <p>Moderate evidence base</p> <p>Limited evidence base</p> <p>Insufficient evidence</p>
<b>Accountable Agent</b>		<p>FAA, Airline, Union, Union Mandated, AME, Airmen, Pilot, FAA Specialist, Airline Examiner, Manufacturer, etc.</p>

<sup>2</sup> Percentages are notional and based on subject matter experts' opinion.

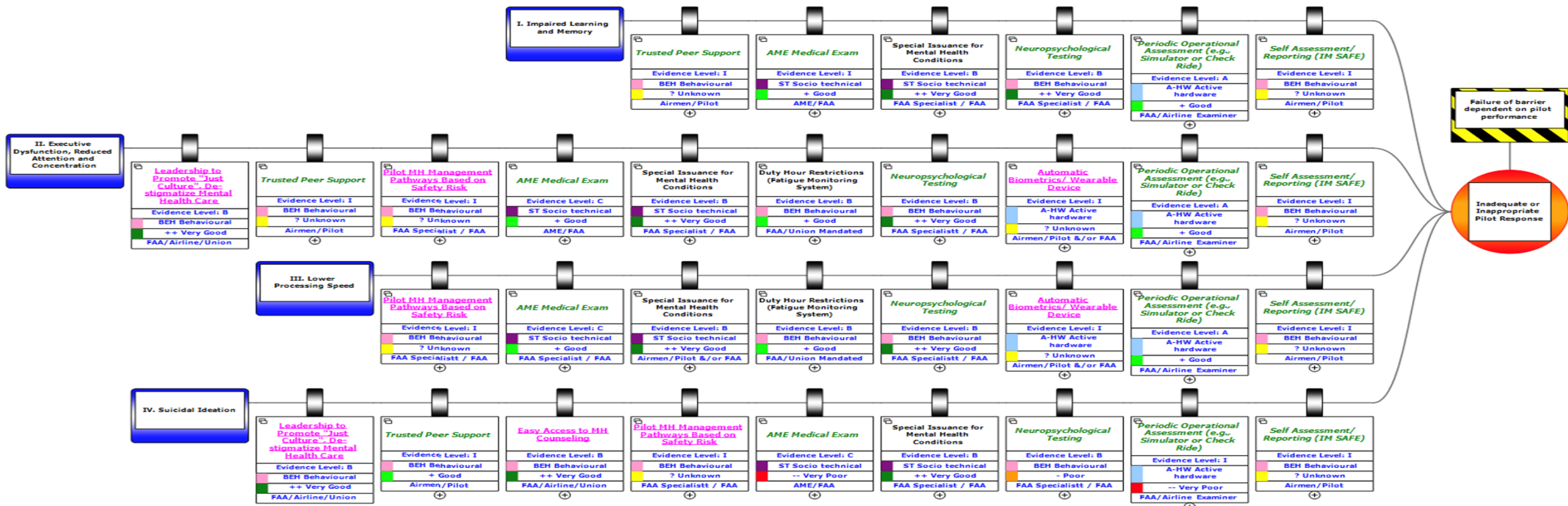


Figure 2: Depression Bowtie Model – Threats & Preventive Barriers (Left Side)

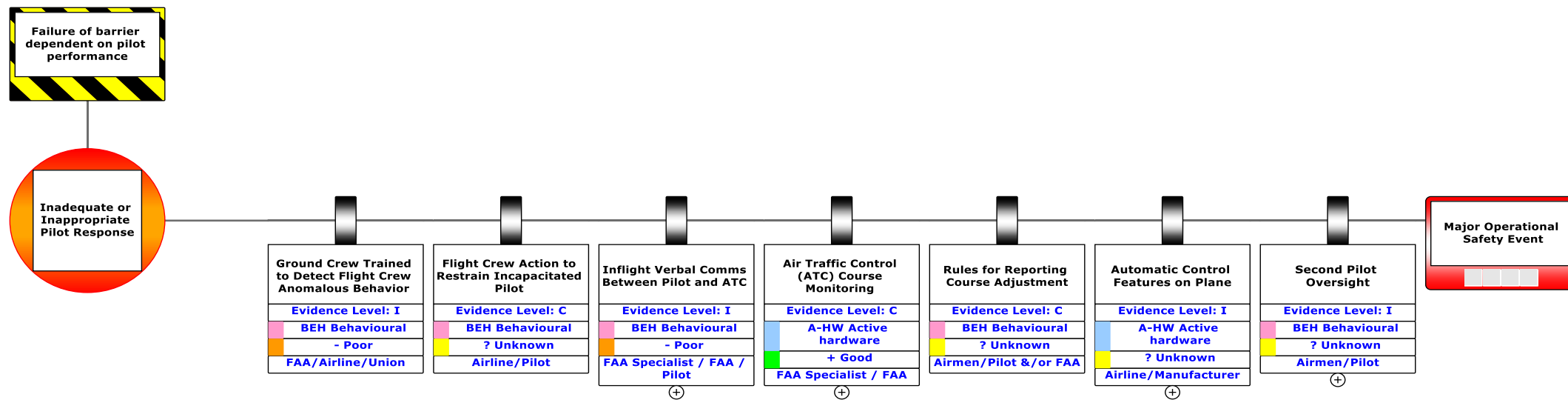
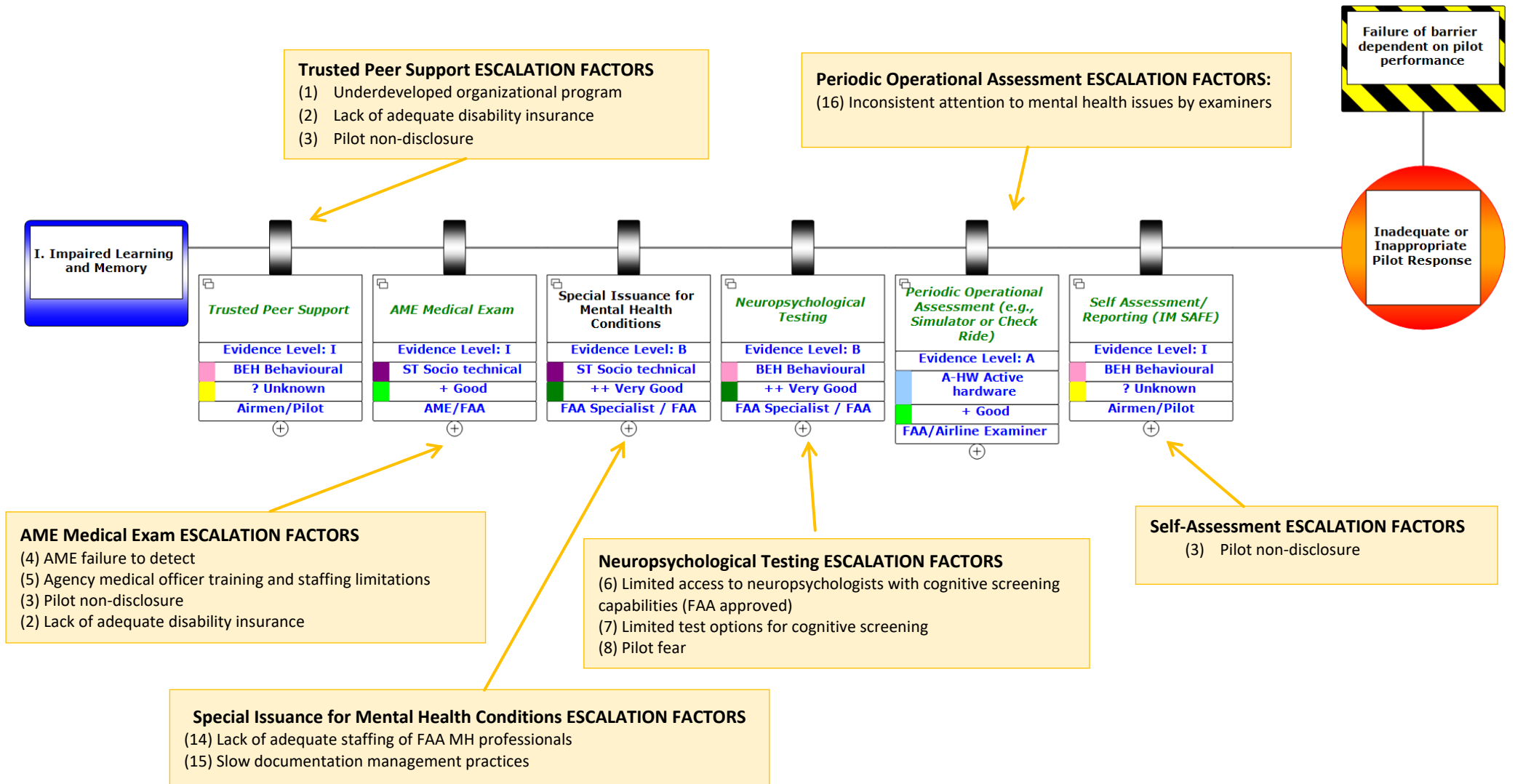


Figure 3: Depression Bowtie Model - Consequences & Recovery Barriers (Right side)

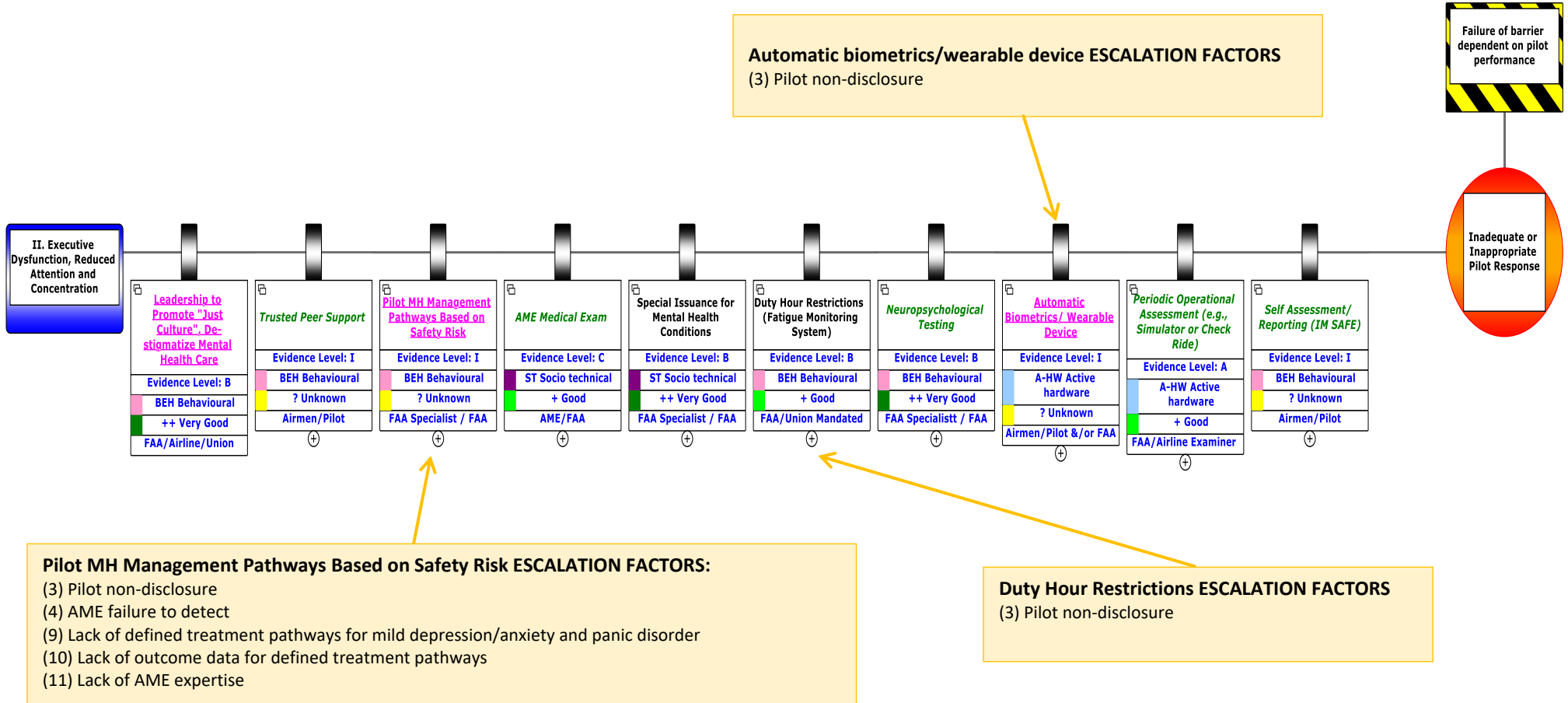


# Preventive Barriers & Escalation Factors

## Threat I: Impaired Learning and Memory

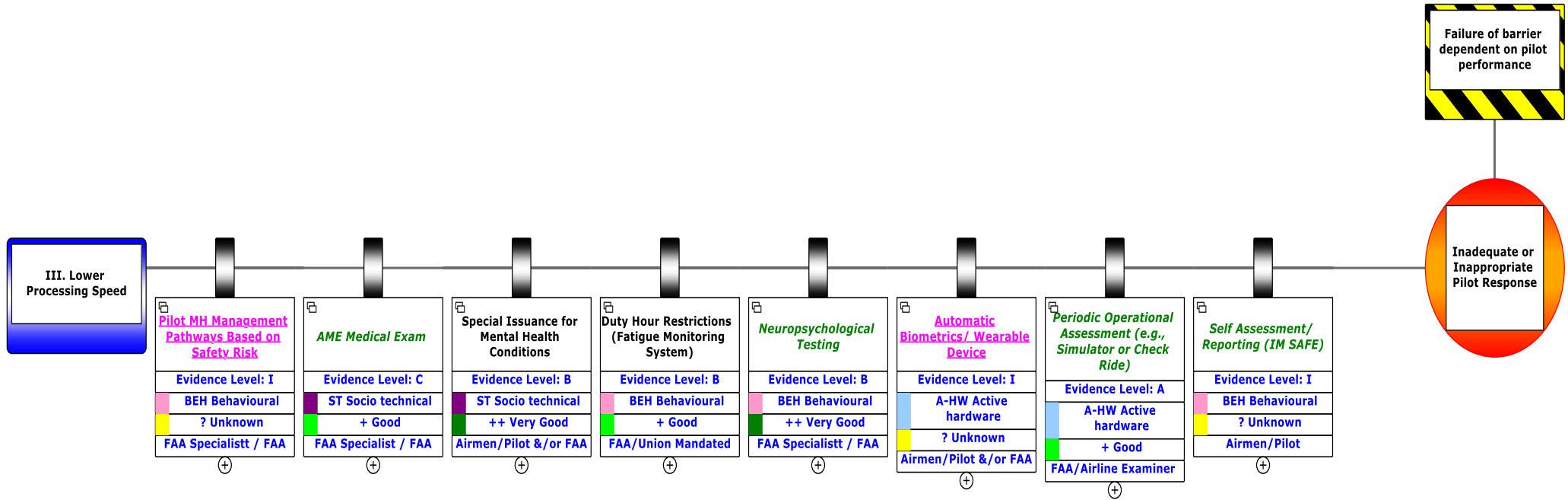


## Threat II: Executive Dysfunction; Reduced Attention and Concentration

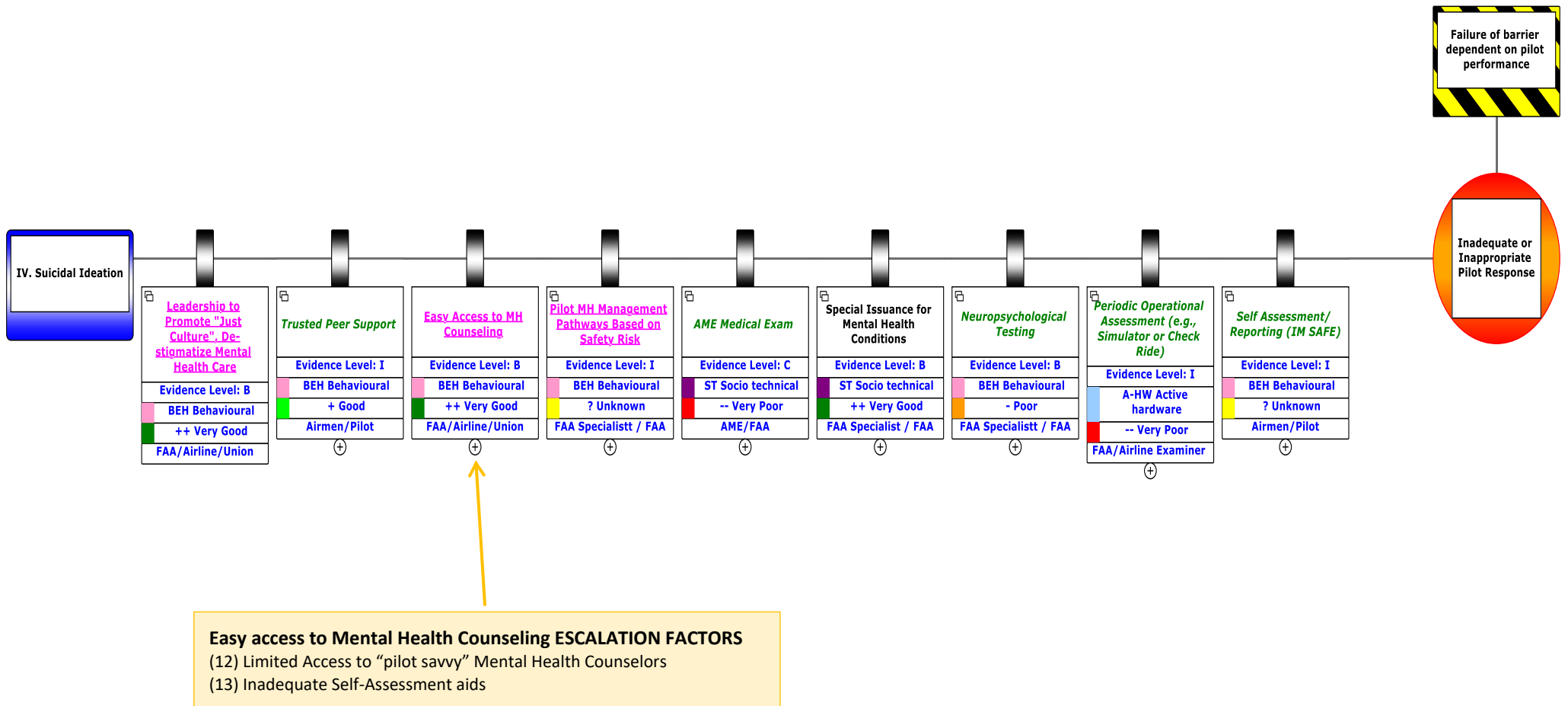


### Threat III: Lower Processing Speed

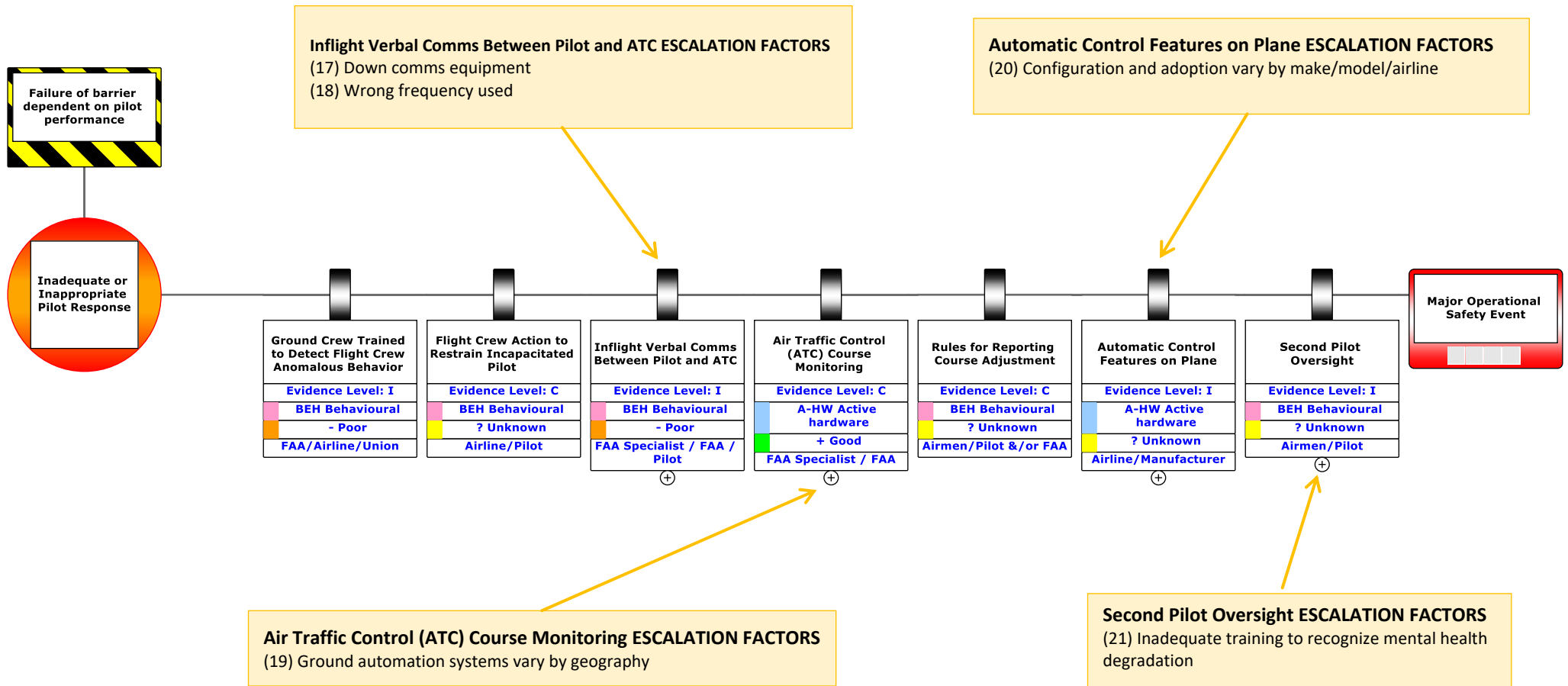
Note: The escalation factors for the barriers on this threat have been illustrated in Threats I and II.



## Threat IV: Suicidal Ideation



## Consequence, Recovery Barriers & Escalation Factors



# Proposed Barriers for Threats and Consequences

Barriers are also intended to mitigate the threats identified to a top event. The table below lists the possible prevention barriers, the type, effectiveness assigned, accountable parties or stakeholders, and any escalation factors impacting a barrier.<sup>6</sup>

**Table 2: Preventive Barriers for Threats**

Barrier	Trusted Peer Support	AME Medical Exam	Neuro-psychological Testing	Periodic Operational Assessment	Self-Assessment Reporting / (IM SAFE)	Leadership to promote "Just Culture"	Pilot MH management pathways based on safety risk	Automatic Biometrics/wearable device	Easy access to MH Counseling	Duty Hour Restrictions	Special Issuance for Mental Health Conditions
<b>Threats</b>	I, II, IV,	I, II, III, IV	I, II, III, IV	I, II, III, IV	I, II, III, IV	II, IV	II, III, IV	II, III	IV	II, III	I, II, III, IV
<b>Type</b>	Behavioral	Sociotechnical	Behavioral	Active hardware	Behavioral	Behavioral	Behavioral	Active hardware	Behavioral	Behavioral	Sociotechnical
<b>Effectiveness</b>	Unknown (I, II) Good (IV)	Good (I, II, III) Very Poor (IV)	Very Good (I, II, III) Poor (IV)	Very Good (I, II, III) Very Poor (IV)	Unknown (I, II, III, IV)	Very Good (II, IV)	Unknown (II, III, IV)	Unknown (II, III)	Very Good	Good (II, III)	Very Good (I, II, III, IV)
<b>Evidence Level</b>	Insufficient (I, II, IV)	Insufficient (I) Limited (II, III, IV)	Moderate (I, II, III, IV)	Strong (I, II, III) Insufficient (IV)	Insufficient (I, II, III, IV)	Moderate (II, IV)	Moderate (II, IV) Insufficient (III)	Insufficient (II, III)	Moderate	Moderate (II, III)	Moderate (I, II, III, IV)
<b>Accountable Agent</b>	Airmen/Pilot	AME/FAA	FAA Specialist/FAA	FAA/Airline Examiner	Airmen/Pilot	FAA/Airline/Union	FAA Specialist/FAA	Airmen/Pilot &/or FAA	FAA/Airline/Union	FAA/Union Mandated	FAA Specialist/FAA (I, II, IV), Airmen/Pilot &/or FAA (III)
<b>Escalation Factor</b>	(1) under-developed organizational program (2) Lack of adequate disability insurance (3) Pilot non-disclosure	(4) AME failure to detect (5) Agency medical officer training and staffing limitations (3) Pilot non-disclosure (2) Lack of adequate disability insurance	(6) Limited access to neuro-psychologists with cognitive screening capabilities (FAA approved) (7) Limited test options for cognitive screening (8) Pilot fear	(16) Inconsistent attention to mental health issues by examiners	(3) Pilot non-disclosure	N/A	(3) Pilot non-disclosure (4) AME failure to detect (9) Lack of defined treatment pathways for mild depression/anxiety and panic disorder (10) Lack of outcome data for defined treatment pathways (11) Lack of AME expertise	(3) Pilot non-disclosure	(12) Limited Access to "pilot savvy" Mental Health Counselors (13) Inadequate Self-Assessment aids	(3) Pilot non-disclosure	(14) Lack of adequate staffing of FAA MH professionals (15) Slow documentation management practices

**Table 3: Recovery Barriers for Consequences**



<i>Barrier</i>	Ground Crew Trained to Detect Flight Crew Anomalous Behavior	Flight Crew Action to Restrain Incapacitated Pilot	Inflight Verbal Comms Between Pilot and ATC	Air Traffic Control (ATC) Course Monitoring	Rules for Reporting Course Adjustment	Automatic Control Features	2nd Pilot Oversight
<i>Consequence</i>	Major Operational Safety Event	Major Operational Safety Event	Major Operational Safety Event	Major Operational Safety Event	Major Operational Safety Event	Major Operational Safety Event	Major Operational Safety Event
<i>Type</i>	Behavioral	Behavioral	Behavioral	Active Hardware	Behavioral	Active Hardware	Behavioral
<i>Effectiveness</i>	Poor	Unknown	Poor	Good	Unknown	Unknown	Unknown
<i>Evidence Level</i>	Insufficient	Limited	Insufficient	Limited	Limited	Insufficient	Insufficient
<i>Accountable Agent</i>	FAA/Airline/Union	Airline/Pilot	FAA Specialist/FAA/Pilot	FAA Specialist/FAA	Airmen/Pilot&/or FAA	Airline/Manufacturer	Airmen/Pilot
<i>Escalation Factor</i>	N/A	N/A	(17) Down comms equipment (18) Wrong frequency used	(19) Ground automation systems vary by geography		(20) Configuration and adoption vary by make/model/airline	(21) Inadequate training to recognize mental health degradation

# Preventive Barriers

## Pilot Mental Health Management Pathways Based on Safety Risk

Category: ■	Threat I Impaired Learning and Memory	Threat II Executive Dysfunction; Reduced Attention and Concentration	Threat III Lower Processing Spread	Threat IV Suicidal Ideation
New barrier to implement				
<b>Effectiveness</b>	N/A	? Unknown	? Unknown	? Unknown
<b>Evidence Level</b>	N/A	I - Insufficient	I - Insufficient	I - Insufficient

### RATIONALE

The pilots and experts interviewed agreed that the current FAA system for managing risk of substance use disorders was effective, but the system for other mental health conditions was less effective. They described the current “disease-focused” system for depression, anxiety, attention-deficit hyperactivity disorder, and other disorders as punitive, fraught with excessive time delays, not commensurate with the safety risk, and made worse by unintentionally promoting health avoidance and underreporting by pilots. We identified expedited methods for substance use disorder that are now in practice in Germany and newly proposed pathways for managing other mental health conditions now emerging in Australia and being shared through the International Civil Aviation Organization (ICAO).

All the pilots and experts interviewed for this research praised the HIMS program's effectiveness for managing pilots with substance use disorder. They described the program as being “tough but fair.” They had reasonable certainty and control of the process, expecting they would return to flying if they completed the program.

Pilots explained that for other mental health conditions, such as stress, adjustment disorder, depression, and anxiety, there is an “open-ended and uncertain” future. They reported concern that there was no certainty and a loss of control with the current FAA process for handling these conditions. They noted that the turn-around time for reports and FAA decision-making was often excessive, leading to increased symptoms of stress and anxiety. This was compounded by the financial hardship which comes with loss of employment during the time that their medical certification was suspended. Leaders from the peer-support community disclosed that pilots commonly under-report symptoms of mild and moderate depression and anxiety out of fear of losing their medical certification. They described seeking and receiving counseling but not reporting it during their Aviation Medical Examiner (AME) evaluation. They expressed interest in changes that would:

- 1) Allow pilots to seek and receive counseling from mental health professionals for stress and bereavement without reporting it to the FAA.
- 2) Allow pilots under treatment for adjustment disorder, mild and moderate depression, or anxiety under care from their physician, with or without selective serotonin reuptake inhibitor (SSRI) or serotonin and norepinephrine reuptake inhibitor (SNRI) medication, to be allowed to maintain their certification. They argue that pilots with these conditions already fly (without reporting) and pose minimal safety risks. They acknowledge that ongoing research should be coupled with any change in policy to monitor the performance of working pilots with mild and moderate mental health conditions.


The OIG also identified this concept in their July 2023 report, “FAA Conducts Comprehensive Evaluations of Pilots with Mental Health Challenges but Opportunities Exist to Further Mitigate Safety Risks.” The subject matter experts (SMEs) interviewed by the OIG stated that the HIMS program was well-liked and there was “a desire for FAA to establish a program that is dedicated to pilots with mental health conditions as the HIMS program is dedicated to pilots with substance dependence issues.”<sup>1</sup>

In an interview with a European aeromedical expert, we learned that pilots with early problems of alcohol use or substance use in Germany can receive expedited care. They can elect to be relieved of flying duties for 90 days, receive intensive counseling (weekly), education, and drug monitoring, and return to flying. During the 90-day suspension, they continue to receive full pay from their airline. The interviewee indicated that they have an approximate 80% success rate of returning pilots to safe flying at the end of 90 days (unpublished report). In the German experience, this environment encourages colleague pilots and peer counselors to intervene early and refer problem drinkers to this effective intervention.

In a **2022 ICAO Working Paper** entitled “Medical Certification and Mental Illness,” presented by Australia, the authors recognize that fear of losing medical certification has led to pilots underreporting mental health conditions and that the burden of mental illness has increased due to the coronavirus disease 2019 (COVID-19) pandemic. They propose a reformed model of medical certification for pilots experiencing mental distress, which is based on “...trust between the certificate holder and a suitably qualified peer who understands the context of their flying or operational role at the same time as having an objective appreciation of the safety of this person at this point in time. The peer is in turn supported by a panel of aerospace medicine and mental health specialists who are appointed by the Regulator to make real-time responsive recommendations about the subject’s fitness for aviation duties in consultation with the peer and treating clinicians. The Regulator remains at arms-length as long as the person is compliant with the terms of the program and the directions of the panel and peer, formalised as conditions on a medical certificate. In this program, the person retains their medical certification and their fitness to fly with, conditions, restrictions, and limitations responsive to their current status.”(see Appendix D: Mental Health Models from Other Sectors and Industries.) The work of Herwin Bongers, a B787 pilot for Air New Zealand and a well-regarded aviation mental health policy expert influenced this report. His paper, “Salutogenic Approach to Mental Health as a Flight Safety determinant,” was considered in their deliberations.<sup>7</sup> This report and proposal towards “a change in the approach to medical certification due to mental illness, towards a salutogenic model that supports the individual maintaining engagement and accessing support within the aviation community” was favorably received by the at the 41<sup>st</sup> Assembly of ICAO in April 2022.<sup>8</sup>

Although published outcomes for the treatment of mental health conditions in airmen are limited, literature for treating mental health conditions in the general population is robust. Early intervention and combinations of counseling, cognitive behavioral therapy, and medications are often recommended in psychiatric clinical guidelines for common conditions such as depression, anxiety/panic, acute stress disorder, and post-traumatic stress disorder.<sup>9</sup>

## Neuropsychological Testing

Category: 	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Speed	<b>Threat IV</b> Suicidal Ideation
Barrier already exists; needs enhancements				
<b>Effectiveness</b>	++ Very Good	++ Very Good	++ Very Good	-Poor
<b>Evidence Level</b>	B - Moderate	B - Moderate	B -Moderate	B - Moderate

### RATIONALE

Neuropsychological testing provides a detailed assessment of a pilot’s mental well-being through a series of standardized tests. The FAA aeromedical program uses a specific test, [CogScreen-AE](#), developed by Gary G. Kay, PhD. in the 1980s.<sup>10</sup> CogScreen-AE is specifically tailored for aeromedical use and is sensitive to mild brain dysfunction, predicting an individual’s performance in the simulator.<sup>11</sup> This tool evaluates pilots with brain injuries, those in the HIMS program monitored during recovery from substance use disorder, and those prescribed SSRI medications for depression or anxiety. It assesses deficits or changes in attention, immediate- and short-term memory, visual perceptual functions, sequencing functions, logical problem-solving, calculation skills, reaction time, simultaneous information processing abilities, and executive functions. The test is administered by a trained neuropsychologist using a computer during assessment. The developers of CogScreen-AE caution that results should not be used as sole criteria for decisions about an individual pilot but must be combined with other information sources. Scores falling in the impaired range do not necessarily reflect brain dysfunction. The test evaluates a limited scope of cognitive functions and may not be sensitive to other forms of impairment.<sup>12</sup>

In 2023, FAA-sponsored researchers began enrolling pilots in a study to develop additional cognitive assessment tools. The study, led by Kelene Fercho, PhD, uses a combination of neuropsychiatric tests to evaluate working memory, attention, and multitasking performance. They seek to enroll 1000+ pilots to assess various combinations of tests and establish normative data such as performance for specific age subgroups. The results of this study may be used to update clinical practices for airmen certification.<sup>13</sup>

Experts interviewed for this study felt that neuropsychological testing is a very good barrier for identification of the first three depression-related threats (i.e., impaired learning and memory; executive dysfunction, reduced attention and concentration; and lower processing speed) but a poor barrier for suicidal ideation. Because of the limited number of

neuropsychologists authorized to use Cog Screen-AE, pilots commonly travel substantial distances, and at significant expense, to complete the testing. The addition of new neuropsychological testing options, with recent validation studies, should be very helpful and welcome in the aerospace community.

### Trusted Peer Support Networks

Category: <span style="color: green;">◆</span> Barrier already exists; needs enhancements	Threat I Impaired Learning and Memory	Threat II Executive Dysfunction; Reduced Attention and Concentration	Threat III Lower Processing Spread	Threat IV Suicidal Ideation
<b>Effectiveness</b>	? Unknown	? Unknown	N/A	+ Good
<b>Evidence Level</b>	I - Insufficient	I - Insufficient	N/A	I - Insufficient

### RATIONALE

The recent study published by the OIG and subsequent interviews performed by the team confirmed that the aviation and medical communities regard peer support as a valuable resource for pilots. The OIG concluded that peer support programs (PSP) promoted by the airlines and recognized by regulators (such as the FAA) could increase the likelihood of treatment and safety.<sup>1</sup> Skilled peer support programs offer pilots with emotional and behavioral concerns a means of confidential access for early intervention. Tailored comprehensive PSPs offer a safe initial point of contact to share experiences and receive support. Pilots who discuss their experiences in a trusting and non-judgmental setting feel empowered and can regain control. Trained peers provide healthy coping mechanisms and suggestions for self-care while sharing credible, trustworthy, and relevant resources and recommendations to seek professional mental health care when appropriate.<sup>14</sup>

### PILOT ASSOCIATIONS

Professional associations offer a range of resources to pilots. The Air Line Pilots Association (ALPA) has a Pilot Assistance program that provides confidential support and resources for pilots dealing with various personal and professional issues, including mental health and substance abuse. The program offers various services, including peer support, counseling, and referrals to mental health professionals and treatment centers. ALPA has a network of pilot volunteers specially trained to provide support and assistance to fellow pilots struggling with mental health or substance abuse issues.

Other pilot associations, such as the Allied Pilots Association (APA) and the Southwest Airlines Pilots Association (SWAPA), offer support and resources for pilots dealing with mental health or substance abuse issues. These services include peer support, confidential counseling, and referrals to treatment programs and mental health professionals.

**Pilot Associations**

**Air Line Pilots Association, International (ALPA):** Largest pilot union in the world representing over 59,000 pilots across 35 airlines in the United States and Canada.

**Allied Pilots Association (APA):** Represents American Airlines pilots with a membership of over 15,000 pilots.

**Southwest Airlines Pilots Association (SWAPA):** Represents the pilots of Southwest Airlines with a membership of over 10,000 pilots.

**International Brotherhood of Teamsters, Airline Division:** Represents a range of airline workers, including pilots, flight engineers, and other related personnel.

**NetJets Association of Shared Aircraft Pilots (NJASAP):** Represents the pilots who fly for NetJets, a private aviation company.

**United Master Executive Council (MEC):** Represents the pilots of United Airlines with a membership of over 13,000 pilots.

### INTERNATIONAL PILOT RESOURCES

Peer support programs are now required in Europe. Germany has a well-regarded program. The German peer support program “[AntiSkid](#),” established in 1988, started as a small group of Lufthansa Airline pilots advocating for pilots struggling with alcohol addiction and eventually became an external supervising expert group. Although the group’s initial focus was alcohol, it has expanded services to include opioid and prescription drug abuse and mental health conditions. Today, most of AntiSkid’s clientele are pilots with chronic conditions, anxiety disorders, and trauma experience. The AntiSkid program helps a pilot access professional counseling and medical care with the goal of getting “back on the line, quickly and legally.” AntiSkid supports 13 airlines throughout Germany.

## Leadership to promote “Just Culture”

<b>Category:</b> ■ New barrier to implement	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	N/A	++ Very Good	N/A	++ Very Good
<b>Evidence Level</b>	N/A	B- Moderate	N/A	B- Moderate

### RATIONALE

The stigma associated with mental health can deter pilots from pursuing treatment for depression and other mental health conditions. This phenomenon has been observed in both civil and military aviation.<sup>15</sup> “Just Culture” (also referred to as Positive Safety Culture) enables an “atmosphere of trust in which people are encouraged to report essential safety-related information but is also clear where the line must be drawn between acceptable and unacceptable behavior (e.g., gross negligence, destructive acts, willful violations). This allows employees to report safety incidents and hazardous conditions and become proactive in identifying safety-related problems and safety trends.”<sup>16</sup> Just Culture has been in place in the European Union and recognized since 2016, and the ICAO council has endorsed its adoption to enable an effective safety culture.<sup>17</sup> A positive safety culture, non-punitive safety reporting and data collection systems, and unbiased safety investigations are critical components of a Safety Management System.<sup>18</sup>

## AME Medical Exam

<b>Category:</b> ◆ Barrier already exists; needs enhancements	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	+ Good	+ Good	+ Good	-- Very Poor
<b>Evidence Level</b>	I – Insufficient	B - Moderate	N/A	C - Limited

### RATIONALE

The AME exam, performed by approximately 2,500 physicians across the US, is the cornerstone of the current system of health assessment for pilots seeking FAA medical certification. Among the SMEs interviewed for this report, the AME exam was rated as “good” for detecting depression symptoms of impaired learning, executive dysfunction, and slow processing speed. This is accomplished through a review of medical records, history taking, and physical examination. However, the SMEs felt that the current AME exam is likely a “poor” barrier to the risk posed by suicidal ideation. This is due to the high incidence of concealment behavior by pilots.

The FAA AME Guide describes the requirements for pilots to disclose a medical history of mental disorders, including depression and anxiety (item 18.m on form 8500-8). Additionally, they should “list all visits in the last 3 years to a physician, physician assistant, nurse practitioner, psychologist, clinical social worker, or substance abuse specialist for treatment, examination, or medical/mental evaluation. The applicant should list visits for counseling only if related to a personal substance abuse or psychiatric condition.” The AME is expected to take appropriate additional history. The AME Guide advises that “[some] problems may have only a slight impact on an individual's overall capacities and the quality of life but may nevertheless have a great impact on safety. Conversely, many emotional problems that are of therapeutic and clinical concern have no impact on safety.” Further, the AME Guide states that “[all] applicants with any of the following conditions must be denied or deferred: attention deficit/hyperactivity, bipolar disorder, personality disorder, psychosis, substance abuse, substance dependence, suicide attempt. In some instances, the following conditions may also warrant denial or deferral: adjustment disorder, bereavement; dysthymic; or minor depression; use of psychotropic medications for smoking cessation.”<sup>19</sup>

The effectiveness of the AME exam as a barrier to mental health safety risk is dependent on a trusting relationship between each pilot and their AME and truthful self-reporting by pilots. Improving the effectiveness of the AME exam to

identify mental health problems includes regular training of AMEs to maintain skills in the mental health interview and efforts to improve pilot self-reporting.

## Special Issuance for Mental Health Conditions

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended.	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	++ Very Good	++ Very Good	++ Very Good	++ Very Good
<b>Evidence Level</b>	B - Moderate	B - Moderate	B - Moderate	B - Moderate

### RATIONALE

Special issuance for pilots with alcohol or other substance dependency can be sought with the HIMS program. HIMS has rigorous specifications for evaluating and monitoring airmen recovering from substance use disorder. HIMS was established in 1974 and is considered very effective at enabling a pathway for recovery and safe flying. The HIMS website reports an 85% long-term abstinence rate for pilots participating in the program.<sup>20</sup>

Special issuance can be sought for major depressive disorder (mild to moderate), either a single episode or recurrent episode; dysthymic disorder; adjustment disorder with depressed mood; or any non-depression-related condition for which an SSRI is used. The FAA psychiatrist determines special issuance after a thorough review of treatment history and current symptoms. Neuropsychiatric testing and periodic review are typically required to maintain a special issuance. A separate HIMS program provides a service for monitoring airmen who are receiving specific SSRI medications for depression, anxiety, or other conditions. In 2020, 389 pilots were receiving SSRI special issuance.<sup>21</sup>

Pilots interviewed for this study reported that the FAA process is “heavy-handed and open-ended” for relatively mild mental health conditions, such as grief reactions, adjustment disorder, or mild depression, for which the pilot sought professional counseling or took medication for more than six months. They reported excessive delays in getting replies from the FAA after submitting medical consultation records and required cognitive test results. This led to additional emotional stress due to their loss of medical certification and the resulting loss of income with the uncertainty of if and when they might return to flying. They reported that in this climate of uncertainty, it was common for pilots to underreport mental health symptoms and treatments, including counseling, behavioral therapy, and psychiatric medications. Although reviewers graded special issuance as a “very effective” barrier, it could be enhanced further by increased staffing of the FAA psychiatric clinician team, improvements in document management, and working to improve a trusting environment for pilot self-reporting of mental health conditions.

## Easy Access to MH Counseling

<b>Category:</b> ■ New barrier to implement	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	N/A	N/A	N/A	++ Very Good
<b>Evidence Level</b>	N/A	N/A	N/A	B - Moderate

### RATIONALE

Pilots and experts interviewed for this report had high praise for the commercial carriers which provide easy access to professional counseling for pilots through their employee assistance programs (EAP). They note that many pilots who initially engage with their peer support line are then encouraged to contact their EAP program, which is staffed by professional counselors. EAP personnel can assist a pilot with a better understanding of their benefits and recommend professional medical help when indicated. Some pilots praised an additional benefit their union or air carrier provided: access to the [Aviation Medicine Advisory Service \(AMAS\)](#). This service includes ready access to board-certified aerospace



physicians to provide “pilot-savvy” advice about their physical and mental health concerns. AMAS can review a pilot’s documentation and coach the pilot through seeking a special issuance.

Peer programs and AMAS advisors stress the importance of pilots receiving care from mental health counselors, psychologists, and psychiatrists who understand the pilots' perspective, documentation needs, and the FAA medical certification process. They provide names of clinicians across the country who meet these criteria and, when necessary, provide consultation to those clinicians to educate them on the aeromedical process. Access to robust EAP programs for Class 1 pilots varies across commercial air carriers and is generally unavailable to Class 2 and Class 3 pilots.

## Periodic Operational Assessment

<b>Category:</b> <span style="color: green;">◆</span> Barrier already exists; needs enhancements	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	+ Good	+Good	+ Good	-- Very Poor
<b>Evidence Level</b>	A - Strong	A - Strong	A - Strong	I - Insufficient

### RATIONALE

Private and recreational pilots are required to complete some form of recurrent training every 24 calendar months to continue flying. To complete this requirement, pilots need to spend time flying with a flight instructor or designated pilot examiner. This can be for a flight review, instrument proficiency check, check ride for a new certificate or rating, or completion of a phase of the FAA’s “Wings” proficiency program (which requires airborne flight instruction). The flight instructor or designated examiner determines if the pilot is qualified to continue flying or if additional instruction is needed. These activities are primarily assessments of the individual’s piloting skills and knowledge required to safely fly (regulations, decision-making, etc.), and there is no requirement for the flight instructor or designated examiner to assess the pilot’s mental health. These individuals are aviation experts and are not specifically trained to recognize or diagnose mental illness. However, if a pilot were showing obvious signs of mental illness or appeared to be under the influence of a substance (regardless of their piloting performance), the flight instructor or designated examiner could refuse to “sign off” on their flight review or rating. These events are scheduled by the pilots, so a pilot can schedule the event during a favorable time (or postpone if they are not feeling well). The flight instructor or designated examiner is only afforded a “snapshot” in time of the pilot’s state of mind.

Airline Transport Pilots have more frequent training requirements than private and recreational pilots. Airlines typically schedule recurrent training every few months. In some cases, this could be computer-based training at home, but much of the training is completed in-person at training centers and in simulators. Airline pilots are also subject to “line check” flights, where they are observed and assessed during regular flight operations. While these in-person assessments occur more frequently for airline pilots, the limitations are similar to those listed above in that the assessing individuals are not trained to recognize mental illness, and the assessments are only a snapshot of the pilot’s state of mind. Therefore, the likelihood that a pilot’s mental health issue or substance abuse situation would be detected is low unless it is egregious. Despite these limitations, experts rated periodic operational assessments as “good” for threats A, B, and C but very poor for threat D (suicidal ideation).

## Self-Assessment/Reporting (IM SAFE)

<b>Category:</b> <span style="color: green;">◆</span> Barrier already exists; needs enhancements	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	? Unknown	? Unknown	? Unknown	? Unknown
<b>Evidence Level</b>	I - Insufficient	I - Insufficient	I - Insufficient	I - Insufficient

### RATIONALE

During initial training, pilots are taught the “IM SAFE” mnemonic, which pilots use for self-assessment before each flight. The mnemonic stands for Illness, Medication, Stress, Alcohol, Fatigue, and Emotion. The goal is for the pilot to consider potential factors that could affect their fitness to complete a flight. This assessment of fitness for flight is taught during initial training and reviewed during flight reviews. The goal is to remind pilots to be cognizant of and assess how their day-to-day condition affects the safety of each flight. If the pilot determines that one or more of these factors is significantly outside their normal bounds, they should reconsider piloting until the issues are resolved. Pilots must attest that they are fit for duty within airline operations just before a flight. Title 14 CFR 117 – FLIGHT AND DUTY LIMITATIONS AND REST REQUIREMENTS: FLIGHTCREW MEMBERS defines fit for duty as “physiologically and mentally prepared and capable of performing assigned duties at the highest degree of safety.” Title 14 CFR Part 117.5 subpart D states: “As part of the dispatch or flight release, as applicable, each flight crew member must affirmatively state he or she is fit for duty prior to commencing flight.” In some cases, this involves signing the dispatch paperwork.

IM SAFE assessments are self-assessments and, therefore, have the inherent weakness of the pilot determining their own fitness. Mental illness, substance abuse, etc. can be difficult to admit even to oneself, so this barrier has limited ability to detect or mitigate the dangers of a pilot flying with a mental illness or under the influence of alcohol or drugs.

## Duty Hours Restrictions (Fatigue Monitoring System)

<b>Category:</b> <span style="color: black;">■</span> Barrier already exists. No foreseeable enhancement recommended	<b>Threat I</b> Impaired Learning and Memory	<b>Threat II</b> Executive Dysfunction; Reduced Attention and Concentration	<b>Threat III</b> Lower Processing Spread	<b>Threat IV</b> Suicidal Ideation
<b>Effectiveness</b>	N/A	+ Good	+ Good	N/A
<b>Evidence Level</b>	N/A	B - Moderate	B - Moderate	N/A

### RATIONALE

Private and recreational pilots do not fly for hire and do not have any regulatory time limitations on the number of hours they can fly or any rest requirements beyond the “F = Fatigue” self-assessment in the IM SAFE mnemonic. However, commercial and airline pilots have complex limits on their “duty period,” “flight time,” and “rest period.” The limits apply daily, weekly, monthly, and yearly. These limits can vary slightly depending on whether the pilot is flying alone or as a two-person crew. Another factor considered is multi-time zone flights and whether the pilot can be relieved by a third pilot and rest during the enroute portion of a long-haul flight to be refreshed when it comes time to land. Commercial pilots can be on duty for up to 14 hours in a day and fly for up to eight hours, flying alone or up to 10 hours if flying as a two-pilot crew. However, there are allowances for slightly exceeding these limits due to airborne delays (e.g., weather). Pilots are also required to have a minimum of a 10-hour rest period immediately prior to duty and a minimum of a 10-hour rest period immediately after duty, and this can be longer for multi-time zone flights. These rules provide some safeguards to reduce pilot fatigue and the associated effect of chronic fatigue on a pilot’s mental wellbeing, helping to ensure the pilot is fit for duty. Poor sleep patterns can be a feature of some mental health conditions, such as depression and anxiety. Limited sleep due to excessive work requirements could exacerbate an existing mental health condition. Therefore, duty hour restrictions were rated as a good barrier for threats I, II, and III but not applicable for threat IV (suicidal ideation).

## Automatic Biometrics and Wearable Device

Category: ■ New barrier to implement	Threat I Impaired Learning and Memory	Threat II Executive Dysfunction; Reduced Attention and Concentration	Threat III Lower Processing Spread	Threat IV Suicidal Ideation
Effectiveness	N/A	? Unknown	? Unknown	N/A
Evidence Level	N/A	I - Insufficient	I - Insufficient	N/A

### RATIONALE

Considerable progress has been made in recent decades in expanding the capabilities and improving the overall efficacy of personal digital devices, including smartwatches, smartphones, and wearable devices. This has attracted significant research and commercial attention towards employing them for various monitoring objectives.<sup>22,23</sup> These monitoring approaches focus primarily on fitness and physical health-related aspects, resulting in a large body of research and countless commercialized applications in this domain. Examples include tracking athletes' training, detecting falls for adults of advanced age, tracking post-surgery therapeutic and rehabilitation exercises, and posture correction.<sup>24,25</sup>

While the central focus of health monitoring applications has been on physical health, a growing range of research focuses on understanding the relationship between observations obtained from digital devices and some aspects of individuals' mental health status. In a related topic, FAA and MITRE completed a study on the potential to identify in-flight pilot incapacitation using remote physiologic monitoring.<sup>26</sup>

Passive sensing of smartphone data correlated to social anxiety, for instance, has been previously studied and shown that analyzing trajectories obtained via smartphone location services can paint a comprehensive picture concerning individuals' proneness to it.<sup>27,28</sup> Smartphones have also helped develop an understanding of generalized anxiety disorders.<sup>29</sup>

Another choice of hardware is application-specific wearable sensor technologies. For instance, wearable electrocardiogram sensors were used to recognize perceived anxiety via pattern recognition.<sup>30</sup> Smartwatches have a unique position among the wide range of various commonly used digital devices. They are in close contact with the skin and, given their attachment to a user's wrist, make it possible to obtain measurements of activity at higher accuracy. Smartwatches can also accurately measure heart rate and oximetry/oxygen saturation. In case of the need for brief questions, interactions, or Ecological Momentary Assessments, smartwatches can also be used to issue messages and acquire responses and entries by the user.<sup>23,31</sup>

Data-driven analyses leveraging smartwatches' sensory readings have been successful at the problem of patient classification for bipolar disorder, schizoaffective disorder, and depression.<sup>32</sup> It has also been shown that physiological readings made by basic smartwatch sensors enable efficient modeling of perceived stress response.<sup>33</sup> While much of the work in this domain is still largely relegated to research activities, several programs of note showcase recent advances impacting mental health. Of particular interest is the ability to leverage biometric data to determine acute and chronic indicators of stress. Apple is perhaps the most notable recent entry into this domain, where a recent update to the iOS Health App now includes mental health monitoring, where users will be able to complete self-assessments on their wellbeing, as well as a dashboard of metrics, such as associations or lifestyle factors, designed to provide insights to identify what might be contributing to their state of mind.<sup>34</sup>

Several other commercially available products offer varying degrees of automated biometric monitoring of stress, with differing approaches to interventions.

- **Fitbit** is a well-established entrant in stress monitoring, particularly with newer devices like the Fitbit Luxe and its Versa and Sense smartwatches. The Fitbit Sense 2 includes a continuous electrodermal activity (cEDA) sensor, which consistently monitors signs of stress.<sup>35</sup> If it detects a spike in associated indicators of stress, it will notify the user and ask for feedback. The product also includes event tracking over time and embeds coping mechanisms. There is also proactive monitoring where a user can self-assess with an EDA Scan, an assessment that takes approximately two minutes and uses the sensor to track stress responses and heart rate variability (HRV) during the session.

- **Garmin** wearables now all offer stress tracking as a standard feature. Garmin devices leverage a proprietary sensor package called Firstbeat, that takes regularly sampled HRV measurements, and, using a proprietary algorithm, translates those into a stress score ranging from 0-100.<sup>36</sup> Garmin also factors in rest and provides users with a daily score from 1 to 100. A lower score indicates lower stress levels and an overall indicator of wellbeing. Garmin also includes guided breathing exercises for stress interventions, which consider HRV and respiration data. It can prompt a user to use these exercises to achieve a calmer state.
- **Samsung** has heart rate monitoring built into its watches to track stress. Samsung uses HRV measurements to generate stress-tracking insights, plotted out in real-time and chronologically.<sup>37</sup> Similar to other offerings, Samsung products include breathing exercises designed to help reduce stress. Samsung has also partnered with mindfulness and the meditation app Calm to provide additional stress reduction features.<sup>38</sup>
- Other companies, like [Whoop](#) and [Oura](#), offer wearable sensors without a direct smartwatch interface that rely on HRV to measure and track stress. Many other products for monitoring mental health rely largely on user-self-reported data<sup>39</sup> and have platforms for providing user-directed therapies and interventions.<sup>40</sup> [Sonde](#), for instance, measures changes in vocal features such as voice and vocal markers to track changes in mental health, essentially functioning like a thermometer measuring body temperature changes.

Overall, HRV has emerged in recent years as a dominant mechanism for physiological stress monitoring. A growing body of literature supports the proposition that HRV is an increasingly sound metric for stress monitoring, particularly for high-stress occupations such as pilots, where measuring heart rate variability can help assess whether habituation has occurred.<sup>41</sup> Habituation, first described in the 1960s, is a form of learning in which the extent of the response to a particular stimulus decreases with repeated exposure to that stimulus. The habituation process has been associated with decreases in hypothalamic-pituitary-adrenal activity following subsequent exposure to the same stress stimulus.<sup>42</sup> Habituation is essential to reducing the deleterious effects of chronic stress that the day-to-day rigors of a stressful job may bring about.

However, even with improvements to monitoring algorithms, there is a broader challenge of the intrinsic disconnect between acute biological and subjective emotional stress responses. A meta-analysis demonstrated that particular associations between user-reported emotional stress and underlying biological markers were detected only in approximately 25% of the studies.<sup>43</sup>

Applications specific to high-stress jobs like first responders are also being actively explored. For example, a study at Mt. Sinai hospital is currently assessing the efficacy of smartwatch-based monitoring on physician wellbeing. The study uses a unique phone app to administer questions and collect data from an Apple Watch worn by participants.<sup>44,45</sup> Tools to monitor workplace efficacy based on more acute cognitive impairment are also increasingly available and clinically accepted.

A commonly used measure in sleep research is the Psychomotor Vigilance Test (PVT) which measures the vigilant attention of an individual to complete specific tasks. In this test, the individual is asked to respond to a series of visual stimuli, evaluating performance on correct and incorrect responses over a 10-minute period. Research is ongoing to determine if shorter tests can perform as well.<sup>79</sup> Ideally shorter tests would be preferable and could be easily administered remotely using web-browser-based tools.

Overall, significant progress has been made in remote biometric and performance monitoring, but these tools are not currently capable of evaluating pilot flight-safety risk. The greatest challenge is the limited capacity of current analytic tools to effectively diagnose chronic conditions or capture the full range of acute emotional distress. Biometric monitoring of “stress” is increasingly available in commercial products; however, “stress” represents only a fractional view of an individual’s overall wellness at a particular moment and may misrepresent a person’s true underlying mental health state. Additional work is needed to determine the extent to which such platforms can reveal pilots' mental health and flightworthiness.

## Recovery Barriers

## Automatic Control Features

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Consequence</b> Major Operational Safety Event
<b>Effectiveness</b>	? Unknown
<b>Evidence Level</b>	I - Insufficient

### RATIONALE

Most of the existing automated control features on aircraft are currently designed to handle an incapacitated pilot and are not well suited to protect against malicious intent. However, there are new capabilities being developed that can be used as possible barriers. These include:

- Automated Traffic Collision Avoidance System (TCAS).** This relatively new capability, for which Airbus was one of the driving development forces, automatically switches the autopilot into a mode that follows TCAS collision avoidance guidance if a conflict with another aircraft is detected. The original motivation for the capability probably arose from experience with TCAS that showed pilots generally struggle to comply accurately with the escape guidance. A fortunate by-product, however, is that the automated capability may also protect the aircraft in the event of pilot incapacitation. New Airbus aircraft are delivered with this capability, and a program is available to retrofit some older Airbus aircraft. However, we do not know the system’s usage frequency or effectiveness.
- Pilot alertness monitor.** The Boeing 777 is offered with a pilot alertness monitoring system as an option. At irregular intervals, the system prompts the flight crew to activate any control on the flight deck. If the flight crew fails to respond, the alerting level is increased. It is unknown how many airlines have elected to have this option activated on their aircraft.

## Second Pilot Oversight

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Consequence</b> Major Operational Safety Event
<b>Effectiveness</b>	? Unknown
<b>Evidence Level</b>	I - Insufficient

### RATIONALE

Part 121 airline operations are conducted with at least two pilots on board, and crew-resource management (CRM) procedures are in place to provide checks and balances for each pilot’s behavior and decision-making. CRM provides some protection against safety events that could be caused by a pilot suffering from a mental health condition. Training programs are conducted at the discretion of the airlines. During the coronavirus disease 2019 (COVID-19) pandemic, some airlines and pilot unions developed expanded training in the area of mental health awareness for pilots and crew. However, this barrier would have limited effectiveness at mitigating a mentally ill or suicidal individual with malicious intent. Part 135, on-demand and air-taxi operations are often conducted with a single pilot and do not benefit from a second pilot’s oversight.

## Air Traffic Control Flightpath Monitoring

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Consequence</b> Major Operational Safety Event
<b>Effectiveness</b>	+ Good

Evidence Level	C - Limited
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**RATIONALE**

Most Part 121 airline flights (not conducted in oceanic airspace) are continuously monitored by Air Traffic Control (ATC) radar systems and deviations from the assigned flight path are likely to be detected quickly by the air traffic controller. While the air traffic controller might quickly detect when a mentally ill pilot has deviated from their assigned flight path, the ability of the controller to intervene is limited. They could try to communicate with the pilot or alert the military if a pilot is unresponsive or expresses malicious intent.

**Inflight Verbal Communications Between Pilot and ATC**

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Consequence</b> Major Operational Safety Event
<b>Effectiveness</b>	-Poor
<b>Evidence Level</b>	I - Insufficient

**RATIONALE**

Similar to ATC flight path monitoring via the radar barrier described above, verbal communications between pilots and controllers occur regularly throughout a flight. This provides another opportunity for the air traffic controller to detect distress in the pilot’s language or even the pilot’s intonation or cadence of speech. Again, similar to the flight path monitoring barrier, the controller’s ability to intervene is limited to offering assistance to the pilot or alerting other authorities to an unresponsive pilot or one that has expressed malicious intent.

**Rules for Position Reporting in Non-Radar Airspace**

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Consequence</b> Major Operational Safety Event
<b>Effectiveness</b>	? Unknown
<b>Evidence Level</b>	C - Limited

**RATIONALE**

During flights in non-radar airspace (in particular during lengthy oceanic flights), pilots must provide periodic position reports. If these reports fail to occur or become suspicious, this provides a potential opportunity for a controller to detect anomalous behavior. However, as described in previous examples, the controller’s ability to intervene is limited.



## Ground Crew Trained to Detect Flight Crew Anomalous Behavior

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Threat</b> <b>Major Operational Safety Event</b>
<b>Effectiveness</b>	-Poor
<b>Evidence Level</b>	I - Insufficient

### RATIONALE

As part of the Safety Culture associated with a Safety Management System (SMS), all airline members are trained and encouraged to report potential safety issues. This includes an informal assessment of all personnel involved in flight operations (e.g., flight crews, ground crews, gate agents, etc.). If any of these personnel appear distressed or otherwise exhibit seemingly unusual behavior, this may lead to further inquiry as to a person’s mental health. This barrier’s effectiveness is limited due to the subjective nature of the assessments and limited opportunity for inter-personal interactions.

## Flight Crew Action to Restrain Incapacitated Pilot

<b>Category:</b> ■ Barrier already exists. No foreseeable enhancement recommended	<b>Threat</b> <b>Major Operational Safety Event</b>
<b>Effectiveness</b>	? Unknown
<b>Evidence Level</b>	C - Limited

### RATIONALE

Flight crew members have procedures for restraining the body parts of an incapacitated pilot while they remain in the respective pilot seat. This barrier is ineffective for a conscious pilot with malicious intent and exists to keep an unconscious pilot’s limbs from interfering with the flight controls of the other pilot. This would be very limited in mitigating a pilot with a mental health issue.

# Observations

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## Mental Health Risk Assessment

- The current system focuses on medical diagnoses of mental health conditions but is not designed to efficiently differentiate between levels of safety risk.
- Medical experts reported that the existence of a mental health condition does not equate to a safety risk. Airmen with mild and moderate depression or anxiety under treatment pose a very low flight safety risk.
- Among pilots with mental health conditions, those with severe illness, including suicidal ideation and poorly controlled substance use disorder, pose the greatest risk to flight safety.
- Existing program elements that provide a barrier to safety risks from mental health conditions are deemed less effective against a pilot with malicious intent.
- The conservative FAA policies on mental health may effectively limit safety risks but might be excessively burdensome for pilots with relatively mild or moderate mental health issues who may pose little safety risk.
- The FAA does not have a data-driven approach to quantifying the risk of mental health conditions and flight safety, but a system could be built and improved over time. Research linking existing data systems could yield improved insight.

## Mental Health Disclosure

- Pilots report a high level of “health care avoidance behavior,” as defined by Hoffman and colleagues, a “phenomenon where pilots avoid seeking medical care or disclosing health information due to the perceived risk of aeromedical certificate loss.” Health care avoidance behavior has been reported to be as high as 56% among pilots in the US and Canada. This includes false reporting and concealment of health problems during the AME exam process.
- In its July 2023 report, the US Inspector General concluded that the FAA has comprehensive procedures to evaluate pilots’ psychological health but that the “ability to mitigate safety risks is limited by pilot’s reluctance to disclose mental health conditions.”
- Improving trust between pilots and the FAA is fundamental to enabling system change and fostering an environment that encourages self-reporting of pilot mental health conditions.

## Mental Health Treatment Program Status

- As reported through the ICAO mental health working group, expedited care programs for mental health conditions are now under development in Australia. Early identification and expedited care for pilots with substance use concerns integrated with peer support is now the norm in Germany.
- Peer support programs in Europe and the US managed by airlines and pilot unions are reported to be very impactful by experts, but objective reporting on their effectiveness is not routinely available due to privacy concerns.
- Peer support programs are mandated in Europe but optional in the US. High-quality peer support programs are not easily accessible to all US commercial pilots, particularly outside the major airlines.
- Limitations on disability, health insurance, and paid leave benefits contribute to pilot health avoidance behavior. Disability benefits for airmen vary widely across the industry.
- Technology advances for physiologic monitoring are promising, but complete automation for detecting mental health conditions and flight safety risk is not yet commercially available.

## Conclusions

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- The current FAA Aeromedical Certification program related to mental health conditions includes a very successful HIMS program focused primarily on substance use disorder. However, for other mental health conditions such as mild depression and anxiety, the current structure achieves system-level safety at the expense of pilot well-being and productivity by grounding many capable airmen who could fly safely and contribute to health care avoidance behavior.
- Health care avoidance behavior is common among pilots who have lost trust in the FAA aeromedical system. This includes pilots not reporting mental health symptoms or care received or avoiding needed care altogether. This impacts pilot job satisfaction negatively and poses a potential flight safety risk since pilots' health can deteriorate.
- Improving truthful pilot self-reporting will be fundamental to improving the safety management system for air travel.
- The multi-layered set of prevention barriers to “mental health-related inadequate pilot response while flying with catastrophic outcome” can be strengthened by reforming and expanding existing programs and developing new components.
- Strong leadership from the FAA, airlines, and pilot unions to destigmatize mental health and embrace concepts of a “Just Culture” will be needed to achieve trust and improve airmen's self-reporting of mental health disorders.
- Strengthening FAA clinical oversight will require a focus on mental health training for AMEs, expanded staffing of the FAA behavioral health office, and enhanced options for neuropsychological testing.
- The development of clinical pathways for risk-based management of mental health conditions could allow pilots with mild mental health conditions to continue to fly, and those with moderate risk receive more intensive care with expedited medical recertification. For those with high safety risk, the program should promote self-reporting, foster early identification by peers, prompt restriction from flying, and close monitoring.
- The expansion of high-quality peer support programs available to all pilots and easy access to mental health counseling can encourage self-reporting of mental health issues and early intervention to maximize the health of pilots and limit safety risks.
- Expanded benefits for health and disability insurance, including paid leave for all commercial pilots, can encourage them to seek help for mental health issues earlier by lessening the financial harm associated with loss of medical certification.
- Automated methods for biometric monitoring and detection of safety risks due to mental health deterioration are not yet ready for operational deployment but comprise a promising area for continued FAA research.

## Recommended Next Steps

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1. **Establish a top-level initiative to de-stigmatize mental health in the aviation industry.** Form an industry leadership collaborative including FAA, airlines, and airmen unions to communicate the benefits of self-reporting mental health conditions, peer-support, and mental health treatment to improve pilot well-being and reduce safety risks. Build upon lessons learned from improvements in recognizing fatigue as a flight safety risk. Evaluate best practices related to the “Just Culture” movement to support pilot well-being and flight safety.
2. **Convene a multi-stakeholder effort to evaluate risk-based mental health management pathways.** Evaluate the potential to allow pilots with mild and moderate mental health conditions to receive early treatment and continue to fly safely. Assess efforts now underway in Australia as reported in the 2022 ICAO Working Paper entitled “Medical Certification and Mental Illness.”
3. **Expand mental-health peer support programs across all pilot communities.** Evaluate best practices from Germany and other European jurisdictions where peer support programs are mandatory. Determine how best to benchmark and evaluate the effectiveness of peer support programs across the industry, including airline and pilot union programs.
4. **Strengthen operational resources available to the FAA behavioral health staff.** Increase staffing of FAA psychiatry and psychology staff where necessary. Automate document flow to help expedite a timelier review of health records and monitoring reports. Adopt additional neuropsychological testing options pending outcomes of current FAA research in this area.
5. **Expand research related to health care avoidance behavior of airmen.** Consider the establishment of routine surveys of airman related to early recognition of mental health issues, care-seeking behavior, willingness to extend peer support, and personal practices of self-reporting. Evaluate pilots' care avoidance behavior across all aviation sectors, including student pilots. Produce scientifically valid trended reports on health care avoidance behavior to better inform industry efforts to improve pilots' mental well-being and safety for the flying public.
6. **Expand research and development of methods to systematically measure the safety risk associated with pilots' physical and mental health conditions.** Consider confidential linking of FAA health information with data sets such as flight track data (e.g., Automatic Dependent Surveillance–Broadcast (ADS-B), Flight Operational Quality Assurance (FOQA)) and other systems, creating a trusted program similar to Aviation Safety Information Analysis and Sharing (ASIAS), to better understand potential associations of airmen health characteristics and flight safety risk. Expand research efforts on pilot physiologic monitoring, mental health, and flight safety.

# Appendices

## Appendix A: Methodology & Approach

The MITRE team conducted several interviews, including pilots, peer network volunteers, AMEs, and Agency Medical Officers. To ensure privacy for the interviewees who were then or had previously experienced mental health conditions, the team followed a strict MITRE Independent Review Board Protocol. Observations and recommendations from the FAA Telemedicine Innovation Challenge that could improve mental health recertifications were considered and applied as part of the recommendations.

Analysis ensued using an SRM paradigm and using the Bowtie model<sup>5</sup> to introduce best practices which can be deployed to support an improved mental health certification program. The model was vetted by clinicians, AMEs, and SMEs (e.g., Pilots, Human Factors experts). The experts assessed and estimated the evidence level and the effectiveness rating for each barrier. Escalation factors that could degrade or render the barrier ineffective were also identified.

Additionally, the team performed an extensive literature search and review of materials provided by the SMEs to support the barriers identified, support the observations, and derive conclusions.

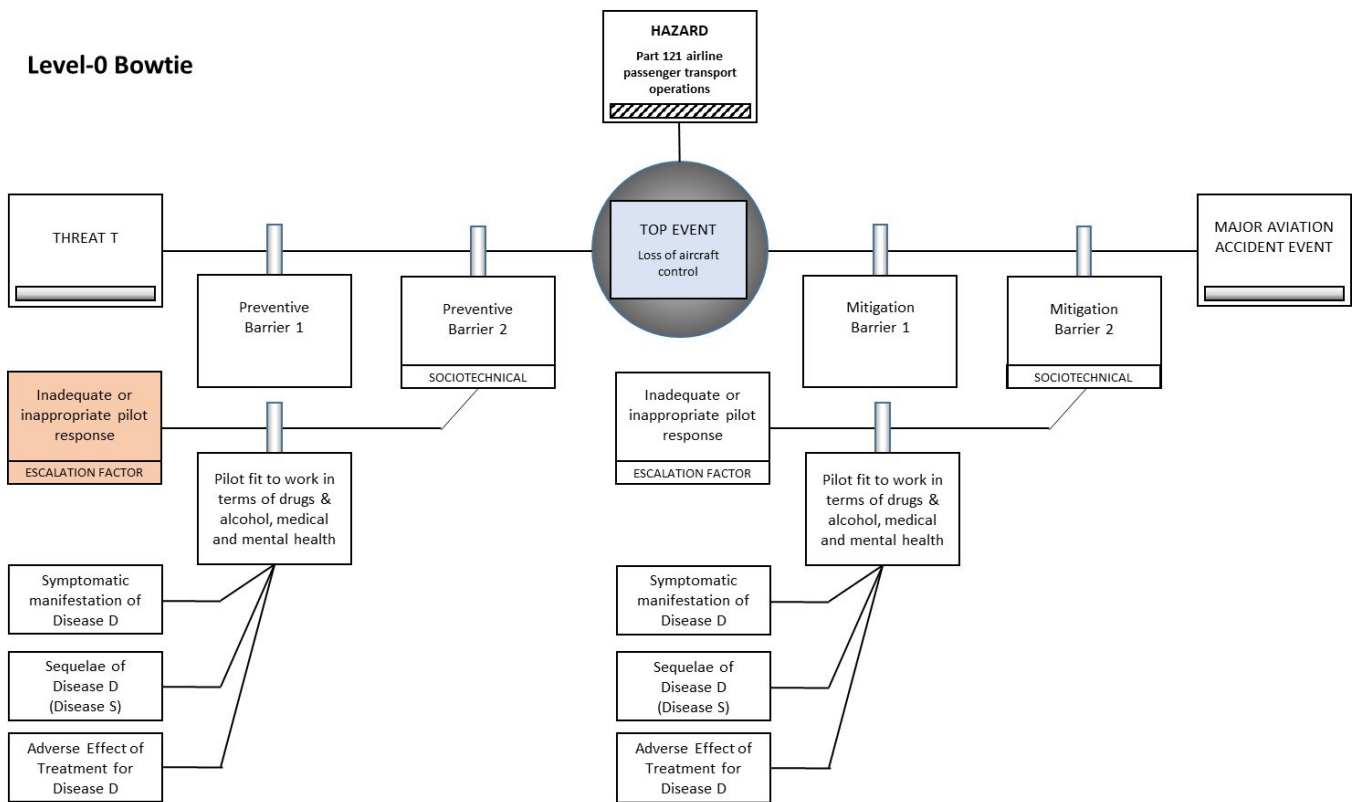


Figure 4: Bowtie Model Level 0 – Loss of Aircraft Control (Top Event)

**Level-1 Bowtie**

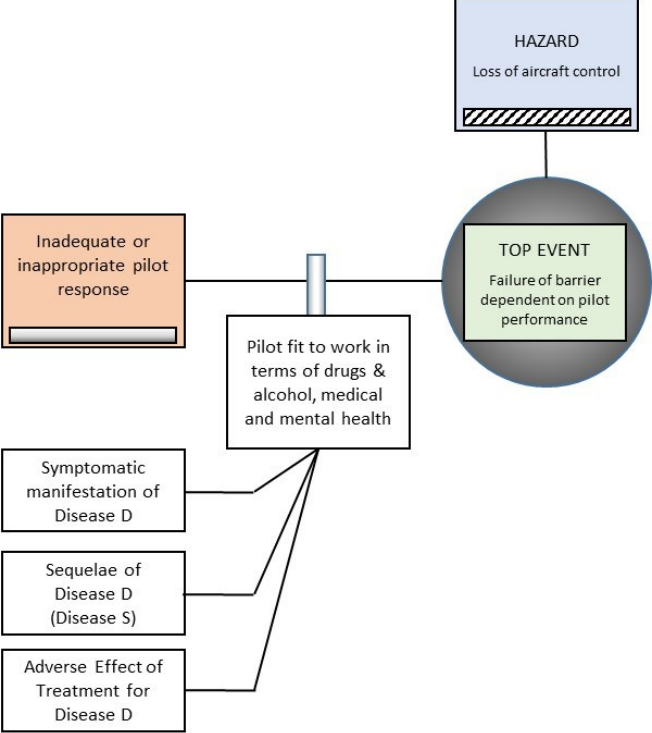


Figure 5: Bowtie Level 1 - Failure of Barrier Dependent on Pilot Performance (Top Event)

**Level-2 Bowtie**

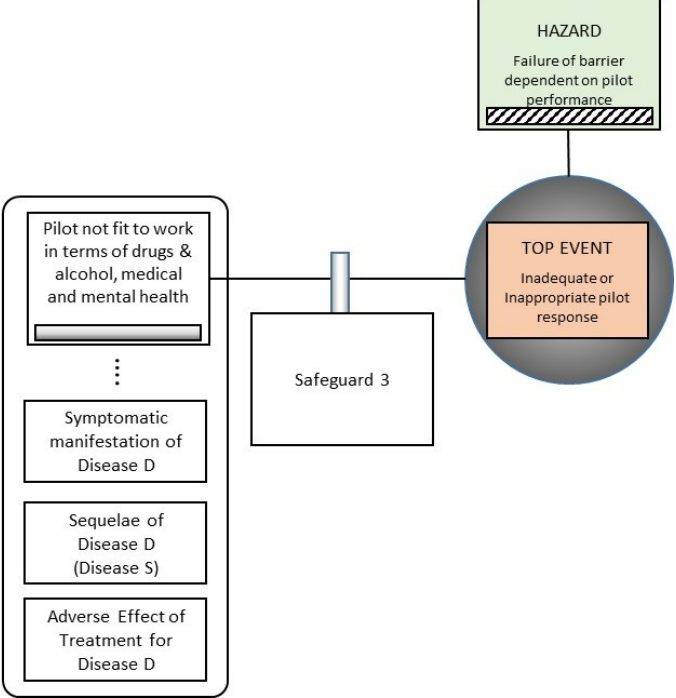
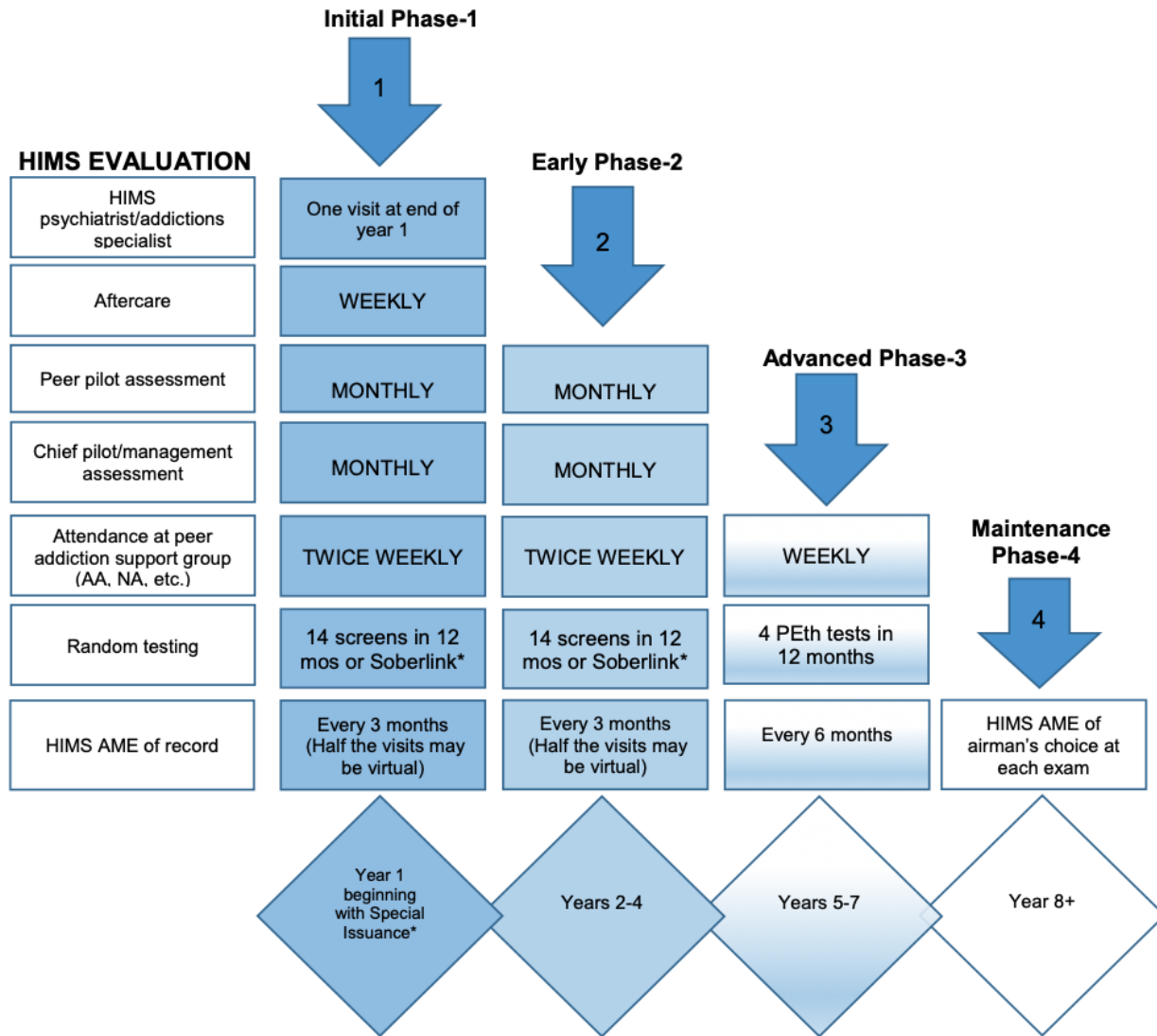


Figure 6: Bowtie Level 2 – Inadequate Pilot Response (Top Event)



# Appendix B: HIMS Step Down Program



Source: [HIMSAMEStepDownPlan.pdf \(faa.gov\)](#)

# Appendix C: ICAO Working Paper



International Civil Aviation Organization

**WORKING PAPER**

A41-WP/256

TE/98

2/8/22

## ASSEMBLY — 41ST SESSION

### TECHNICAL COMMISSION

#### Agenda Item 31: Aviation Safety and Air Navigation Standardization

#### MEDICAL CERTIFICATION AND MENTAL ILLNESS

(Presented by Australia)

##### EXECUTIVE SUMMARY

The global burden of disease due to mental ill health is higher than that of any other illness. We know the prevalence of mental ill health in the aviation community is higher than in the general population; however, the declaration of this illness by medical certificate-holders remains rare. Key barriers to the declaration by individuals of mental illness and its management in aviation include the stigma of perceived personal failing accompanying the diagnosis and fear of having their aviation medical certificate restricted, suspended, or cancelled. These issues are increasing in aviation due to the impacts of the COVID-19 pandemic. It is therefore timely to examine the current approach to medical certification of mental illness. This paper proposes a move away from the traditional pathogenic disease-based approach to a salutogenic model that supports the individual experiencing mental ill health to maintain engagement in the aviation industry and to access the support this community brings

**Action:** The Assembly is invited to:

- a) note the traditional pathogenic approach to aviation medical certification in the case of mental illness is a significant barrier to certificate-holders seeking help or disclosing their illness;
- b) request ICAO to develop guidance to assist risk assessment and decision-making by medical examiners and regulators that would under appropriate circumstances permit the safe early return or continuation in a flying role of individuals diagnosed with mental illness;
- c) support States utilising ICAO guidance to develop evidence-based, risk-informed and peer-supported aeromedical decision-making tools that include alternatives to aviation medical certificate suspension and cancellation

<i>Strategic Objectives:</i>	This working paper relates to the Safety Strategic Objective.
<i>Financial implications:</i>	Nil
<i>References:</i>	Doc 8984, <i>Manual of Civil Aviation Medicine</i> WHO World Mental Health Report 2022 <sup>1</sup> FAA Human Intervention and Motivation Study

<sup>1</sup> [World mental health report: Transforming mental health for all \(who.int\)](https://www.who.int/world-mental-health-report)

## 1. INTRODUCTION

1.1 It has been established for many years the global burden of disease due to mental health is the highest contributor to years of life lost due to disability, and reduction in the global rate of suicide is one of the World Health Organizations (WHO) Sustainable Development Goals.

1.2 It is also acknowledged this burden is under-reported both due to the data collected, but more importantly due to the social and cultural reluctance of people to declare they have problems with their mental wellbeing. In the aviation community, this has been even more significant with the paradigm of an aviator needing to be made of the “right stuff” to be able to be part of this community, let alone to thrive and succeed.

1.3 In more recent years the “personal failure” approach to mental ill health has been replaced to a moderate degree by the pathogenic model of disease. This has been a step forward in acknowledging that the mental state is a part of the human condition, as captured by the simple but effective statement of the title of the United Kingdom’s National Health Service’s mental health strategy: “No health without mental health”.

1.4 Aviation medical examiners (AME) have in the last few decades adopted a much more medical model of assessment, diagnoses and management. In the Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) and the WHO’s Eleventh Revision of the International Classification of Diseases (ICD-11) a set of criteria which, when met (or not), means one is or isn’t diagnosed with a mental illness. Aviation medical professionals use questionnaires, checklists, outcome measures to define an applicant’s mental health, its severity and prognosis. Regulators use these to inform quantitative research in support of interventions and medications to fix this pathology, with parallels drawn to the way we manage other chronic diseases like asthma, diabetes or heart failure.

1.5 AMEs also use these pathogenic, criterion-based medical approaches to aeromedical certification, to determine the presence or absence of disease when suspending or reinstating a medical certificate. This approach has been considered to be the safe option for decades, but it is becoming increasingly apparent in global health data, this model is not the safest approach.

1.6 This paper proposes a new approach to medical certification in mental health, based on the salutogenic principle of human wellbeing.

## 2. DISCUSSION

2.1 The pathogenic model of defining mental illness has been important in supporting the acknowledgement and acceptance of the presence of mental illness at community and individual levels. Normalising the presence of a broad spectrum of diverse symptoms has driven life-saving narratives in Australia through initiatives such as “R U OK day”, and the growth of information and support from organisations such as BeyondBlue and the Black Dog Institute.

2.2 This increased acceptance has also supported the move towards acknowledging the message that “it’s OK not to be OK”, which links into the concept that every person may experience features of mental ill health at any stage, without necessarily having a diagnosis. This extends into the encouragement of accessing advice and support, without necessarily needing therapeutic intervention for a disease. This is the underpinning principle for the salutogenic approach to mental health and illness.

2.3 Mental health is not a binary sick/not sick status (pathogenic approach), rather it is a continuum of well / less well / illness.

2.4 The retention of the pathogenic approach to mental illness forms a barrier to aviation safety. Current medical standards and certification are built on the pathogenic, binary well/not well (fit/not fit) approach. If an applicant is not well and fit for certification, the current approach is, they must be sick and not fit for certification. The middle ground, where someone is not entirely well, but not yet meeting the criteria for a diagnosis or requiring therapy, is currently inaccessible to certificate-holders. They are therefore less likely to seek help or accept help offered to prevent further deterioration and build capacity to respond to mental distress. Their mental status is therefore more likely to deteriorate such that they become increasingly unwell. People who are experiencing distress and symptoms will keep flying, controlling airspace, or exercising other privileges while potentially impaired by remaining untreated, or while being treated with interventions that are not safe or effective – just to be able to retain their certificate.

2.5 Rather than continue to see certificate-holders deny their illness, avoid treatment and operate while unwell and potentially impaired, it is safer to fly while being treated and supported by their peers and their industry, under appropriate circumstances. In the same way AMEs now permit certification with diseases that historically would have precluded certification, it is appropriate to revisit our approach to certification with mental illness. The Human Intervention and Motivation Study (HIMS) program with the United States Federal Aviation Administration has clearly demonstrated that the salutogenic approach to complex biopsychosocial conditions in the aviation environment can successfully support certificate-holders to acknowledge and declare their symptoms or illness, and effectively engage in treatment.

2.6 Australia has developed a proposed model of medical certification for certificate-holders experiencing mental distress that is responsive to the individuals needs and status of the person, is supported through a peer network established by the Regulator, with oversight and governance of the system and processes by the Regulator.

2.7 By using a peer network, Australia is following the proven HIMS approach, building on trust between the certificate holder and a suitably qualified peer who understands the context of their flying or operational role at the same time as having an objective appreciation of the safety of this person at this point in time. The peer is in turn supported by a panel of aerospace medicine and mental health specialists who are appointed by the Regulator to make real-time responsive recommendations about the subject's fitness for aviation duties in consultation with the peer and treating clinicians. The Regulator remains at arms-length as long as the person is compliant with the terms of the program and the directions of the panel and peer, formalised as conditions on a medical certificate. In this program, the person retains their medical certification and their fitness to fly with, conditions, restrictions and limitations responsive to their current status. This does not preclude the assessment and subsequent cancellation or suspension of an individual's aviation medical approvals/ certifications should the results of risk assessment warrant such action.

2.8 Trust is paramount to this model, consistent with the principles of Just Culture. The Regulator trusts the certificate holder to be open and honest in their disclosure of symptoms and compliance with the direction of their peer and overseeing panel. The certificate holder trusts the Regulator not to intervene unless there is a clear and immediate hazard to the safety of air navigation due to severity of symptoms (on the advice of the panel or peer), or non-compliance with the requirements of the program. Verification of trust, is delivered in the form of audit and oversight by the Regulator. This



includes ensuring that peers and panelists are suitably qualified and current, and acting within the scope of their role; the delivery of the program includes appropriate schedules and reporting of peer engagement by the certificate-holder; and a longer-term post-implementation review through stakeholder engagement and data review regarding reporting and success of the model over time.

### 3. CONCLUSION

3.1 The first step in enacting meaningful and sustainable change in the mental health of the aviation community is to acknowledge this is a real, current and significant problem for which the historical approach of the pathogenic model to certification may no longer be fit for purpose.

3.2 It is important therefore that a significant first step in making a change is to acknowledge our traditional approach is not best suited to achieving the dual goals of aviation safety and management of the industry's burden of mental illness.

3.3 ICAO and States can take steps to review current programs and methodologies to find ways to implement new approaches that bring greater industry and individual engagement, and therefore greater safety. Each State will have very different cultural acceptance of the principles and risk appetite for change in the presence of mental ill health, and will require different resources and approaches to review and implementation if and when they are ready to implement change.

3.4 The support of ICAO through mechanisms such as expert panels, working groups and advisory bodies is imperative to supporting a consistent, global and safe approach for all.

3.5 ICAO's endorsement of further development work on the salutogenic principle will enable each nation to review and implement their desired approach to medical certification in the presence of mental ill-health using evidence-based, safety-informed, internationally accepted principles.

— END —

## Appendix D: Mental Health Models from Other Sectors and Industries

### Department of Energy

The Department of Energy oversees and manages the **Human Reliability Program (HRP)**, a program designed to ensure that individuals in sensitive positions that grant them access to restricted materials, nuclear explosive devices, facilities, and programs, meet the highest standards of reliability and physical and mental suitability.<sup>46</sup> This is accomplished through a system of continuous evaluation that identifies individuals whose judgment and reliability may be impaired by physical or mental/personality disorders, alcohol abuse, use or abuse of drugs or other substances, or any other condition or circumstance that may be of a security or safety concern.

#### MEDICAL AND PSYCHOLOGICAL ASSESSMENT

In addition to traditional security clearance measures, the HRP involves an intensive physical and psychological assessment component, conducted both in advance of initial HRP certification, and on an ongoing basis.

- A comprehensive medical assessment is performed for initial certification and then annually for recertification but may be performed more often if required. A designated physician is responsible for the medical assessment.
- As part of this medical assessment, a psychological evaluation must be conducted. This evaluation consists of a structured psychological assessment and a semi-structured interview.
- The evaluation consists of a semi-structured interview for recertification, but a psychological test may also be conducted if warranted. Additionally, every third year, the psychological evaluation includes a psychological test.<sup>47</sup>
- There does not appear to be a specific psychological test required for these exams, but rather, examiners are advised that “a nationally normed psychological or psychiatric inventory screening instrument should be considered for HRP-certified positions.”<sup>48</sup>

Finally, all HRP candidates are required to be screened for drug and alcohol use prior to certification and will also be subjected to at least one random drug and alcohol test within 12 months.

#### EVALUATION AND REASSESSMENT

The HRP program also includes a comprehensive program for reporting and ongoing monitoring of personnel concerns. If a risk is identified, the person in question can be subject to revocation or temporary removal of HRP certification.

Within 24 hours of identification of a reliability concern, the person is required to be removed from their active duties, and access to secure environments is restricted until their status is finalized.

When an individual has been temporarily removed due to a safety concern, the certifying official has the option to take one of the following actions to address the issue:

- Reinstatement: Continue the temporary removal and direct actions the individual can take to resolve concerns (e.g., rehabilitation). After completion of the intervention, the matter is reevaluated.
- Revoke certification: Individuals whose HRP certification is revoked have a mechanism to appeal all decisions.

### Department of Transportation

The Department of Transportation (DOT) requires individuals in safety-sensitive positions, including pilots, to meet certain mental health standards to obtain and maintain their medical certification. The specific mental health requirements for pilots are set forth in Title 14 of the Code of Federal Regulations (14 CFR) Part 67, which outlines the medical standards and certification procedures for pilots.

Under 14 CFR Part 67, pilots must demonstrate that they do not have any mental health conditions that would make them unable to safely perform the duties of their job. To do so, pilots must undergo a medical evaluation with a designated FAA medical examiner who will assess their mental health history, current mental status, and any treatment they have received.

The FAA medical standards require that pilots do not have any of the following mental health conditions, unless they can demonstrate that the condition does not affect their ability to safely perform their job:

- A psychosis, bipolar disorder, or severe personality disorder.
- Substance dependence or substance abuse within the past two years.
- An established medical history or clinical diagnosis of a mental health disorder that, in the opinion of the FAA, would interfere with the safe operation of an aircraft.
- Any other mental health condition that the FAA determines is disqualifying.

Pilots are also required to report any mental health conditions or treatment to the FAA on their medical certification application. Failure to report a disqualifying mental health condition or treatment can result in the revocation of a pilot's medical certificate and may subject them to civil penalties or criminal prosecution.

### COMMERCIAL DRIVERS

The Federal Motor Carrier Safety Administration (FMCSA) sets the medical standards and certification procedures for commercial drivers in the United States, including the requirements for mental health. The specific mental health requirements for obtaining a commercial driver's license (CDL) are set forth in the FMCSA's regulations, which can be found in Title 49 of the Code of Federal Regulations (49 CFR) Part 391.<sup>49</sup>

Under Part 391, commercial drivers must meet certain mental health standards to be medically qualified to operate a commercial vehicle. The standards require that a commercial driver:

- Does not have a current clinical diagnosis of any mental, emotional, or psychiatric disorder that would interfere with the safe operation of a commercial vehicle.
- Does not have a history of any mental, emotional, or psychiatric disorder that would interfere with the safe operation of a commercial vehicle.
- Is not currently taking any medication that would interfere with the safe operation of a commercial vehicle.
- Does not have any condition that would interfere with the ability to perform the tasks of operating a commercial vehicle.

Commercial drivers must undergo a medical examination performed by a certified medical examiner listed on the National Registry of Certified Medical Examiners to meet these standards. During the examination, the medical examiner will evaluate the driver's mental health history, current mental status, and any medications they are taking that could affect their ability to operate a commercial vehicle safely.

If a driver has a history of a mental health disorder, they may need to provide additional documentation and undergo further evaluation to determine whether they meet the mental health requirements for a CDL. The FMCSA may also require periodic mental health evaluations for commercial drivers with a mental health disorder history.

Many commercial driver associations offer support to drivers who have mental health or substance abuse condition. These associations recognize that mental health

and substance abuse issues can impact a driver's ability to operate a commercial vehicle safely, and they provide resources and support to help drivers get the help they need and maintain their livelihoods.

For example, the [National Association of Small Trucking Companies](#) offers a Driver Health & Wellness Program that provides resources and support for drivers dealing with various health issues, including mental health and substance abuse. The program includes access to a telemedicine platform that allows drivers to connect with health care providers for mental health consultations and medication management.

It is important for commercial drivers to seek out and use these resources if they are struggling with mental health or substance abuse issues, as they can provide valuable support and help drivers maintain their physical and mental health while also ensuring the safety of themselves and others on the road.

The DOT has other mental health regulations that apply to individuals in safety-sensitive positions. For example, the Federal Railroad Administration's (FRA) regulations require operators to conduct a fitness-for-duty evaluation for employees working in safety-sensitive positions in the railroad industry, including a mental health assessment. The FRA regulations also require that individuals in safety-sensitive positions report any mental health conditions or treatments as well as any substance use to their employer.<sup>50</sup>

The DOT also requires assessments of individuals working in safety-sensitive positions in the pipeline industry. The Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations require operators to have a written plan for assessing alcohol and drug use and mental and physical health conditions for individuals in safety-sensitive positions.<sup>51</sup> The regulations also require that individuals in safety-sensitive positions report any mental health conditions or treatments to their employer.

Furthermore, the DOT's regulations on drug and alcohol testing apply to individuals in safety-sensitive positions in all modes of transportation, including aviation, trucking, railroads, and pipelines. These regulations require that individuals in safety-sensitive positions be free from the effects of drugs and alcohol while performing their duties and establish testing procedures to ensure compliance with this requirement. DOT is also looking into the effect of roadside fatigue or drowsiness such that testing for this could become part of roadside checks.<sup>52</sup>

Overall, the DOT recognizes the importance of mental health in safety-sensitive positions across the transportation industry and has established regulations to



help ensure that individuals in these positions are mentally fit to perform their duties safely.

## First Responders

### MENTAL MAY DAY

In Northern Virginia, the Fairfax County Fire and Rescue Department developed a “Mental Mayday” program to teach its members how to ask for help and what to look for in colleagues struggling. The program provides a structured plan to identify and actively support firefighters experiencing behavioral health crises. This program results from a collaborative effort between the department’s Behavioral Health and Professional Development sections, and the personal experiences of Lt. Adam Bartman.<sup>53,54</sup> The program is currently being taught as part of the department’s officer certification courses and has been included as part of the curriculum for recruit training.

First responders typically require an annual health review conducted by the County’s Occupational Health Department. Additionally, the Fairfax County Fire Department is actively developing a procedure where every incident a firefighter encounters is noted and scored to assess their trauma exposure levels. A firefighter encounters between 80 and 100 high-trauma exposures per year.<sup>55</sup> With such high trauma exposure, the Department has standing reservations for inpatient-level rehabilitation and an on-call therapist. If a significant incident is reported, the firefighter is sent to clinicians for professional assessment. After this assessment, the clinician, the firefighter, and their superior collaborate to determine how best to serve the firefighter’s needs. Lt. Bartman estimated that approximately 70% of firefighters who meet with the clinician devise an acceptable plan to get through the crisis and return to work that same day.<sup>56</sup> The program finds that an immediate response plays a major role in recovery time compared to someone who must wait several weeks to receive an appointment with a professional.

### FIRST RESPONDERS WELLNESS CENTER OF CHICAGO, IL

The [First Responders Wellness Center](#) (FRWC) located in Chicago provides treatment services catered to the needs of their first responders (i.e., law enforcement, fire service, emergency medical services/emergency medical technicians, emergency department staff, any first responder or veterans) while acknowledging the professional culture, demands of the job, and being faced with life and death situations constantly. The FRWC provides specialized training, intervention, crisis management, and evidence-based therapy (e.g., eye movement desensitization reprocessing, neurofeedback, and cognitive-behavioral therapy). The FRWC also conducts

psychological testing for police and public safety service members during pre-employment selection, special duty, and fitness for duty exams. Programs and services are provided through insurance.

## National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) employs a strict and thorough astronaut selection process, given the nature of its space mission. Since 1959, its [Human Research Program \(HRP\)](#) has carried out intensive psychiatric screening to identify signs of mental illnesses that could jeopardize a mission’s success.<sup>57</sup> Astronaut candidates must complete hours of psychiatric screening during the selection process. Anyone identified as likely to have a behavioral or psychiatric problem during flight is eliminated. The candidates who made it through have typically come from extremely high-stress roles (e.g., pilots, physicians, engineers) and are specifically chosen because of their ability to handle stressful circumstances and solve problems while under tremendous pressure.

NASA is funding research to further streamline the selection process, such as determining whether certain biomarkers in a potential astronaut’s body could cause an increased stress response or whether certain genes could signal disturbed sleep patterns.<sup>57(p29)</sup> The astronaut selection process in the future might involve a DNA test.

To prevent and manage mental health crises while in space, NASA has teams of providers, including psychiatrists and psychologists, that support personnel during space missions. For example, the International Space Station (ISS) crew members participate in psychological conferences with medical staff every two weeks.

The agency also ensures and promotes wellbeing through psychosocial support. Its [Family Support Office](#) serves as a resource to the astronaut families by hosting educational events and informational updates. Internet access, hobbies, and care packages that can give crew members a sense of connection to home are also made available.<sup>58</sup> Additionally, space agencies have prepared for mental health crises while in space. The ISS has antipsychotics, antidepressants, and anxiolytic drugs in its medicine kit as well as physical restraint systems, if necessary.

## Physicians

Substance use disorders and other psychiatric illnesses are common in the general population. More than 10% of Americans will develop an addictive disorder in their lifetime, representing over 30 million people.<sup>59-61</sup> In the physician population, at least 10% of physicians will develop an addictive disorder throughout their career, and

approximately one-third of physicians will have a condition that could impact their ability to practice with reasonable skill and safety at some point in their career.<sup>62-65</sup>

Due to potential patient safety risks, a network of Physician Health Programs (PHPs) has been developed to treat physicians and other health care professionals in safety-sensitive positions. PHPs offer a more intensive and extensive treatment than those usually found in the general population. Because of this higher level of treatment coupled with PHP-supported continuing care, the treatment outcomes of physicians are much better than outcomes in the general population.<sup>62-65</sup>

A PHP is a confidential resource for physicians, other licensed health care professionals, or those in training suffering from addictive, psychiatric, medical, behavioral, or other potentially impairing conditions. PHPs coordinate effective detection, evaluation, treatment, and continuing care monitoring of physicians with these conditions. This coordination and monitoring of a participant's progress allows PHPs to provide documentation verifying a participant's compliance with treatment and continuing care recommendations. The Federation of State Physician Health Programs (FSPHP) is a nonprofit membership organization that advocates for high standards and best practices among PHPs. A state medical society typically sponsors individual PHPs.

1. The FSPHP supports the early detection, evaluation, and treatment of physicians and other licensed health care professionals suffering from addictive, psychiatric, medical, behavioral, or other potentially impairing conditions. Appropriate evaluation and treatment of these physicians at programs experienced with the treatment of professionals in safety-sensitive employment will ultimately enhance the health of the provider and better protect the public.
2. The FSPHP strongly opposes the discrimination of physicians during licensing, credentialing, or at any time based on a history of addictive, psychiatric, or other illness.
3. The FSPHP supports using PHP services whenever possible instead of disciplinary action. When PHP services are not used, it is less likely that physicians will receive early intervention and appropriate treatment. It is well-known that illness often predates impairment by a period of years. The FSPHP believes earlier intervention in potentially impairing illness to be more efficacious than intervention in later stages of disease.
4. The FSPHP believes a physician's health and treatment history should be held with the utmost

privacy and confidentiality. This ensures those in need can seek help without fearing punishment, disciplinary action, embarrassment, or professional isolation. Moreover, maintaining confidentiality increases the chances of recovery and incentivizes early intervention.

Several long-term studies have reported recovery rates from 70% to 90% for physicians with substance use disorders monitored by PHPs.<sup>66</sup> Abstinence rates approaching 90 percent are reported for physicians in PHPs with substance use disorders, at the end of five years.<sup>66-68</sup> Physicians who have successfully completed monitoring with a PHP experienced a lower risk of malpractice claims after monitoring.<sup>69</sup> PHPs facilitate the early detection of illnesses that can lead to impairment, and they have a documented record of achieving long-term remission with successful outcomes.<sup>65-68</sup>

## US Armed Forces

The military relies on its recruitment and qualification processes to determine whether an applicant is fit for duty. This includes disqualifying prospective recruits diagnosed with mental health conditions, such as anxiety disorders, bipolar, Asperger's Syndrome, or depression.<sup>70</sup> Waivers do exist but can only be granted after specific requirements are met.

For active service members, the stigma attached to mental health conditions is a predominant factor leading to the avoidance of health care. This sentiment has roots in the cultural misconception that service members must be flawless to be deemed ready. Additionally, there is a prevailing belief that service members should independently manage their challenges. The latter contributes to treatment dropout of approximately 63%.<sup>15</sup> Furthermore, a recent study shows that US military pilots avoid mental health care out of fear that certain conditions will affect their flying status and that the number is higher than paid civilian commercial pilots.<sup>71</sup>

The Department of Defense requires each service to "implement combat and operational stress control (COSC) policies and programs to prevent, identify, and manage the effects of these combat and operational stress reactions (COSRs)."<sup>72,73</sup> Implementation of COSC uses the Stress Continuum Model. Some of these programs include:

- US Army's [Comprehensive Soldier Fitness](#) and [Battle Mind](#). The former is based on 30 years of resilience research results to ensure that soldiers, families, and civilians have the critical resilience and coping skills needed to face physical and psychological challenges. Battle Mind aims to equip soldiers to face fear and adversity in combat before, during, and after

deployment. Its lifecycle approach prepares new soldiers mentally for what to expect and helps combat veterans transition back to society.<sup>74</sup>

- [Navy Operational Stress Control \(OSC\)](#) was established to promote psychological health and improve the resilience of marines and sailors. The Navy also issued a mental health playbook for its leadership and sailors to mitigate and address mental health issues, emphasizing preventative maintenance, including self-care. When issues do occur, the playbook provides steps on how to connect the sailors with the proper mental health care team and ensures access to services such as peer support, deck leadership, nonclinical practitioners (e.g., chaplains), and medical/clinical practitioners.<sup>75</sup>
- US Marine Corps [Operational Stress Control and Readiness \(OSCAR\)](#) program embeds mental health personnel who function as combat/operational mental health specialists who also train officers and noncommissioned officers to recognize when Marines show signs of stress and intervene early.<sup>76</sup> However, evaluation of the early versions of the program revealed certain issues to include “combat and operational stress training not integrated into the deployment cycle, lack of annual training for non-deployed troops, and significant variations of the outcomes across the battalions.”<sup>77</sup> The program has been revised and is now on OSCAR Generation III.

- US Airforce [Task Force True North Program](#) seeks to improve the well-being and resilience of active airmen and dependents. Its Embedded Mental Health Teams (EMHT) initiative aims to decrease mental health stigma, encourage help-seeking behavior, and intervene early to prevent negative outcomes, such as absenteeism and self-harm.<sup>78</sup> EMHTs are contracted mental health providers reporting to the Base Mental Health Clinics, and with their accessibility and civilian status, the airmen tend to trust them more as evidenced by the increased number of members seeking help. Leadership support (such as direct referrals) was key to recruiting airmen to participate. However, attrition of EMHTs mainly due to the mismanagement of the contracting firm responsible for recruiting and hiring is an issue. Some members also would like to see more EMHTs with military experience.

The military assigns the overall responsibility for preserving the health of operationally deployed troops to commanders of combatant commands in recognition that they are best equipped “to balance evolving tactical requirements that places the troops in harm’s way against the enduring strategic imperative to preserve the health of the force.”<sup>73</sup> Furthermore, the military also subscribes to extending mental health services to families and caretakers, thereby considering the full ecosystem in its approach to mental health prevention and action.

## Acronyms and Terms

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ALPA	Air Line Pilots Association, International
AMAS	Aviation Medicine Advisory Service
AME	Aviation Medical Examiners
APA	Allied Pilots Association
ATC	Air Traffic Control
CDL	Commercial Drivers License
CFR	Code of Federal Regulation
COSC	Combat and Operational Stress Control
COSR	Combat and Operational Stress Reactions
CRM	Cockpit Resource Management
DOT	Department of Transportation
EAP	Employee Assistance Program
EDA	Electrodermal Activity
EMHT	Embedded Mental Health Teams
FAA	Federal Aviation Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FRWC	First Responders Wellness Center
FSPHP	Federation of State Physicians Health Programs
HIMS	Human Intervention Motivation Study
HRP	Human Reliability Program
HRV	Heart Rate Variability
ICAO	International Civil Aviation Organization
IM SAFE	Illness, Medication Stress, Alcohol, Fatigue, and Emotion
ISS	International Space Station
MEC	United Master Executive Council
MH	Mental Health
NASA	National Aeronautics and Space Administration
NJASAP	NetJets Association of Shared Aircraft Pilots
OIG	Office of the Inspector General
OSC	Navy Operational Stress Control

OSCAR	Operational Stress Control and Readiness
PHP	Physician Health Programs
PSP	Peer Support Program
PVT	Psychomotor Vigilance Test
SME	Subject Matter Expert
SRM	Safety Risk Management
SSRI/SNRI	Selective Serotonin Reuptake Inhibitors/ Serotonin Norepinephrine Reuptake Inhibitors
SWAPA	Southwest Airlines Pilots Association
TCAS RA	Traffic Alert and Collision Avoidance System, Resolution Advisory

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