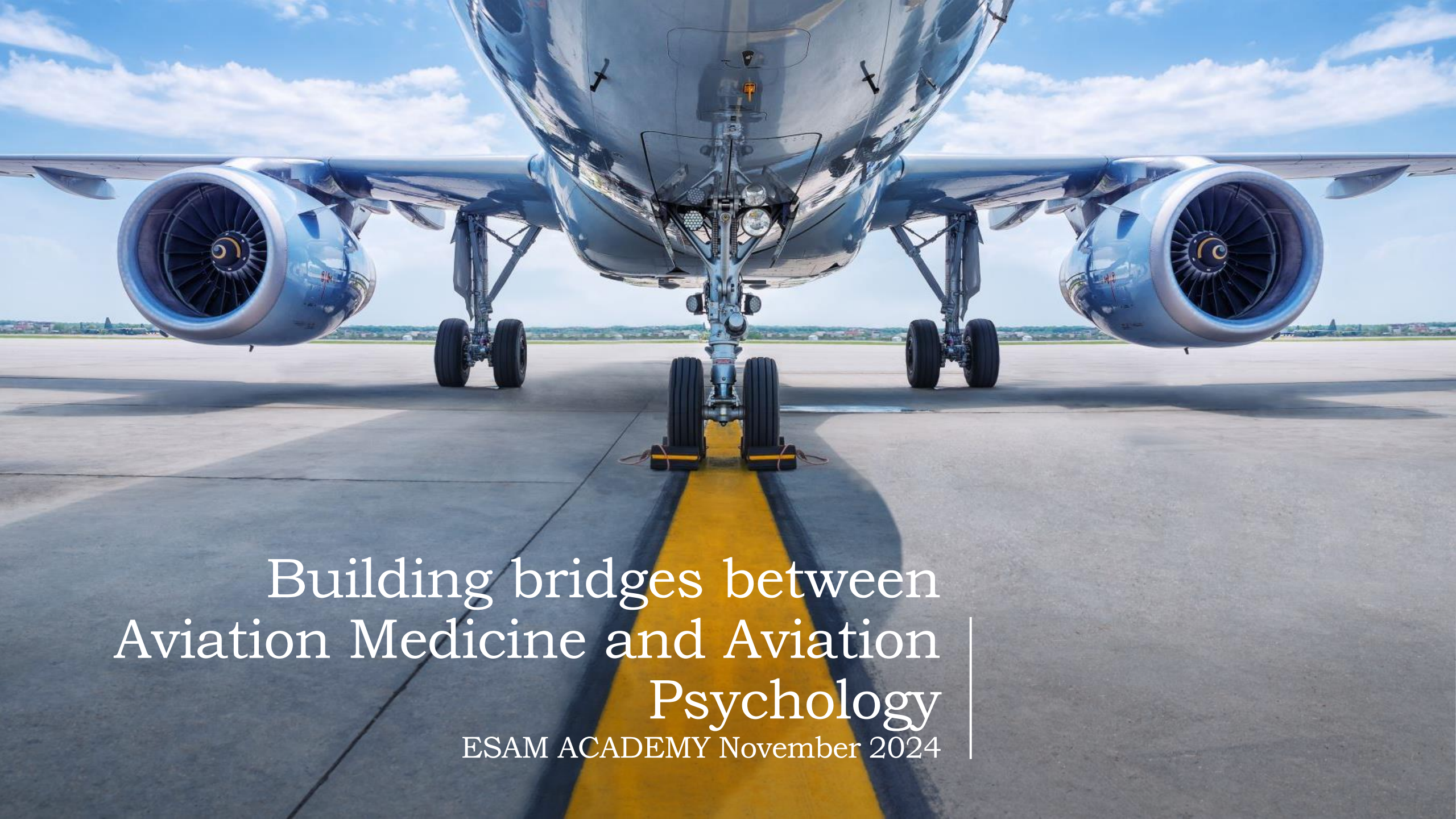


Building bridges between Aviation Medicine and Aviation Psychology

ESAM ACADEMY November 2024

Introduction

EUROPEAN ASSOCIATION FOR AVIATION PSYCHOLOGY

CERTIFICATE OF ACCREDITATION

This is to certify that

KATRIEN VERCAUTEREN

has fulfilled the EAAP requirements for

Aviation Psychologist

This accreditation will start on 01.02.2022 and be valid for a period of five (5) years from that date.

Registration number: **AP158**

Drs. Ir. André Droog
President

Dr. Michaela Schwarz
Secretary General

EAAP

Vercauteren Katrien
+32 472 266 420 info@crewmind.net

Accredited Aviation Psychologist
Clinical Psychologist
Solution Focused Psychotherapist

PgDip Neuropsychology (ongoing)
Aviation psychologist FAA

Circle of Expert Group Mental Health ESAM
Supporting Member of AMABEL (AME Association BE)

Airline/Commercial Pilot since 2000

Course content

ONLINE NOVEMBER 16TH

- Part MED Mental Health Criteria
  - Psychological Selection Criteria: Mental Health disorders
  - Part MED Mental Health Specialists
  - Mesafe project – MIRAP process

PRACTICAL TRAINING NOVEMBER 26TH

- Psychological Evaluation Techniques
  - Mental State Examination
  - Clinical Interview
  - Limitations of questionaires and psychodiagnostic tools
- How and when to refer to a MHS? Referal question formulation
- The MIRAP process: a case study

Psychological assessment

KEY QUESTIONS:

1. Is there evidence for a mental health disorder (now or in the past)?
2. What are the associated mental incapacitation events (MIE's)?
3. Is medical certification possible with or without risk mitigating factors?

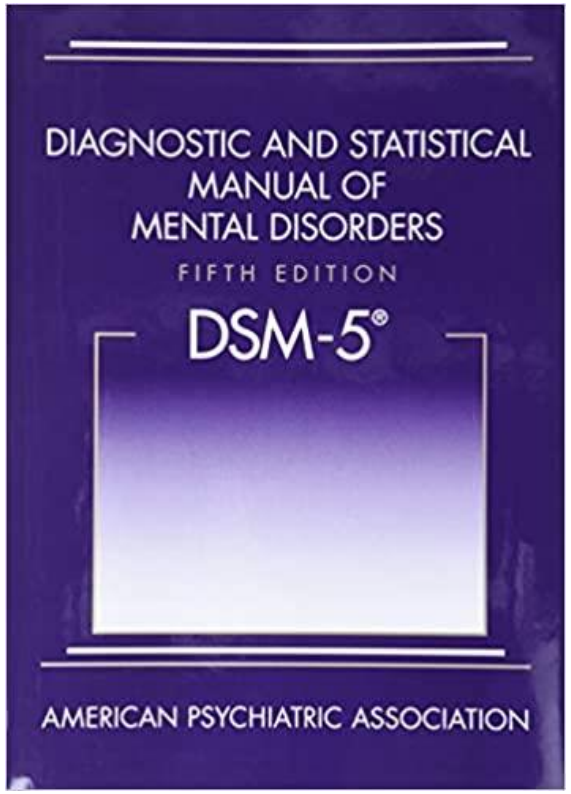
Pilot Core Competences

- Flight Path Management manual control
- Flight Path Management automatic control
- Knowledge
- Application of procedures
- Communication
- Leadership and teamwork
- Problem solving and decision making
- Situational awareness
- Workload management

1. Part Med: Mental Health Disorders and their MIE's

DSM 5: 451 mental disorders – 20 categories

- Neurodevelopmental disorders
- Schizophrenia spectrum and other psychotic disorders
- Bipolar disorder
- Personality disorders
- Substance related and addictive disorders
- Depressive disorders
- Anxiety disorders
- Trauma and stressor related disorders
- Feeding and eating disorders
- Obsessive compulsive and related disorders



Mental Incapacitation Events (MIE)

We focus on Mental Incapacitation Events rather than on the diagnoses.

Symptoms of mental health disorder / biomedical treatment may constitute risks for mental incapacitation events:

Examples:

- Concentration/attention problems
- Hallucinations/ delusional thinking/ manic state
- Suicidal ideations/ behaviour
- Agressive behaviour/ deliberate self harm
- Panick attack

Neurodevelopmental disorders: Attention Deficit (Hyperactivity) Disorder AD(H)D

- Prevalence increasing, especially in young people
- Problems in concentration and attention (MIE), reduced impulse control, problems in executive functioning of the frontal cortex (decision making/planning/mult-tasking, complex analysing…)
- Farmacological treatment: stimulant (methylphenidate/dexamphetamine) acting 3-8 hours
- Stimulant effect and short acting time make compatibility with aviation duties impossible
- 1/3 (outgrows the condition as an adult)
- Consult MHS in case of doubt: check if diagnosis is still valid
- In case of valid diagnose (with or without biomedical treatment): incompatible with pilot/ATCO duties as ADHD influences CORE qualities pilots and ATCOs should have

Neurodevelopmental disorders: Autism Spectrum Disorder ASS

- Before age of 12/ genetic / high psychiatric comorbidity
- Problems in social communication and interaction (CRM cockpit environment is a challenge)
- Limited and repetitive behaviour
- Increased risk of suicide
- Reduced cognitive flexibility: Highly rigid – low stress tolerance – social interaction problems - inflexibility (MIE)
- **Neuropsychological assessment mandatory!**
- Spectrum: high functioning persons (Asperger) with minor problems in communication/doubtfull diagnose could be considered

Schizophrenia spectrum and other Psychotic disorders

- Anormalities in one or more of the following five domains: delusions, hallucinations, disorganized thinking, disorganized or abnormal motor behaviour (including catatonia) and negative symptoms (more with schizophrenia, less with other psychotic disorders).
- Negative symptoms: diminished emotional expression and avolition. Other symptoms include alogia, anhedonia, and asociality.
- Impaired judgement, increased risk for suicide, cognitive problems, difficulties in interpersonal communication (MIE)
- Biomedical treatment with antipsychotics (incompatible with flying/ATCO duties).
- Certification difficulties because:
  increased rist of relapse when antipsychotic treatment is discontinued and
  negative symptoms often remain present after the psychotic symptoms are in remission

Depressive disorders

- Prevalence: women-men (2:1) Genetic (40%): neuroticism
- Major depressive disorder: Suicide risk x17 (MIE)
- Sleeping problems, concentration and attention problems, reduced executive functioning prefrontal cortex (decision making, planning,….) (MIE)
- The SSRI's Sertraline, citalopram and escitalopram are antidepressants permitted for EASA for treatment of depressive symptoms or as maintenance medication after treatment for depression.
- Mild depressive symptoms may allow functioning in cockpit/ATCO
- ALWAYS check for possible manic/hypomanic episodes, these MAY indicate bipolar disorder!

Bipolar 1 or 2 disorder

- Derived from manic-depressive disorder
- Peak onset between age 20 – 30 – more than 90% who have single manic episode get recurrent mood episodes – genetic processes strongly affect predisposition (90% for twins)
- Risk factors: childhood emotional traumas, family conflicts, cannabis and other substances
- Bipolar 1: manic episode that may have been preceded by and may be followed by a hypomanic or major depressive disorder (1 week abnormally, persistently elevated, expansive or irritable mood and persistently increased activity or energy) – Bipolar 2: hypomanic episode (4 days)
- Lack of insight in disease, rapidly shifting mood, sometimes hostile and physically threatening, when delusional: may become physically assaultive or suicidal (increased risk 20-30x) suicide death: 5/6%, impaired concentration and judgement, diminished cognitive ability (MIE)
- BIPOLAR 1: Medical certification impossible: relapse risk is too high even if condition is stable with medication
- BIPOLAR 2: depends on severity of the episodes, only stable patients with a history of mild symptoms will in some cases be able to be classified
- Antipsychotic medication – mood stabilizers

Anxiety disorders

- Separation anxiety – selective mutism – specific phobia – social anxiety disorder – panic disorder – agoraphobia – generalized anxiety disorder – substance/medication induced anxiety - ,…
- In panic disorder: expected or unexpected panick attacks, persistantly concerned or worried about panic attacks, abrupt surges of intense fear/discomfort, psychical and/or cognitive symptoms, distraction (MIE)
- Fear of flying: pilot may not dare to perform all elements of the operation anymore
- In case of severe social anxiety: communication may be impaired
- When untreated: often not compatible with flying/ATCO duties

Fear of flying

- Specific anxiety before or during flying
- Pilots: training anxiety
- Special courses/therapy exists
- Some airlines have a specific ‘fear of flying’ program
- Example: course
  - Basic theory of flying
  - Fear and the role of safety and avoidance behaviour: fight- flight- freeze
  - Practical exposure exercises

Trauma and stressor related disorders

POST TRAUMATIC STRESS DISORDER (more than 1 month)

- Exposure to actual or threatened death/serious injury/sexual violance (directly/witnessing/close family member or friend)
- Intrusion symptoms: distressing memories, distressing dreams, dissociative reactions (flashbacks), psychological/physiological reactions to cues that resemble traumatic event
- Persistant avoidance – negative alterations in cognitions and mood, alterations in arousal and reactivity
- Suicide risk, concentration problems, fatigue, intrusions leading to short moments of incapacitation, high comorbidity with depressive disorder

Stress related disorders

ACUTE STRESS DISORDER

Short term, typically immediately after the trauma

3 days to 1 month

Similar symptoms like PTSD

Some airlines have CISM program: Critical Incident Stress Management program

ADJUSTMENT DISORDER

Short or long term

Linked to a single event or series of stressful events

Life changing (mourning)- recurrent (relationship/work related problems) – continuous (serious illness)

Emotional and behavioral reactions excessive and disproportionate in intensity, quality and persistence

Substance related and addictive disorders

- In aviation:

Alcohol (92.9%)

Opioids (2.1%)

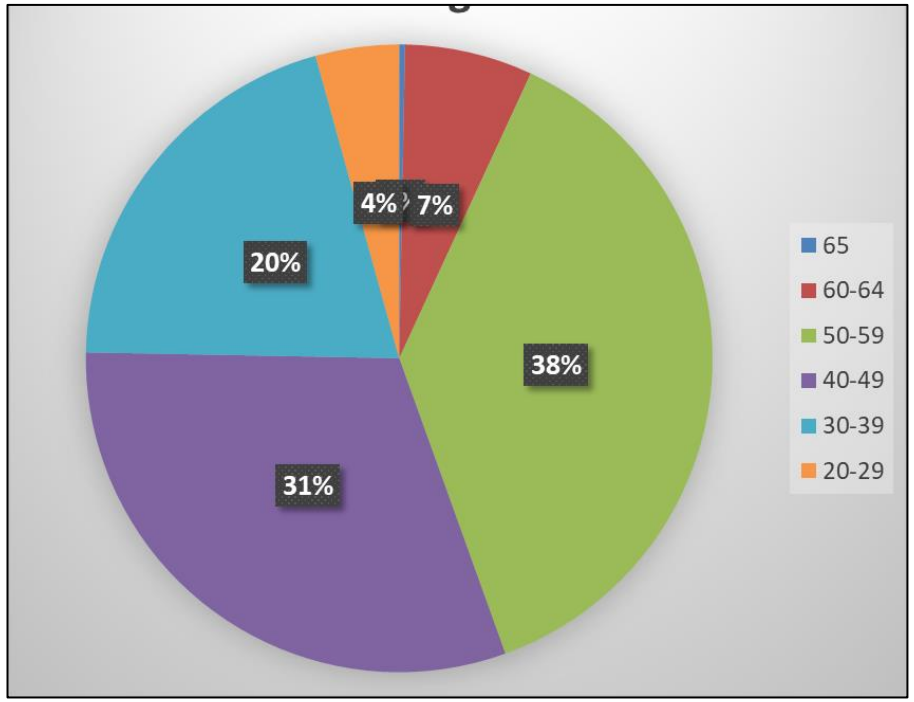
Cannabis (1.8%)

Cocaine (1.7%)

Stimulants (0.4%)

Sedative hypnotics (0.2%)

Others (0.8%)



Substance use disorder

- Part MED Annex 1 ED Decision 2019/002/R:
- Mental or behavioural disorder due to substance use or misuse, with or without dependancy should be assessed as unfit.
- Fit assessment after 2 years of documented sobriety. Earlier may be considered with OML after treatment, evaluation and inclusion into a support program.
- Existing support programs:
  - HIMS (Human intervention motivation study FAA)
  - Antiskid Netherlands and Germany
  - Other national programs

Feeding and eating disorders

- Anorexia nervosa, bulimia nervosa, binge-eating disorders, rumination disorder, avoidant/restrictive food intake disorder, ….
- Craving and patterns of compulsive use (symptoms resembling substanse use disorder): same neural systems are involved including reward and self control
- Increased risk for suicide
- Pre-occupation with eating may hinder the ability to concentrate on flight duties
- Severe underweight: cognitive rigidity, impaired decission making
- Severe cases of eating disorder: medical certification not possible
- Mild cases may be compatible when treated by mental health care professional (risk mitigation)

Obsessive-Compulsive and related disorders

- OCD (obsessive compulsive disorder), body dysmorphic disorder, hoarding disorder, trichotillomania (hair pulling disorder), excoriation disorder (skin picking),....
- Obsessions (intrusive thoughts, urges or images experienced as intrusive and unwanted)
- Compulsions (repetitive behaviour or mental acts that must be applied rigidly)
- Distress caused by the disorder may lead to concentration problems, distraction, compulsions may interfere with necessity to perform certain aviation related tasks

Personality disorders

Cluster A: Paranoid personality disorder – schizoid personality disorder – schizotypical personality disorder

Cluster B: antisocial personality disorder – borderline personality disorder – histrionic personality disorder – narcistic personality disorder

Cluster C: avoidant personality disorder – dependant personality disorder – obsessive-compulsive personality disorder

Personality disorders

CLUSTER B:

- Antisocial attitudes, impulisvity, emotional dysregulation: leading to higher social risks, increased risk for suicide
- Strong and recurrent pattern of difficulties in interpersonal realtionships (incompatible with flight safety)
- Certification only after thorough mental evaluation: suffering from established personality disorder or personality traits?

2. Part MED Mental Health Specialists (MHS)

AVIATION PSYCHIATRIST

Psychiatric evaluations conducted by qualified psychiatrist having adequate knowledge and experience in aviation medicine.

AVIATION (Clinical) PSYCHOLOGIST

Psychological opinion and advise conducted by a suitably qualified and accredited clinical psychologist with expertise and experience in aviation psychology.

Listed and certified by EAAP: European Association for Aviation Psychology

www.eaap.net


EUROPEAN ASSOCIATION FOR AVIATION PSYCHOLOGY

CERTIFICATE OF ACCREDITATION

This is to certify that

KATRIEN VERCAUTEREN

has fulfilled the EAAP requirements for

Aviation Psychologist

This accreditation will start on 01.02.2022 and be valid for a period of five (5) years from that date.

Registration number: AP158

Drs. Ir. André Droog
President

Dr. Mikaela Schwarz
Secretary General

EAAP

Types of mental health experts

- Psychiatrist
- Clinical psychologist
  - Addiction medicine specialist?
  - Specialised nurse as a part of assessment?
- Involved in the treatment of the applicant
- Involved as an independent expert

MHS- treatment

- Upon referral AME/ occupational physician/ (PSP)
- Upon referral GP, or sought directly by applicant
- Preferably affinity / experience with aviation, will not always be feasible
- Most important: optimal treatment (clinical experience, language, cultural setting, distance)

MHS- independent expert

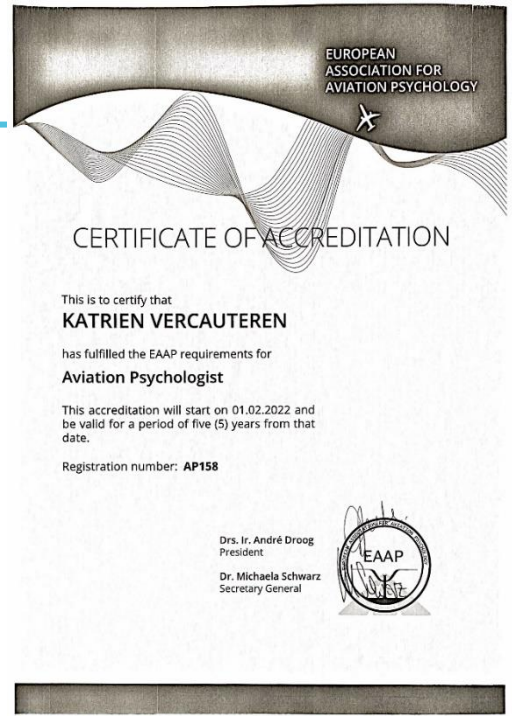
- Upon referral AME/ occupational physician/ medical assesor
- Indepent expert opinion with regards to aviation/ ATCO-duties
- Knowledge on aviation domain much more important
- But knowledge of the clinical condition and local circumstances even more!
- Consider: aviation MHS acting as a liason between specialised MHS and AME in rare conditions

  For instance (psychiatric expertise by psychiatrist specialised in developmental disorders- liaison with aviation psychiatrist/ aviation psychologist)

- Need to be independent → pool in each Member State needs to be large enough

Aviation psychologist

- Course and requirements by EAAP European Association for Aviation Psychology www.eaap.net
- Some countries official role
- Selection (occupational) vs mental (clinical) health assessment
- For aeromedical assessment: **clinical** psychologists
- For AME: check clinical experience on subject matter


EUROPEAN ASSOCIATION FOR AVIATION PSYCHOLOGY

CERTIFICATE OF ACCREDITATION

This is to certify that

KATRIEN VERCAUTEREN

has fulfilled the EAAP requirements for

Aviation Psychologist

This accreditation will start on 01.02.2022 and be valid for a period of five (5) years from that date.

Registration number: AP158

Drs. Ir. André Droog
President

Dr. Michaela Schwarz
Secretary General

EAAP

Aviation psychiatrist

- Not an official qualification
- Membership of a national aeromedical association (which will be member of ESAM)
- Participation in aeromedical congresses and/or aeromedical publications
- Training/ practicing as an AME
- Personal flying experience (Although e.g., flying as a private pilot is very different compared to the operations of commercial pilots. Even operational circumstances can differ substantially.

3. MESAFE

WHY MESAFE?

Need for science-based regulation

Horizon Funds

Tenders

Several projects: cardiology, diabetes and mental health

MESAFE
MEntal health for aviation SAFEty

MESAFE

Overview state of the art diagnostics and treatment, surveys stakeholders (pilots, ATCOs, AMEs, Medical Assessors)

Usefulness and screening substance abuse

Mental Health screening

Risk assessment and risk mitigation

Target groups MESAFE

Class 1 en 3 certificate holders

Focus commercial pilots en ATCOs

Large and heterogeneous group

MESAFE team

Deep Blue Srl is contractor

Scientific: Paola Tomasello, Francois Brambati

External experts

- Antony Wagstaff
- Ries Simons
- Diederik de Rooy

Home / Domains / Research & Innovation / Research / Research projects / MESAFE (Mental health)

Safety Management & Promotion

Research & Innovation
- AI Roadmap
- Call for abstracts - European Academia
- Research & Innovation home
- Research
  - EASA's Scientific Committee (SciComm)
  - Research projects
  - Research reports
- News
- Events
- Event Proceedings

Rotorcraft & VTOL

Urban Air Mobility (UAM)

MESAFE (Mental health)

PROJECT - OPEN | HORIZON EUROPE | **EASA participation:** Contract and technical management | **Research Domain:** Safety

The research objectives and expected outcome

This research project assesses new medical developments for the early diagnosis as well as treatment of mental health conditions which could pose a safety risk for aviation and would consequently lead to pilot and air traffic controller (ATCO) unfitness or the limitation of their medical certificate for safety purposes.

Currently, there are no specific, validated mental health assessment methods for aviation use, incorporating the specific operational needs, to address the issues identified. Research is needed to

Research Project details

Downloads

Get notified via email alerts

General Aviation
Environment
International cooperation
Safety Management & Promotion
Research & Innovation
AI Roadmap
Call for abstracts - European Academia
Research & Innovation home
Research
EASA's Scientific Committee (SciComm)
Research projects
Research reports
News
Events
Event Proceedings
Rotorcraft & VTOL
Urban Air Mobility (UAM)

Downloads

- MESAFE - D-1.1 - Report on the review of diagnostic measures
- MESAFE - D-1.2 - Report on the review of treatment options
- MESAFE - D-2.1 - Report on the analysis of the availability of diagnostic tests
- MESAFE - D-3.1 - Report on the analysis of the suitability of screening and confirmation tests
- MESAFE - D-4.1 - Report on the risk of incapacitation and limitation of licence privileges
- MENTAL HEALTH ASSESSMENT: A survey to collect the Aeromedical Examiners and Assessors' point of view — Booklet of results
- AEROMEDICAL MENTAL HEALTH ASSESSMENT: two surveys to collect the European pilots' and ATCOs' point of view — Booklet of results
- MESAFE — Leaflet

Research Project details
Downloads
Get notified via email alerts

Get notified via email alerts

Stay informed when this page is updated, or when we publish new content like this. You can always unsubscribe or update these settings later on.

Mesafe perspective

It’s about risks (caused by mental health problems)

Risk of mental incapacitation events (MIEs)

Useful to find symptoms of mental disorders

(Assumption): connection between risks and mental disorders

Need for replicability of diagnoses. Classificationsystem (eg DSM) useful

Focus on clinical judgement

Questionnaires and psychometric tools **only** as a means of support

Focus assesment

Focus on 2 key principles

Mental Incapacitation Events (MIE) -rather than diagnoses

Mental Incapacitation Event Risk Matrix

Mental health Incapacitation Event (MIE)

Not a diagnosis, but a risk that we see based on the diagnosis

Each MIE is evaluated separately, .i.e may be more than one for a diagnosis

For events that are borderline acceptable risk or needs special mitigation, evaluation is difficult and needs mental health and operational competence:

“Aeromedical-Operational Board”

MIE Examples

Concentration/attention problems

Suicidal behaviour

Panic attack

Deliberate self-harm

Agressive behavior

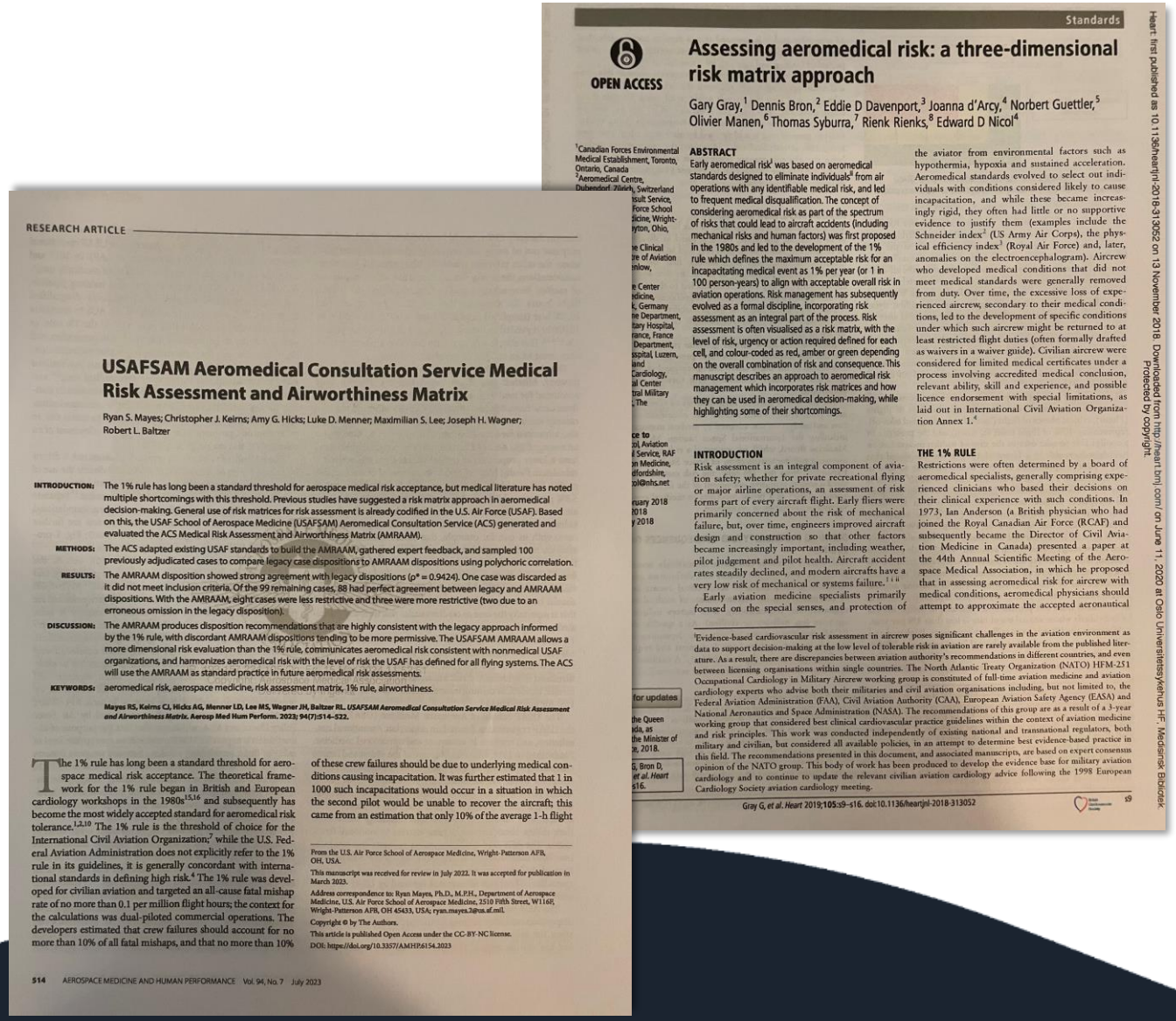
Manic state

Delusional thinking

Hallucinations

Safety risk management principles

- Based on ICAO risk matrix
- Similar to matrix proposed by NATO cardiology group and USAF SAM.
- Adapted for use for the full scale of incapacitation event severity and probability



RESEARCH ARTICLE

USAFSAM Aeromedical Consultation Service Medical Risk Assessment and Airworthiness Matrix

Ryan S. Mayes; Christopher J. Keirns; Amy G. Hicks; Luke D. Menner; Maximilian S. Lee; Joseph H. Wagner; Robert L. Baltzer

INTRODUCTION: The 1% rule has long been a standard threshold for aerospace medical risk acceptance, but medical literature has noted multiple shortcomings with this threshold. Previous studies have suggested a risk matrix approach in aeromedical decision-making. General use of risk matrices for risk assessment is already codified in the U.S. Air Force (USAF). Based on this, the USAF School of Aerospace Medicine (USAFSAM) Aeromedical Consultation Service (ACS) generated and evaluated the ACS Medical Risk Assessment and Airworthiness Matrix (AMRAAM).

METHODS: The ACS adapted existing USAF standards to build the AMRAAM, gathered expert feedback, and sampled 100 previously adjudicated cases to compare legacy case dispositions to AMRAAM dispositions using polychoric correlation.

RESULTS: The AMRAAM disposition showed strong agreement with legacy dispositions ($\rho^* = 0.9424$). One case was discarded as it did not meet inclusion criteria. Of the 99 remaining cases, 88 had perfect agreement between legacy and AMRAAM dispositions. With the AMRAAM, eight cases were less restrictive and three were more restrictive (two due to an erroneous omission in the legacy disposition).

DISCUSSION: The AMRAAM produces disposition recommendations that are highly consistent with the legacy approach informed by the 1% rule, with discordant AMRAAM dispositions tending to be more permissive. The USAFSAM AMRAAM allows a more dimensional risk evaluation than the 1% rule, communicates aeromedical risk consistent with nonmedical USAF organizations, and harmonizes aeromedical risk with the level of risk the USAF has defined for all flying systems. The ACS will use the AMRAAM as standard practice in future aeromedical risk assessments.

KEYWORDS: aeromedical risk, aerospace medicine, risk assessment matrix, 1% rule, airworthiness.

Mayes RS, Keirns CJ, Hicks AG, Menner LD, Lee MS, Wagner JH, Baltzer RL. ***USAFSAM Aeromedical Consultation Service Medical Risk Assessment and Airworthiness Matrix.*** ***Aerosp Med Hum Perform.*** **2023; 94(7):514–522.**

The 1% rule has long been a standard threshold for aerospace medical risk acceptance. The theoretical framework for the 1% rule began in British and European cardiology workshops in the 1980s[15,16] and subsequently has become the most widely accepted standard for aeromedical risk tolerance.[1,2,10] The 1% rule is the threshold of choice for the International Civil Aviation Organization;[7] while the U.S. Federal Aviation Administration does not explicitly refer to the 1% rule in its guidelines, it is generally concordant with international standards in defining high risk.[4] The 1% rule was developed for civilian aviation and targeted an all-cause fatal mishap rate of no more than 0.1 per million flight hours; the context for the calculations was dual-piloted commercial operations. The developers estimated that crew failures should account for no more than 10% of all fatal mishaps, and that no more than 10% of these crew failures should be due to underlying medical conditions causing incapacitation. It was further estimated that 1 in 1000 such incapacitations would occur in a situation in which the second pilot would be unable to recover the aircraft; this came from an estimation that only 10% of the average 1-h flight

From the U.S. Air Force School of Aerospace Medicine, Wright-Patterson AFB, OH, USA.

This manuscript was received for review in July 2022. It was accepted for publication in March 2023.

Address correspondence to: Ryan Mayes, Ph.D., M.P.H., Department of Aerospace Medicine, U.S. Air Force School of Aerospace Medicine, 2510 Fifth Street, W116F, Wright-Patterson AFB, OH 45433, USA; ryan.mayes.3@us.af.mil.

DOI: https://doi.org/10.3357/AMHP.6154.2023

Standards

OPEN ACCESS

Assessing aeromedical risk: a three-dimensional risk matrix approach

Gary Gray,[1] Dennis Bron,[2] Eddie D Davenport,[3] Joanna d'Arcy,[4] Norbert Guettler,[5] Olivier Manen,[6] Thomas Syburra,[7] Rienk Rienks,[8] Edward D Nicol[4]

[1]Canadian Forces Environmental Medical Establishment, Toronto, Ontario, Canada
[2]Aeromedical Centre, Dubendorf, Zürich, Switzerland

ABSTRACT

Early aeromedical risk[1] was based on aeromedical standards designed to eliminate individuals[2] from air operations with any identifiable medical risk, and led to frequent medical disqualification. The concept of considering aeromedical risk as part of the spectrum of risks that could lead to aircraft accidents (including mechanical risks and human factors) was first proposed in the 1980s and led to the development of the 1% rule which defines the maximum acceptable risk for an incapacitating medical event as 1% per year (or 1 in 100 person-years) to align with acceptable overall risk in aviation operations. Risk management has subsequently evolved as a formal discipline, incorporating risk assessment as an integral part of the process. Risk assessment is often visualised as a risk matrix, with the level of risk, urgency or action required defined for each cell, and colour-coded as red, amber or green depending on the overall combination of risk and consequence. This manuscript describes an approach to aeromedical risk management which incorporates risk matrices and how they can be used in aeromedical decision-making, while highlighting some of their shortcomings.

INTRODUCTION

Risk assessment is an integral component of aviation safety; whether for private recreational flying or major airline operations, an assessment of risk forms part of every aircraft flight. Early fliers were primarily concerned about the risk of mechanical failure, but, over time, engineers improved aircraft design and construction so that other factors became increasingly important, including weather, pilot judgement and pilot health. Aircraft accident rates steadily declined, and modern aircrafts have a very low risk of mechanical or systems failure.[1 i ii]

Early aviation medicine specialists primarily focused on the special senses, and protection of the aviator from environmental factors such as hypothermia, hypoxia and sustained acceleration. Aeromedical standards evolved to select out individuals with conditions considered likely to cause incapacitation, and while these became increasingly rigid, they often had little or no supportive evidence to justify them (examples include the Schneider index[2] (US Army Air Corps), the physical efficiency index[3] (Royal Air Force) and, later, anomalies on the electroencephalogram). Aircrew who developed medical conditions that did not meet medical standards were generally removed from duty. Over time, the excessive loss of experienced aircrew, secondary to their medical conditions, led to the development of specific conditions under which such aircrew might be returned to at least restricted flight duties (often formally drafted as waivers in a waiver guide). Civilian aircrew were considered for limited medical certificates under a process involving accredited medical conclusion, relevant ability, skill and experience, and possible licence endorsement with special limitations, as laid out in International Civil Aviation Organization Annex 1.[4]

THE 1% RULE

Restrictions were often determined by a board of aeromedical specialists, generally comprising experienced clinicians who based their decisions on their clinical experience with such conditions. In 1973, Ian Anderson (a British physician who had joined the Royal Canadian Air Force (RCAF) and subsequently became the Director of Civil Aviation Medicine in Canada) presented a paper at the 44th Annual Scientific Meeting of the Aerospace Medical Association, in which he proposed that in assessing aeromedical risk for aircrew with medical conditions, aeromedical physicians should attempt to approximate the accepted aeronautical

[i]Evidence-based cardiovascular risk assessment in aircrew poses significant challenges in the aviation environment as data to support decision-making at the low level of tolerable risk in aviation are rarely available from the published literature. As a result, there are discrepancies between aviation authority's recommendations in different countries, and even between licensing organisations within single countries. The North Atlantic Treaty Organization (NATO) HFM-251 Occupational Cardiology in Military Aircrew working group is constituted of full-time aviation medicine and aviation cardiology experts who advise both their militaries and civil aviation organisations including, but not limited to, the Federal Aviation Administration (FAA), Civil Aviation Authority (CAA), European Aviation Safety Agency (EASA) and National Aeronautics and Space Administration (NASA). The recommendations of this group are as a result of a 3-year working group that considered best clinical cardiovascular practice guidelines within the context of aviation medicine and risk principles. This work was conducted independently of existing national and transnational regulators, both military and civilian, but considered all available policies, in an attempt to determine best evidence-based practice in this field. The recommendations presented in this document, and associated manuscripts, are based on expert consensus opinion of the NATO group. This body of work has been produced to develop the evidence base for military aviation cardiology and to continue to update the relevant civilian aviation cardiology advice following the 1998 European Cardiology Society aviation cardiology meeting.

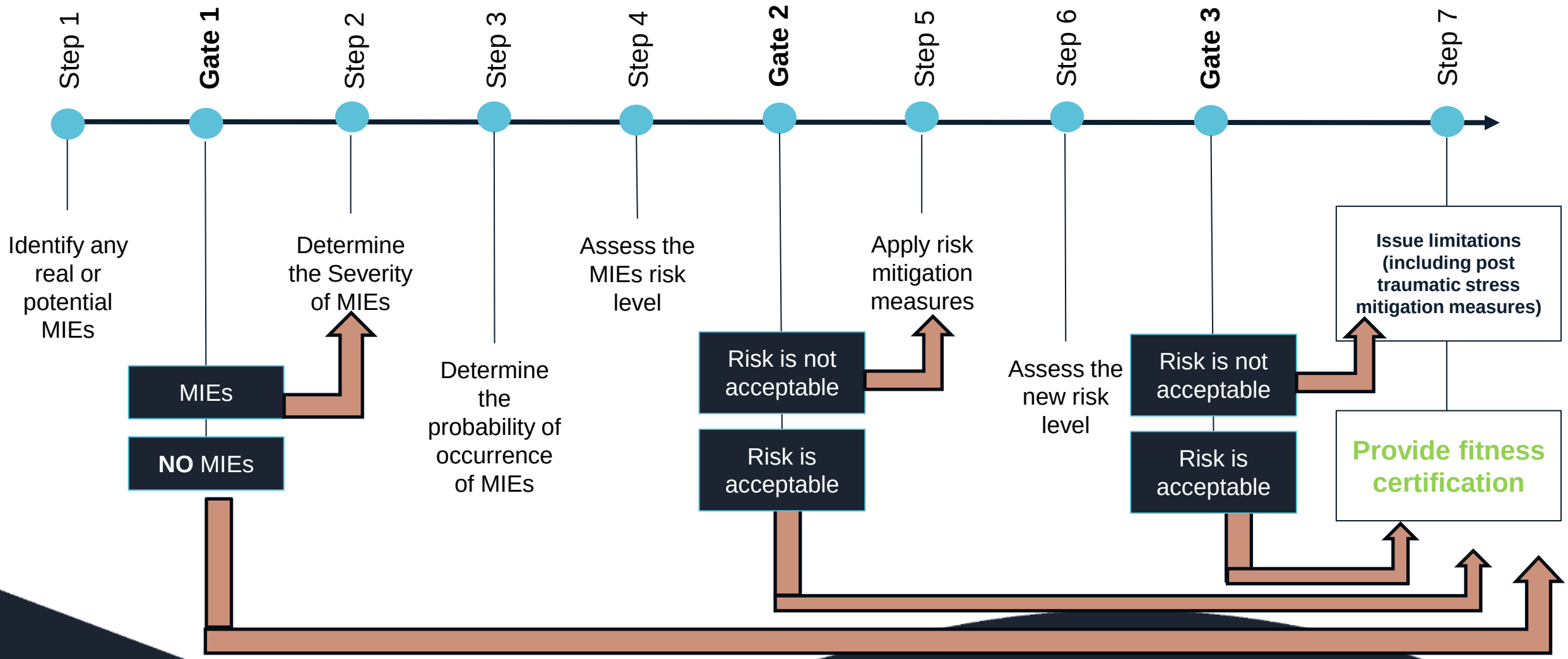
MESAFE MATRIX Risk assessment of mental health			**Catastrophic - A**	**Hazardous - B**	**Major - C**	**Minor - D**	**Negligable - E**
			May cause catastrophic event	may cause flight safety critical event	May comprimise flight safety	Reduced effectiveness and capacity to adapt to operational requirements	Minimal impact on flight safety
	Frequency per year	Flight hours between each event (approx) *	Total incapacitation	Severe incapacitation	Major decrement on performance	Minor to moderate performance compromise, may continue duties	Minimal impact on performance
Frequent 5	> 1/month	100	5A	5B	5C	5D	5E
Occasional 4	1-10 times	1.000	4A	4B	4C	4D	4E
Remote 3	10-99%	10.000	3A	3B	3C	3D	3E
Improbable 2	1-10%	100.000	2A	2B	2C	2D	2E
Extremely improbable 1	<1%	>1.000.000	1A	1B	1C	1D	1E

*given random onset of event unconnected to flight. If event is connected to flying activity (e.g. Murder suicide or flight anxiety),use career frequency rather than yearly

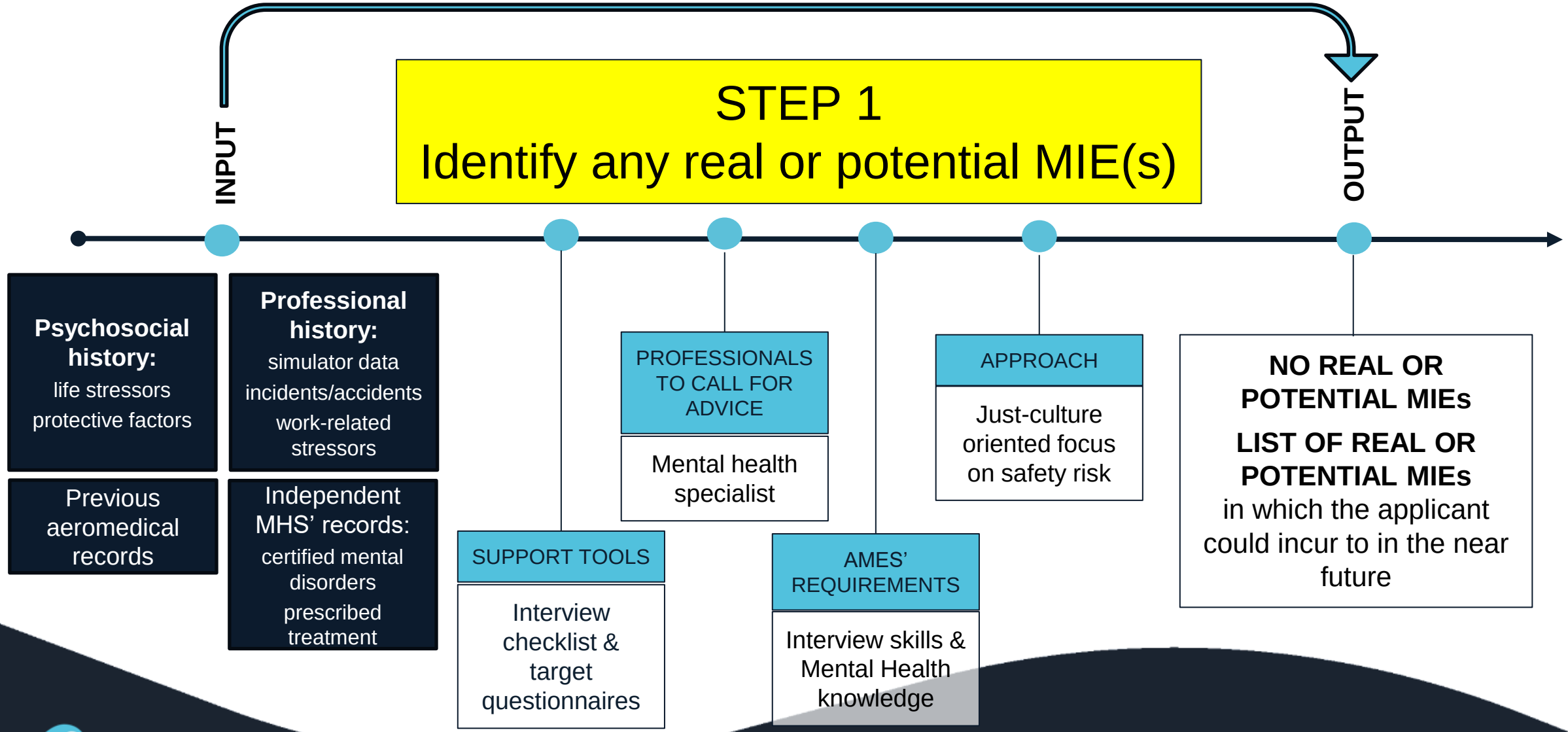
	Risk unacceptable
	Risk unacceptable, but may in some cases be acceptable after thorough review and specific mitigation. A medical board should in such cases be employed**
	Risk may be acceptable - may require operational and/or personal risk reduction**
	Risk acceptable

**Operational risk reduction could be co-pilot, backup crew, time window to land helicopter etc. Personal risk factors could be close follow-up by psychologist, peer-support etc. Formalised risk reduction is documented and required in the certificate.

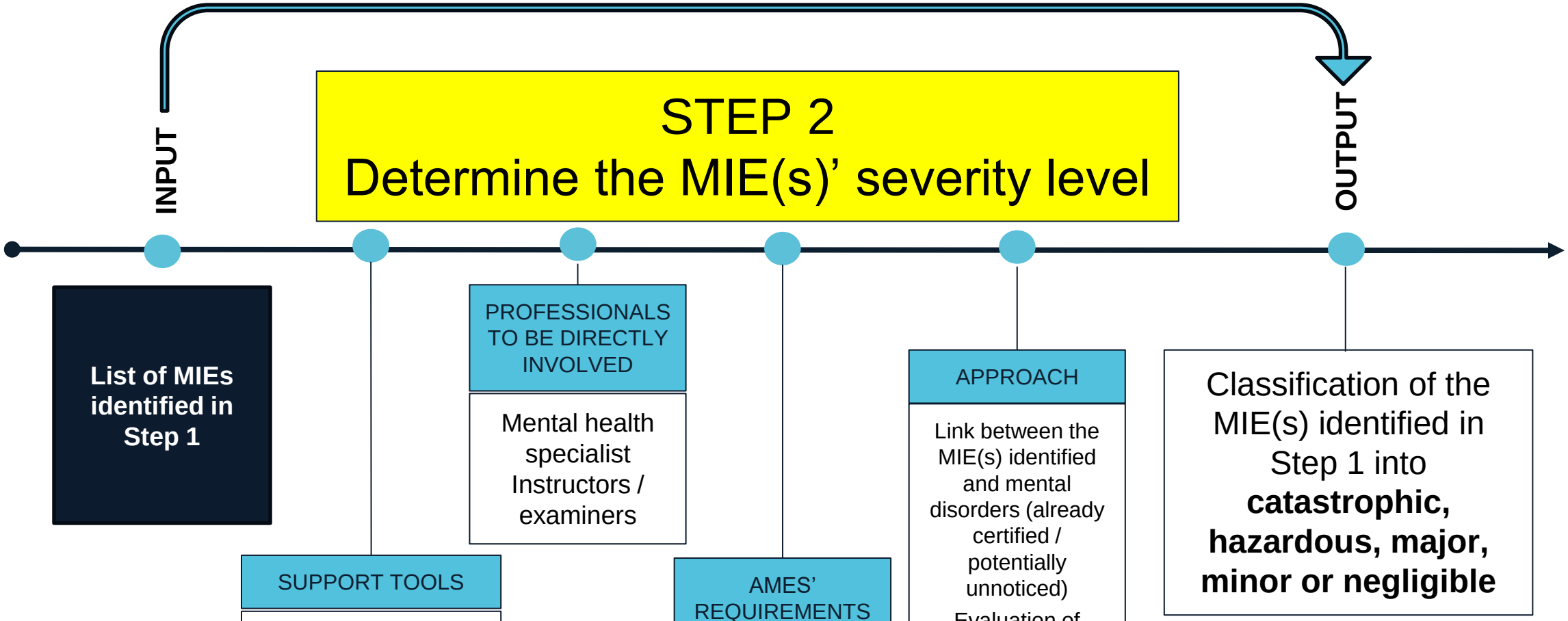
The MIRAP steps



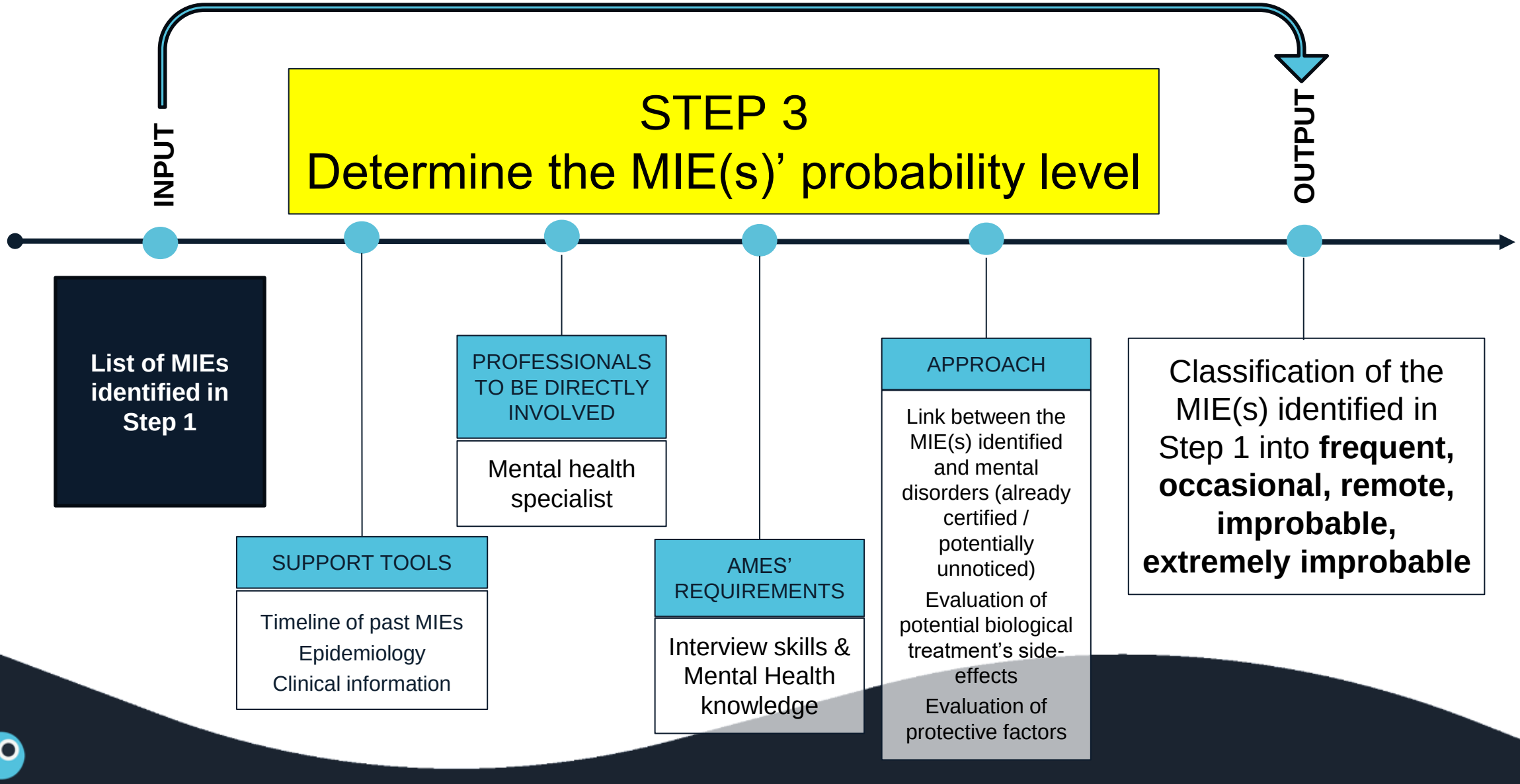
STEP 1 – IDENTIFY ANY REAL OR POTENTIAL MIE



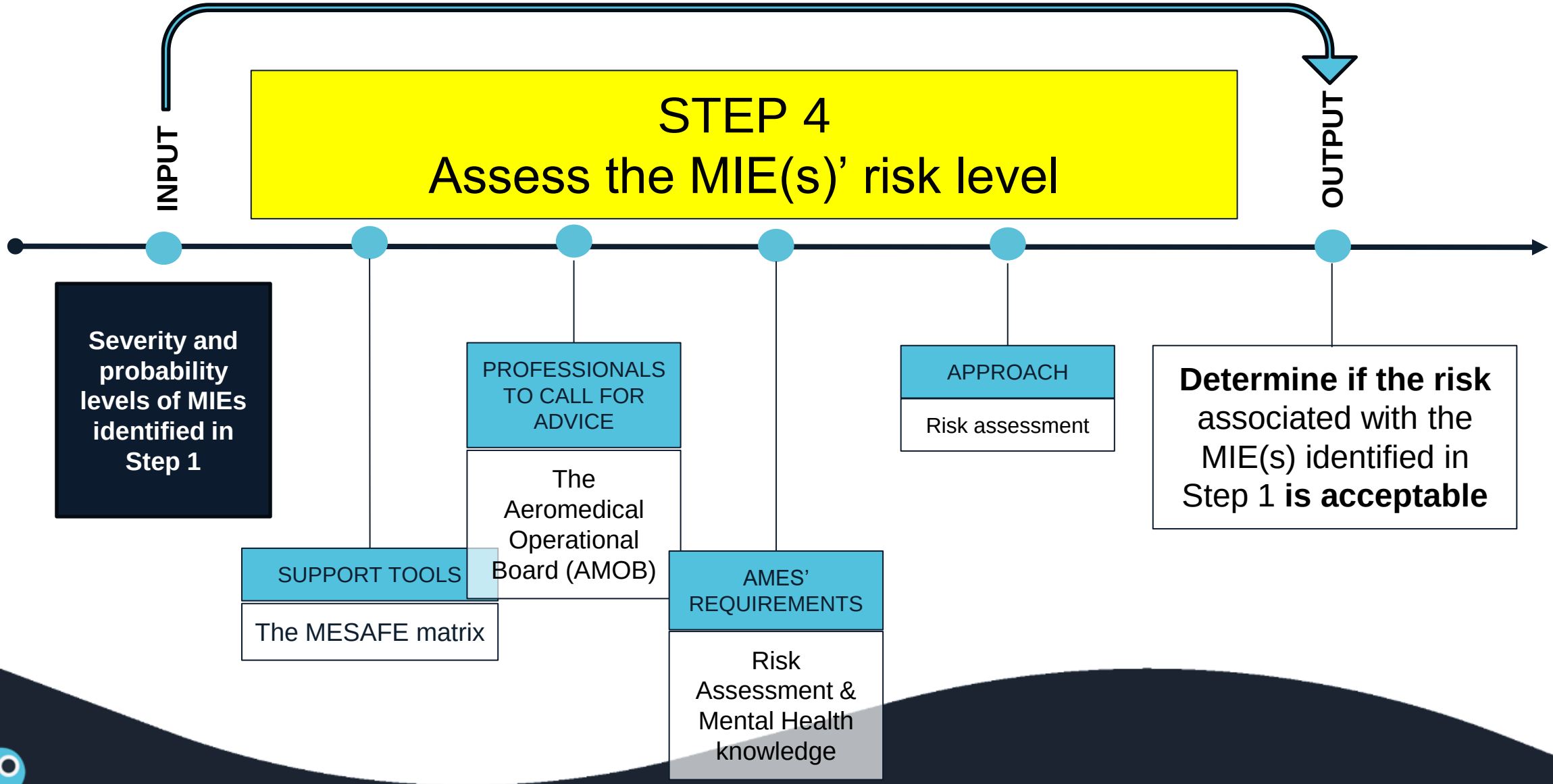
STEP 2 – DETERMINE THE MIE(s)' SEVERITY LEVEL



STEP 3 – DETERMINE THE MIE(s)' PROBABILITY LEVEL



STEP 4 – ASSESS THE MIE(s)' RISK LEVEL



MESAFE MATRIX Risk assessment of mental health			**Catastrophic - A**	**Hazardous - B**	**Major - C**	**Minor - D**	**Negligable - E**
			May cause catastrophic event	may cause flight safety critical event	May comprimise flight safety	Reduced effectiveness and capacity to adapt to operational requirements	Minimal impact on flight safety
	Frequency per year	Flight hours between each event (approx) *	Total incapacitation	Severe incapacitation	Major decrement on performance	Minor to moderate performance compromise, may continue duties	Minimal impact on performance
Frequent 5	> 1/month	100	5A	5B	5C	5D	5E
Occasional 4	1-10 times	1.000	4A	4B	4C	4D	4E
Remote 3	10-99%	10.000	3A	3B	3C	3D	3E
Improbable 2	1-10%	100.000	2A	2B	2C	2D	2E
Extremely improbable 1	<1%	>1.000.000	1A	1B	1C	1D	1E

MIE 2

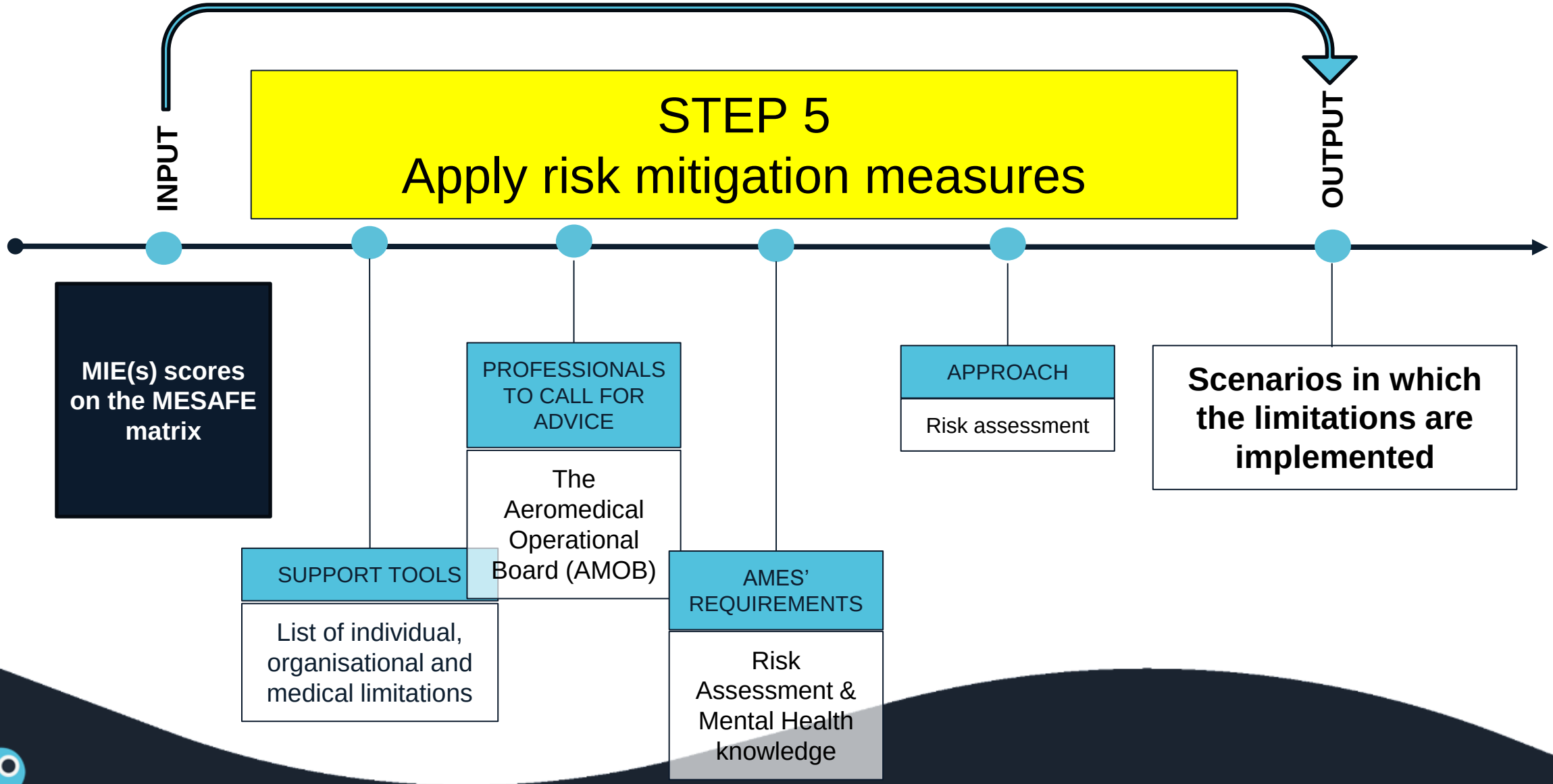
MIE 1

*given random onset of event unconnected to flight. If event is connected to flying activity (e.g. Murder suicide or flight anxiety),use career frequency rather than yearly

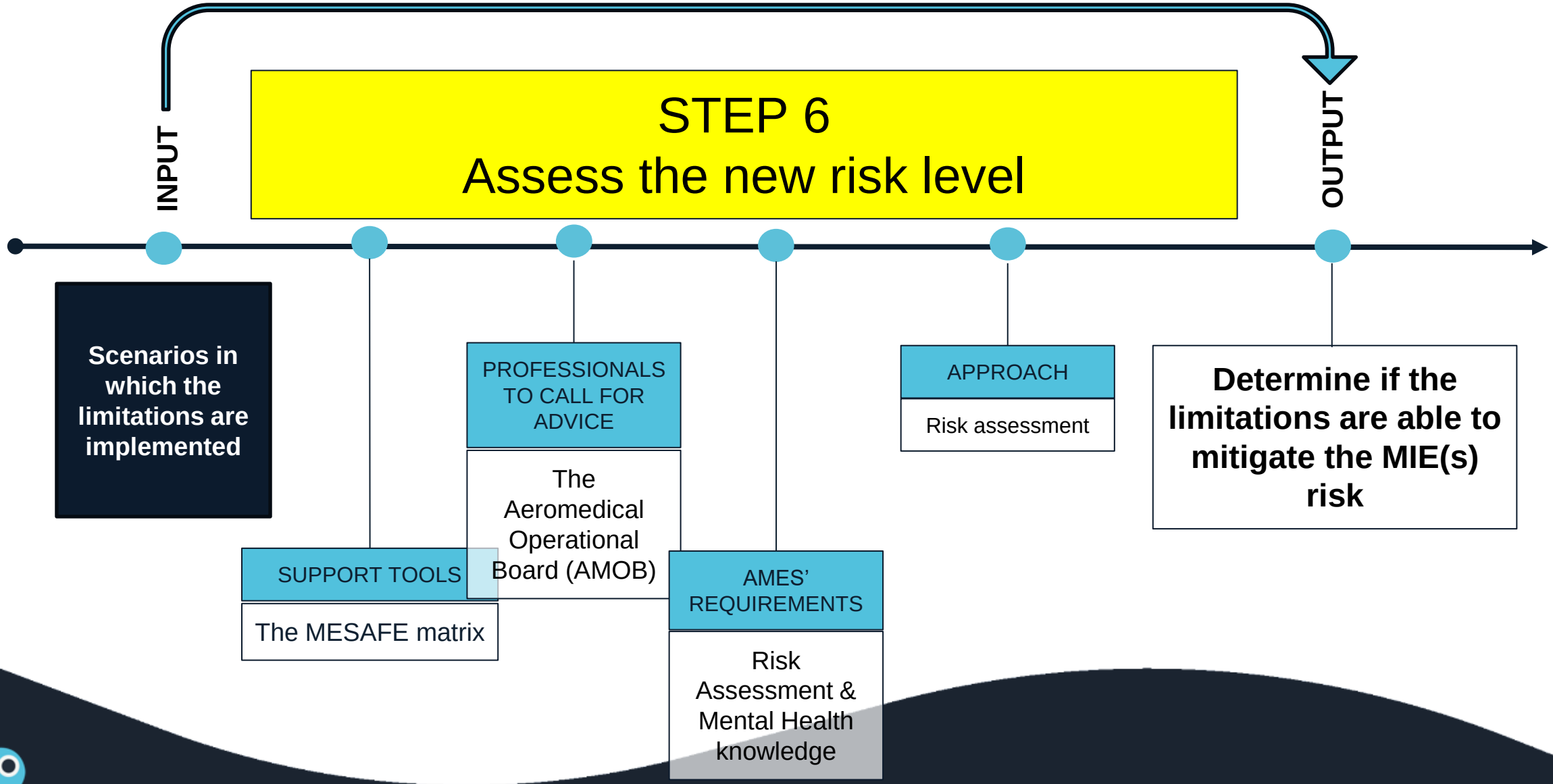
	Risk unacceptable
	Risk unacceptable, but may in some cases be acceptable after thorough review and specific mitigation. A medical board should in such cases be employed**
	Risk may be acceptable - may require operational and/or personal risk reduction**
	Risk acceptable

**Operational risk reduction could be co-pilot, backup crew, time window to land helicopter etc. Personal risk factors could be close follow-up by psychologist, peer-support etc. Formalised risk reduction is documented and required in the certificate.

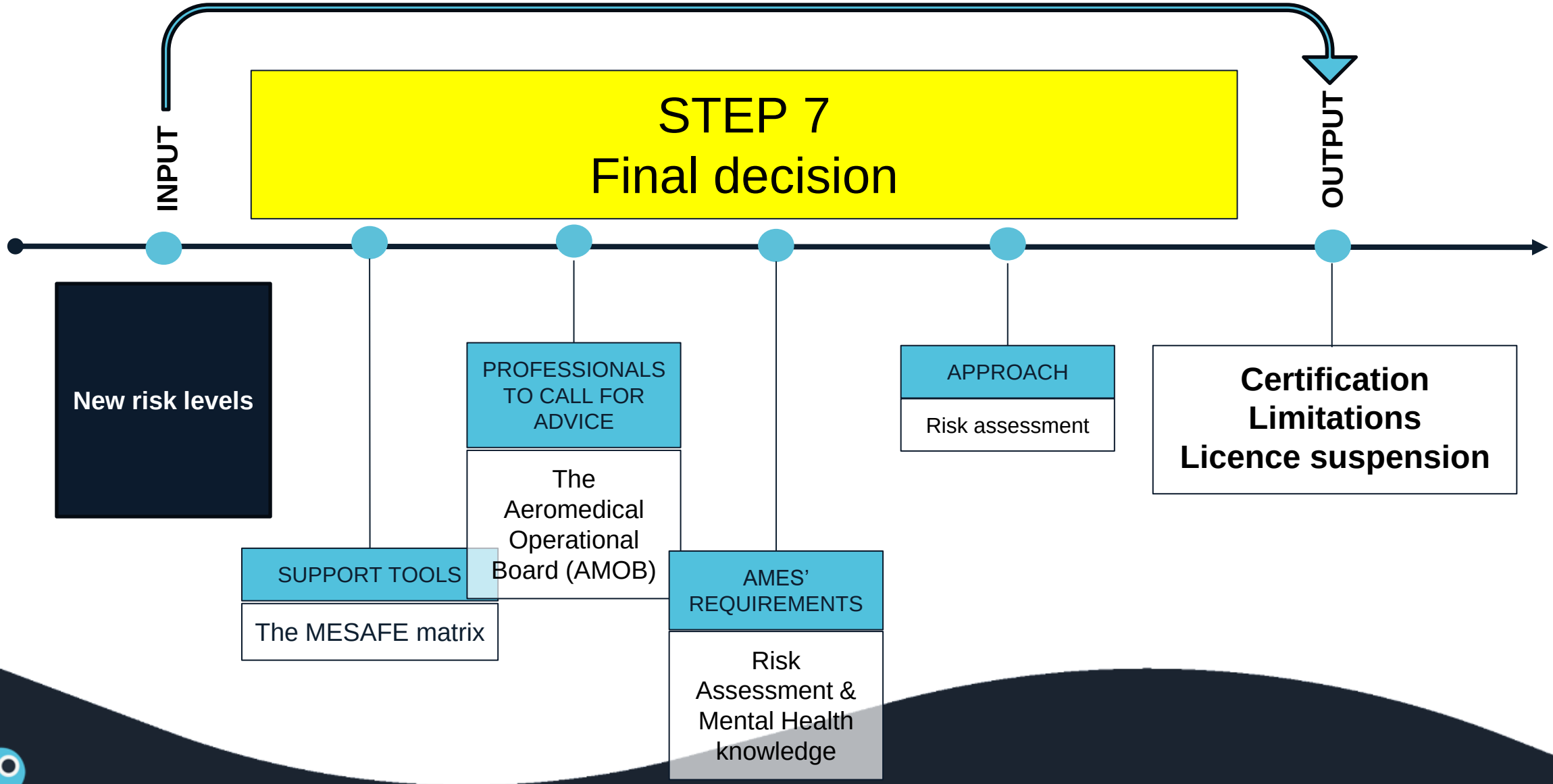
STEP 5 – APPLY RISK MITIGATION MEASURES



STEP 6 – ASSESS THE NEW RISK LEVEL



STEP 7 – FINAL DECISION



The result

- first and foremost a decision on a difficult case

For the AME and Medical Assessor:

- Standardised
- Specific and accurate
- Documented
- Easy to update with changes

- For the Pilot or ATCO:
  - Common language
  - Participation
  - Transparency
  - Easier to understand decision
  - Easier to understand what changes would require new assessment

The aeromedical-operational board

The aeromedical-operational board is recommended to comprise of (an) AME(s), mental health experts acceptable to the licensing authority (psychiatrist, clinical psychologist), and operational experts.

Moreover, It is recommended to actively involve the applicant concerned in the deliberations of the board whenever possible. This is considered to be useful because

1) the applicant can think along with the board about the operational safety consequences of her/his mental health symptoms; and
2) the applicant might better understand the arguments and decision of the board and this might facilitate the applicant's acceptance of the decision.

Practical Training Course

1. Psychological Evaluation Techniques
   - Limitations of questionaires and psychodiagnostic tools
   - Clinical Interview
   - Mental State Examination

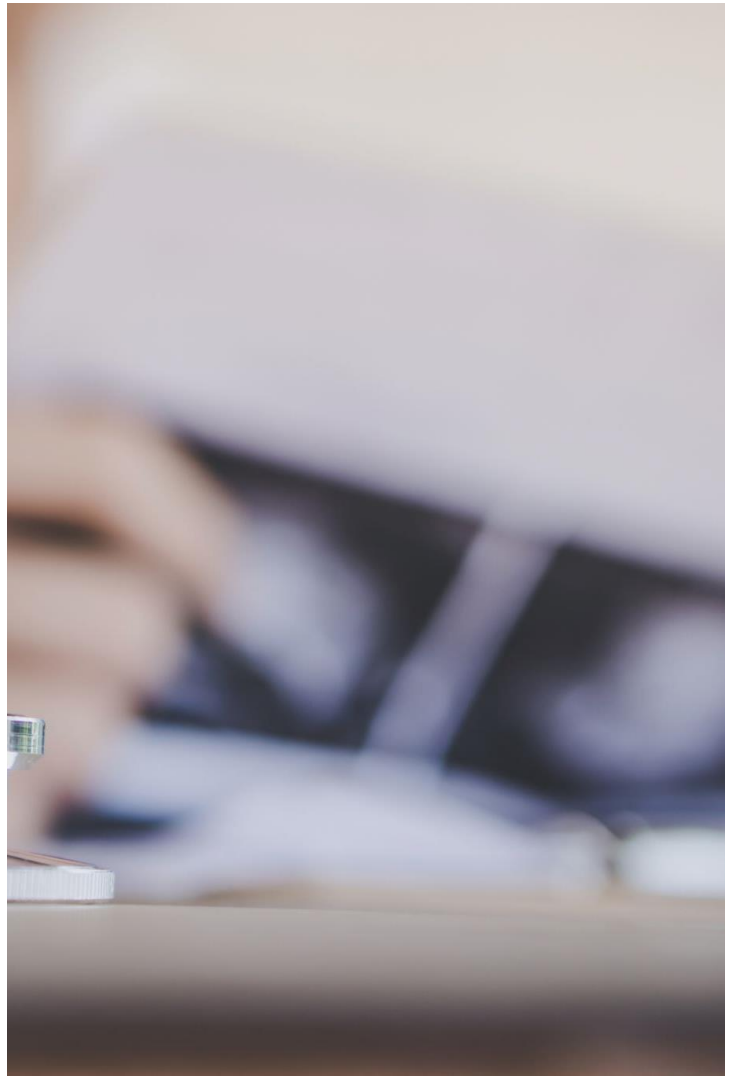
2. How and when to refer to a Mental Health Specialist (MHS)? Referal question formulation.

3. The MIRAP process: a case study

What are the challenges?

The safety assumption according to which an applicant suffering from a mental health disorder will seek help and self-declare the condition might fail:

- Stigma and blame culture
- Vulnerability, shame
- Mistrust
- Fear of repercussions:
  - Loss/denial of medical
  - Impact on professional ambition and career
  - Financial risk (some loss of license insurences do not cover mental health disorders)



Under-Reporting of Self-Reported Medical Conditions in Aviation: A Cross-Sectional Survey

Strand et al. (2022)

RESULTS: Among the 1616 respondents, 726 (45%) were commercial pilots, 457 (28%) private pilots, 272 (17%) air traffic controllers, and the remaining were cabin crew or crew in aerodrome/helicopter flight information service (AFIS or HFIS, respectively). A total of 108 were initial applicants.
Analyses revealed that being a commercial pilot showed a higher risk for under-reporting compared with other classes and the perception of aeromedical examiners in a supportive or authoritative role reduced the risk.
CONCLUSIONS: Under-reporting of medical conditions could be significant in aviation.

Mental health problems in aviation

27% of the adult EU population (18-65) had at least one mental disorder in the past year: substance use, psychoses, depression, anxiety (Wittchen et al., 2011)

These is significant evidence that pilots are adult human beings (Simons et al., 2016)

Frequent causes for grounding a **pilot** were cardiovascular (19%), **psychiatric (11%), neurological (10%), and psychological (9%)..** Psychiatric and psychological diagnoses were most frequent in the age 20-40 cohort. (Simons et al., 2016)

Sharp increase of new mental disorder cases with pilots (Antiskid Germany)

2020: +50%

2021: +100% (compared to 2019)

First time severe expressions of depressive disorder

First time suicidal thoughts and behaviour

Mental health problems in aviation

Most common psychological problems with flight crew:

- Mood disorder (unipolar depression – major depression)
- Anxiety (often training related)
- Occupational stress (longer working hours, decreased working conditions, training related)
- Sleep disorders
- Relationship problems
- Substance abuse
  - Alcohol (92.9%)
  - Opioids (2.1%)
  - Cannabis (1.8%)
  - Cocaine (1.7%)

Mental health problems in aviation

RED Flags:

- Psychosis
- Suicidal ideation and deleberate self harm
- History of use of antidepressants or other psychiatric drugs
- History of electroconvulsive therapy
- Psychiatric hospitalizations
- Bipolar spectrum disorder
- Affective instability (ex. Borderline/bipolar/recurrent depressive disorder/personality)

BLIND SPOTS:

- ! ADHD Attention Deficit (Hyperactivity) disorder
- ! ASS Autism Spectrum Disorder
- ! Personality disorder

1. Psychological Evaluation Techniques

MESAFE screened questionaires and psychodiagnostic tools:

'NO QUESTIONAIRES/PSYCHODIAGNOSTIC TEST BATTERIES are suitable to be used in the context of aeromedical screenings'

Be very cautious when questionaires are used: high face validity, no pilot norms, most can only be used when there is valid reason to believe there is mental health issue (not to be used on 'all pilots'), forensic questionaires are not suitable in aviation context

CORE of the psychological evaluation should therefore be:

CLINICAL INTERVIEW + MENTAL STATE EXAMINATION

Trust and alliance

Professionalism + honesty + trust are the building blocks of a good working relationship between AME and pilot/ATCO

1. Number 1 top priority for a pilot/ATCO = flight safety and a healthy and fullfilling career: clarify that this is also your priority as AME
2. Let them know they can expect supportive response to their problems
3. Show interest in professional and social life
4. Make them feel comfortable in non threatening environment: personalized approach, listen carefully, give and ask feedback
5. Be honest and frank about possible safety risks of disclosed (mental) health problems
6. Recommend ways to adress problems outside of medical in order to prevent them from becoming an issue impacting fitness for duty: peer support, specialized counseling, ….
7. Work towards a career long relationship

Clinical interview

ASK OPEN QUESTIONS

ASSUME TENDENCY TO WITHHOLD INFORMATION: FOCUS ON NON-VERBAL SIGNS

ADMIT THAT SOME QUESTIONS MAY FEEL LIKE ‘INTRUSIVE TO PRIVACY’

IF THE ANSWER IS NO, ASK THE QUESTION AGAIN IN A DIFFERENT WAY

Focus

1, Focus on **symptoms** of mental health problems:

Weight loss /gain

Concentration/attention problems

Mood/affect

Training issues

Sleeping problems,...

2, Focus on **Mental Incapacition Events** rather then diagnose

Clinical interview

Birth/early childhood difficulties/trauma/abuse

Educational difficulties: child and adolescent school history

Family situation/ housing/ employment history

Important life events (death, divorce, job loss) - coping / hobbies

Current life stressors (personal/work related)

Flight training difficulties
Long absence from work

Past and current medication (SSRI, benzo, sleep, ritaline,…)

Alcohol and drug use
Criminal/legal offences

Personal and family psychiatric history

Mental State Examination

APPEARANCE	BEHAVIOUR/ATTITUDE	SPEECH	THOUGHT PROCESS
THOUGHT CONTENT	MEMORY	CONCENTRATION and ATTENTION	EMOTIONAL STATE

Mental fitness certification decision

Evaluate:

1. Presence of a mental disorder and potential comorbidities in the history of the applicant
2. Presence of a mental disorder and potential comorbidities in the current timeframe
3. The Incapacitation risk level (including an evaluation of the impairment in performing flight duties and of the level of social dangerousness)
4. Personal protective and risk factors (psychosocial circumstances, physical health,…)

2. Referral to Mental Health Specialist (MHS)

SELECTION MHS

1. Independant Aviation Psychiatrist
2. Specialist Psychiatrist
3. Independant Aviation Clinical Psychologist
4. Specialist Clinical Psychologist

REFERRAL QUESTIONS

1. Is there evidence for a mental health disorder (now or in the past)? (Be as specific as possible: depression/anxiety disorder).
2. What are the associated mental incapacitation events (MIE's) that could have an impact on a safety function (pilot/ATCO)?

Referral to a mental health expert

- In case of doubt
- If possible, discuss referral and questions first
- Factual questions
  - Is there a mental disorder?
  - If so, which one and classification
  - (Aviation related risks)
- A mental health specialist can never determine someone’s piloting capabilities

Part MED Mental Health Specialists (MHS)

AVIATION PSYCHIATRIST

Psychiatric evaluations conducted by qualified psychiatrist having adequate knowledge and experience in aviation medicine.

AVIATION (Clinical) PSYCHOLOGIST

Psychological opinion and advise conducted by a suitably qualified and accredited clinical psychologist with expertise and experience in aviation psychology.

Listed and certified by EAAP:
European Association for Aviation Psychology
www.eaap.net


EUROPEAN ASSOCIATION FOR AVIATION PSYCHOLOGY

CERTIFICATE OF ACCREDITATION

This is to certify that
KATRIEN VERCAUTEREN
has fulfilled the EAAP requirements for
Aviation Psychologist

This accreditation will start on 01.02.2022 and be valid for a period of five (5) years from that date.

Registration number: AP158

Drs. Ir. André Droog
President

Dr. Mikaela Schwarz
Secretary General

EAAP

Example referral question

1. Is there evidence of a psychiatric disorder (specific) at the time of the examination?

If yes, does this disorder have an impact on the ability to fly/work as an ATCO?

If yes, is there a higher risk for a mental incapacition as a result of the disorder?

If yes, does the treatment have an impact on the ability to fly/work as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

2. If there is no evidence of a psychiatric disorder, is there evidence of medical history that imposes a higher risk for mental incapacition during flying/working as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

Info from mental healthcare providers

- (Written) consent from the applicant
- Consider to obtain information from provider directly
- Only ask factual information (diagnosis made, treatment, treatment results, any complaints still existing etc)
- No judgement on flying capabilities
- The applicant’s own GP, psychiatrist, psychologist is NOT completey impartial and may be biased

Medical confidentiality

- No big changes to medical confidentiality laws advised
  - Medical law/confidentiality is largely outside jurisdiction of EU, and of EASA
  - Unified legal regime for dealing with medical confidentiality in relation to aviation professionals specifically seems difficult
- Non-adherence, especially by practitioners not familiar with aerospace medicine
- Strict regulation may increase non-disclosure and may drive aircrew with problems underground
- Consent of applicant basis of sharing information
- Except in cases of clear and imminent danger

Pilot/ ATCO Professionalism

- Professional behaviour/ lack of cannot and should not be determined by MHS
- Mental disorders are a **different entity** from unprofessional/ unsafe behaviour
- Some aviation professionals with mental disorders will be highly professional
- Some aviation professionals acting highly unprofessional do not have a mental disorder
- What is professional? → aviation professionals should decide

A Just Culture - (MESAFE definition)

- A safety culture in which all safety sensitive personnel can report mental issues
- A supportive atmosphere without a risk of job- or income loss
- Only reliable diagnostic tools are used to detect mental health risks
- A maximum effort is made to ensure that employees can return to their job safely
- Balancing the rights and duties of all involved

Case study A

Candidate pilot Class 1– 31 years old

- Doubled in second grade of school
- Uses ritaline (via general practitioner) – no official diagnose
- No known family history of developmental disorders
- Subtle signs of distraction and body movements
- Stable family life and successful stable professional career as entrepreneur with 20 employers

Case study A

REFERRAL TO MHS?

Aviation psychiatrist?

Aviation psychologist?

Specialist psychiatrist/psychologist?

REFERRAL QUESTION

?

Example referral question

1. Is there evidence of AD(H)D at the time of the examination?

If yes, does this disorder have an impact on the ability to fly/work as an ATCO?

If yes, is there a higher risk for a mental incapacition as a result of the disorder?

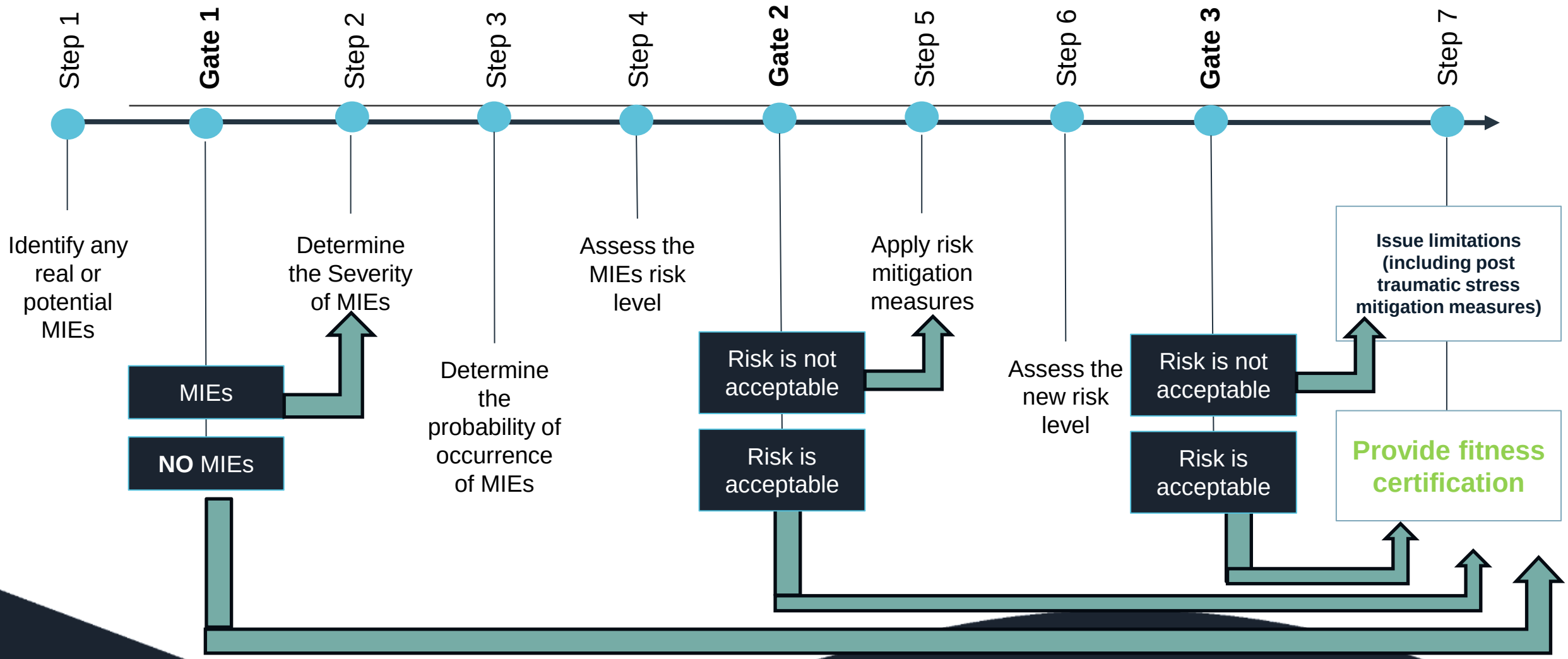
If yes, does the treatment have an impact on the ability to fly/work as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

2. If there is no evidence of AD(H)D, is there evidence of medical history that imposes a higher risk for mental incapacition during flying/working as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

The MIRAP steps



Case study B

Air transport pilot Class 1 – 44 years old

- Psychiatric hospitalization due to severe depressive symptoms
- Divorce with significant problems about child care
- Biomedical treatment with quetiapine – benzodiazepine in hospital
- SSRI stable dose for 1 month - sertraline
- Wants to return to flying activities 6 months after hospitalization

Case study B

REFERAL TO MHS?

REFERAL QUESTION

Example referral question

1. Is there evidence of a mood disorder at the time of the examination?

If yes, does this disorder have an impact on the ability to fly/work as an ATCO?

If yes, is there a higher risk for a mental incapacition as a result of the disorder?

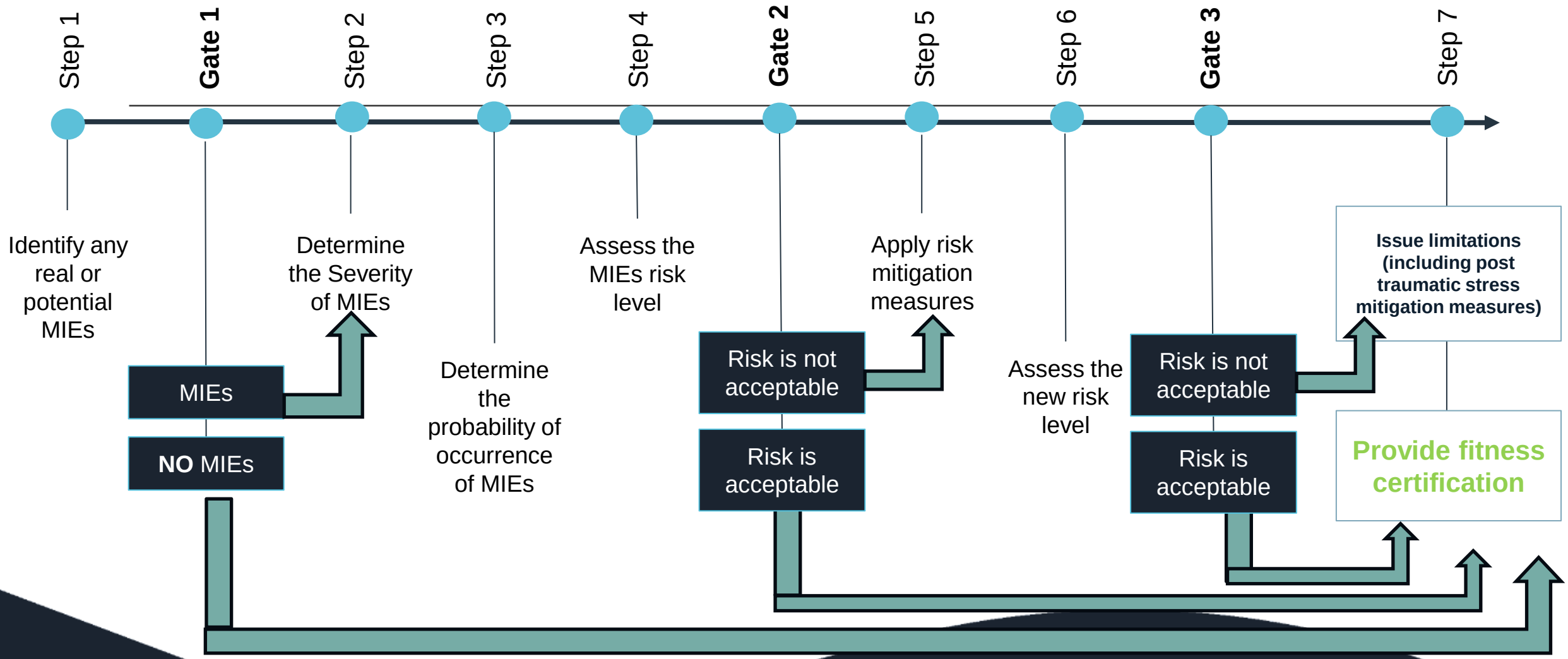
If yes, does the treatment have an impact on the ability to fly/work as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

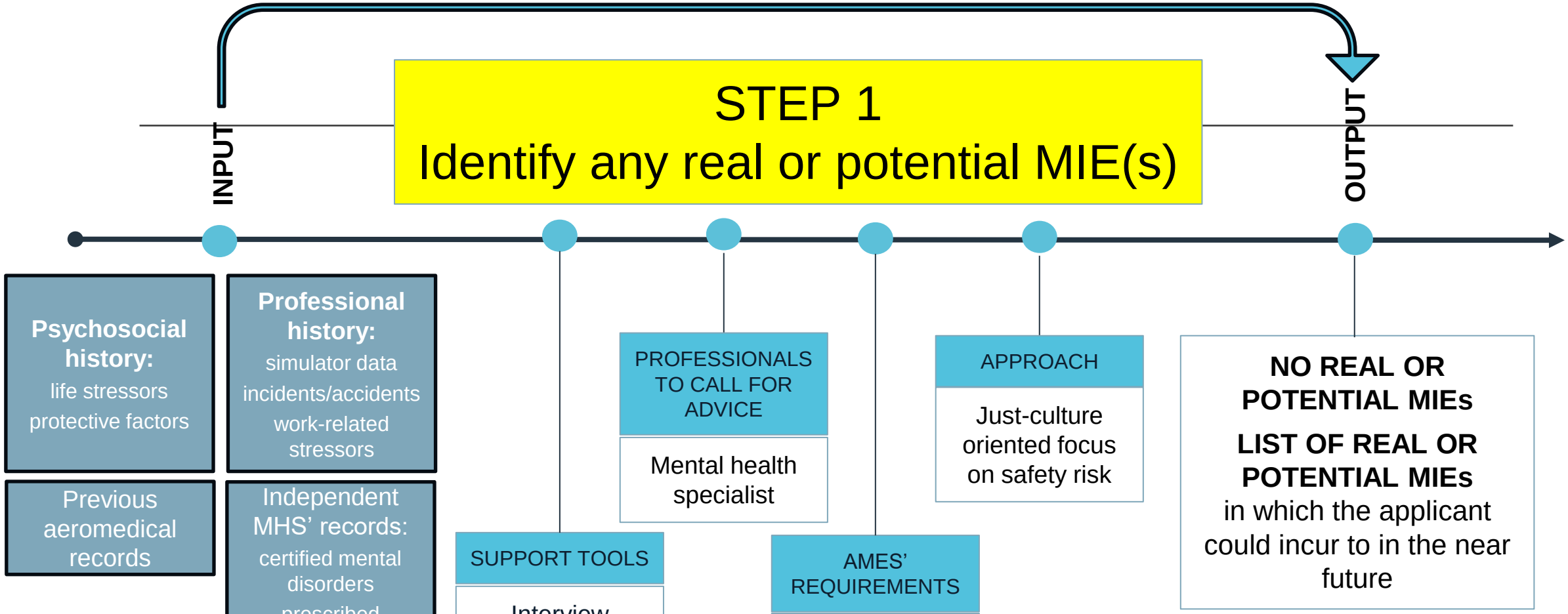
2. If there is no evidence of mood disorder, is there evidence of medical history that imposes a higher risk for mental incapacition during flying/working as an ATCO?

If yes, are there mitigating measures to reduce the risk for incapacitation?

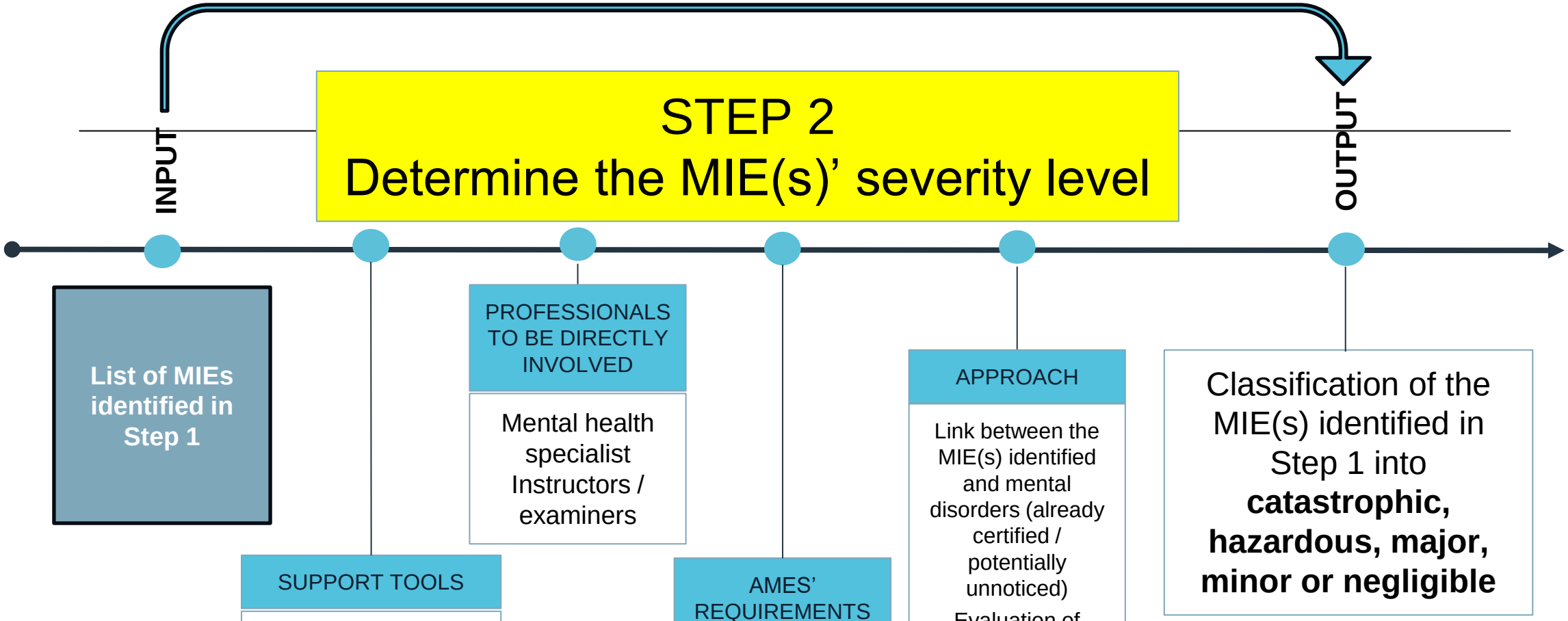
The MIRAP steps



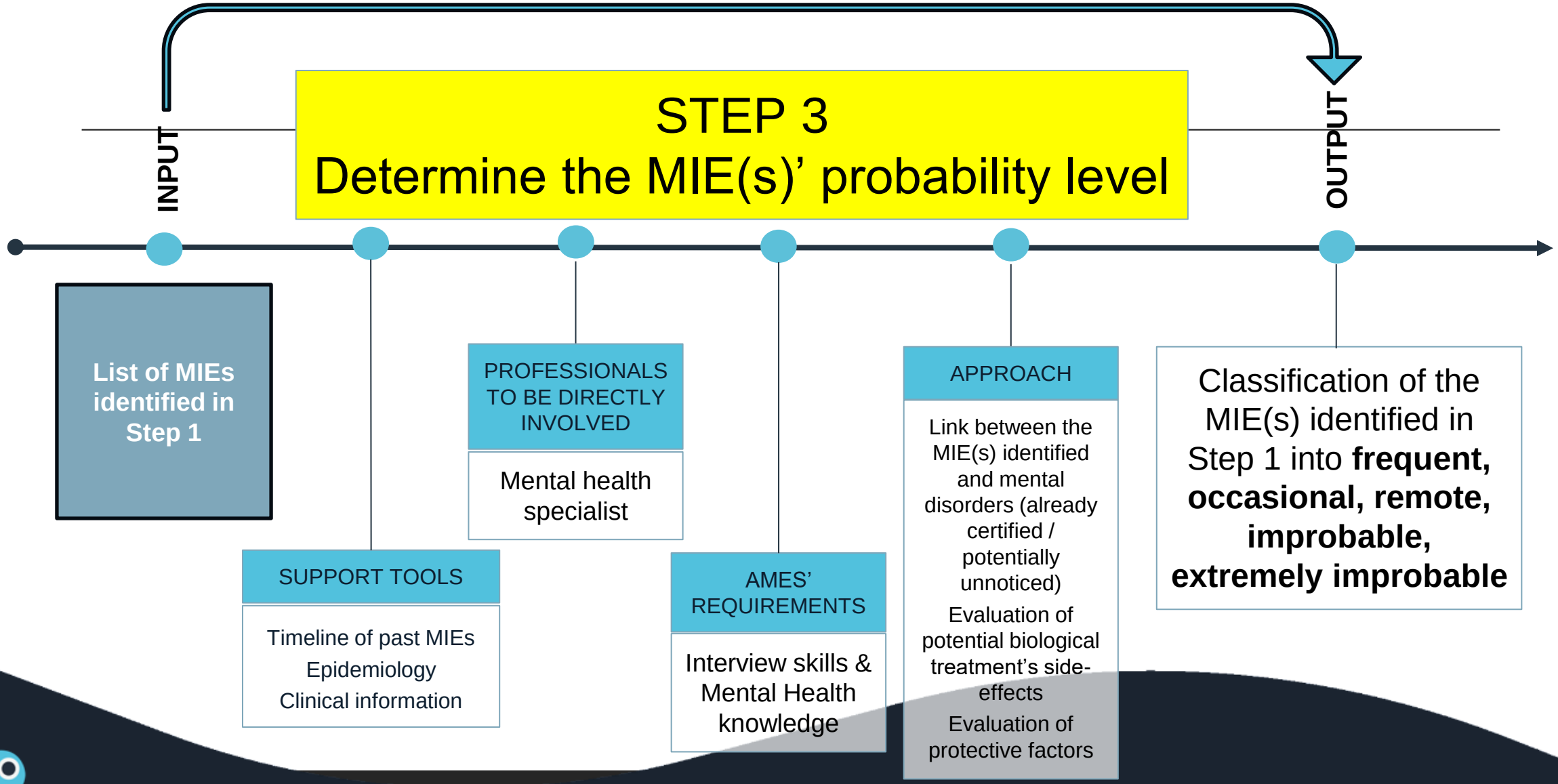
STEP 1 – IDENTIFY ANY REAL OR POTENTIAL MIE



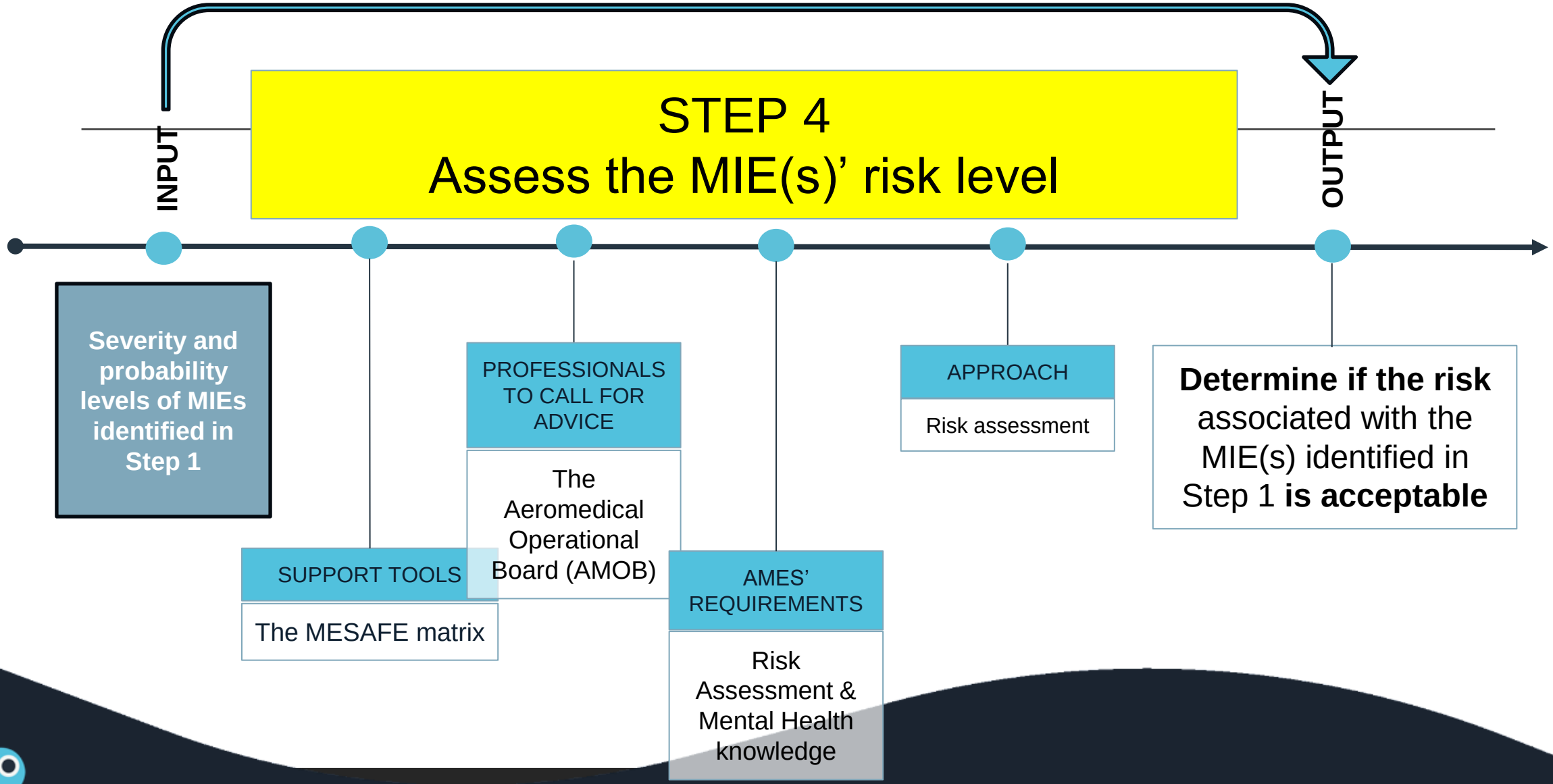
STEP 2 – DETERMINE THE MIE(s)' SEVERITY LEVEL



STEP 3 – DETERMINE THE MIE(s)' PROBABILITY LEVEL



STEP 4 – ASSESS THE MIE(s)' RISK LEVEL



MESAFE MATRIX Risk assessment of mental health			**Catastrophic - A**	**Hazardous - B**	**Major - C**	**Minor - D**	**Negligable - E**
			May cause catastrophic event	may cause flight safety critical event	May comprimise flight safety	Reduced effectiveness and capacity to adapt to operational requirements	Minimal impact on flight safety
	Frequency per year	Flight hours between each event (approx) *	Total incapacitation	Severe incapacitation	Major decrement on performance	Minor to moderate performance compromise, may continue duties	Minimal impact on performance
Frequent 5	> 1/month	100	5A	5B	5C	5D	5E
Occasional 4	1-10 times	1.000	4A	4B	4C	4D	4E
Remote 3	10-99%	10.000	3A	3B	3C	3D	3E
Improbable 2	1-10%	100.000	2A	2B	2C	2D	2E
Extremely improbable 1	<1%	>1.000.000	1A	1B	1C	1D	1E

MIE 2

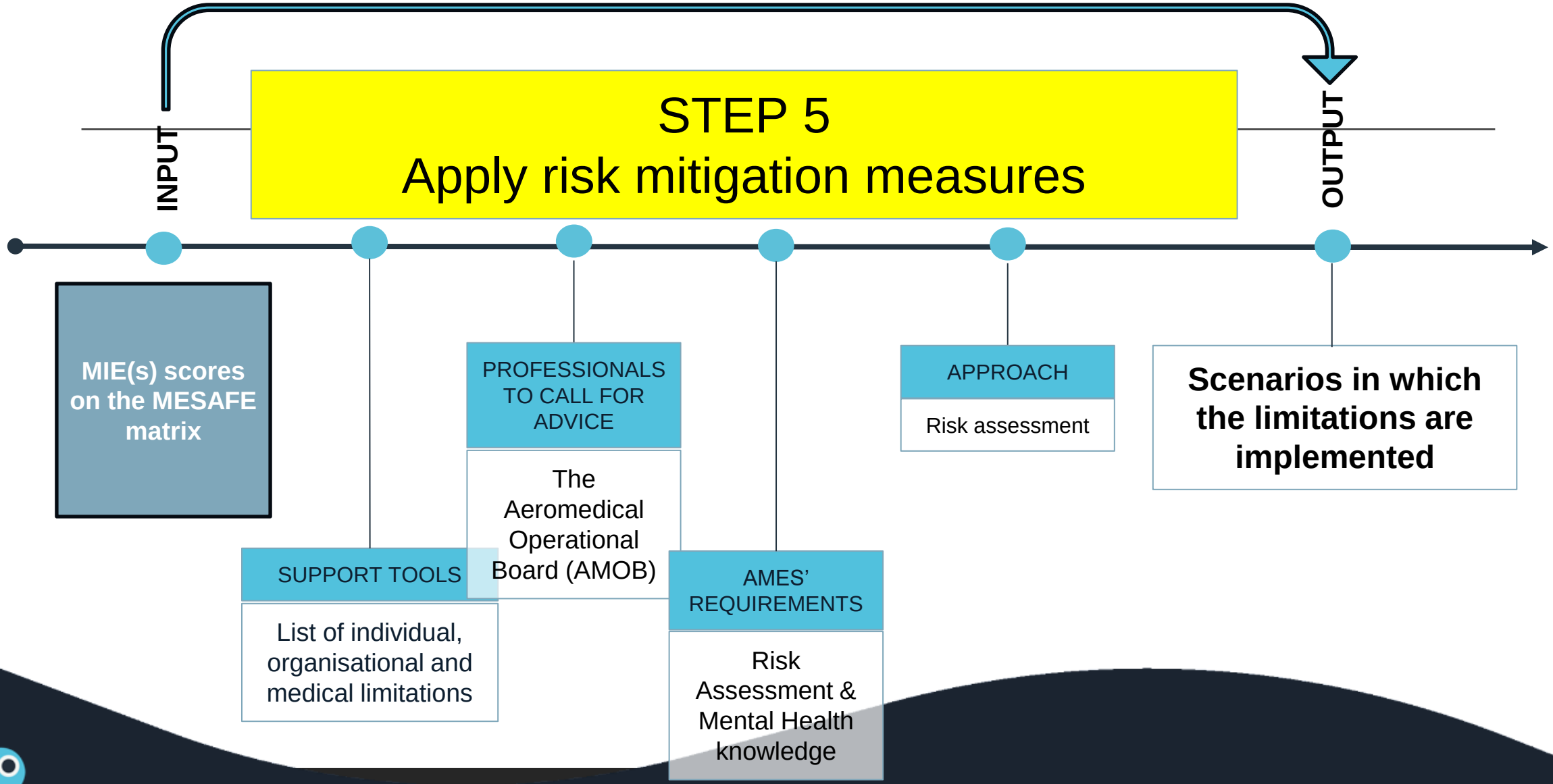
MIE 1

*given random onset of event unconnected to flight. If event is connected to flying activity (e.g. Murder suicide or flight anxiety),use career frequency rather than yearly

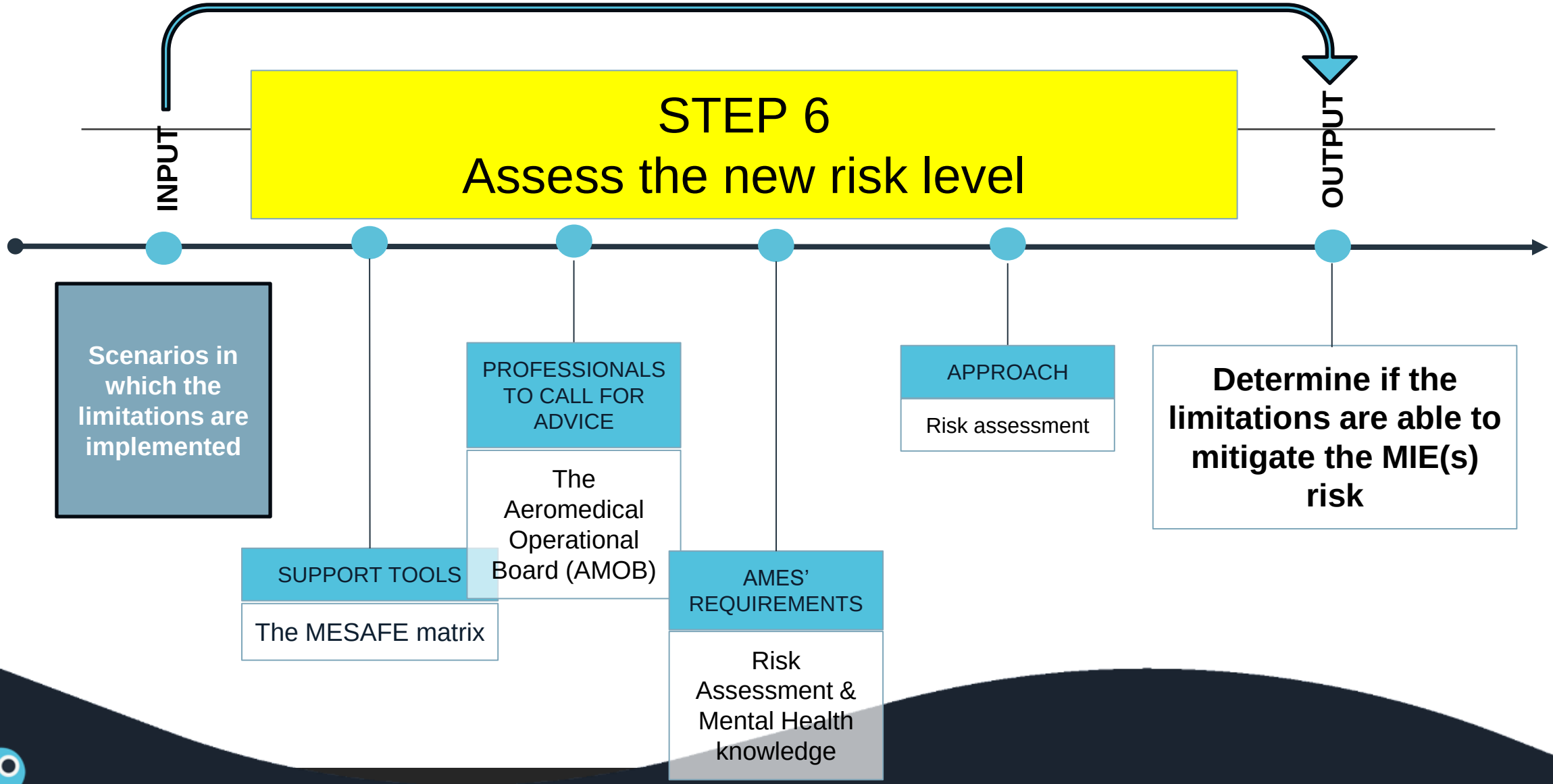
	Risk unacceptable
	Risk unacceptable, but may in some cases be acceptable after thorough review and specific mitigation. A medical board should in such cases be employed**
	Risk may be acceptable - may require operational and/or personal risk reduction**
	Risk acceptable

**Operational risk reduction could be co-pilot, backup crew, time window to land helicopter etc. Personal risk factors could be close follow-up by psychologist, peer-support etc. Formalised risk reduction is documented and required in the certificate.

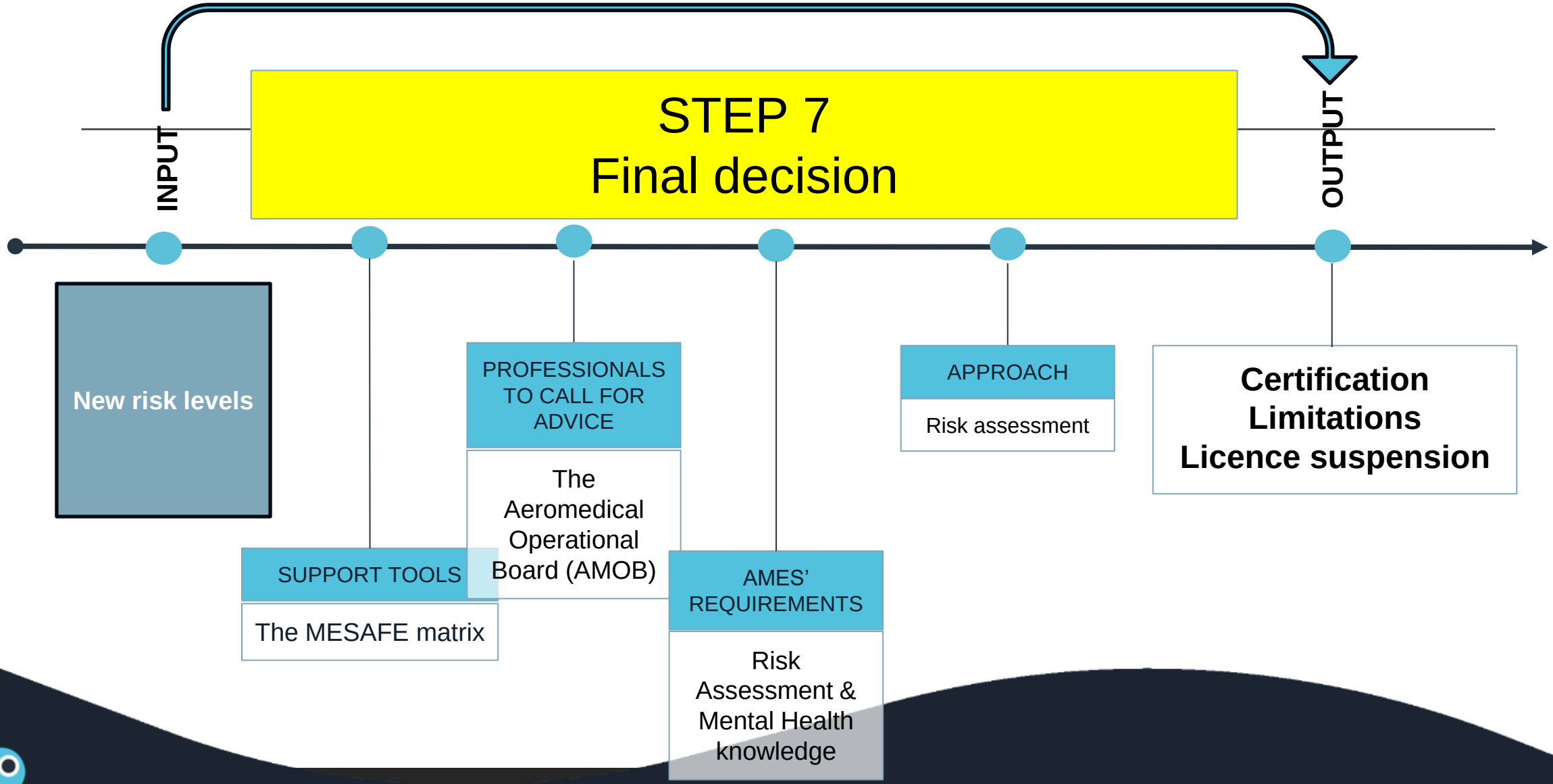
STEP 5 – APPLY RISK MITIGATION MEASURES



STEP 6 – ASSESS THE NEW RISK LEVEL



STEP 7 – FINAL DECISION



Case C: Ms. P, 33 years

- First-officer of a medium size European airline. Was about to start training to become captain, but became pregnant.
- Sick leave for 8 months due to depressive disorder. Depressed mood, sleeping and concentration difficulties, no suicidal feelings.
- Started with burn-out symptoms after a spontaneous abortion at 22 weeks gestation and death of her mother.
- After 14 sessions CBT due to lack of improvement started sertraline by psychiatrist.
- Now 4 months on 100mg, once monthly follow-up CBT-session, consolidation phase.
- Symptoms in full-remission for 2-3 months, remission is confirmed by independent psychiatric assesment.
- Medical has lapsed, now visits to AME, wants to fly again.
- Physical health is good. No history of mental health problems.

What is the main aeromedical challenge?

- The risk due to the sertraline usage?

- The risk due to a new depressive episode?

- Is certification possible?

Treatment & risks

- In general (stable) treatment will mitigate risks

- Risks caused by disorder and side-effects treatment and benefits

- *Total compatibility with flight duties = compatibility of the underlying disorder x compatibility of the biological treatment (risks and side-effects) x benefits of the biological treatment.*

- **It’s not about yes or no, it’s about the risk**

Some considerations

- The underlying disorder, its risks and especially the risk of (unexpected) relapses

---

- Stable dosage for at least 4 weeks?
- Side effects of treatment (especially on concentration and attention) and long-term risks
- Benefits of the medication (risks that are diminished)
- Is the medication part of a larger treatment plan?
- Are the symptoms in remission?

Five years later

- After a tripartide discussion with her treating psychiatrist, ms P. decides to continue the sertraline in order to mitigate the risk of a relapse of the depression or a post partum depression.

- Becomes pregnant after six months, office work in line with company procedures, healthy son is born, return to flying afterwards.

- Continuation of treatment, 2,5 years later birth of healthy daughter.

- When daughter is two years, she wants to taper the medication.

Discontinuing the medication

- After a new tripartide consultation with het psychiatrist, a tapering plan is made.

- Risk of relapse (+/- 50%) discussed.

- Sertraline dosage will decrease by 25mg per 3 months (1 year in total). After each dosage change, 4 weeks on ground, consultation with occupational physician afterwards.

- Monthly follow-up with psychiatrist.

- Discontinuation uneventful. Low frequency follow-up visits with psychiatrists for three more years, no relapse. She continues to fly succesfully for quite some years.

Biological treatment

ASSESSING THE BENEFITS AND SIDE-EFFECTS OF BIOLOGICAL TREATMENT

Treatment & risks

- In general (stable) treatment will mitigate risks
- Risks caused by disorder and side-effects treatment and benefits
- *Total compatibility with flight duties = compatibility of the underlying disorder x compatibility of the biological treatment (risks and side-effects) x benefits of the biological treatment.*
- **It’s not about yes or no, it’s about the risk**

Some considerations

- The underlying disorder, its risks and especially the risk of (unexpected) relapses
- Stable dosage for at least 4 weeks?
- Side effects of treatment (especially on concentration and attention) and long-term risks
- Benefits of the medication (risks that are diminished)
- Is the medication part of a larger treatment plan?
- Are the symptoms in remission?

Some advice with regards to SSRI treatment

- Treatment by or under supervision of a psychiatrist.
- During the starting phase no signs of bipolarity or increased aggression or suicidality.
- Jointly supported by the mental healthcare provider, AME and occupational physician.
- Patient allows the free sharing of information between mental healthcare providers, AME and the occupational physician.
- At least one family member, friend or relative of the patient is involved.

Some advice with regards to SSRI treatment (ctnd)

- Stable dosage for a reasonable amount of time.
- The disorder is in remission for a reasonable period of time.
- Side-effects are stable and tolerable, no interactions with other drugs.
- There are no sleep complaints.
- An ECG has been made and is OK.
- If applicable, along with the pharmacological treatment, psychotherapy is offered.

Some advice with regards to SSRI treatment (cntd)

- During changes of the dosage or when stopping, the patient should not fly or perform ATC duties.
- Dose changes, stopping and tapering of the medication need to be supervised by a psychiatrist.
- Except in case of severe side-effects or medical necessity, tapered gradually.
- Sufficient attention should be paid to relapse prevention.

Other psychotropic drugs than SSRI, things to consider

- Sedation is a side-effect of many psychotropic drugs (antypsychotics, benzodiazepines)
- Risk of misuse and/or dependency (benzodiazepines, methylphenidate)
- Other mental side-effects, especially during starting phase (psychosis, mania)
- Long-term side effects
- **Likeliest main issue: risk of the disorder**

Attention Deficit Hyperactivity Disorder

- Prevalence increasing, especially in young people
- Farmacological treatment: stimulant (methylphenidate, dexamphetamine, others) acting 3-8 hours
  - No constant levels during day
- Stimulant effect and short acting time make compatibility with aviation duties difficult
- Risk of dependency, difficulties with international travel
- Even more difficult: problem with concentration and attention
- Repeat diagnostics? Neuropsychological assessment?

Benzodiazepines

- ‘Tranquilizers’
- Can help to aid sleep
- Influence on attention and concentration minimal after working-time
- Considered safe if suffienct time before commencing duties
- MAIN QUESTION: why are they needed? Just to help sleeping? Or to control emotions?
- Risk of dependency

Wrap up

Questions?

Suggestions?

What challenges are ahead for the future?