



Center for Investigation and Prevention
of Aeronautical Accidents

MENTAL HEALTH

Critical Biopsychosocial Factors and the Prevention
of High-Impact Events in Flight Crews

Flight Safety Study
E-01/CENIPA/2025



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2. Executive Summary

This Flight Safety Study was developed in response to the growing global concern regarding the risks associated with the mental health of aviation professionals, particularly after high-profile international events such as the Germanwings Flight 9525 accident in 2015. Furthermore, decades of investigative experience accumulated by the Center for the Investigation and Prevention of Aeronautical Accidents (CENIPA) have demonstrated the need to deepen the technical understanding of human factors that may affect operational safety.

Unlike traditional Flight Safety Studies prepared by CENIPA—usually derived from trends identified in Final Reports of aeronautical accident and incident investigations—this work does not originate from the analysis of specific occurrences. Rather, it is an initiative based on scientific evidence and international best practices, developed by professionals with extensive expertise, with the objective of anticipating a rare yet potentially catastrophic type of event: aircraft-assisted suicide.

Thus, this Study represents a preventive and strategic action, designed to ensure that CENIPA and the organizations that make up the Aeronautical Accident Investigation and Prevention System are technically prepared to address eventualities of this nature, ensuring institutional responses that are swift, coordinated, and aligned with the best practices in operational safety and mental health.

Differing from other international initiatives that addressed the topic in a limited manner, this Study expands the approach by also incorporating the Brazilian context, with its cultural, operational, and regulatory particularities.

Accordingly, this work is innovative on a global scale by integrating:

- Investigation of accidents with suspected aircraft-assisted suicide;
- Psychiatric forensic analysis applied to the aeronautical environment;
- Risk and protective factors for the mental health of pilots and air traffic controllers;
- Models of institutional psychological support, including Peer Support Programmes;
- Application of Corporate Resource Management (CRM) training as a preventive tool.

It is therefore a comprehensive work that covers all stages of the operational safety cycle, ranging from preventive actions to the investigative procedures applied to aeronautical accidents.

The Study is structured into seven chapters, each addressing an essential thematic axis:

1. **Psychiatric Forensics in the Aviation Context:** methodological and ethical aspects of psychiatric evaluations of pilots and air traffic controllers, considering the interface between mental health and operational risk.
2. **Suicidal Behavior Onboard Aircraft:** discussion of the biopsychosocial impact of suicidal events in aviation, including case analyses and recommendations for supporting affected teams.
3. **Risk and Protective Factors:** detailed mapping of predisposing, precipitating, and protective factors for suicide among aviation professionals, based on international literature and national data.
4. **Air Traffic Control Activity and Its Impact on Mental Health:** analysis of the biopsychosocial effects of air traffic control work, including fatigue, stress, burnout, and the risk of operational errors.
5. **The Challenge of Peer Support Programmes in Mental Health:** critical evaluation of the implementation of Peer Support Programmes in Brazil, with recommendations adapted to the country's organizational and social culture.
6. **CRM as a Preventive Tool:** study on the integration of CRM concepts into suicide prevention, focusing on communication, leadership, and threat management.
7. **Investigation of Aeronautical Accidents with Suspected Aircraft-Assisted Suicide:** methodological proposal to enhance accident investigations involving possible suicidal intent, including the use of psychological autopsy and interviews with family members.

The uniqueness of this Flight Safety Study lies in its ability to combine practical accident investigation experience with the most recent scientific evidence on mental health, human behavior, and operational safety. Among its methodological highlights are:

- Use of technical references from agencies such as the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA – France), the National Transportation Safety Board (NTSB – USA), the International Civil Aviation Organization (ICAO), and the European Union Aviation Safety Agency (EASA);
- Use of high-impact reference articles in psychology and psychiatry;
- Application of Human Factors, CRM, and Aerospace Psychology concepts;
- Inclusion of biopsychosocial approaches in all phases: prevention, monitoring, investigation, and post-event support;
- Proposal of tools applicable to both civil and military sectors.

Additionally, the Study fills longstanding gaps in Brazilian technical-operational literature, offering a national reference for regulatory agencies, air operators, aerodrome operators, training centers, and health services linked to the aviation sector.

By publishing this Study, CENIPA reaffirms its mission to protect lives through the prevention and investigation of aeronautical accidents, expanding the concept of operational safety to definitively include mental health as a critical element. The publication of this work aims to:

- Contribute to the formulation of public policies related to operational safety and mental health in aviation;
- Strengthen accident investigation processes from a biopsychosocial perspective;
- Raise awareness among managers, health professionals, and aviation personnel regarding the importance of continuous preventive and supportive measures;
- Encourage future research in the field of operational safety and human factors.

Finally, it is important to highlight that there is no evidence of an increase in aeronautical occurrences in Brazil associated with mental health issues. Therefore, this Study should be understood as a proactive initiative by CENIPA, aimed at supporting and stimulating discussions on the topic and encouraging the adoption of mitigating actions to improve mental health.

This Study may be revised at any time, should new relevant facts justify it. We wish you an insightful reading.

3. Psychiatric Forensics in the Aviation Context

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3.1 Introduction

The practice of medicine is a field extensively regulated by ethical principles and normative actions established by the Federal Council of Medicine. Within this sphere, however, psychiatry holds particular interest due to its direct impact on the patient's conduct, behavior, and even values. Such consequences can have significant repercussions on society, affecting other individuals and encompassing a broad interface with the law, the legal system, and institutional regulations in general (ABDALLA-FILHO; CHALUB; TELLES, 2016). At the same time, psychiatry is the medical specialty that most interacts with or serves as an open field for various disciplines and areas of knowledge, such as religion, philosophy, law, genetics, pharmacology, and others.

Psychiatric evaluation serves multiple purposes, ranging from clinical care—aimed at alleviating symptoms and signs of mental illness or behavioral changes—to forensic purposes, with the goal of establishing a link between mental disorders and potentially criminal or dangerous behavior toward oneself or others.

Thus, the purpose of a forensic psychiatric examination is to clarify facts or matters of interest to judicial, administrative, or private authorities. In the aviation context, the primary objective of the evaluation is to answer a central question: whether the individual's mental health (or mental state) renders them fit to perform aviation duties; whether there is a risk of sudden incapacitation during flight; or whether they pose a danger to aviation activities. It must be understood that performing aviation duties means operating a complex control system—potentially explosive and harmful—that moves both on the ground and at high speeds in the air. In other words, the evaluation seeks to determine whether the individual's psychiatric and/or psychological condition allows them to safely perform piloting activities, without impairments—whether in the air, during flight, or on the ground, considering the potential consequences of an accident on ground-based systems and individuals.

It is important to recognize that the forensic examination is inherently asymmetrical. In this type of medical interaction, one party possesses all the information, while the other—the physician—must attempt to obtain the essential data to form a professional judgment regarding the crew member being evaluated. This dynamic also intersects with Brazilian law, particularly the individual's right not to produce evidence against themselves. Therefore, the medical examiner must rely on the examinee's willingness to provide the necessary information.

Given the broad functional implications of this evaluation, certain elements must be included in the forensic medical report, even if briefly. These include the examinee's personal history, which should be recorded with as much detail as possible; the mental

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status examination conducted during the psychiatric evaluation; and the diagnosis, if applicable. Additionally, any symptoms or signs observed that may impact aviation performance must be documented and investigated from a forensic perspective before the individual is fully cleared to resume aviation duties.

Attention to the last point is particularly important, as some findings in psychological tests, for example, may not indicate the presence of a disorder but could suggest or warrant further investigation by the medical examiner prior to issuing a final technical judgment. Some authors argue that the criteria for evaluating crew candidates or active personnel in Brazil are overly restrictive. While technically appropriate, this may lead examinees to conceal psychiatric disorders (BARROS; CASTELLANA, 2020).

As indirect evidence of this risk, some studies—such as the systematic review conducted shortly after the Germanwings¹ accident—clearly indicate that the prevalence of mental disorders among crew members is at least as high as in the general population (PASHA; STOKES, 2018). Related factors include fatigue and circadian rhythm disruptions; however, the evidence is primarily based on cross-sectional studies, which present significant limitations for establishing causality. One might argue that only individual factors are at play in this context, but it is well known that heavy workloads, night shifts, and long working hours are prominent stressors (MARQUEZE et al., 2023).

In this chapter, considering this scenario, we will review the main regulatory aspects of Brazilian aviation, analyzing two contexts: general civil aviation, regulated by the National Civil Aviation Agency (ANAC); and military aviation, mostly governed by regulations of the Brazilian Air Force (FAB).

3.2 Technical Regulatory Aspects – ANAC

Brazilian Civil Aviation Regulation (RBAC) No. 67, Amendment No. 05, which outlines the requirements for medical certification, lists conditions most commonly associated with suicidal behavior, as described in the following paragraphs of Section 67.75 (Mental and Behavioral Requirements):

- (a) The applicant must not suffer from any disorder that may increase the likelihood of sudden unfitness, whether to safely operate an aircraft or to safely perform assigned duties.
- (b) The applicant must not have a medical history or clinical diagnosis of:
 - (1) organic mental disorder;
 - (2) mental and behavioral disorder due to psychoactive substance use, including alcohol or other substance-induced dependence syndrome;
 - (3) schizophrenia, schizotypal disorder, or delusional disorder;
 - (4) mood (affective) disorder;

¹ Occurred on March 24, 2015, Germanwings commercial flight 9525 crashed on French territory, resulting in the loss of 150 people, among them the co-pilot Andreas Lubitz, who intentionally and in a controlled manner directed the aircraft into the ground.

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- (5) neurotic disorder, stress-related disorder, or somatoform disorder;
[...]
- (7) personality or behavioral disorder in adults.

However, specific mention of suicide or self-harm is found only in Supplementary Instruction (IS) No. 67-004B, Revision B, issued by ANAC, under item 5.5 – Mental and Behavioral Requirements, which states: “5.5.5 Applicants with a history of self-harm, suicide attempts, repetitive abnormal behaviors, impulse control issues, or aggressive outbursts must be deemed unfit to obtain an Aeronautical Medical Certificate (CMA).” Given the severity of the condition, it is highly unlikely that the applicant will succeed in appealing the decision. This aspect is primarily due to the fact that the strongest predictive factor for suicide is a previous attempt, and the other conditions listed in that item are likewise predisposing factors for self-destruction.

It is important to highlight that RBAC 67 itself establishes, in Section 67.15, item (c), the obligation to report to ANAC or to the examiner responsible for certification any decrease in psychophysical fitness:

67.15 Validity of the Aeronautical Medical Certificate (CMA)

...

- (c) The holder of a valid CMA must report to ANAC, or to the examiner responsible for their certification, any decrease in psychophysical fitness that may prevent them from exercising the privileges of their licenses and ratings without compromising flight safety. They must also refrain from exercising such privileges until receiving a new judgment of “fit” or “fit with restrictions” from an examiner or from ANAC.
- (1) To support its judgment and resolve doubts regarding psychophysical fitness, ANAC may request an opinion from a healthcare professional.

3.3 Technical Regulatory Aspects – Brazilian Air Force (FAB)

All crew members undergo an initial evaluation that includes both a psychiatric examination and a psychological assessment. Reassessments by psychiatrists and other specialized professionals are only conducted under the following circumstances: in the event of an air incident or accident; for air traffic controllers over the age of 60; when the individual is referred by the general medical examiner conducting the health inspection; or when there are indications of psychological illness, based on mental health screening questionnaires.

The administration clearly states the purpose of the examination for the military physician in the following item of the Aeronautics Command Instruction (ICA) that regulates health inspections (ICA 160-6):

- 9.2.1.3** Examiners must always keep in mind that the ultimate goal of the examination is to assess the current or potential capacity to correctly perform a specific function, to satisfactorily integrate into a group, and to preserve the safety and efficiency of air operations in the case of those destined for such

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activity, and for others, within their specific duties, as applicable (BRASIL, 2022, p. 37).

Regarding the technical analysis itself, in addition to clearly restricting any mental or behavioral disorders due to functional risk, the regulation explicitly defines which health attributes are mandatory for operational safety in the psychological examination:

9.3.2.5 In examinations intended for activities directly related to flight or operational tasks in general, the psychological evaluation must also assess, from a mental standpoint, the current or potential capacity of the examinee to exhibit safe behaviors, thereby preserving the safety and efficiency of air operations, operational activities, and other tasks inherent to military routine. In this regard, traits such as impulsivity, poorly managed aggression, emotional balance, among other aspects of the examinee that could pose risks to the intended or current activity, are evaluated (BRASIL, 2022, p. 53).

9.3.2.7 The psychological evaluation is intended to assist Psychiatry in identifying psychopathological changes that indicate the presence or absence of mental disorders and the examinee's adaptability to military life, with attention to their mental health (BRASIL, 2022, p. 54).

For the psychiatric conclusion, there is no direct mention of medication use; however, there is a clear directive regarding the absence of mental disorders due to their potential impact on flight operations, as stated in item 9.3.1.1:

9.3.1.1 The interviewer must ensure the absence of any psychiatric disorder that could compromise the execution of the function intended by the candidate, and when doubts persist, may resort to any means deemed necessary, such as psychological evaluation or the involvement of other examiners, in order to resolve any uncertainty regarding the final conclusions (BRASIL, 2022, p. 53).

In summary, this is a highly detailed evaluation process that considers the general medical assessment, scientifically validated screening questionnaires, and specialized professional evaluations. These assessments take into account not only the presence or absence of disorders but also any signs, symptoms, or test results that may indicate risk to air operations.

There is no direct mention of psychiatric medication use, but the legislation clearly states that any existing psychiatric condition must not pose any risk to aviation. This presents a significant dilemma for the examining psychiatrist and the medical boards responsible for health inspections. As a general rule, military crews do not report or disclose the use of psychiatric medications or any other substances that may affect mental functions and impair the crew member's discernment or judgment. Unlike the specific provisions for selective serotonin reuptake inhibitors (SSRIs) in civil aviation, no medicinal exceptions are currently included in the military context.

3.4 Discussion

Indeed, in the *Manual of Civil Aviation Medicine* (2012), Doc 8984, published by ICAO, the Aerospace Medical Association working group emphasized that extensive

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psychiatric evaluations as part of routine aeromedical assessments would not be productive; on the contrary, they would increase costs and make the forensic evaluation process slower and more bureaucratic. However, it is important to consider the cultural context behind this statement. An initial psychiatric evaluation in the United States costs approximately \$500, and subsequent follow-up evaluations may range from \$80 to \$200 (WOOLDRIDGE, 2022). In this regard, it is always essential to consider the cultural context of medical articles in general, and particularly those addressing mental health.

Regardless, it is important to highlight that the interview with the examinee is fundamental. It is relevant for the psychiatrist/psychologist to gather information regarding family history, organizational background, and psychotropic medication use. Data collected during this interview may provide significant clues for a more accurate assessment. Equally important for psychiatric evaluation are details about a history of head trauma or diseases potentially harmful to the brain, including COVID-19.

One complicating factor in mental and behavioral assessment is the frequency with which these evaluations are conducted. In civil aviation, formal psychiatric examinations are mandatory only during initial certification and following serious accidents or incidents. Psychological evaluations, on the other hand, are spaced out every five years.

Another important limitation of psychological and psychiatric evaluations concerns the questionnaires used (Annexes L and M of Doc 8984), given the possibility of intentional misrepresentation by the examinee, who may answer questions incorrectly to conceal a potential disorder.

Moreover, periodic forensic evaluations cannot fully identify or prevent all potential issues faced by the examinee. Between evaluations, the crew member may experience bereavement, divorce, or organizational stressors that could alter the condition initially assessed by the psychiatrist or psychologist. Consequently, if continuous monitoring and risk management regarding mental health are not adequately conducted by the airline or even by the Brazilian Air Force (FAB), exposure to risk may increase.

Within ANAC's scope², information must be clearly and coherently recorded to allow for medical record audits for appeals, investigations (in the event of an aeronautical occurrence), or legal proceedings. Statements that may be used to support a "not fit" judgment must be documented in a signed Responsibility Term by the applicant, with the aim of reducing legal challenges based on denial or retraction of statements made to the

2 Although ANAC personnel participated in the preparation of this Flight Safety Study, it is emphasized that the assertions regarding possible amendments to current legislation do not represent the official position of the Agency. Even though a revision is possible, there is no ongoing initiative in this regard and, should one be undertaken, it will follow the regulatory process established by ANAC's Collegiate Board.

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physician. Additionally, it is crucial to remember that between psychological evaluations and any psychiatric consultations, mental and behavioral assessments must be conducted by medical examiners from other specialties, who, in case of doubt, may refer the patient for specialized care.

In the military context, there are stricter restrictions regarding the presence of symptoms or formal psychiatric diagnoses presented by crew members. Psychological test results indicating alterations in specific mental functions may serve as grounds for restricting the individual's aviation activities, prompting preventive evaluation to ensure safe operations in this regard. Furthermore, although there is no provision for constant or periodic reassessment by psychiatrists or psychologists, other examiners are trained to refer cases—whether based on symptom reports or positive responses in the screening questionnaires presented in this chapter.

3.5 Final Considerations

Dissimulation is one of the main challenges in forensic evaluation, and there are no definitive solutions that, based on the current body of scientific knowledge, can eliminate all uncertainties. However, expanding the search for symptoms or signs of mental or behavioral alterations—even during the physical examination conducted by the examiner—may contribute to safer performance of aviation duties.

Furthermore, conducting psychiatric and psychological evaluations at appropriate intervals will serve as an important protective factor against mental health issues in both civil and military aviation.

Despite the limitations cited in this chapter, medical forensics remains a significant safety barrier against aeronautical occurrences.

References

- Abdalla-Filho, E., Chalub, M., & de Borba Telles, L. E. (2016). *Forensic Psychiatry by Taborda* (3rd ed.). Porto Alegre: Artmed Editora.
- Barros, D. M., & Castellana, G. B. (Eds.). (2020). *Forensic Psychiatry: Legal, Ethical, and Clinical Interfaces* (2nd ed.). Porto Alegre: Artmed.
- Brasil. Comando da Aeronáutica. Diretoria de Saúde. (2022, December 22). *Portaria DIRSA nº 221/DMP, de 22 de dezembro de 2022. Aprova a reedição da ICA 160-6 "Instruções Técnicas das Inspeções de Saúde na Aeronáutica"*. Boletim do Comando da Aeronáutica, (240), 18912.
- Gonçalves, D. M., Stein, A. T., & Kapczinski, F. (2008). Performance of the Self-Reporting Questionnaire as a psychiatric screening questionnaire: A comparative study

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with Structured Clinical Interview for DSM-IV-TR. *Cadernos de Saúde Pública*, 24(2), 380–390. <https://doi.org/10.1590/s0102-311x2008000200017>

International Civil Aviation Organization. (2012). *Manual of Civil Aviation Medicine* (Doc 8984, 3rd ed.). Retrieved from <https://standart.aero/en/icao/book/doc-8984-manual-of-civil-aviation-medicine-en-cons>

Marqueze, E. C., Sá e Benevides, E. A., Russo, A. C., Fürst, M. S. G., Roscani, R. C., Guimarães, P. C. V., & Salim, C. A. (2023). Organizational risk factors for aircrew health: A systematic review of observational studies. *International Journal of Environmental Research and Public Health*, 20(4). <https://doi.org/10.3390/ijerph20043401>

Pasha, T., & Stokes, P. R. A. (2018). Reflecting on the Germanwings disaster: A systematic review of depression and suicide in commercial airline pilots. *Frontiers in Psychiatry*, 9, Article 86. <https://doi.org/10.3389/fpsy.2018.00086>

Wooldridge, A. (2022). How much does a psychiatrist cost without insurance in 2022? Retrieved from <https://www.khealth.com/learn/healthcare/how-much-does-a-psychiatrist-cost-without-insurance/>

4. Suicidal Behavior Onboard Aircraft

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Overview

Since the early days of air navigation, aeronautical occurrences have been present—nowadays less frequent, though not entirely eliminated. Accidents and critical incidents, from a systemic perspective, are interpreted as phenomena that emerge from the interactions among technical, human, social, and organizational system components. They represent the alignment of multiple contributing factors at a specific moment in time (Reason, 2000).

According to Ribeiro (2009), the study of human factors is fundamental in the field of aviation, as even with the increasing presence of technological instruments, human protagonism in decision-making and the execution of specific actions often ensures the safe progression of a flight.

Analyzing the development of psychological processes in professionals operating within this context, as well as the traumatic consequences of disasters, crises, and emergencies, constitutes an important area of work for mental health professionals—whether psychologists, psychiatrists, or occupational physicians working within this culture. Such situations evoke intense emotional responses and require time for psychological processing by those affected.

There is still limited literature addressing the theme of suicide in the context of work within the aeronautical environment, particularly onboard aircraft. The emblematic suicide case involving Germanwings in 2015, which claimed the lives of 144 passengers on the same flight, heightened interest in the topic, with a focus on prevention and care for flight crews.

Considering suicide as a complex phenomenon, in which various risk factors converge with one or more precipitating factors, we can draw an analogy to James Reason's (2000) accident model, represented by the openings in the "Swiss cheese." The occurrence of a suicide event in the aeronautical environment can cause damage of varying proportions (Reason, 2000).

Among the definitions of emergency, one can highlight "unexpected situations that compromise the life and physical integrity of one or more individuals, resulting in material, economic, and human losses, and causing emotional impact on those affected." Based on these criteria, a suicidal crisis fits the concept of an emergency (Cogo et al., 2015).

Thus, the impact caused by suicidal behavior and/or episodes in the aeronautical environment goes beyond material and human losses, as the psychological consequences may lead affected individuals to experience physical and emotional symptoms of varying intensity and duration. Those affected may include both direct and indirect individuals, such as crew members, family members, friends, rescue teams, healthcare professionals,

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and anyone who may suffer damage, loss, or difficulty as a result of the potentially traumatic event.

According to Parkers (1998), the concept of the “shattered assumptive world” aptly describes a psychological phenomenon observed after an event of such magnitude, as all our beliefs, life plans, ideals of prediction and control, interpretations of the past, expectations for the future, and everything presumed to be known about oneself and the world are called into question, prompting the individual to reassess their conceptions and assumptions about reality.

For most people, these symptoms are transient and resolve within a short period. However, for some, they may persist for a longer duration, increasing susceptibility to socioemotional harm. Certain elements may facilitate or hinder recovery, such as the presence of support groups and psychological assistance tailored to the specific demands arising from traumatic experiences (Franco, 2005).

4.2 The Myth of Icarus and Human Unpredictability

According to Greek mythology, Daedalus was renowned in the city of Athens as a skilled man—an architect and inventor. One of his creations was a labyrinth designed to imprison the Minotaur (a beastly creature with the body of a man and the head of a bull), commissioned by Minos, king of the island of Crete. Due to various circumstances and conflicts with the king, Daedalus was imprisoned along with his son, Icarus, in the very labyrinth he had designed.

Seeking a way to escape, Daedalus crafted wings by collecting feathers from numerous birds inhabiting the island, binding them with threads, and securing them with beeswax to prevent detachment. He shaped them to resemble perfect wings, like those of birds. He then built wings for himself and his son, intending to fly to a neighboring island. However, despite his father’s warning about the danger of flying too close to the sun—due to the heat that could melt the wax—Icarus, overwhelmed by the sensation of freedom, continued to ascend, reaching an altitude unsafe for his flight condition.

The high temperature affected Icarus’s wings, melting the wax that held the feathers together, causing him to plunge into the Aegean Sea. Daedalus, unable to prevent his son’s death, watched the feathers floating on the water and, lamenting his own skills, realized the worst had occurred. He arrived safely in Sicily, where he buried Icarus’s body and named the place Icaria in memory of his son.

Just as Icarus was driven by unconscious motivations and the intense sensation of freedom granted by flight, human beings may become lost amid overwhelming stimuli and sensations, potentially resulting in unpredictable behaviors. In light of this parallel, it is pertinent to question what factors led Icarus to completely disregard the sole safety rule he had been warned about.

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This reflection brings us to the cases of aircraft-assisted suicide—a mystery present both in mythology and in contemporary reality—raising profound questions.

Today, although aircraft are equipped with advanced technology and complexity, we cannot overlook human factors, which remain essential for pilots to consider the consequences of their actions and the boundaries that must be respected. In this regard, flight safety work becomes critically important. Beyond preventing incidents and accidents, it also involves the thorough investigation of critical occurrences, aiming to identify errors and failures that allow for deeper reflection on actions and interventions capable of reducing or neutralizing the likelihood of future episodes. Measures such as clarifying instructions, revising manuals, issuing safety bulletins, and establishing more specific regulations are examples of actions that may be adopted. All Final Reports from investigations of critical events are made available for consultation, as their analysis should contribute to awareness and prevention of future occurrences, ensuring overall operational safety.

4.3 Psychological Support after Accidents and Critical Incidents

The involvement of psychological science in aviation began during the World Wars. After observing the effects of stress on Royal Air Force crew members, it became necessary to implement selection processes using psychological tests and psychiatric interviews, as well as training for pilots and copilots. Thus, in 1915, Germany established the first center for conducting psychological tests for the selection of pilots, navigators, and bombardiers (Ribeiro, 2019).

From the Great Wars to the present day, the military and operational environment has contributed to the development of the aviation field. Psychology has aligned itself with technical knowledge and aviation research, becoming essential to ensure safer air operations.

Considering that critical incidents, aviation accidents, workplace accidents, and other traumatic events can cause intense emotional impact on survivors, it is essential that the experience be verbalized and addressed technically. A safe space must be provided for affected team members to narrate their experiences, listen to others, and activate internal coping resources. Additionally, psychoeducation enhances the ability to recognize physical signs and emotional reactions that directly affect quality of life both in and outside the workplace.

The emotional impact of traumatic situations does not affect only individuals who survive accidents, natural disasters, or catastrophes. These events can psychologically affect a wide range of people, including:

- **Primary victims** (survivors),
- **Secondary victims** (family members, air traffic control professionals, and individuals emotionally close to survivors),

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- **Tertiary victims** (emergency responders, physicians, military personnel, investigators, and other professionals involved in the scene),
- **Quaternary victims** (the population in the affected area),
- And a **fifth level**, comprising individuals who, after exposure to media coverage of the accident, experience discomfort and suffering.

The same applies to individuals who unintentionally witness suicide cases (Franco, 2015).

4.3.1 Psychological First Aid (PFA)

According to the *Psychosocial Support Guide* (PAHO, 2015), developed by the World Health Organization (WHO) and translated into Portuguese by the Pan American Health Organization (PAHO, 2015), Psychological First Aid (PFA) provides basic guidelines for individuals offering assistance after disasters or critical experiences. PFA is intended as initial support for people who have experienced extreme distress and includes the following actions:

- Provide practical, non-intrusive care and support;
- Assess needs and concerns;
- Help individuals meet basic needs (food, information);
- Listen without pressuring them to speak;
- Comfort and help them remain calm;
- Assist in locating information, services, and social support;
- Protect from further harm.

This approach is grounded in principles of empathy, comfort, and support, and is applicable across a wide range of contexts. Psychological First Aid is a primary care strategy used to minimize emotional suffering immediately following crises and emergencies, such as aviation disasters, catastrophes, critical incidents, and cases involving violent death, suicide attempts, or completed suicides.

The environment in which Psychological First Aid is provided must be safe and offer sufficient privacy to calmly support the affected individual. Adapting care to the institutional culture of aviation is important for the effectiveness of the intervention, as is attention to other health and emergency response needs.

In disaster situations, focusing on how the individual feels in the moment and their role as a survivor—rather than as a victim—can be more productive. The goal is to reduce initial stress and promote short-term adaptive functioning through active listening, practical support, and connection to other services when needed. In such cases, if

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psychiatric medication is required, it may be prescribed preventively by a psychiatrist, typically for short-term use (within weeks following the event).

Literature indicates that any trained individual may administer Psychological First Aid; it is not an exclusive practice for mental health professionals. However, when the intervention is intended to provide psychological support following a suicide attempt or completed suicide in an aeronautical or corporate setting, it is recommended that the activity be conducted by a mental health professional, given the specificity of the topic and the need for technical responsibility.

4.3.2 Critical Incident Stress Debriefing (CISD)

The CISD protocol is part of a multidisciplinary and integrated crisis intervention program known as *Critical Incident Stress Management (CISM)*, which can be defined as a system for planning various crisis intervention strategies for individuals directly or indirectly affected by a critical situation. This technique gained prominence in the 1980s and is still used today in post-crisis interventions for small groups across different contexts.

The program includes activities that begin in the pre-crisis phase (training, information), extend through the acute phase of the incident, and continue into the post-crisis phase (Everly & Mitchell, 2000). The development of this technique was influenced by the Military Psychiatry intervention model, which was used for the psychological rehabilitation of soldiers on the front lines during World War II (Franco et al., 2015).

According to Barreto and Fonseca (2010), CISD is conducted with a homogeneous group, led by a mental health professional and one or two trained volunteers, facilitating the process. Its objectives are to:

- Mitigate the psychological impact of the traumatic experience;
- Accelerate normal recovery processes;
- Identify individuals who may require ongoing care;
- Prevent the development of disorders resulting from exposure to traumatic events.

The technique involves reviewing or analyzing the critical situation, encouraging emotional expression, and promoting cognitive processing of the distressing experience (Franco et al., 2015). Participation must be voluntary, and the CISD protocol follows seven structured phases:

1. Introduction
2. Fact
3. Thought
4. Reaction

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5. Symptoms
6. Information/Education
7. Reentry (Everly & Mitchell, 2000)

These seven phases are described as follows:

1. **Introduction/Rapport:** The professionals introduce themselves and explain the procedures and objectives of the intervention, as well as its confidential and ethical nature. Group expectations are explored, and interaction is encouraged.
2. **Facts:** Participants recount and describe the critical experience.
3. **Thoughts:** Expression of initial thoughts following the event.
4. **Reaction:** Discussion of emotional reactions and sensations experienced during the critical moment.
5. **Symptoms:** Physical and psychological symptoms that emerged or intensified after the critical occurrence are addressed.
6. **Information/Education:** Psychoeducation regarding the symptoms presented, stress management, and decompression techniques.
7. **Reentry:** Integration of unresolved or pending issues, clarification of possible doubts, and referrals to specialized teams when necessary.

The work protocol described above allows for the emergence of numerous contents and distinct emotions. Cultural factors, family and social support, age group, resilience capacity, degree of exposure, and personal involvement in the traumatic event may directly influence the emotional response expressed by each individual.

The emotional sequelae of traumatic events can be mitigated through narrative and information on emotional management (Cordeiro & Oliveira, 2019). In this way, the activity helps prevent and reduce the onset of potential disorders resulting from exposure to a potentially traumatic event. Participants have the opportunity to verbalize and listen to the accounts of other group members and individuals involved in the occurrence.

The psychologist's or physician's posture as group facilitator must be welcoming, proactive, empathetic, and free from judgment or criticism, with a focus on support, respecting each individual's uniqueness and willingness to speak or remain silent. In group settings, it is important to reinforce the importance of maintaining confidentiality and professional ethics throughout the activity. CISD is a psychological support technique used in armed conflicts, aviation accidents, and incidents, and may be conducted after medical first aid and psychological care, if necessary, following a critical occurrence. This model may also be adapted and applied by experienced professionals to support individuals affected by completed suicide cases in aeronautical and corporate environments.

Immediate and preventive psychological interventions following traumatic experiences—such as psychological debriefing and CISD—have faced criticism from

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some professionals regarding their effectiveness in reducing the risk of Post-Traumatic Stress Disorder (PTSD), according to evidence-based medicine criteria. On the other hand, many researchers affirm that most individuals who receive CISM find it helpful and feel supported within the groups (Carlier, Voerman & Gersons, 2000). However, some critics of CISM argue that perceiving it as helpful does not necessarily equate to preventing psychopathology or reducing PTSD. The technique continues to be used in the United States and Europe. The International Critical Incident Stress Foundation (Inc. – ICISF) provides training programmes and interventions worldwide.

When discussing early interventions of any kind, it is important to consider the expected outcomes of such approaches: alleviating the psychological consequences of the traumatic event, reducing the risk of PTSD, restoring workplace functioning, and so forth. Therefore, although some early interventions may not prevent the later development of PTSD, they may serve other important functions that have not been adequately documented in current research findings (Foa et al., 2009).

Since the suicide terrorist attacks of September 11, 2001, in the United States, there has been growing interest in conducting empirical research and systematic literature reviews on best practices for early interventions and treatment of disorders resulting from traumatic experiences.

4.3.3 Eye Movement Desensitization and Reprocessing – EMDR

Eye Movement Desensitization and Reprocessing (EMDR) therapy is a technique recommended by the World Health Organization (WHO) for treating PTSD following critical situations. This approach, developed by American researcher Francine Shapiro in 1987, focuses on the storage and interpretation of the experience. Change is understood as a byproduct of reprocessing, resulting from an alteration in memory storage and its connection to adaptive memory networks (Shapiro, 2001).

According to Mesquita (n.d.), the EMDR therapist identifies the trauma, understands how it is affecting the individual's life, and stimulates the brain to process disturbing memories. The process considers images, emotions, bodily sensations, negative beliefs, and coping resources. Essentially, the technique helps the brain “digest” disturbing memories through bilateral stimuli, which may be visual, tactile, or auditory, activating communication between the brain's hemispheres—analogous to the movement that occurs during the REM (Rapid Eye Movement) stage of sleep, the final sleep stage in which dreams occur and the eyes move from side to side. During dreaming, the brain processes events and emotions from the day, leading to understanding and information consolidation. However, when disturbing events are associated with intense emotions and bodily sensations, the brain may not effectively process the images of the event linked to those emotions and thoughts.

This approach allows for both individual and group intervention protocols. Professionals applying this technique must undergo extensive training and hold specific

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credentials. The use of EMDR techniques has expanded and shown effective results in treating individuals affected by traumatic experiences.

4.3.4 Cognitive Behavioral Therapy

According to Maffini and Cassel (2020), Cognitive Behavioral Therapy (CBT), initially developed by Aaron Beck as a treatment model for depression, has gained recognition for its application in various psychopathologies, including PTSD (Mello et al., 2011; Oliveira, 2017). The effects of CBT stem from the collaborative relationship between therapist and patient, assisting in the identification of dysfunctional beliefs and supporting the patient's cognitive restructuring (Beck, 2013). CBT is considered one of the most effective approaches in demonstrating positive outcomes for patients with PTSD, as it incorporates techniques such as prolonged exposure, relaxation, and cognitive restructuring to reduce anxiety, depression, and symptoms related to trauma and the disorder.

4.4 Possible Mental Disorders and Trauma-Related Phenomena

4.4.1 ASD – Acute Stress Disorder or Acute Stress Reaction

Treatment should focus on reducing the affected individual's suffering during the traumatic experience. Most people who go through a potentially traumatic event do not develop ASD. However, providing specialized support promotes attention to mental health. For diagnosis, the presence of some of the following symptoms must be observed, occurring between three days and one month after the trauma (APA, 2022):

Intrusion (memories, dreams, flashbacks)
Negative mood
Dissociative symptoms
Avoidance symptoms
Arousal symptoms

There is no absolute indication for pharmacological treatment, as it is usually transient and resolves spontaneously. Benzodiazepines are contraindicated, as they may facilitate the development of Post-Traumatic Stress Disorder (PTSD).

In addition to classical therapies, other possibilities may assist in the reestablishment of well-being, including integrative and complementary health practices, psychoeducation in symptom management, and social support (MIGUEL, 2021).

Therefore, it is important that a person who has recently experienced a serious traumatic event be regularly monitored by a mental health professional for a minimum

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period of one month, in order to prevent the disorder. Furthermore, the development of Acute Stress Disorder (ASD) is not always related to the progression to PTSD; however, it is possible for PTSD to develop even if the person has not previously exhibited symptoms of ASD (MIGUEL, 2021).

4.4.2 PTSD – Post-Traumatic Stress Disorder

PTSD is the most prevalent mental disorder approximately one month after exposure to a severe traumatic event, a concrete episode or threat of death, serious injury, or situations involving violence. This type of disorder may occur in individuals who directly experienced, witnessed, learned about the occurrence involving a close person, or were frequently exposed to details of aversive events. Symptoms include re-experiencing or reliving; avoidance; negative changes in cognition and mood; and increased arousal (SILVA, 2016). This type of traumatic event results in clinically significant distress, social or occupational impairment, or impairment in other areas of life (APA, 2022).

Without appropriate treatment, PTSD may persist throughout life. It is important that the individual receives medical and psychological follow-up as soon as possible, as the condition may also evolve into other comorbidities and phenomena, such as Major Depressive Disorder (MDD), anxiety disorders, substance use disorder, insomnia, and even suicide. Risk behavior manifestations, reduced socioemotional skills, and impaired performance may also occur.

Regarding professionals such as aircraft crew members, these consequences are particularly concerning, as their duties involve interaction with other people, complex equipment, and activities that require safety precautions and focused attention. Thus, difficulty concentrating, startle responses, memory and sleep disturbances—common symptoms of PTSD—pose serious risks to operational safety in the case of these professionals (CAMARA; MARQUES; MALAGRIS, 2020).

4.4.3 Brief Psychotic Disorder or Acute and Transient Psychotic Disorder

For the diagnosis of this disorder, also referred to as brief reactive psychosis, one or more of the following symptoms must be present: delusions, hallucinations, disorganized speech or behavior, with or without catatonia. Symptoms must last at least one day, or less than one month, and evolve with complete return to normal functioning.

However, even though it is a brief condition, the level of impairment may be severe, requiring specialized follow-up to assist in restoring psychological functioning, minimizing cognitive losses, and preventing actions based on delusional ideas. Supervision and care to ensure that nutrition and hygiene are maintained are also welcome. Studies indicate a higher risk of suicidal behavior during the acute episode, and

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more than 50% of individuals may experience a recurrence of psychotic symptoms (APA, 2022).

4.4.4 Prolonged Grief Disorder

Prolonged grief disorder is characterized by intense and maladaptive reactions following the death of someone with whom the bereaved had a significant bond. The diagnosis may be defined after the condition persists for at least 6 months, according to WHO (2022), or 12 months, according to APA (2014). There is strong distress, intense yearning or longing for the deceased, sadness, frequent crying, and preoccupation with thoughts or memories of the deceased. At least three of the following symptoms must occur on most days, for at least the past month (APA, 2022):

Identity disruption since the death (feeling as though part of oneself has died)
Marked sense of disbelief regarding the death
Avoidance of reminders that the person is deceased. Intense emotional distress (e.g. anger, bitterness, guilt)
Difficulty reintegrating socially, isolation)
Emotional numbness because of the death
Loss of sense of life and purpose
Intense loneliness as a consequence of the death

Source: Adapted from APA, 2014

According to WHO (2022), this disorder is more prevalent in women and, if not properly treated—along with its comorbidities (especially Major Depressive Disorder – MDD)—it may evolve into suicidal ideation and behavior.

Prolonged grief disorder may affect a person following the loss of someone due to any type of death; however, special attention should be given when the loss results from suicide. Culturally, there are more taboos and stigmas associated with discussions about suicide than with any other form of death. Therefore, individuals grieving a suicide have fewer opportunities to speak about their pain than those grieving other causes of death (DAMIANO et al., 2021).

According to Botega (2015), the grieving process following suicide tends to be more difficult and painful, as it combines feelings of sadness, shame, guilt, and anger.

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Additionally, it involves a series of questions regarding the reasons, psychosocial factors that contributed to the death, and countless reflections on what could have been done to prevent the tragic outcome. This psychological movement may lead to a state of mental overload and intense suffering, making the grieving process more difficult to resolve.

4.4.5 Substance Use Disorder (Alcohol and Other Psychoactive Substances)

Another relevant issue observed as a consequence of exposure to traumatic situations—particularly significant in the aviation field—concerns the onset or intensification of psychoactive substance use. The World Health Organization (WHO, 2022) defines psychoactive substances as those that act on the nervous system and alter thought, affect, and behavior. These changes may range from mild stimulation, such as that caused by a cup of coffee, to more intense alterations in the perception of time, space, or even of one's own body (GALDURÓZ, 2006).

The use of substances such as alcohol, coffee, tranquilizers, cigarettes, and other drugs may initially serve as a way to relieve distress, but there are risks of predisposing the crew member to the development of dependence, worsening existing symptoms and/or causing serious illnesses. The effects of these substances on the brain include changes in attention, concentration, memory, emotional tension, and impairment of intellectual capacity, such as reasoning, judgment, and decision-making ability.

It is important to emphasize that the human element is the most flexible, adaptable, and valuable part of the aeronautical system, but it is also the most vulnerable to external influences that may negatively affect its performance (ICAO, 2003).

For diagnosis, in summary, there must be a problematic pattern of psychoactive substance use, with significant clinical and psychosocial impairments, and the presence of at least two of the following behaviors occurring within a 12-month period (APA, 2022):

Consumption in larger amounts or over a longer period than intended
Persistent desire or unsuccessful efforts to cut down or control use
A great deal of time spent in activities necessary to obtain the substance, use it, or recover from its effects
Craving or strong urge to use the substance
Recurrent substance use resulting in failure to fulfill major role obligations at work, school, or home
Continued substance use despite having persistent or recurrent social, interpersonal, or occupational problems caused or exacerbated by its effects

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Important social, occupational, or recreational activities are given up or reduced because of substance use
Recurrent substance use in situations in which it is physically hazardous due to health impairments
Continued use of stimulants despite knowledge of having a persistent or recurrent physical or psychological problem likely to have been caused or exacerbated by the substance
Tolerance – a need for markedly increased amounts of the substance to achieve intoxication or desired effect
Characteristic withdrawal syndrome

Source: Adapted from APA, 2022

According to Oliveira et al., professionals who face daily work-related stress, such as alternating shift schedules (especially night shifts), are subject to high demands for responsibility and attention. These professionals, however, are more susceptible to psychological illness, making them more vulnerable to the abusive use of psychoactive substances as a way to relax, enhance performance, cope with emotional and physical strain from work life, etc. Such substances may lead to severe conditions, resulting in extreme consequences in the performance of their duties. Therefore, considering the abusive use of psychoactive substances as a crucial risk factor for workplace accidents and incidents is fundamental to operational safety. Permanent strategies for prevention, detection, and treatment must be implemented through specific programmes in corporate environments.

4.4.6 Insomnia

Insomnia can be understood as a secondary symptom, frequently associated with conflicts, anxiety disorders, illnesses, or a specific sleep disorder. In the latter case, it is characterized by recurrent and persistent difficulty in initiating or maintaining sleep, resulting in dissatisfaction with its quality. When the condition lasts for more than three months and occurs at least three times per week, it is referred to as chronic insomnia; if it lasts for a shorter period, it is classified as acute insomnia. For diagnosis, the individual must report sleep-related distress and/or significant impairments in social, occupational, or other areas of daily functioning. Chronic insomnia may occur independently or be related to a mental disorder, another medical condition, or substance use, provided it began beforehand (AASM, 2014).

Chronic insomnia requires pharmacological and psychotherapeutic treatment, in which predisposing and precipitating factors are assessed. Understanding these factors, combined with psychoeducation and sleep hygiene techniques, is essential for mitigating and resolving insomnia. Sleep quality and achieving restorative sleep directly affect physical and mental disposition, as well as the maintenance of attention levels.

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4.4.7 Suicide

This is a tragic consequence related to intense psychological suffering and is closely associated with mental disorders. It is estimated that more than 80% of suicides are committed by individuals with some form of mental illness, both in developing and developed countries (DAMIANO et al., 2021).

There are several models and theories regarding the development of suicidal behavior. In summary, all describe it as a multifactorial phenomenon that presents at least four phases, which are not necessarily linear, consecutive, or obligatory: thoughts of death/desire or suicidal ideation; planning of the suicidal act; suicide attempt; and completed suicide (MELEIRO, 2018).

Various studies have concluded that PTSD represents a significant risk factor for suicidal thoughts and behaviors, being one of the few psychiatric disorders that distinguishes those who think about suicide from those who actually attempt self-extermination (WEBER, 2020). In the general population, individuals with PTSD are 14.9 times more likely to attempt suicide. Studies indicate that 95% of refugees who experienced a potentially severe traumatic event presented PTSD associated with suicidal behavior. Among war veterans, following depressive episodes, PTSD increases the likelihood of suicidal ideation by up to four times. The greatest risk factor for suicide is a history of previous attempts (LEIVA-BIANCHI, 2017).

The results of these studies suggest that the increase in suicidal ideation associated with PTSD may be caused by the presence of multiple psychiatric comorbidities, which is common among individuals suffering from this disorder. A case of death by suicide may elicit a wide range of feelings in those who face this difficult experience, such as shock, sadness, horror, confusion, anger, emptiness, shame, guilt, rejection, agitation, and helplessness. Generally, there is a tendency toward silence and isolation in the face of such a situation.

Although suicide usually occurs in solitude, it does not happen in isolation from a system that involves other people. The event is embedded in an “interinstitutional space” in which the workplace, family, friends, school, religious group, and other associations are affected. It is estimated that for each suicide, between 5 to 10 people are deeply impacted, and their emotional reactions are influenced by the social representations and attitudes of those around them (BOTEGA, 2015).

As presented, the individual with suicidal ideation who conceives a plan to carry out the act usually does so alone. However, unfortunately, we have observed a significant increase in cases of homicide followed by suicide and, to a lesser extent, cases of suicide assisted by aircraft, resulting in tragic consequences and immeasurable human impact. Preventive actions and the maintenance of safety barriers are essential in the aeronautical environment.

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When a suicide occurs in the workplace, in addition to immediate actions such as notification and activation of emergency response teams, institutional support for welcoming and providing practical assistance to the family is also necessary, along with psychological support for employees affected by the loss. These actions are referred to as postvention and aim to “encourage the expression of ideas and feelings related to the trauma and the processing of grief due to suicide.” The goal of postvention is to provide support, care, and minimize the development of possible psychological disorders in individuals affected in their workplace following suicide. Therefore, postvention can also be considered a form of prevention (BOTEAGA, 2015).

4.5 Final Considerations

Work cannot be viewed merely as the execution of tasks without considering subjectivity. Mental health occupies precisely a subjective “gap” that lies between prescribed work and actual work. While work can generate suffering, it is also a factor of growth and development. All institutions—military, public, or private—must consider human vulnerability in the face of various emotional impacts resulting from individual and collective traumatic experiences.

When it comes to offering psychological support in critical situations involving irreparable losses, it is essential to recognize that emotional factors can directly influence the occurrence of errors or negligence, which, in turn, may lead to tragedies. In cases of suicide involving a team member, support for managers and assistance for employees is indispensable. Providing a space for affected individuals—whether directly or indirectly—to express associations, memories, feelings, and representations plays a crucial role in reintegration and maintaining operational functionality in the workplace. Unlike machines, human nature benefits from attention, the valuing of life, empathy, and understanding of the effects of grief.

The proposal for emotional support activities goes beyond offering technical listening; it promotes exchanges and reflections based on critical situations, fostering care, breaking taboos, and reinforcing attention to mental health. In practice, institutions that manage post-critical care effectively tend to receive greater recognition and respect from their members.

Participants in support interventions often report benefits that extend beyond their professional lives, such as a broadened perspective on human suffering, enabling them to identify signs and symptoms in people within their social circles, families, or friends who may require specialized listening.

Moreover, the sense of belonging also provides individuals within institutional environments with a sense of security, reaffirms bonds among peers and leadership, and increases motivation. Expressions of gratitude are frequently heard regarding invitations to participate in support activities, the feeling of being cared for, recognition of oneself

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as someone important within the system, and the legitimate right to be heard and have their mourning period respected after potentially traumatic critical situations.

Another phenomenon observed in psychological support activities relates to previously experienced traumatic situations. These range from episodes of assault, accidents, loss of loved ones, workplace accidents, pregnancy loss, other suicides, and cases of sexual and psychological violence. Conflicting and psychologically difficult-to-process content finds a pathway to emerge through the current issue and gains a new opportunity to be addressed with professionals.

All emerging content must be treated legitimately, with the care of technical management that interprets singular situations within a group process, while ensuring that individual content is not overly exposed in the organizational psychological support setting. Professionals conducting such actions must be prepared to be approached after the group session ends and to provide one or more individual consultations. It is essential to have a health network available to ensure effective referral to multidisciplinary team professionals. Integrative medicine practices are complementary and welcome.

It is also advisable that support activities be conducted by more than one psychologist, preferably in pairs, and depending on the number of participants, by three professionals. While one or two are responsible for leading the group, another should maintain attentive observation of the group's verbal, physical, and emotional reactions, taking notes to guide specific clinical actions and to prepare minutes or reports, respecting all ethical care and professional confidentiality. Another relevant point is reinforcing the confidential nature of the activity with participants at the beginning of the session, as associations and fantasies that the content discussed in that work-related space might be disclosed to hierarchical superiors, managers, or directors are not uncommon.

Attention to the location of the room, acoustics, an adjacent room reserved for possible individual consultations, absence of cameras, low employee traffic, etc., is also welcome to provide psychological comfort and mitigate exposure. It cannot be expected that such settings will be available in all types of in-company psychological and psychiatric support. Regarding consultations conducted immediately after a natural disaster or large-scale accident, it is not possible to outline a setting, and the technical team must assess the best scenario to provide initial psychological care.

We conclude that, despite the variables involved in situational contexts, the uniqueness of each participant must be acknowledged. The real experience of dealing with loss and death is also symbolic, and rites of passage assist the psychic apparatus in the grieving process.

Emotional support work often brings reflections on the situations shared during group listening sessions. Analogous to aircraft accident investigations, the technical reflections that remain with professionals involved in psychological support can significantly contribute to the development of ethically grounded reports, both for planning strategic actions for the prevention, detection, and treatment of mental disorders,

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and for the creation of protocols, normative documents, and guiding frameworks for building and maintaining a culture of psychological safety and attention to mental health.

As established by Regulatory Standard No. 01 of the Ministry of Labor, updated by Ordinance MTE 1.419 of August 27, 2024, measures for the identification, assessment, and continuous prevention of psychosocial risks are mandatory in corporate environments. In addition to focusing on mapping, preventing, and treating already affected workers, simultaneous actions are also foreseen for the recognition, mitigation, and elimination of human, environmental, technological, and organizational components that pose risks to mental health in organizations. Psychosocial risk factors at work include: inadequate organizational management, excessive workloads, poor communication, lack of support, conflicting relationships, insecurity, lack of recognition, and situations of violence including moral and sexual harassment. Understanding and efficiently managing psychosocial risks is vital to promoting a healthy work environment and protecting the health and lives of employees.

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References

1. Albuquerque, B. S., & Zacarias, G. M. (2016). *Psychology as an ally in disaster risk management*. Revista Ordem Pública, 9(1), 109–120. <https://rop.emnuvens.com.br/rop/article/view/113>
2. Alves, E. G. R., Oliveira, D. R., & Antunes, L. A. (2021). *Psychology in air accidents*. São Carlos, SP: RIMA Publishing.
3. American Academy of Sleep Medicine. (2014). *International classification of sleep disorders* (3rd ed.). Darien, IL: AASM.
4. American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders: DSM-5-TR* (5th ed.). Washington, DC: APA.
5. Bacelar, A., & Pinto Jr., L. R. (2019). *Insomnia: From diagnosis to treatment*. São Caetano do Sul, SP: Difusão Editora.
6. Barreto, M. R. M., & Fonseca, C. S. (2010). *Psychological support after the occurrence of an aeronautical accident: A case report*. Revista Conexão SIPAER, 1(3). <http://conexaosipaer.com.br/index.php/sipaer/article/view/49>
7. Betts, K. S., Williams, G. M., Najman, J. M., & Alati, R. (2013). *The role of sleep disturbance in the relationship between post-traumatic stress disorder and suicidal ideation*. Journal of Anxiety Disorders, 27(7). <https://pubmed.ncbi.nlm.nih.gov/24176805/>
8. Botega, N. J. (2015). *Suicidal crisis: Assessment and management*. Porto Alegre, RS: Artmed.
9. Cogo, A. S. (2010). *The psychologist working in emergencies: Experience and meaning* (Master's thesis, Pontifical Catholic University of São Paulo). <https://tede2.pucsp.br/handle/handle/15935>
10. Conselho Federal de Psicologia. (2021). *Technical references for psychologists working in comprehensive risk, emergency, and disaster management*. Brasília, DF: CFP. https://site.cfp.org.br/wp-content/uploads/2021/10/Crepop-RT-Emergencias-e-Desastres-web_v2.pdf
11. Câmara, D. S. L., Marques, D. R., & Malagris, L. E. N. (2020). *Aeronautical accidents and PTSD in flight crews*. Boletim da Academia Paulista de Psicologia, 40(98), 119–128. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415711X2020000100013
12. Cordeiro, D. C., & Oliveira, J. G. (2019). *Case report of psychological support after aeronautical accident in fighter aviation*. Conexão SIPAER, 10(2), 6–14. <http://conexaosipaer.com.br/index.php/sipaer/article/view/621>
13. Damiano, R. F., Luciano, A. C., Cruz, I. D. G., & Tavares, H. (2021). *Understanding suicide* (1st ed.). Santana de Parnaíba, SP: Manole.
14. Ferraz, M. de, Azevedo, N., & Moreira, T. (2017). *Psychological support after accident: A case report in a Brazilian Navy aircraft squadron*. Revista da Aviação Naval, 47(77), 4–11. <https://portaldeperiodicos.marinha.mil.br/index.php/aviacaonaval/issue/view/386>

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15. Franco, M. H. P. (2005). *Psychological care for aviation emergencies: Theory reviewed in practice*. Estudos de Psicologia (Natal), 10(2), 177–180. <https://doi.org/10.1590/S1413-294X2005000200003>
16. Fukumitsu, K. O. (2018). *Life, death and grief: Brazilian perspectives*. São Paulo, SP: Summus Publishing.
17. Galduróz, J. C. F., et al. (2006). *First household survey on the use of psychotropic drugs in Brazil: Aviation, quality of life and institutional fatigue*. Campinas, SP, 203–218.
18. Giuntini, F. P. (2016). *The importance of psychoactive substance prevention in civil aviation – Aircraft pilots* (Undergraduate thesis, Unisul Virtual, Santa Catarina).
19. Leiva-Bianchi, M., Soto-Escalona, P., & Serrano, C. (2017). *Suicidal ideation and post-traumatic stress after the 27-F earthquake and tsunami*. Revista de Psicología, 16(1). <https://revistapsicologia.uchile.cl/index.php/RDP/article/view/46445>
20. Martins, D. A. (2003). *The concept of Human Factors in the International Civil Aviation Organization (ICAO): Human Factors Guidelines for Aircraft Maintenance Manual (Doc 9824)*. Montreal, Canada: ICAO.
21. Martinussen, M., & Hunter, D. R. (2018). *Aviation psychology and human factors*. Boca Raton, FL: Taylor & Francis Group.
22. Meleiro, A. (2018). *Psychiatry: Fundamental studies* (1st ed.). Rio de Janeiro, RJ: Guanabara Koogan.
23. Mesquita, M. I. (n.d.). *What is EMDR therapy and how does it work*. ITCC – Teaching, Research and Individual and Family Care. <https://intcc.com.br/o-que-e-a-terapia-emdr-e-como-funcional/>
24. Miguel, E. C., Lafer, B. M., Elkis, H., & Forlenza, O. V. (2021). *Psychiatric clinic: Psychiatric therapeutics* (2nd ed., Vol. 3). Barueri, SP: Manole.
25. Pan American Health Organization. (2015). *Psychological first aid: Guide for field workers*. Brasília, DF: PAHO.
26. Parkes, C. M. (1998). *Grief: Studies on loss in adult life*. São Paulo, SP: Summus Publishing.
27. Reason, J. (2000). *Human error: Models and management*. BMJ, 320(7237). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1117770/>
28. Shapiro, F. (2001). *Eye movement desensitization and reprocessing: Basic principles, protocol and procedures* (3rd ed.). New York, NY: Guilford Press.
29. Silva, P. O. (2016). *Effects of transcranial magnetic stimulation (TMS) for the treatment of post-traumatic stress disorder: Systematic literature review and meta-analysis* (Master's thesis, Santa Casa de São Paulo School of Medical Sciences).
30. Weber, F. C., Norra, C., & Wetter, T. C. (2020). *Sleep disturbances and suicidality in posttraumatic stress disorder: An overview of the literature*. Frontiers in Psychiatry. <https://www.frontiersin.org/articles/10.3389/fpsy.2020.00167/full>
31. World Health Organization. (n.d.). *International classification of diseases (11th revision)*.

5. Risk and Protective Factors

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5.1 Introduction

Suicide is a phenomenon that cannot be understood from a single perspective. In fact, there is a complex interaction among various factors that either enhance the context leading to suicidal action or distance the individual from such behavior. Furthermore, the uniqueness of each person and their specific context of factors result in distinct dynamics, which require a comprehensive evaluation of each case.

Within the aviation context, the National Transportation Safety Board (NTSB) recognizes that distinguishing between air occurrences involving suicidal intent and unintentional situations can be complex and difficult, as the circumstances of these two groups present similar characteristics (Lewis et al., 2007). According to the World Health Organization – WHO (2000), Mitchell et al. (2005), and Santos (2007), it is not possible to generalize the predictive value of each isolated factor outside its context. In this sense, it is also not feasible to define a uniform suicidal profile, although studies do recognize recurring characteristics among individuals (Bhatt et al., 2018; Baldaçara et al., 2021).

This section of the study aims to raise awareness and promote prevention regarding risk factors, as well as to elucidate the main protective factors against the risk of suicide and homicide in aircraft. Although the incidence of in-flight suicide cases is low, the recorded cases are characterized by high lethality when they do occur (Kenedi, Appel, & Friedman, 2019). Therefore, understanding this topic becomes relevant for the aviation community. To achieve the proposed objectives, scientific research was conducted to investigate contributing risk factors and their possible protective counterparts.

5.2 Myths about Suicide

Suicide is a phenomenon surrounded by ignorance, fear, prejudice, discomfort, and condemnatory attitudes, which lead to silence regarding the issue. The booklet *Demystifying Suicide* by the TJE (2018, p. 8) defines suicidal ideation as “something that can develop in individuals from different backgrounds, social classes, ages, genders, and sexual orientations. It results from a complex interaction of biological, genetic, psychological, social, cultural, and environmental factors.”

One of the false social myths surrounding suicide is that those who intend to take their own lives do not give any warning. However, we know this is not true, and all warning signs that may indicate a person is thinking about suicide should be taken seriously. Often, these signs are expressed through subtle changes in behavior, such as a sudden urgency to organize financial matters and settle outstanding issues, which may go unnoticed in the workplace. In aviation, it is common for pilots not to report their

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psychological suffering due to fear of being removed from duty, which in turn leads to the development of addictions that mask their mental condition.

There is also the misconception that suicide is an individual decision, since everyone has the full right to exercise their free will. However, many individuals who commit suicide suffer from mental disorders such as schizophrenia, substance dependence/abuse, depression, among others, which radically alter their perception of reality and interfere with their free will. Another major factor is the lack of awareness of the individual's diagnosis, which allows them to make sudden and surprising decisions regarding the suicidal act. It is important to emphasize that suicide is not necessarily linked to a mental disorder, but rather to a critical moment that can be overcome. People are less likely to take their own lives when they accept help and are aware that they are ill.

Another recurring myth in the general population is that those who commit suicide are weak. Individuals who attempt suicide are experiencing intense psychological suffering, and this is widely supported by various studies and research in the field of mental health (Silva, 2016; O'Connor & Pirkis, 2020). It is important to highlight that suicide is a complex and multifaceted phenomenon, influenced by various factors, including social, psychological, and biological ones.

It is commonly believed that a person who overcomes a suicidal crisis or survives a suicide attempt is no longer at risk. However, studies show that those who survive a suicide attempt are more likely to make further attempts in the future (Pisani et al., 2023; Barzilay et al., 2023). Therefore, it is essential that these individuals continue to receive care and attention (Silva et al., 2016).

Moreover, it is important to emphasize that warning signs related to suicide should not be considered in isolation. Demystifying this subject and giving it proper attention are of utmost importance for prevention. As pointed out in the *Demystifying Suicide* booklet by the TJE (2018), data from the World Health Organization (WHO) emphasize that 90% of suicide cases can be prevented, provided there are adequate conditions to offer voluntary or professional help. Therefore, it is crucial to overcome the stigmas associated with suicide, provide continuous support to individuals who have already experienced suicidal crises, and ensure access to mental health resources and services to prevent future attempts.

The taboo surrounding the discussion of this topic is based on the misconception that talking about it may increase the chances of someone committing suicide. This erroneous belief causes many people to hesitate when faced with someone who is contemplating taking their own life. However, this is a highly harmful myth. Talking about suicide with someone experiencing suicidal thoughts can offer alternatives and encourage seeking professional help. With appropriate treatment, significant improvements can be achieved, and suicidal ideation can even be eliminated (Barbosa & Rosa, 2022).

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Another common myth is the belief that suicide is exclusive to people from higher social classes. This mistaken idea arises from the perception that individuals from lower socioeconomic classes do not have time to think about suicide. However, studies show that people facing extreme hardship or financial difficulties are more susceptible to psychological harm, developing conditions such as depression, anxiety, and suicidal ideation. Individuals with low income tend to seek medical help less often when facing health problems, while those with higher per capita family income have easier access to specialized professionals, private consultations, and necessary medications, which are relatively expensive for low-income individuals (Santos & Kassouf, 2007).

There is also a belief that suicidal behavior is hereditary—that is, having a family member who has attempted or committed suicide increases the likelihood that an individual will also attempt it. However, this does not necessarily mean that the person will develop suicidal ideation. Likewise, the absence of a family history of suicide does not mean someone is free from this concerning thought. The combination of genetic factors related to personality and mood disorders, such as depression and bipolar disorder, or other neuropsychiatric disorders—which also have a hereditary basis—demonstrates the genetic influence on suicidal behavior. Nevertheless, the increased risk of suicide associated with a suicidal family member is not always accompanied by a history of psychiatric disorder (Santos & Kassouf, 2007).

An individual's behavior is influenced by various factors, including genetics, family history, habits, and worldview. In the case of people with a family history of suicide, there is often a greater concern with the subject present in their narrative, which may lead to psychological identification with a relative who committed suicide. This occurs because we are psychosocial beings, shaped by our experiences.

Based on this understanding, two conclusions can be drawn. The first is that there is an increased risk of suicidal behavior among relatives of individuals who have committed suicide. The second is that more severe psychiatric disorders, such as bipolar disorder, depression, schizophrenia, and substance abuse, also have a hereditary component and increase the risk of suicide.

However, it is important to emphasize that this does not mean suicidal behavior or psychiatric disorders are inevitable solely due to an aggravating family history. There are various protective factors and prevention strategies that can be adopted, including therapeutic interventions, social and psychoeducational support, which can help reduce risk and promote the mental health of individuals with a family history of psychiatric disorders and suicidal behavior.

To understand this entire process, the risk and protective factors will be described below.

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5.3 Risk Factors

One of the main challenges in risk analysis for patients evaluated as being subject to behavior that may lead to suicide is the tendency to reduce the assessment to a kind of checklist of risk factors versus protective factors. A comprehensive and multidisciplinary care evaluation may be necessary to adequately stratify the risk.

Although risk factors are associated with a higher prevalence of suicide, it is important to remember that about half of the cases occur in patients classified as low risk, once again indicating the need for a very careful individualized assessment (Large et al., 2016).

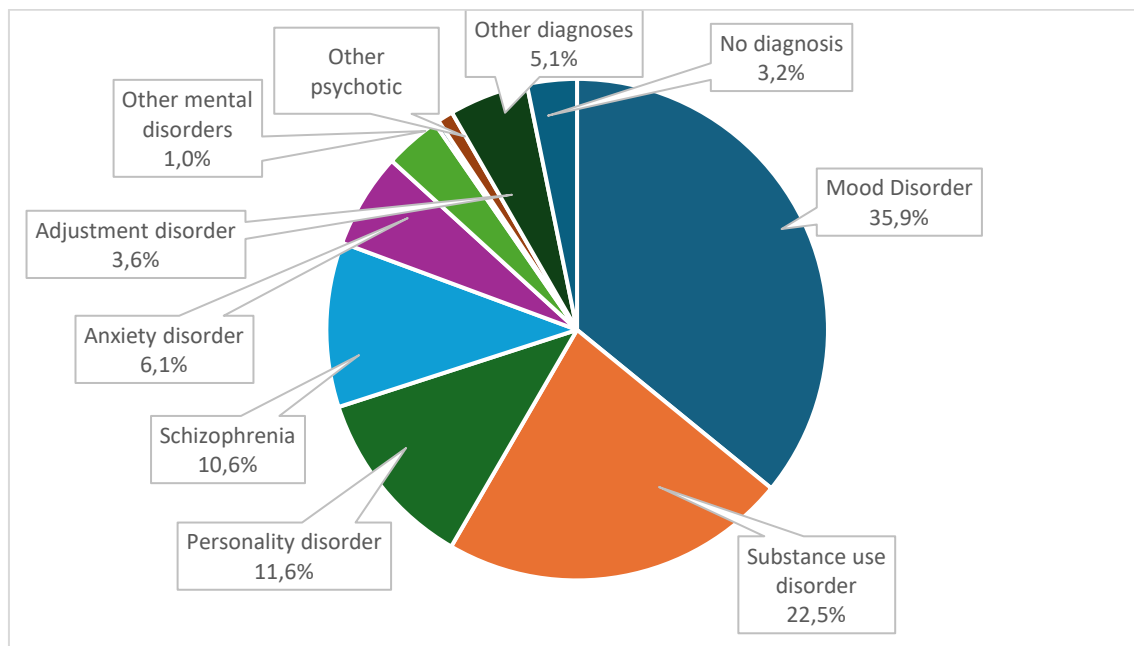
No risk factor, in isolation, should be regarded as the sole cause of such a complex and multifaceted phenomenon as suicidal behavior analysis. The examiner must associate the symptoms present in the individual with the risk and protective factors they exhibit.

Aircraft pilots face a series of risk factors that can affect their physical and mental health. Among these factors, we can highlight occupational stress, mental disorders, sleep problems, alcohol and drug abuse, as well as personal and financial issues.

The research conducted by Bertolote and Fleischmann (2002) brought to light the importance of including biological factors in this evaluation. By analyzing records of 15,000 suicide cases in various countries, it was found that 96.8% of these individuals had documented mental illnesses. This discovery led to the systematic study of interactions between genetics, other biological issues, and the environment, resulting in a more comprehensive and dynamic understanding of the risk and protective factors related to suicide.

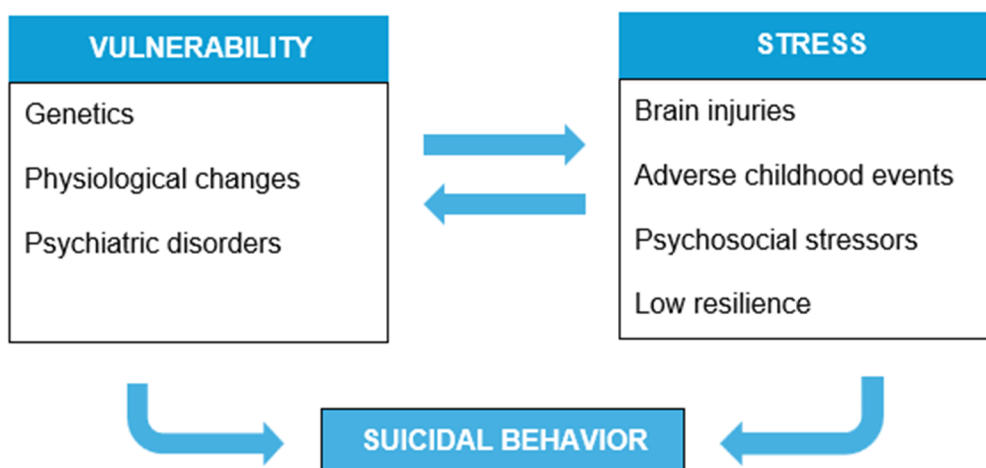
Although there is no single scale or method to determine an individual's suicide risk, knowledge about how these factors operate can support more well-founded decision-making for prevention. Based on these studies, the presence of mental illness is currently considered the greatest risk factor for suicidal behavior, without excluding others. Thus, different pathologies imply different levels of risk, as shown in the figure below:

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Source: Booklet “*Suicide: Informing to Prevent*” Brazilian Association for Research – ABP / Federal Council of Medicine – CFM, 2014.

The connection between mental illnesses and suicidal behavior is primarily attributed to two key factors: increased impulsivity and cognitive constriction, the latter altering the perception of reality. It is important to highlight that most suicide cases occur impulsively. Furthermore, in the context of suicidal behavior—which encompasses suicidal ideation, suicide attempts, and completed suicide—risk and protective factors interact in a complex manner, as illustrated in the figure below:



Source: Booklet “*Suicide: informing to prevent*” – Brazilian Psychiatric Association (ABP) / Federal Council of Medicine (CFM), 2014.

It is a hazardous task to list all risk factors relevant to a specific culture or group of individuals, especially crew members, who are subjected to numerous work-related

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variables. However, based on a consensus in the specialized literature, it is possible to identify the main factors already researched and associated with suicide attempts or even completed suicide (BALDAÇARA et al., 2021), as highlighted below:

Risk Factors:

- History of previous suicide attempt (the greatest risk factor).
- Presence of mental illness:
 - often undiagnosed;
 - frequently untreated or inadequately treated;
 - borderline personality disorder, anorexia nervosa, major depression, and bipolar disorder are the psychiatric conditions with the highest suicide risk (CHESNEY, 2014); and
 - it is important to remember that many mental illnesses are chronic and should be treated continuously to prevent relapses. Generally, treatment does not result in work incapacity, although this must be assessed individually.
- Family history of suicide and/or suicide attempts (heritability for suicide attempt propensity is 55%).
- Adverse events in childhood and adolescence.
- Male gender (women attempt suicide three times more than men, but men use more lethal means, which is relevant in this context).
- Recent losses.
- Social isolation.
- Also noteworthy are the absence of social support, unemployment, cognitive rigidity, disabling physical illnesses, and lack of adherence to treatment.

Suicide prevention does not follow a simple formula, but increasing protective factors and reducing risk factors has proven to be an effective approach. According to the Health Department of the Federal District (2016), the WHO highlights that suicide is the second leading cause of death among people aged 15 to 29, yet 90% of cases can be prevented. Specifically regarding mental illnesses, they can be treated, allowing patients to regain the will to live.

It is important to understand that suicide is generally not a direct desire for death, but rather an expression of ambivalence. The suicidal individual does not necessarily seek death itself, but the end of their suffering, which is perceived as inescapable, endless, and unbearable. When this suffering is reduced or disappears, the desire to live and appreciation for life return (SANTOS; KASSOUF, 2007).

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Some environmental and work-related factors, such as long working hours, shift work, and lack of sleep, may contribute to individual illness, including occupational stress. Occupational stress has been studied as a factor that intensifies the three components of Burnout: emotional exhaustion, depersonalization, and reduced engagement capacity (MASLACH; JACKSON; LEITER, 1996). Therefore, this type of chronic stress has been associated with the development of Burnout (BRYANT-LEES et al., 2021). According to this author, both occupational stress and Burnout are related to psychological suffering and Post-Traumatic Stress Disorder (PTSD).

Moreover, pilot mental health is a relevant factor, as the pressures associated with the pilot's job can affect their mental and emotional health, leading to conditions such as depression, anxiety, and other psychiatric disorders. According to Wiegmann and Shappell (2016), the mental health of this professional is a critical factor in aviation operational safety and is essential to ensure the well-being of the pilot, crew, and passengers. This study highlights that mental health issues can affect attention, memory, decision-making, and other skills essential to flight safety.

The 1982 accident involving Captain Seiji Katagiri³ is an example that illustrates how mental health affects judgment and can lead to suicidal behavior. During the incident, Katagiri engaged the aircraft's engines in reverse, resulting in a loss of altitude and the death of 24 passengers. Reports indicate that the captain was out of control, crying intensely in the cockpit (THOMAS, 2022). He suffered from hallucinations and depression. This case underscores the importance of considering mental health in high-responsibility professions and highlights the need for awareness and support for individuals facing mental health issues to prevent tragic outcomes.

Sleep problems are another factor affecting pilots, according to Caldwell (2005). Sleep deprivation is a common issue in aviation due to long working hours and frequent time zone changes. Furthermore, this deprivation may contribute to mental health problems such as depression and anxiety. Research shows that sleep deprivation can affect a person's mood and emotions, increasing the risk of developing mental disorders (BAGLIONI; SPIEGELHALDER; LOMBARDO; RIEMANN, 2010). Pilots face significant levels of stress, and sleep deprivation can exacerbate this stress, leading to mental health issues.

An additional example that highlights the influence of mental health is the case of Germanwings Flight 9525, which occurred in 2015. In this accident, co-pilot Andreas Lubitz deliberately crashed the aircraft into the French Alps, resulting in the death of all 150 people on board. It was later revealed that Lubitz suffered from mental health issues,

³ Japan Air Lines Flight 350 was a McDonnell Douglas DC-8-61, registered JA8061, operating a regular domestic passenger flight from Fukuoka to Tokyo, Japan. The aircraft crashed on February 9, 1982, while approaching Haneda Airport, in Tokyo Bay, resulting in 24 fatalities. Flight 350 was the first Japan Air Lines accident of the 1980s. The investigation attributed the cause of the accident to the deliberate actions of the aircraft's Captain.

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including depression and suicidal tendencies. This tragic event underscores the importance of properly recognizing and treating mental health issues, especially in high-risk professions, in order to prevent devastating consequences (MELLO, 2015).

According to Kenedi, Appel, and Friedman (2019), a recent analysis of pilot suicide cases in the five years prior to and the two years following the tragic homicide-suicide episode involving Germanwings revealed that six out of nine pilots who used aircraft to commit suicide had expressed suicidal thoughts to others before the acts. Surprisingly, five of these pilots disclosed their intentions days before carrying out their suicides. The stigma associated with seeking help for mental and medical health issues often results in missed opportunities for treatment for these pilots.

Furthermore, the organizational culture of airlines plays an important role in this context. The practices and policies adopted by companies, along with the power dynamics among employees, can impact pilots' mental well-being. The work environment may create a climate of fear and silence, making it difficult for pilots to seek help when needed. Additionally, the pressure to meet deadlines and maintain high standards of safety and performance can increase pilots' exposure to stressors such as fatigue and social isolation, which may contribute to suicidal behaviors.

Personal and financial issues are also factors that affect mental health and increase the risk of suicide. Several studies report the relationship between financial difficulties and mental health problems, including an increased risk of suicide. For example, a study conducted by Hawton et al. (2013) showed that financial problems were a contributing factor in 32% of suicide attempts.

A related example is Flight MI 185, which departed from Jakarta, Indonesia, bound for Singapore on December 19, 1997. During the flight, the aircraft was cruising at an altitude of 35,000 feet over Sumatra Island when it suddenly plunged at high speed into a river, resulting in the death of 104 passengers. After investigations, Indonesian authorities concluded that Captain Tsu Way Ming had intentionally manipulated the flight instruments. Investigators discovered that the pilot was facing several financial problems and, in the week prior to the accident, had purchased a life insurance policy that covered the mortgage of the house where he lived with his wife and three children, in the event of his death (FLIGHT SAFETY, 2008).

Alcohol can also affect people's mental health, increasing the risk of depression, anxiety, and other mental disorders. According to Pompili et al. (2010), alcohol abuse is one of the main risk factors for suicide, potentially increasing the likelihood of a person committing such an act by up to ten times.

The abuse of other drugs can also cause serious physical and mental health problems. According to the World Health Organization's *Global Status Report on Alcohol and Health* (2014), the abuse of psychoactive substances is one of the main risk factors for suicidal behavior, potentially leading to a significant increase in the risk of suicide attempts and completed suicide.

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The risk factors affecting aircraft pilots are complex and interrelated, requiring a comprehensive assessment of each case. Understanding these factors is important for preventing aviation accidents and promoting pilots' mental health. Implementing policies and practices aimed at supporting pilots' mental health and creating a healthy and positive work environment can help reduce the risk of suicide and improve aviation safety. This may include the implementation of psychological support programmes and encouraging the pursuit of professional help to deal with mental health issues. Additionally, it is important for airlines to foster a healthy and encouraging work environment that values open, transparent communication and collaboration among employees.

5.4 Protective Factors

Regarding this topic, it is important to first highlight the concept of protective factors, which are those that act preventively against suicide. Thus, strong emotional bonds, a sense of belonging to a group or community, religiosity, being married or in a stable relationship, and having young children are considered some of the protective factors, as well as personality traits and cognitive style (BOTEGA, 2015). These factors can reduce the level of suicide risk by strengthening the individual's coping capacity. In this sense, the feeling of belonging to groups and social support mitigate the effects of loneliness and isolation experienced in various environments.

With respect to the relationship between life satisfaction and domains of suicidal ideation, a negative association was found between this construct and repulsion toward life (SANTOS et al., 2016), as well as, according to studies by Chioquetta and Stiles (2007), an association between life satisfaction and lower levels of suicidal ideation.

Passareli and Silva (2007) emphasized the importance of Seligman's Authentic Happiness Theory, which highlights that life satisfaction stems from three elements: positive emotions, engagement, and meaning. Thus, positive emotions represent what we feel and what brings us satisfaction, such as pleasure, enthusiasm, ecstasy, and comfort. When we lead a life that succeeds in this element, finding pleasure and achievable challenges, we have what Seligman (2004) calls a pleasant life. These feelings may be associated with the present (physical pleasures and comfort), the past (satisfaction, contentment, pride, and serenity), and the future (optimism, hope, confidence, and faith).

Another important element is engagement, which refers to the ability to become involved with a goal until it is achieved: fully committing without noticing the passage of time, occurring when one loses self-awareness in an engaging activity. Regarding this element, Seligman (2004) states that it is essential to use our personal talents and strengths. People who have a life goal possess what this professor from the University of Pennsylvania calls an engaged life.

The third element, called meaning, means that we must live with purpose and meaning to belong to and serve something greater than ourselves. According to Seligman (2004), this meaning can be experienced through institutions created by humanity that

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allow for such purpose: religion, family, scouting, etc. Based on this element, the author defines a meaningful life as the use of individual virtues and strengths to achieve one's goals.

Sleep quality and duration are protective factors, as research indicates a significant relationship between sleep and the risk of suicidal ideation (BRYANT-LEES et al., 2021). According to Walker and Van der Helm (2010), sleep is important for regulating emotions. Affective memories are preferentially enhanced during sleep periods, and the extent of emotional memory improvement is associated with specific characteristics of REM sleep, both in quantity and quality. Thus, sleep loss has been shown to amplify the negative emotional consequences of disruptive daytime experiences while dulling the positive benefits associated with rewarding activities. A night of sleep can enable appropriate affective brain reactivity to the emotional challenges of the following day, maintaining the functional integrity of the mPFC-amygdala circuit, influencing appropriate behavioral repertoires such as ideal social judgments and rational decisions.

Research conducted with remote aircraft pilots from the U.S. Air Force indicated that, although the isolation required for the activity is a risk factor, support from fellow service members—especially from leadership figures—promotes health and mitigates the risk of suicidal ideation (BRYANT-LEES et al., 2021). Furthermore, the same research found that service members who had such support were more likely to seek help from health professionals compared to those who did not report feeling supported by peers and leaders.

Analyses of the profiles of individuals involved in aviation incidents with characteristics suggestive of possible suicide may aid in the development of preventive indicators based on observable behaviors. One tool for developing such profiles is toxicological testing, when possible, on the bodies of deceased pilots. Post-mortem toxicological evaluations may provide relevant data regarding the use of psychiatric medications and the abuse of legal or illegal substances. However, such data must be interpreted with caution, as the presence of psychiatric medications is not necessarily related to suicidal behavior (VUORIO, 2017). Another rich source of information is the medical history of the deceased. However, such data are often underexplored, as many investigation committees lack medical personnel and/or do not have contact with the physician who previously treated the deceased (VUORIO, 2017).

The process of gathering these data and constructing a detailed profile and history of the individual is called psychological autopsy. Thus, investigators can conduct a psychological autopsy, going back many years in the medical history with the help of interviews and any available records of the pilot's background (VUORIO, 2014).

In conclusion, the following protective factors can be highlighted:

- High self-esteem;
- Strong family support and well-established social bonds;

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- Religiosity and a reason to live;
- Absence of mental illness;
- Living with meaning and purpose;
- Having children at home and a sense of responsibility toward the family;
- Desired and planned pregnancy; and
- Resilience.

5.5 Risk Assessment

According to the booklet *Suicide: informing to prevent* (2014), published by the Brazilian Psychiatric Association, the World Health Organization (WHO) identifies three common psychopathological characteristics in the mental state of individuals at risk of suicide: ambivalence, impulsivity, and rigidity.

- **Ambivalence:**
 - the desire to live and to die are confused within the individual; and
 - there is an urgency to escape pain and suffering, flee from problems, and find rest.
- **Impulsivity:**
 - the impulse to commit suicide is transient and lasts only a few minutes or hours; and
 - the impulse is generally triggered by negative psychosocial events: rejection, reprimand, failure, bankruptcy, death of a loved one, etc.
- **Rigidity:**
 - inability to perceive alternative ways to cope with or resolve the problem.

Also according to the aforementioned booklet, mental functioning revolves around three core feelings:

- **Intolerable** (“I can’t take it anymore”);
- **Inescapable** (“There’s no way out”);
- **Interminable** (“This will never end”).

In addition to the psychopathological characteristics mentioned above, other aspects must be considered in a risk assessment:

- How close was the patient to completing suicide?
- Has the patient attempted suicide before?
- Does the patient have the ability to control their impulses?

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- Are there recent stressors that have worsened their ability to cope or participate in the treatment plan?
- Are there protective factors?
- What reasons does the patient have to stay alive?
- What is the patient's outlook on the future?

Regarding levels of risk, they are classified as low, medium, and high, and their management can be carried out as follows:

- **Low Risk:** the person has had some suicidal thoughts but has not made any plans. Management:
 - listen, welcome, understand, and alleviate suffering;
 - facilitate the individual's connection to available support and help: social, institutional, familial, and religious;
 - treat any possible psychiatric disorder; and
 - refer to a specialized professional.
- **Medium Risk:** the person has suicidal thoughts and plans but does not intend to commit suicide immediately. Management:
 - take full care with any means of suicide that may be present in the care environment;
 - listen and establish a non-suicide therapeutic contract;
 - invest in potential protective factors;
 - request permission to contact family and/or friends, providing guidance on preventive measures: hiding weapons, knives, ropes; keeping medications in places inaccessible to the person, etc.;
 - in the case of pilots, they must undergo evaluation and treatment before returning to duty, and their return should be conditional on the remission of risk;
 - make family and friends allies in protecting the patient, while preserving confidentiality of personal information; and
 - refer to psychiatric services.
- **High Risk:** the person states they will commit suicide and has plans. Management:
 - establish a "non-suicide" contract;
 - inform family and/or friends; and

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- refer to psychiatric services for evaluation, intervention, and, if necessary, hospitalization – this is a psychiatric emergency.

In light of the above, we reinforce the broad scope of risk factors, which include psychosocial, medical, and personality aspects, all of which must be rigorously investigated in order to attempt to mitigate the risk of suicide in the individual in question.

5.6 Final Considerations

The risk factors for suicide are complex and encompass multiple aspects, making its occurrence difficult to predict. Therefore, it is extremely important to prevent its emergence due to its lethal potential, even though such events are rare. In the context of mental health and suicide, it is relevant to emphasize that, in the case of pilots, maintaining regular health and undergoing medical examinations are essential to identify risk factors related to suicidal behavior.

It is also important to highlight that the risk factors for pilots may differ somewhat from those of the general population, especially regarding the role of psychiatric disorders. However, it is necessary to acknowledge the limitations of this study, as the data are based on accident reports and investigations, without access to additional medical information to determine the profiles of pilots involved in suicides or information about previous attempts. Moreover, the known data depend on reports from the NTSB, which in some cases are incomplete and leave certain details unknown (LAUKKALA et al., 2018).

Despite these limitations, analyzing these risk factors and their particularities in the context of pilots is essential for implementing effective preventive measures. Understanding the specific aspects related to aviation and the profiles of pilots with mental health issues can contribute to the development of more targeted and effective strategies for promoting mental health and preventing suicide within this professional group.

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References

- Brazilian Psychiatric Association. (2014). *Suicide: informing to prevent*. Brazilian Psychiatric Association, Commission for the Study and Prevention of Suicide. Brasília: CFM/ABP.
- Barbosa, E. R., & Rosa, J. P. da C. (2022). *15 myths about suicide*. Paraná Institute of Psychiatry. Retrieved May 23, 2023, from <https://institutodepsiquiatriapr.com.br/blog/15-mitos-sobre-o-suicidio>
- Baglioni, C., Spiegelhalder, K., Lombardo, C., & Riemann, D. (2010). Sleep and emotions: A focus on insomnia. *Sleep Medicine Reviews*, 14(4), 227–238. <https://doi.org/10.1016/j.smr.2009.10.007>
- Bhatt, M., Perera, S., Zielinski, L., Eisen, R. B., Yeung, S., El-Sheikh, W., DeJesus, J., Rangarajan, S., Sholer, H., Iordan, E., Mackie, P., Islam, S., Dehghan, M., Thabane, L., & Samaan, Z. (2018). Profile of suicide attempts and risk factors among psychiatric patients: A case-control study. *PLoS ONE*, 13(2), e0192998. <https://doi.org/10.1371/journal.pone.0192998>
- Baldaçara, L., Rocha, G. A., Leite, V. S., Porto, D. M., Grudtner, R. R., Díaz, A. P., Meleiro, A., Correa, H., Tung, T. C., Quevedo, J., & Silva, A. G. da. (2021). Brazilian Psychiatric Association guidelines for the management of suicidal behavior. Part 1: Risk factors, protective factors, and assessment. *Brazilian Journal of Psychiatry*, 43(5), 525–537. <https://www.scielo.br/j/rbp/a/cmpMjxk5QTgVfxk7GzTysZN/>
- Barzilay, S., Fine, S., Akhavan, S., Haruvi-Catalan, L., Apter, A., Brunstein-Klomek, A., Carmi, L., Zohar, M., Kinarty, I., Friedman, T., Fennig, S. (2023). Real-time real-world digital monitoring of adolescent suicide risk during the six months following emergency department discharge: Protocol for an intensive longitudinal study. *JMIR Research Protocols*, 12, e46464. <https://doi.org/10.2196/46464>
- Bertolote, J. M., & Fleischmann, A. (2002). Suicide and psychiatric diagnosis: A worldwide perspective. *World Psychiatry*, 1(3), 181–185. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1489848/>
- Botega, N. J., Werlang, B. S. G., Cais, C. F. da S., & Macedo, M. M. K. (2015). Suicide behavior prevention. *Psico*, 37(3), 213–220. <https://revistaseletronicas.pucrs.br/ojs/index.php/revistapsico/article/view/1442>
- Bryant-Lees, K. B., Martinez, R. N., Frise, A., Bryan, C. J., Goodman, T., Chappelle, W., & Thompson, W. (2021). Predictors and protective factors for suicide ideation across remotely piloted aircraft career fields. *Military Psychology*, 33(4), 228–239.
- Caldwell, J. A. (2005). Fatigue in aviation. *Travel Medicine and Infectious Disease*, 3(2), 85–96. <https://www.sciencedirect.com/science/article/abs/pii/S1477893904001012>

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Chesney, E., Goodwin, G. M., & Fazel, S. (2014). Risks of all-cause and suicide mortality in mental disorders: A meta-review. *World Psychiatry*, 13(2), 153–160. <https://pubmed.ncbi.nlm.nih.gov/24890068/>

Chioqueta, A. P., & Stiles, T. C. (2007). Psychological buffers, hopelessness, and suicidal ideation. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 28(2), 67–73. <https://pubmed.ncbi.nlm.nih.gov/17722687/>

Coordenadoria de Serviços Psicossociais e de Saúde, Secretaria de Gestão de Pessoas / PJES. (2018). *Booklet: Demystifying suicide* (1st ed.). Espírito Santo. Retrieved May 23, 2023, from www.tjes.jus.br

Distrito Federal, Secretaria de Saúde. (2016, August 30). *According to WHO, 90% of suicide cases could be prevented*. Brasília. Retrieved May 23, 2023, from <https://www.saude.df.gov.br/web/guest/w/segundo-oms-90-dos-casos-de-suicidio-poderiam-ser-evitados>

Flight Safety Australia. (2018). Final flight: SilkAir. *Flight Safety Australia*, 18–28.

Hawton, K., Casañas, C. C., Hall, C., & Saunders, K. (2013). Risk factors for suicide in individuals with depression: A systematic review. *Journal of Affective Disorders*, 147(1–3), 17–28. <https://www.sciencedirect.com/science/article/abs/pii/S0165032713000360>

Kenedi, C. A., Appel, J. M., & Friedman, S. H. (2019). Medical privacy versus public safety in aviation. *The Journal of the American Academy of Psychiatry and the Law*, 47(2), 224–238. <https://jaapl.org/content/early/2019/04/18/JAAPL.003839-19>

Laukkala, T., Vuorio, A., Bor, R., Budowle, B., Navathe, P., Pukkala, E., & Sajantila, A. (2018). Copycats in pilot aircraft-assisted suicides after the Germanwings incident. *International Journal of Environmental Research and Public Health*, 15(3), 491. <https://doi.org/10.3390/ijerph15030491>

Large, M., Kaneson, M., Myles, N., Myles, H., Gunaratne, P., & Ryan, C. (2016). Meta-analysis of longitudinal cohort studies of suicide risk assessment among psychiatric patients: Heterogeneity in results and lack of improvement over time. *PLoS ONE*, 11(6), e0156322. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4902221/>

Lewis, R. J., Johnson, R. D., Whinnery, J. E., & Forster, E. M. (2007). Aircraft-assisted pilot suicides in the United States, 1993–2002. *Archives of Suicide Research*, 11(2), 149–161. Retrieved from <https://psycnet.apa.org/record/2007-07920-002>

Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *Maslach burnout inventory manual* (3rd ed.). Palo Alto, CA: Consulting Psychologist Press.

Mello, G. (2015). The Germanwings air accident and its impacts on aviation. *Caderno de Seguro*, 185, 28–33. Retrieved from <https://cadernosdeseguro.ens.edu.br/pdf/cad-seg-185--artigo-gustavo-mello.pdf>

Mitchell, A. M., Garand, L., Dean, D., Panzak, G., & Taylor, M. (2005). Suicide assessment in hospital emergency departments – Implications for patient satisfaction and

5. Risk and Protective Factors

compliance. *Topics in Emergency Medicine*, 27(4), 302–312. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/20448823/>

World Health Organization. (2014). *Global status report on alcohol and health*. Geneva: World Health Organization. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/112736/9789240692763_eng.pdf

O'Connor, R. C., & Pirkis, J. (2020). *The international handbook of suicide prevention* (2nd ed.). Wiley Blackwell.

Passareli, P. M., & Silva, J. A. da. (2007). Positive psychology and the study of subjective well-being. *Estudos de Psicologia*, 24(4), 513–517.

Pompili, M., Serafini, G., Innamorati, M., Dominici, G., Ferracuti, S., Kotzalidis, G. D., Serra, G., Girardi, P., Janiri, L., Tatarelli, R., Sher, L., & Lester, D. (2010). Suicidal behavior and alcohol abuse. *International Journal of Environmental Research and Public Health*, 7(4), 1392–1431. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2872355/pdf/ijerph-07-01392.pdf>

Pisani, A., Connor, K., Van Orden, K., Jordan, N., Landes, S., Curran, G., McDermott, M., Ertefaie, A., Kelberman, C., Ramanathan, S., Carruthers, J., Mossgraber, K., & Goldston, D. (2023). Effectiveness of a targeted brief intervention for recent suicide attempt survivors: A randomised controlled trial protocol. *BMJ Open*, 13(3), e070105. Retrieved from <https://doi.org/10.1136/bmjopen-2022-070105>

Santos, W. S. dos, Ulisses, S. M., Costa, T. M. da, Farias, M. G., & Moura, D. P. F. de. (2016). Influência de fatores de risco e proteção frente à ideação suicida. *Psicologia, Saúde e Doenças*, 17(3), 515–526. Retrieved from <https://www.redalyc.org/articulo.oa?id=36249164016>

Santos, M. J. dos, & Kassouf, A. L. (2007). Uma investigação dos determinantes socioeconômicos da depressão mental no Brasil com ênfase nos efeitos da educação. *Revista Economia Aplicada*, 11(1), 5–26. Retrieved from <https://www.scielo.br/j/ecoa/a/mDtTXW3y776MFQyYkShc7Mv/abstract/?lang=pt>

Thomas, E. (2022, April 15). Suicide by jetliner. *Medium*. Retrieved from <https://medium.com/japundit/suicide-by-jetliner-635ff72c3835>

Walker, M. P., & Van Der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological Bulletin*, 135(5), 731–748. <https://doi.org/10.1037/a0016570>

Wiegmann, D. A., & Shappell, S. A. (2016). *A human error approach to aviation accident analysis: The human factors analysis and classification system*. Ashgate Publishing Ltd.

World Health Organization. (2014). *Preventing suicide: A global imperative*. Geneva: World Health Organization. Retrieved from http://www.who.int/entity/mental_health/suicideprevention/world_report_2014/en/index.html

6. Air Traffic Control Activity and Its Impact on Mental Health

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6.1 Introduction

The activity of air traffic control involves an extensive cognitive process. The individual performing this task must possess specific knowledge related to complex operational procedures, which involve constantly changing information. One of the main responsibilities of the controller is to ensure that aircraft fly safely, maintaining the minimum regulatory separation between them. This is accomplished through the provision of air traffic control services across the various units of the Brazilian Airspace Control System (SISCEAB, 2011).

These professionals are responsible for controlling aircraft during the various phases of flight, operating in aerodrome control towers, approach controls for terminal areas, area control centers, and air defense units. To provide air traffic control services, it is necessary to manage a wide range of data and work tools located on a console. The demands imposed are variable and depend on the region of the airspace and the traffic flow at a given moment. It is up to the controller to make final decisions, which, at times, must be executed within very limited timeframes (SISCEAB, 2011).

This profession carries immense responsibility, as it involves the transportation of lives and the management of high-value material assets. Moreover, it is considered stressful due to working conditions, shift schedules, and duty rosters. These characteristics can alter the biological cycle and sleep quality, compromising quality of life, increasing pressure in the work environment, and even leading to accidents. In this context, symptoms such as emotional exhaustion, burnout syndrome, and other mental disorders may develop (SISCEAB, 2011).

6.2 Burnout Syndrome

Burnout syndrome can be characterized as a psychological disorder involving emotional tension and stress related to physical, emotional, and psychological working conditions. It manifests especially in individuals whose professions require direct and intense interpersonal involvement. A typical symptom is the sensation of physical and emotional exhaustion, which is reflected in negative attitudes such as: absenteeism, aggressiveness, isolation, sudden mood swings, irritability, difficulty concentrating, memory lapses, anxiety, depression, pessimism, and low self-esteem (CID, 2022).

A Polish study evaluated stress perception and the occupational risk of developing burnout among air traffic controllers and highlighted a high risk of burnout in this population when compared to a group of firefighters. This study also emphasized that the work environment influences employee well-being and job satisfaction. In the case of air traffic controllers, variability in perceived stress levels was primarily determined by feelings of helplessness and, to a lesser extent, by self-efficacy. The evaluated air traffic

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controllers indicated that the presence of signs of helplessness in life situations were the most significant sources of stress perception, while the lack of efficiency in neutralizing and managing adversities had a lesser impact. A moderately strong correlation was observed between occupational exhaustion and perceived stress levels in the group of air traffic controllers (Makara-Studzińska et al., 2021).

Burnout syndrome may be related to feelings resulting from the depletion of physical energy, mental stamina, and cognitive capacity. Burnout symptoms develop as a consequence of work overload caused by occupational demands, leading to the professional's psychophysical exhaustion and reducing motivation to engage with tasks. Individuals with high positive self-esteem and a sense of control over their environment can mitigate the negative effects of workplace demands and increase commitment by mediating the relationship between job resources and engagement. These characteristics serve as tools to protect against exhaustion (Makara-Studzińska et al., 2021).

6.3 Air Traffic Control and Mental Health

Air traffic control is a profession that demands situational awareness from the individual—that is, cognitive competence to perceive elements of the work environment in space and time, in an optimized manner, and to process information in both the present and the future.

Although only 5% of commercial aircraft accidents result from air traffic control errors, 55% of accidents are caused by pilot errors and, directly or indirectly, involve air traffic controllers, according to an analysis of the causes of all civil aviation accidents in the United States between 1985 and 1997. This analysis showed that the highest percentage of accidents related to air traffic controllers were due to skill errors, indicating failures in attention or memory, decision-making errors, and perception errors (Pape et al., 2001). Nearly half of all fatalities occurred during final approach and landing. Taxiing, takeoff, approach, and landing are considered the most critical phases of flight for both pilots and air traffic controllers (Boening, 2018). Air traffic control has been classified as the fourth most stressful job, although this ranking may be underestimated (Vogt, Hagemann, & Kastner, 2006).

A study conducted by Truschzinski and collaborators sought to examine how air traffic control activity could influence emotional conditions and found that cognitive workload and task performance could lead controllers to exhibit high levels of neuroticism, compromising their ability to manage a greater number of aircraft and resulting in collisions (Truschzinski et al., 2018). Neuroticism may, under certain demands, cause reductions in attention, concentration, or memory—fundamental factors in the execution of tasks performed by these professionals. Furthermore, psychological factors such as neuroticism reduce cognitive processing capacity (Studer-Luethi et al., 2012). Air traffic controllers manage various tasks that require cognitive resources,

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making it necessary to continuously evaluate and monitor their performance (Loft, 2007; Majumdar, 2002).

Mental workload, fatigue, stress, loss of situational awareness, and decision-making capacity are human factors that influence professional performance and result in work-related errors (Graziani et al., 2016). The decision-making process of air traffic controllers chronically overloaded by workplace demands that exceed their resources can lead to a series of negative consequences. The most significant are health deterioration, symptoms of burnout syndrome, and the occurrence of risky situations at work. In the case of air traffic controllers, there is the possibility of “image loss,” which refers to the incorrect perception by the controller of an aircraft’s position compared to its actual location.

On the other hand, many errors occur in situations of workload underload, which highlights the role of optimal stress levels in cognitive function efficiency (Rodrigues et al., 2018). The so-called complacency syndrome—a sense of self-satisfaction accompanied by unawareness of real dangers—may explain the causes of aviation accidents that occur during routine flights (Kontogiannis & Malakis, 2009). According to Endsey, from the perspective of workload underload, automation has led to changes in the organization of work for pilots and air traffic controllers, making their work more passive, which can reduce reaction capacity, affect the peak efficiency of cognitive functions and skills, and increase workload when high levels of acute stress are present. Additionally, it may lead to overconfidence and riskier behaviors (Endsey et al., 2000).

There are few studies that have assessed stress perception among air traffic controllers. The Polish study confirmed the assumption of low stress perception in groups of air traffic controllers (Makara-Studzińska et al., 2021). This result is similar to findings from a study of Norwegian air traffic controllers (Martinussen et al., 2006). These data represent a positive outlook regarding the likelihood of tragic and costly errors in air traffic control. It is noted that human factors can be attributed to 70–80% of accidents in high-risk industries (Sneddon et al., 2006), a context in which air traffic control is situated.

Thus, maintaining the mental health of air traffic controllers, in addition to being a health promotion action, aims to ensure that these professionals perform their duties safely, as a single error can result in the loss of many lives. Physical and mental fatigue are among the most important factors related to air traffic control performance (Lyu et al., 2019), potentially increasing the occurrence of errors.

Understanding the human being as the most sensitive part of the flight safety triad (human, machine, and environment), the maintenance of physical and mental health must be prioritized by regulatory bodies in order to reduce the number of occurrences and accidents involving air traffic control. According to data from the Operational Safety Subsystem Management Information System for Airspace Control accessed in 2023 (SIGCEA), 603 air traffic occurrences were recorded over the past seven years. These

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statistical data reinforce the importance of implementing measures that enhance safety in control activities. The risk of aviation accidents and incidents will never be zero, and all measures adopted to ensure the safe execution of this activity must be encouraged (SIGCEA, 2023).

Aircraft accidents or incidents are events classified as the most serious in the context of air traffic occurrences. Over the past 10 years, CENIPA has concluded investigations into nine aviation incidents involving air traffic control. However, it is important to highlight that there are incidents and accidents from the past five years that are still under investigation, and therefore, these numbers may be underestimated (CENIPA, 2023).

To illustrate the impact of an aviation accident involving air traffic control activity, one can cite the 2006 Gol 1907 accident, the most severe to occur on national territory, resulting in the death of 154 people. In this accident, human error occurred both on the part of air traffic control and the pilots. This fact demonstrates how air traffic accidents can have catastrophic dimensions, and all measures that may minimize these risks must be adopted.

Air traffic controllers are a segment of the general population and are subject to the development of mental disorders. As an example, it is important to mention that depression is a relatively common condition in the general population, with an annual prevalence of 3 to 11%. It presents a chronic and recurrent course, with periods of remission and exacerbation. Up to 80% of individuals who receive treatment for a depressive episode will experience a second episode during their lifetime. In addition to being prevalent, chronic, and recurrent, depression is disabling, ranking as the fourth leading cause of social disability globally (Silveira et al., 2018).

In primary care services and other general medical services, 30 to 50% of depression cases go undiagnosed. It is likely that for professionals outside the mental health field, such as aircrew members, identification is even more difficult. Therefore, it is suggested that basic notions for identifying signs and symptoms suggestive of mental disorders be included in CRM training programmes (Silveira et al., 2018).

Inadequate adherence to medical recommendations and lack of access to optimal treatment may contribute to the worsening of the clinical condition, potentially culminating in suicide. The literature shows that the association between suicide and mental disorders exceeds 90%, with mood disorders accounting for approximately 35.8% of cases (Silveira et al., 2018).

6.4 Discussion

This chapter aimed to highlight the particularities inherent to air traffic control activity, its implications for quality of life at work, and the psychophysical health of these professionals. The need to work in shifts, to constantly improve specific knowledge, and

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to manage air traffic and the lives of multiple people simultaneously from a console makes the profession of air traffic controller one that demands attention from a psychophysical standpoint by regulatory bodies, as well as by the companies providing this service. The Airspace Control System (SISCEAB), in a survey conducted in 2011, had already pointed out that symptoms such as emotional exhaustion, burnout syndrome, and other mental disorders found a conducive environment for development among these workers.

The Polish study conducted by Makara-Studzińska et al. (2021) corroborates the conclusions of the SISCEAB survey by evaluating stress perception and the occupational risk of developing burnout among air traffic controllers compared to a group of firefighters—a population that also performs a socially responsible activity. In this study, a high risk of burnout was detected in the group of controllers compared to firefighters.

Burnout syndrome develops as a consequence of work overload caused by occupational demands, leading to the professional's psychophysical exhaustion. As a result, motivation to engage with tasks becomes compromised. A lack of commitment in such a sensitive activity as air traffic control may be the initial trigger in a sequence of errors that could eventually lead to an aviation accident.

Human errors originate from inattention, work overload, and lack of training. Actions that promote well-being in the workplace and improve quality of life are essential to reduce errors related to air traffic control activity.

Furthermore, Silveira et al. (2018) reported that depression is a common condition in the population, with an annual prevalence of 3 to 11%, a chronic and recurrent course, and periods of remission and exacerbation. Moreover, it is a disabling disease, ranking as the fourth leading cause of social disability globally. Air traffic controllers are part of society and are therefore susceptible to developing this comorbidity. Many cases of depression are underdiagnosed, and there remains significant social stigma surrounding mental illness. It is suggested that basic notions for identifying signs and symptoms suggestive of mental disorders be included in CRM training.

There are no statistical data regarding the incidence of mental disorders and suicide among air traffic controllers. Therefore, the implementation of general measures adopted for the broader population—such as providing adequate care conditions, effective treatment, and environmental control of risk factors—are considered essential elements.

6.5 Final Considerations

The development of programmes aimed at valuing life and promoting mental health among air traffic controllers is a tool that the regulatory body can adopt to address conditions such as depression, burnout, and even suicide within this class of workers.

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Regarding air traffic control professionals, the early identification of cases and referral to specialists is an important tool that has been used by other countries and has yielded positive results. This approach may be applied to address this health issue effectively.

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References

- Boeing. (2019). *Statistical summary of commercial jet airplane accidents: Worldwide operations 1959–2018*. Commercial Airplanes. http://www.boeing.com/resources/boeingdotcom/company/about_bca/pdf/statsum.pdf
- Borghini, G., Astolfi, L., Vecchiato, G., Mattia, D., Babiloni, F., & Cincotti, F. (2020). A multimodal and signals fusion approach for assessing the impact of stressful events on air traffic controllers. *Scientific Reports*, 10(1), 8600. <https://doi.org/10.1038/s41598-020-65653-0>
- Botega, N. J., & Soares, T. (s.d.). *Avaliação e manejo de risco de suicídio*. Pontifícia Universidade Católica do Rio Grande do Sul. <https://salavirtual.pucrs.br/curso/terapia-cognitivo-comportamental>
- Organização Mundial da Saúde (OMS). (2022). *Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde (CID-11)*. <https://www.paho.org/pt/noticias/11-2-2022-versao-final-da-nova-classificacao-internacional-doencas-da-oms-cid-11-e>
- Departamento de Controle do Espaço Aéreo (DECEA). (2011). *Análise do trabalho do controlador de tráfego aéreo no SISCEAB considerando a implementação de novas tecnologias*. Instituto de Pesquisas da Aeronáutica (IPA). https://www.fab.mil.br/Download/arquivos/sic/Relatorio_Gestao_2021.pdf
- Endsley, M., Bolté, B., & Jones, D. (2000). *Situation awareness in air traffic control: Enhanced displays for advanced operations*. U.S. Department of Transportation, Federal Aviation Administration. https://hf.tc.faa.gov/publications/2000-situation-awareness-in-air-traffic-control/full_text.pdf
- Fiocruz. (s.d.). *Fiocruz avalia excesso de suicídios no Brasil na primeira onda de Covid-19*. <https://portal.fiocruz.br/noticia/fiocruz-avalia-excesso-de-suicidios-no-brasil-na-primeira-onda-de-covid-19>
- Graziani, I., Dehais, F., & Tessier, C. (2016). Development of the human performance envelope concept for cockpit HMI design. In *Proceedings of the HCI-Aero 2016 International Conference on Human-Computer Interaction in Aerospace* (Paris, France, 14–16 September 2016). <https://hal.science/hal-01409075/document>
- Kontogiannis, T., & Malakis, S. (2009). A proactive approach to human error detection and identification in aviation and air traffic control. *Safety Science*, 47(5), 693–706. <https://doi.org/10.1016/j.ssci.2008.10.009>
- Loft, S., Sanderson, P., Neal, A., & Mooij, M. (2007). Modeling and predicting mental workload in en route air traffic control: Critical review and broader implications. *Human Factors*, 49(3), 376–399. <https://doi.org/10.1518/001872007X197017>

6. Air Traffic Control Activity and Its Impact on Mental Health

- Lyu, T., Song, W., & Du, K. (2019). Human factors analysis of air traffic safety based on HFACS-BN model. *Applied Sciences*, 9(23), 5049. <https://www.mdpi.com/2076-3417/9/23/5049>
- Majumdar, A., & Ochieng, W. Y. (2002). Factors affecting air traffic controller workload: Multivariate analysis based on simulation modeling of controller workload. *Transportation Research Record: Journal of the Transportation Research Board*, 1788(1), 58–69. <http://journals.sagepub.com/doi/10.3141/1788-08>
- Makara-Studzińska, M., Wajda, Z., & Wajda, M. (2021). An exploration of perceived stress, burnout syndrome, and self-efficacy in a group of Polish air traffic controllers and maritime navigators: Similarities and differences. *International Journal of Environmental Research and Public Health*, 18(1), 53. <https://www.mdpi.com/1660-4601/18/1/53>
- Martinussen, M., & Richardsen, A. M. (2006). Air traffic controller burnout: Survey responses regarding job demands, job resources, and health. *Aviation, Space, and Environmental Medicine*, 77(4), 422–428.
- Pape, A. M., & Wiegman, D. A. (2001). Air traffic control (ATC) related accidents and incidents: A human factors analysis. In *Proceedings of the 11th International Symposium on Aviation Psychology* (Columbus, OH, USA, 5–8 March 2001). [https://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/human_factors_maintenance/air_traffic_control_\(atc\)_related_accidents_and_incidents.a_human_factors_analysis.pdf](https://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/human_factors_maintenance/air_traffic_control_(atc)_related_accidents_and_incidents.a_human_factors_analysis.pdf)
- Rodrigues, S., de Oliveira, L. M., & de Souza, W. C. (2018). Cognitive impact and psychophysiological effects of stress using a biomonitoring platform. *International Journal of Environmental Research and Public Health*, 15(6), 1080. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6025398/>
- Silveira, D. G., & Barros, C. C. L. (2018). Andreas Lubitz: Um olhar da psiquiatria para o copiloto do voo 9525 da Germanwings. *Revista Conexão Sipaer*, 9(3), 2–11. <http://conexaosipaer.com.br/index.php/sipaer>
- Secretaria Municipal de Saúde do Rio de Janeiro (SMS). (2016). *Avaliação do risco de suicídio e sua prevenção* (1ª ed.). https://subpav.org/download/prot/Guia_Suicidio.pdf
- Sneddon, A., Mearns, K., & Flin, R. (2006). Situation awareness and safety in offshore drill crews. *Cognition, Technology & Work*, 8(4), 255–267. <http://link.springer.com/10.1007/s10111-006-0040-1>
- Studer-Luethi, B., Jaeggi, S. M., Buschkuhl, M., & Perrig, W. J. (2012). Influence of neuroticism and conscientiousness on working memory training outcome. *Personality and Individual Differences*, 53(1), 44–49. <https://linkinghub.elsevier.com/retrieve/pii/S0191886912000815>

6. Air Traffic Control Activity and Its Impact on Mental Health

Truschzinski, M., Schmidt, L., & Bengler, K. (2018). Emotional and cognitive influences in air traffic controller tasks: An investigation using a virtual environment. *Applied Ergonomics*, 69, 1–9.

Vogt, J., Hagemann, T., & Kastner, M. (2006). The impact of workload on heart rate and blood pressure in en-route and tower air traffic control. *Journal of Psychophysiology*, 20(4), 297–314. <https://econtent.hogrefe.com/doi/10.1027/0269-8803.20.4.297>

7. The challenge of Peer Support Programmes in mental health

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7.1 Introduction

Mental health is a growing concern across all areas of society and industry. In the aviation sector, the concern is even greater due to the complexity of the activity. The numerous human interfaces in flight operations, the high financial investment, and especially the lives involved make the scenario extremely challenging and stressful for pilots, who are on the front line of the air transport service.

One of the safety recommendations resulting from the investigation of the tragic accident involving the Airbus A320, operated by Germanwings, on March 24, 2015, was that:

EASA shall ensure that European operators promote the implementation of peer support groups to provide a process for pilots, their families, and colleagues to report and discuss personal and mental health issues, with the assurance that the information will be kept confidential in a just culture work environment and that pilots will be supported and guided with the aim of receiving help, ensuring flight safety, and enabling them to return to flight duties, when applicable. (BEA, 2016, p. 103)

The investigation, carried out by the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA), showed that although the symptoms of the co-pilot who intentionally caused the accident were compatible with those of a psychotic depressive episode and he was taking medication that made him unfit for aviation activity, he, the co-pilot, did not seek any type of counseling or support program before continuing to exercise the privileges of his license, even though there were at least two distinct types of psychological support programmes directly available (Mayday Foundation and Anti-Skid Programme) from his employer (BEA, 2016, p. 85).

BEA attributed this behavior to the likely result of difficulties in overcoming the stigma associated with mental illness – which carries with it prospects of losing medical certification and, therefore, employment as a pilot – should he seek professional help within the aviation system (BEA, 2016).

The report in question highlights that self-declaration in cases of pilots experiencing a decrease in psychophysical fitness or beginning regular treatment with medication may be encouraged if psychological support programmes are available for crew members facing emotional or mental health problems (BEA, 2016).

Among these programmes, there are those that are structured as promoting peer support (Peer Support Programmes), whose main additional characteristic is precisely to seek to provide a “safe zone” for pilots to address, among themselves and based on prior training, issues related to personal difficulties, negative life events, and various emotional matters, thereby aiming to reduce the risk (regarding job retention) and the stigma of seeking professional help for issues related to maintaining mental health. Peer support

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functions as a source of emotional and practical support that individuals offer one another. In work environments, peer support may include helping colleagues deal with difficult situations, encouraging one another, and providing useful resources and information. This program can be particularly important in suicide prevention, as it may help reduce isolation and loneliness, which are notable risk factors.

Peer support can be defined as “offering and receiving help, based on a shared understanding, mutual respect, and mutual empowerment, among people in similar situations” (MEAD *et al.*, 2001, *apud* FORTUNA *et al.*, 2022, p. 573). In another, more specific and current definition, it is:

Social and/or emotional support that combines knowledge derived from lived experiences, offered through a mutual agreement by individuals who self-identify as having or having had mental health challenges, as well as other social, psychological, and medical challenges. This support is directed at service users who share similar challenges, with the aim of promoting a self-determined personal change in the service user. (FORTUNA *et al.*, 2022, p. 573)

The challenges in adopting a program involving this type of support are varied. On the other hand, some of the traditional problems that lead to the underutilization of corporate medical-psychological support programmes can be addressed differently in Peer Support Programmes: questions regarding the maintenance of confidentiality, lack of awareness of the program and its capabilities, and the perception of a permanent stigma associated with the act of seeking professional help for personal matters are issues that take on new contours in this format (HUBBARD, 2016; BEA, 2016).

Currently, EASA has developed a research project called ME SAFE – MEntal Health for Aviation SAFETY, which seeks a series of parameters aimed at providing assistance and preventing the abuse of illicit substances, through the promotion and early diagnosis of mental health conditions that may eventually incapacitate the human resource from performing their duties (EASA, 2022). This initiative is aligned with the latest practices for implementing peer support programmes in the European market (HOSEGOOD, 2016; AMDA, 2016),* promoting full awareness of this issue and reducing the stigma on those who seek help.

7.2 Peer Support in Brazil

Despite the lack of specific legislation or requirements in Brazil, some commercial passenger airlines have begun implementing initiatives of this kind, based on peer support. For several years now, there have been various types of medical and/or psychological support initiatives and programmes within airlines.

The implementation of such a program may encounter differences in countries with varying cultural perspectives regarding mental health. In some cultures, openly

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discussing mental illness is still taboo, which may discourage pilots from seeking help or accepting support from emotional support pilots.

Careful work is needed to overcome these cultural barriers and establish a solid foundation for the program, allowing these interactions between pilots to continue to occur by transforming a good practice within the group, in a horizontal context, into a systematized support procedure, with generally vertical flows from the hierarchical standpoint of processes.

“Power distance” is a concept that refers to how hierarchy and the distribution of power are perceived and accepted in a given society or organization. In the global industry, the level of power distance can vary significantly between different cultures. In Western countries, hierarchies are less pronounced and communication is more open and direct among crew members, suggesting a tendency toward lower power distance. Decision-making emphasizes participation and collaboration among all involved, with a more decentralized character.

In other cultures, with more rigid power structures—especially in countries with greater influence from social hierarchies—there may be a higher power distance in the workplace.

Thus, it is important to consider that Brazil is a country with a mixed culture, influenced by various factors, including its colonial origins, ethnic and social diversity, and marked by political and socioeconomic crises. Here, hierarchies are often expected and valued, both in society at large and within organizations, including aviation. This may be reflected in more rigid communication in operational environments, with greater deference to authority and an emphasis on centralized decision-making, including informal occasions in the work setting.

In the United States and Europe, there is a tendency toward an egalitarian work environment, with a more informal and less rigid approach to hierarchy. The United States stands out as a more individualistic culture, in which personal success and autonomy are more highly valued. Thus, Americans are less hesitant to seek support aimed at personal and professional growth, maintaining a more constant flow and visibility in the workplace.

In Brazil, on the other hand, hierarchy is more pronounced, with a strong emphasis on authority, and many individuals prefer to go unnoticed and avoid drawing attention to themselves. This may affect the dynamics of a Pilot Peer Support Programme, as open and frank communication between pilots of different hierarchical levels may be more challenging, with subordinates tending to suppress their frustrations and assertiveness.

Direct and assertive communication is valued in most European countries, as well as in the United States. In these regions, pilots tend to express opinions and concerns spontaneously and objectively. In Brazil, there is a tendency toward indirect communication, using more gestural, polite, and diplomatic language. This may lead to

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differences in peer communication styles, generating discomfort, noise, and misunderstandings.

The United States and some European countries generally have a more formal culture regarding rules and protocols. Brazilian culture is generally more flexible with respect to these norms, and this may affect how pilots interact and follow established procedures. It is important to take into account the differences in regulatory contexts between Europe, the United States, and Brazil when implementing a Pilot Peer Support Programme. Brazil still does not have specific legislation for these peer programmes, and ensuring that all mitigating proposals from the organizations involved are followed, in accordance with public health authority recommendations and aligned with cultural particularities, can be quite challenging.

7.3 Expanding the Space for Discussing Mental Health Issues

Airline pilots constantly deal with decision-making processes and face unique challenges that can affect their mental health, such as fatigue, hurry sickness, work overload, and social isolation. They also constantly deal with uncertainties regarding schedule changes and the various scenarios they will face on each flight. In addition, they are always involved in intense evaluation and training processes that contribute to mental exhaustion. Therefore, it is essential that measures be taken to support their emotional health.

It was observed by the group of aviators that colleagues' complaints often remain confined to the cockpit itself, likely due to fear of harming a colleague by reporting them to leadership or other areas of the company, and also partly due to a sense of mutual protection, perceived as corporatism. The general population's lack of preparedness in dealing with health issues, especially mental health, also contributes to the lack of seeking specialized services or health treatments.

An empathetic, safe, and trustworthy environment can optimize time, financial resources, and especially minimize the impacts of late diagnoses, resulting from lack of self-care and self-awareness, self-medication, or even health condition concealment within organizations.

Conflicts related to work routine, professional difficulties, and social roles are the most commonly discussed topics among pilots during flights or meals at hotels between flight legs. In fact, one of the foundations of the Peer Support Programmes is empathy, the identification among the group, a fertile ground for transferential processes that enable demystification and awareness about the importance of support networks and individual care for physical and mental health.

The main emotional dilemmas shared among pilots are generally related to long family absences, stress, and insecurity. Pilots have irregular work schedules and spend days away from their homes. Long absences can cause feelings of loneliness and

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disconnection between the crew member and their family. Moreover, during flight periods, pilots may have limited access to communication with their loved ones. Reduced communication makes it difficult to manage family conflicts and may often be perceived as carelessness on the part of the absent individual.

The pressure experienced by pilots can be stressful, especially during emergency situations or contingencies. Work-related stress can negatively affect the pilot, especially when experienced in isolation without family support. The constant monitoring of their activities, periodic technical evaluations, and frequent psychophysical exams also keep pilots in a permanent state of stress and tension. The main fear is making a mistake—which is inherent to being human—or being deemed unfit for work activities.

Insecurity due to the volatility of the aviation industry can lead to financial concerns and uncertainties regarding professional stability and job security. These concerns can create additional tensions that influence both future outlook and financial and family planning, as well as decision-making processes during flight operations.

The Aerospace Medical Association (AsMA) had recommended, in September 2015, through a letter addressed to the Federal Aviation Administration (FAA) (AsMA, 2015)—which revised previous recommendations issued in 2012—that awareness of mental health issues among civil aviation professionals be expanded.

According to the BEA report and AsMA's related recommendations, the management of a decrease in psychophysical fitness can be optimized by including the intervention of colleagues and/or family members. AsMA (2015) recommended expanding awareness of mental health issues beyond the medical examiner of the medical certification system, in order to facilitate greater recognition, reporting, and discussion.

Peer Support Programmes are already well implemented in some of the major foreign airlines, particularly in North America, where the principles of just culture are already better known and more consistently applied. However, according to AsMA itself, these types of programmes may present challenges in their implementation when applied in smaller, less mature organizations or those with a different cultural context.

In Brazil, one of the challenges for implementation is related to potentially differential cultural aspects, such as: less exposure to principles and practices of just culture, generally more rigid hierarchies, less familiarity with managing confidential and sensitive matters, among other issues.

For peer support groups to be effective, those involved and their families need to be assured that mental health issues will not be stigmatized, that concerns raised will be treated confidentially, and that pilots will be well supported, with the goal of enabling them to maintain or return to their flight duties safely (BEA, 2016). In other words, the company must commit to improving organizational culture. Organizations can promote empathy, compassion, and mutual respect among employees, creating a work environment that values mental health and employee well-being. In an airline, this

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translates into a work environment where workload, stress, and especially fatigue are managed.

At the core of this type of Peer Support Programmes are, precisely, the peers, who are volunteers—usually fellow pilots previously trained in basic listening and guidance skills—aimed at helping their colleagues. The discussion about the usefulness of this type of initiative is especially relevant regarding the goal of helping individuals face personal challenges and difficulties while also preventing problems of insidious development from becoming specific medical or psychological conditions that may, ultimately, pose risks of suicidal ideation and behavior.

The fellow pilot is inserted into this process as an important catalyst between a manifest complaint and a simple piece of advice or a referral of more critical cases to the airline's assistance channels or the healthcare network. Pilots who share unique experiences and challenges in their profession develop a common foundation for communication among themselves. By connecting with other pilots, they know they are speaking with someone who understands the complexity and pressure inherent to the job. This mutual understanding facilitates openness and frank discussion of conflicts and concerns.

Crew members tend to develop trusting relationships with one another, as they know they can count on the support of someone who has experienced similar situations. Furthermore, the exchange of experiences plays a fundamental role, since pilots understand each other's emotions and challenges, which creates a more adapted and welcoming environment for the free and objective expression of their emotions.

Within the organizational hierarchies of airlines, there may be a perceived distance between pilots and leaders or health professionals. Pilots often feel more comfortable sharing their conflicts with individuals who are in a similar position to theirs, rather than seeking help from those who may be perceived as superior in terms of authority or status. The leveling nature of emotional peer support programmes among pilots minimizes this hierarchical barrier and allows for open and sincere communication.

Pilots may still be reluctant to share conflicts and concerns with leaders or health professionals due to the possibility of negative consequences for their careers or compensation. They may fear that their emotional vulnerabilities will be misinterpreted or that they will be stigmatized as unable to cope with work-related stress, a factor inherent to the profession.

In this context, peer supporters provide a safe and confidential environment, without disparities in capabilities, in which support can be sought without fear of negative professional repercussions. Asking for help legitimized by a shared reality between the parties is generally perceived as a less exhausting and painful process. However, empathy alone, without a favorable atmosphere, is not fertile enough ground to enable the success of such programmes. More horizontal relationships and a just culture are the foundations for building caring relationships among pilots.

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7.4 Justifications for Implementing Peer Support Programmes in Aviation

Crew members are exposed to specific risk factors for the development of mental health problems, whether related to stress and fatigue (irregular work schedules), family separation, social isolation, increased exposure to critical incidents, among other factors (*ALBUQUERQUE; FONSECA, 2016*). Pilots, although considered highly psychologically stable individuals, are not immune to problems. Due to performing a specific role in a relatively small market, it is common for them to feel fear or shame of stigmatization and job loss. They also try to avoid the perception of weakness that the group may develop. Likewise, there is great concern about the confidentiality of the process, culminating in a state of denial of their problems.

It is important to note that medical certification processes, even when including psychological testing, have significant limitations in the task of detecting serious mental illnesses. Tests for psychiatric disorders as part of the pilot's periodic medical certification are neither productive nor cost-effective (*BEA, 2016, p. 98*). Thus, an accessible peer support programme is an excellent tool for seeking help, especially by reducing stigma and encouraging pilots to seek professional help for their mental health problems honestly.

There are some cases of accidents related to mental disorders, one of the most recent and tragic being the Germanwings Flight 9525 accident. The calculation of acceptable risk for pilot incapacitation in flight is based on the "1% rule," which depends on the presence of a second pilot. However, mental incapacitation should not be treated the same way as incapacitation due to other health problems, as the risks cannot be mitigated in the same way by the principle of two-pilot operation, as seen in the case in question. Therefore, the acceptable risk target for non-detection of a mental disorder should be even more ambitious than the assessment of "classic" physical incapacitation risk. Following ICAO methodology, a quantitative target of this nature—that is, in the case of investigating the presence of incapacitating mental disorder—should be at least two orders of magnitude lower than the 1% of the traditional rule, i.e., 0.01% (*BEA, 2016*). Peer Support Programmes can contribute to this bold goal.

The European Union Aviation Safety Agency (EASA) has required since 2018 that pilots employed by European airlines have a peer support programme available to them, in order to recognize, manage, and address problems that may compromise their ability to perform their profession safely. Alcohol and drug detection tests are also part of this series of requirements, ensuring that pilots and flight attendants are always mentally capable and fit to perform their duties on board.

Additionally, organizations can create formal and informal peer support groups for employees. Formal support networks may include workplace counseling groups, while informal support networks may consist of coworkers who regularly meet to talk and offer support to one another. Organizations may also provide mental health resources,

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such as counseling services, to ensure that employees have access to professional help when needed.

For requirements, compliance methods, and guidelines under ICAO and EASA, one may consult the following documents: EU (2018) (see CAT.GEN.MPA.215 – Support programme); EASA (2016); ICAO (2018); and Jordan (2016). A well-developed regulatory framework tends to facilitate effective implementation (*FAHNENBRUCK; STEINHARDT, 2017*). Furthermore, there must be training and guidance for those involved, including the training of those who will initiate training for others, covering topics such as active listening techniques, empathy, and identification of warning signs for referral to health professionals when necessary, among other topics. Planning for ongoing training must also be carried out.

Additionally, there must be: a clearly defined policy and structure; an easy method for expressing concerns and problems; a defined approach regarding the use of an independent health provider; a monitoring group for programme actions; and close cooperation between operators and pilot associations, aiming at programme promotion initiatives; proactive and reactive support for negative events and various issues; and the highest possible degree of confidentiality (*GIBBS, 2017*). Moreover, a clear, unambiguous expression of support and commitment from senior management is an absolute condition for long-term success (*FAHNENBRUCK; STEINHARDT, 2017*).

7.5 Confidentiality, Reduction of Stigma and Concealment

Available evidence indicates that Peer Support Programmes can provide benefits primarily in reducing stigma and negativity surrounding mental health issues. These programmes can be a powerful tool for protecting mental health in the workplace and are likely to have a positive impact on peers, peer supporters, and the overall workplace culture (*GIBBS, 2017; FAHNENBRUCK; STEINHARDT, 2017*).

There are several ways in which companies can promote peer support in their work environments. One of the most effective ways is to provide training in suicide prevention and communication skills for employees and managers, either voluntarily or by recommendation from another crew member. These trainings may include identifying warning signs of suicide, effective communication with people going through difficult times, and especially connection with mental health resources.

It is extremely important that the peer support and follow-up programme be firmly linked to the company's operational safety policy, since its first and strongest pillar of success is confidentiality. Participation must always be voluntary and unpaid, but will always require genuine dedication, as the need for contact with designated peers may arise at any time of day. This programme must be accessible and available to all who are interested in participating, with peers designated and trained to act in the best possible way during mentoring.

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It is important to establish that the confidentiality inherent to a just and non-punitive culture presupposes limits: it must be broken immediately when there is a risk to the individual, to the safety of operations, or for legal reasons. For this, there must be a clearly defined process that ensures the legal protection of all involved, as well as the ease of rapid referral to the responsible physician for further evaluations.

Trained pilot peers become part of a company database, offering their help whenever necessary. These pilots may be requested by those seeking help or assigned to them randomly. This designation must occur in a safe environment, ensuring confidentiality and the smooth progress of the process.

To ensure confidentiality and non-punitive handling of the process as a whole, it is common among airlines for this project to be linked to the operational safety department, favoring alignment with the company's safety culture. This process ensures that the pilot peer is able to offer support in various areas, such as stress caused by flight simulators or line checks, fatigue, anxiety, among others.

Regarding company culture, the goal is that, through a well-managed Peer Support Programme, the company is able to establish a "safe zone" that allows for broader discussion of mental health issues. A "safe zone," in this case, refers to a secure space in which aviation professionals can share their experiences, concerns, and challenges under conditions of absolute confidentiality while maintaining the company's high level of operational safety (*ALBUQUERQUE; FONSECA, 2016*). The idea is to promote trust among participating pilots, establishing a non-threatening, initially non-punitive, confidential environment with the assurance that fellow pilots will be there to help, without any intention of assigning blame or responsibility (*BEA, 2016*).

Establishing a "safe zone" may be essential for the success of Peer Support Programmes, as it allows individuals to open up and seek help in a truly effective way. The aim, in this sense, is to reduce the chances of permanent damage to professional careers, thereby decreasing the stigma associated with seeking assistance for mental health.

It should be emphasized, however, that the safe zone, as well as the general rule of confidentiality, must consider all applicable hard limits when, in a given case, there is actual compromise of safety—for the individual, for third parties, or for operations—due to applicable requirements, for example, those related to crew member medical certification (*RBAC No. 67*) or the company's psychoactive substance prevention programme (*RBAC No. 120*), including specific policy also for medication use.

Establishing partnerships with external organizations specialized in mental health to achieve greater adherence and neutrality helps in the development of more effective and comprehensive programmes, providing additional resources associated with proven best practices.

7.6 CRM: A Fertile and Prosperous Environment for the Popularization of Peer Support Programmes

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Aviation is a complex and challenging environment in which mutual collaboration is essential to ensure operational safety and the mental health of airline pilots. CRM concepts aim to enhance cooperation, communication, decision-making, and teamwork in the cockpit or within the organization as a whole. These elements are also present in the current context of implementing Peer Support Programmes for pilots.

The rise of CRM in the aviation field occurred, in part, due to its efficiency and ability to unite teams in solving operational contingencies, managing conflicts—including interpersonal ones—and coordinating their daily tasks with the goal of operational safety. Moreover, current legislation that includes this practice in the industry and the frequent refresher training of the programme considerably favor the dissemination of the tool.

CRM currently stands out as the main human factors strategy for individual emotional self-development and the maturity of professional groups, promoting a cultural shift regarding teamwork. CRM is capable of fostering a caring perspective toward others, an extremely fertile ground for spreading the culture of peer support, helping to promote an environment in which pilots feel comfortable discussing their emotional challenges without fear of reprisal or stigma.

By mentioning the peer support programme during CRM training, a cultural shift is encouraged in the following aspects:

- Spontaneous seeking of health support services by crew members;
- Valuing human relationships in the operational environment;
- Encouraging group discussions on health topics considered taboo;
- Popularization and demystification of the Peer Support Programme within companies; and
- Enabling the project for other operational areas that involve teamwork, similar to what occurs with flight crews.

Currently, CRM is seen as the ideal setting to assist in promoting a mental health culture, primarily developing observation and a caring perspective toward colleagues in distress at work, since cockpit and corporate resources directly influence human performance.

7.7 Limitations of Peer Support

When examining the benefits and risks associated with Peer Support Programmes, it is essential to address the general lack of investment in mental health. Although awareness of the importance of mental health has increased in recent years, the allocation of resources and investments is still insufficient to address the issue. This can result in inadequate infrastructure and a stigmatized culture for dealing with the emotional challenges faced by crew members, increasing exposure time to stress, the risk of

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developing mental disorders, or even reducing the chances of identifying suicidal traits within the professional class.

Although data is still relatively limited regarding the effectiveness and benefits directly experienced by pilots in this type of programme (*MULDER, 2018*), peer support can promote well-being, for example in the form of “hope and belief, empowerment and increased self-esteem, self-efficacy and self-management of difficulties, as well as greater social inclusion and engagement,” as presented in the study by Repper and Carter (2010) apud Gibbs (2017, p. 353).

In view of additional potential challenges for programme implementation, such as lack of financial and human resources, the need for continuous training and monitoring of results, clear strategies must be actively developed to overcome these difficulties, aiming at raising awareness about the importance of the peer support programme and promoting a culture of care and respect for mental health (*LLOYD; CAMPION, 2017; DAHLSTROM, 2017; FAHNENBRUCK; STEINHARDT, 2017; GIBBS, 2017*).

Even though it operates under the safeguard of the operational safety department, this process requires constant monitoring by health professionals trained in managing mental health issues, who act as adjuncts ensuring the proper conduct of the programme and intervening when necessary. This process cannot be compared to an emergency service, nor to a suicide prevention programme, being only part of the corporate strategy for dealing with such issues.

Despite the benefits of peer support, it is important to recognize the limits of its scope, as peers are not health professionals trained to diagnose or treat mental health problems. Therefore, Peer Support Programmes must have a clear protocol for identifying situations in which the intervention of a health professional is necessary, such as in cases of suicidal ideation, self-harming behavior, or worsening of previously identified symptoms. In these and other cases, referral to qualified health professionals and efficient communication between peers and health professionals will be essential to ensure proper care and continuity of treatment.

Confidentiality is a critical aspect of Peer Support Programmes, as it is a condition for creating a safe and trustworthy environment in which aviation professionals feel comfortable sharing their experiences and concerns (*ALBUQUERQUE; FONSECA, 2017; FAHNENBRUCK; STEINHARDT, 2017; GIBBS, 2017*). However, there must be limits to confidentiality to protect the safety of the individual and others involved, especially in cases of imminent risk to safety or when applicable legislation requires disclosure of information. It is important that participants in peer support programmes are aware of the limits of confidentiality and the situations in which information may eventually be shared with medical teams or civil aviation authorities, whenever there is a risk to life or physical integrity—whether of those involved or third parties—or when a breach of any applicable requirement occurs.

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Specific training for pilot peers must be continuous and of high quality, ensuring that they receive training that enables them in active listening, crisis management, and identification of potential mental health warning signs. This is essential so that they know how to direct demands according to their nature and severity. Lack of investment in such training may result in inadequate support and negative consequences for both the pilot seeking help and the pilot peer.

7.8 Responsive Regulation

Responsive regulation refers to a regulatory approach that seeks to balance the actions of the regulatory authority with the cooperation and engagement of stakeholders (AYRES; BRAITHWAITE, 1992).

Whereas in classical regulation the command-and-control approach focuses on identifying and punishing offenders rather than addressing the underlying causes of the problems found, responsive regulation focuses on identifying and seeking to resolve underlying issues in order to promote continuous improvement, including of the regulation itself. It encourages cooperation and the exchange of information among stakeholders, better supporting actions that various participants agree should be pursued.

In aviation, responsive regulation can be applied to peer support programmes, encouraging collaboration among airlines, unions, regulatory bodies, and health professionals to develop and implement effective policies and practices. This approach can increase trust among stakeholders, improve communication, and promote shared responsibility for the well-being of aviation professionals.

Governments, health authorities, and companies must recognize the importance of active engagement in addressing mental health issues, including the risk of suicide, which is already one of the leading causes of death worldwide. It is crucial that qualified health professionals, such as physicians and psychologists, lead this discussion and intervention, as lack of preparedness can worsen the situation or lead to tragic consequences. The risk of suicide must be treated as a medical emergency, just like any other serious health condition. Health professionals possess the necessary training and knowledge to identify warning signs, provide appropriate support, and refer individuals at risk for specialized treatment. The sensitive topic of suicide requires thoughtful approaches grounded in scientific evidence.

7.9 The Role of Physicians and Other Health Professionals in Peer Support Programmes in Brazilian Aviation

Brazilian legislation establishes that certain activities are exclusive to physicians, including determining the prognosis related to nosological diagnosis, recommending and performing invasive procedures, issuing medical certificates of health conditions, among other activities, as provided in Articles 4 and 5 of Law No. 12.842, dated July 10, 2013.

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In aviation peer support programmes, physicians and other health professionals such as psychologists can work together to provide support, guidance, and appropriate referrals to aviation professionals, respecting the responsibilities of each profession.

In addition to their role in the training programme itself, as well as in the supervision and updates carried out for the learning and development of the group directed at pilot peers, it is necessary to establish clear guidelines for the role of health professionals in the programmes, ensuring comprehensive care and guaranteeing appropriate referral and supervision in cases of greater complexity or those requiring specialized and immediate medical intervention.

7.10 Protection for Pilot Peers

Being responsible for providing support to colleagues in need can be stressful and emotionally challenging, especially in situations involving suicidal ideation. Pilots who serve as pilot peers may face intense emotional burdens that can affect their own mental health and professional performance. Emotional overload without adequate support available to them may lead to burnout and a reduced ability to provide effective support.

The pilot peer continues to perform their regular operational duties, which poses a risk of conflicts of interest and work overload. It is important to ensure that the time and energy required for the pilot peer role are properly allocated, in order to avoid compromising operational safety or causing them to deviate from their operational responsibilities.

It is also necessary to establish clear guidelines regarding the roles and responsibilities of pilot peers and ensure proper supervision. Company leadership must provide resources to assist the pilot peer in handling difficult situations and making appropriate decisions.

Selected pilot peers may also face challenges in maintaining objectivity and impartiality. The programme may become a source of tension and resentment if some pilots perceive others as informants rather than genuine supporters. It will also be compromised if it is understood as just another channel for personal reporting, or if certain colleagues are perceived as receiving preferential or differentiated treatment from the group. This can create divisions and harm the work environment, negatively affecting overall well-being among pilots within organizations.

7.11 Final Considerations

Peer support programmes in aviation can be a valuable approach to complement the company's strategy in promoting mental health among aviation professionals, contributing to operational safety and the overall well-being of pilots and other workers in the sector.

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It is important to recognize that, although pilot peers receive appropriate training to support their peers, they do not replace qualified mental health professionals. They can offer initial support, but it is crucial to have a much broader protection network of specialized professionals available for cases that require more advanced interventions, especially in emergencies such as suicide risk.

The implementation of these programmes must consider the challenges and limitations involved, including the role of physicians and other health professionals, confidentiality, and the creation of a “safe zone,” as well as the possibility that a future regulatory solution may benefit from a responsive and risk management approach—not merely based on command-and-control provisions, but rather with a greater degree of autonomy and responsibility on the part of operators and other participating entities.

By addressing the important issues related to mental health and expanding the space for discussion through collaboration among various actors in the sector, Peer Support Programmes have the potential to improve the quality of life of aviation professionals and increase the safety and efficiency of flight operations, even though further research is needed for these benefits to be effectively demonstrated.

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References

Aerospace Medical Association (AsMA) – Expert Working Group on Pilot Mental Health. (2015, September 21). *Letter to FAA Administrator, Michael Huerta, on pilot mental health and updated recommendations*. Federal Aviation Administration.

Agência Nacional de Aviação Civil (ANAC). (2021). *Brazilian Civil Aviation Regulation – RBAC No. 67 – Amendment No. 05: Requirements for the issuance of Aeronautical Medical Certificates, registration and accreditation of physicians, accreditation of clinics, and agreements with public entities*. Brasília, DF: ANAC.

Agência Nacional de Aviação Civil (ANAC). (2021). *Brazilian Civil Aviation Regulation – RBAC No. 120 – Amendment No. 03: Prevention programme for risks associated with the misuse of psychoactive substances in civil aviation*. Brasília, DF: ANAC.

Albuquerque, C., & Fonseca, M. (2016). Psychosocial stressors associated with being a pilot. In R. Bor, C. Eriksen, M. Oakes, & P. Scragg (Eds.), *Pilot mental health assessment and support: A practitioner's guide* (pp. xx–xx). CRC Press LLC. <https://ebookcentral.proquest.com/lib/erau/detail.action?pqorigsite=primo&docID=4767383>

Ayres, I., & Braithwaite, J. (1992). *Responsive regulation: Transcending the deregulation debate*. Oxford University Press.

Brazil. (2013, July 10). *Law No. 12.842: Provides for the practice of medicine*. Official Gazette of the Union. http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/lei/l12842.htm

Dahlstrom, N. (2016). Human factors and factor of the human: Pilot performance and pilot mental health. In R. Bor, C. Eriksen, M. Oakes, & P. Scragg (Eds.), *Pilot mental health assessment and support: A practitioner's guide* (pp. xx–xx). CRC Press LLC. <https://ebookcentral.proquest.com/lib/erau/detail.action?pqorigsite=primo&docID=4767383>

European Union (EU). (2018). *Commission Implementing Regulation (EU) 2018/1042 of 23 July 2018 amending Regulation (EU) No 965/2012 as regards technical requirements and administrative procedures related to introducing support programmes, psychological assessment of flight crew members and systematic analysis of data on cyber threats* (CELEX No. 32018R1042). EUR-Lex. <https://eur-lex.europa.eu/legalcontent/EN/TXT/HTML/?uri=CELEX%3A32018R1042&from=EN>

European Aviation Safety Agency (EASA). (2016). *Opinion No. 14/2016: Aircrew medical fitness – Implementation of the recommendations made by the EASA-led Germanwings Task Force on the accident of the Germanwings Flight 9525 (Changes to Regulation (EU) No 965/2012)* (pp. 1–70). <https://www.easa.europa.eu/en/downloads/21686/en>

7. The challenge of Peer Support Programmes in mental health

Fahnenbruck, G., & Steinhardt, G. (2016). Peer-to-peer support and development programmes for pilots – Time for a holistic approach. In R. Bor, C. Eriksen, M. Oakes, & P. Scragg (Eds.), *Pilot mental health assessment and support: A practitioner's guide* (pp. xx–xx). CRC Press LLC. <https://ebookcentral.proquest.com/lib/erau/detail.action?pqorigsite=primo&docID=4767383>

Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA). (2016). *Final report: Accident on 24 March 2015 at Prads-Haute-Bléone (Alpes-de-Haute-Provence, France) to the Airbus A320-211, registered D-AIPX, operated by Germanwings* (p. 115). https://www.bea.aero/uploads/tx_elydbrapports/BEA2015-0125.en-LR.pdf

Gibbs, S. (2016). Peer support programme for pilots. In R. Bor, C. Eriksen, M. Oakes, & P. Scragg (Eds.), *Pilot mental health assessment and support: A practitioner's guide* (pp. xx–xx). CRC Press LLC. <https://ebookcentral.proquest.com/lib/erau/detail.action?pqorigsite=primo&docID=4767383>

Hubbard, T. (2016). Stigma associated with mental illness among aircrew. In R. Bor, C. Eriksen, M. Oakes, & P. Scragg (Eds.), *Pilot mental health assessment and support: A practitioner's guide* (pp. xx–xx). CRC Press LLC. <https://ebookcentral.proquest.com/lib/erau/detail.action?pqorigsite=primo&docID=4767383>

International Civil Aviation Organization (ICAO). (2018). *Promoting, maintaining and supporting mental well-being in aviation during the COVID-19 pandemic* (EB 2020/55). Montreal: ICAO. https://www.icao.int/Meetings/TRIPSymposium2018/Documents/EB_20_55_Mental%20Health.pdf

Jordaan, A. (2016). *Strengthening mental health in civil aviation* (p. 20). International Civil Aviation Organization. https://www.icao.int/safety/aviation-medicine/AvMedSARS/Strengthening%20mental%20health%20in%20Civil%20Aviation_%20Ansa%20Jordaan.pdf

Lloyd, C., & Champion, D. P. (2017). Occupational stress and the importance of self-care and resilience: Focus on veterinary nursing. *Irish Veterinary Journal*, 70(30), 1–7. <https://doi.org/10.1186/s13620-017-0108-7>

Malhlke, C. I., Priebe, S., Heumann, K., Daubmann, A., Wegscheider, K., & Bock, T. (2017). Effectiveness of one-to-one peer support for patients with severe mental illness: A randomized controlled trial. *European Psychiatry*, 42, 103–110. <https://doi.org/10.1016/j.eurpsy.2016.12.007>

7. The challenge of Peer Support Programmes in mental health

Mulder, S., & De Rooy, D. (2018). Pilot mental health, negative life events, and improving safety with peer support and a just culture. *Aerospace Medicine and Human Performance*, 89(1), 41–51. <https://doi.org/10.3357/AMHP.4903.2018>

Fortuna, K. L., Solomon, P., & Rivera, J. (2022). An update of peer support/peer provided services: Underlying processes, benefits, and critical ingredients. *Psychiatric Quarterly*, 93(2), 571–586. <https://doi.org/10.1007/s11126-022-09971-w>

CAA International (UK). (2022). *Pilot peer assistance and support programmes – Is your airline ready?* Aviation Safety Insights. <https://caainternational.com/pilot-peer-assistance-and-support-programmes/>

White, S., Foster, R., Marks, J., Morshead, R., Goldsmith, L., Barlow, S., Sin, J., & Gillard, S. (2020). The effectiveness of one-to-one peer support in mental health services: A systematic review and meta-analysis. *BMC Psychiatry*, 20(1), 534. <https://doi.org/10.1186/s12888-020-02923-3>

Additional References:

Lyons, N., Cooper, C., & Lloyd-Evans, B. (2021). A systematic review and meta-analysis of group peer support interventions for people experiencing mental health conditions. *BMC Psychiatry*, 21(1), 315. <https://doi.org/10.1186/s12888-021-03321-z>

Santilhano, W. (2018). *Peer support in the wellbeing of pilots* (Master's thesis, Johannesburg Business School). https://www.researchgate.net/publication/325157449_Peer_support_in_the_wellbeing_of_pilots

8. Corporate Resource Management (CRM) as a Tool for Preventing Aircraft-Assisted Suicide

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8.1 Introduction

Suicide committed by pilots using the aircraft as a means is a rare phenomenon in aviation; however, when it occurs, it presents catastrophic potential and strong media impact. According to research by Vuorio et al. (2014), in the United States, between 1993 and 2012, only 0.33% of fatal accidents involved crew member suicides.

The term used for this type of suicide in English is *aircraft-assisted pilot suicide*. In a correlated manner, we will refer to this phenomenon as *pilot suicide by means of aircraft*. The pilot places the aircraft in a collision situation or establishes a steep dive trajectory, both intentionally. In the first case, the accident resembles a Controlled Flight Into Terrain⁴ (CFIT). In the second, the condition is similar to Loss of Control In-Flight (LOC-I).

Politano and Walton (2016) present data from the National Transportation Safety Board (NTSB), from 1982 to 2014, involving suicide by means of aircraft, with the highest incidence among male pilots, likely suffering from depression. One-third of the cases occurred under the influence of drugs or alcohol, and 54.9% under the effect of external stressors, which could have been previously identified by the airline. Additionally, according to this database, 7.8% of the pilots who committed suicide had already made a previous suicide attempt.

Confirmation that an aviation accident was caused by the pilot's deliberate intent requires in-depth investigations and an additional layer of complexity. In Brazil, to date, CENIPA does not have a database similar to that of the NTSB to perform statistical analysis of this phenomenon.

The most emblematic and widely studied aviation accident involving suicide by means of aircraft was Germanwings Flight 4U9525, which crashed into the French Alps in March 2015, killing 150 people. The accident brought attention to a sensitive topic: crew mental health. Co-pilot Andreas Lubitz, in addition to mental health issues, suffered from various financial difficulties and a possible chronic vision problem.

Before the Germanwings accident, there were other disasters, including Japan Airlines Flight 350 in 1982, Royal Air Maroc Flight 630 in 1994, Silk Air Flight 185 in 1997, EgyptAir Flight 990 in 1999, and LAM Mozambique Airlines Flight 47 in 2013 (Rice & Sher, 2015). The pilot in the latter event had experienced significant stress

⁴ The term "terrain" also includes other surfaces with which the aircraft may collide, such as a large body of water (sea) or another obstacle (mountain).

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periods, such as a prolonged divorce process and the loss of a child in a car accident, which also led to the suicide hypothesis. Furthermore, it is suspected that co-pilot Andreas Lubitz of the Germanwings flight may have “copied” the *modus operandi* of the LAM accident.

The COVID-19 pandemic highlighted the urgency of prioritizing mental health and psychosocial support in countries and communities to reduce suffering and better meet the population’s needs (*Pan American Health Organization, 2020*). Much has been discussed since then, and for aviation, the topic is of utmost relevance.

Pilots were exposed to particularly high psychological stressors due to new preventive measures, strict quarantine experiences, financial losses, and unemployment (*Stadler, 2022*). These stressors combine with shift work in a remote, confined, pressurized, and risk-associated environment, which are occupational stressors of aviation activity. One aspect analyzed by mental health specialists relates to the association between economic downturns and suicide rates in the general population (*Milner, Niven & Lamontagne, 2015*). Vuorio and Bor (2020) warn that financial and economic effects, especially after the pandemic, may increase, in the near future, the number of suicides committed by aircraft crew members.

Attention to psychiatric and psychological symptoms has significantly increased since the beginning of the pandemic in 2020, and recent systematic reviews have confirmed that certain groups showed increased morbidity, especially regarding the rise of psychiatric disorders, particularly in individuals with a history of mental illness (*Zakia et al., 2022; Ying Sun et al., 2023*). However, current data does not indicate a generalized increase in cases across all subgroups, nor an exponential rise in psychiatric illness risk following the COVID-19 pandemic. Nevertheless, it is important to highlight that the presence of prior mental illness as a risk factor for increased psychiatric morbidity due to COVID-19 also raises concern, as mental disorders are a strong risk factor associated with suicide (*Baldaçara et al., 2021*).

Moreover, as demonstrated by the systematic review conducted by Pasha and Stokes (2018), airline pilots may suffer from depression at a frequency similar to that of the general population. However, the consequences of a pilot in a depressive state who has not received proper treatment may pose risks to themselves, their crew, passengers, and people on the ground. According to the authors, the prevalence of depression experienced by these pilots ranged from 1.9% to 12.6% in the studies reviewed.

Following the recommendations and standardized practices of the International Civil Aviation Organization (ICAO), Civil Aviation Authorities require pilots to hold an Aeronautical Medical Certificate (AMC) as a condition for exercising the privileges of their license to operate an aircraft. Periodic medical examinations occur throughout crew members’ careers to certify their physical and mental fitness for performing onboard duties. The purpose of medical certification is to reduce flight safety risks arising from

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health issues, with validity periods depending on class, role, age, and other possible health conditions.

However, despite the relevant role that the AMC plays in flight safety, the relationship between the certificate and the exercise of the profession brings an aspect that remains unresolved in the aviation field: the establishment of measures to reduce the risk of income loss and the stigma associated with crew members being removed from duty due to mental health reasons.

The Aerospace Medical Association's working group (2012) believes that extensive psychiatric evaluations as part of routine medical examinations are neither productive nor economically viable. However, it recommends that aeromedical examiners pay greater attention to mental health issues, especially the most common and detectable conditions and life stressors that may affect pilots and their performance in flight. The group encourages increased education and global recognition of the importance of mental health in aviation safety. Thus, various disorders and syndromes require greater attention, including depression, anxiety/panic, stress, substance abuse or dependence (alcohol, psychotropic drugs, or illicit drugs), which result in observable behaviors that facilitate their detection, diagnosis, and appropriate treatment⁵.

In this way, awareness of mental health issues in aviation and the resulting care and assistance actions can contribute to the prevention of aviation accidents. There are several possibilities for making the aviation system more robust. When it comes to education focused on the human being, their capabilities and limitations, and their impact on operational safety, Crew Resource Management (CRM), which will be addressed below, represents a defense barrier that can be better explored to confront this situation.

8.2 Crew Resource Management (CRM)

Aviation is a complex sociotechnical system that interconnects people, technologies, and environments, each with the potential to affect the other (*International Civil Aviation Organization [ICAO], 1989*). It is important to highlight that in complex systems, it is the human contribution that often provides the most important safety barriers and sources of recovery. In aircraft operations, the crew is the last line of defense to prevent an accident or mitigate its negative consequences (*Reason, 1997*), within a dynamic work context that generates or reverberates failures from other parts of the system.

⁵ In Brazil, the Brazilian Civil Aviation Regulation – RBAC No. 120 provides for the existence, applicable to various types of air operators, of a Program for the Prevention of Risk Associated with the Improper Use of Psychoactive Substances. This program includes preventive measures against the risk posed by the use of psychoactive substances and medications with psychotropic effects.

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With the evolution of aviation, large aircraft used in passenger transport have experienced significant technological advances that allow pilots to work more efficiently in managing systems, as well as increasing equipment reliability rates. However, accidents such as the runway collision in Tenerife (*ALPA, 1978*) and the emergency landing of a DC-8 due to fuel exhaustion near Portland (*NTSB, 1979*) spurred actions aimed at more effective management of cockpit resources (*ICAO, 1989*).

In response, Crew Resource Management (CRM) training was developed to counter deficient resource management, aiming to improve communication, leadership, teamwork, situational awareness, and decision-making in the cockpit. CRM seeks the effective use of all available resources to ensure operational safety, enhancing crew effectiveness in managing threats and errors.

Beyond the cockpit, CRM has come to include cabin crew, flight dispatchers, air traffic controllers, and aircraft maintenance professionals. In a more corporate approach, encompassing other individuals involved in aviation activity, the term *Corporate Resource Management* is used, which analyzes human factors from different perspectives. From the role of organizational, supervisory, and workplace context factors to the role of the individual, all are interrelated in building safe work environments (*ICAO, 2002*).

In Brazil, CRM is mandatory for air operators subject to Brazilian Civil Aviation Regulations (RBAC) No. 121, 135, 90, and 91 – Subpart K. The first two apply to public air transport operations, the third to special public aviation operations, and the last to the operation of an aircraft under a shared ownership program. Supplementary Instruction (IS) No. 00-010A – Crew Resource Management Training (CRM) details and guides the application of the requirements set forth in the RBAC, issued by the National Civil Aviation Agency (ANAC). Similarly, in military aviation, each Major Command establishes its own guidelines for the mandatory execution of CRM, due to the specificities of military operations, using as a basis the CRM Manual produced by CENIPA (2023).

Aircraft pilots are periodically trained in CRM. They serve both as crew members on board and as instructors and evaluators (check pilots) of other pilots. There is evidence that some pilots who committed suicide involving aircraft had previously shared suicidal thoughts with their peers, some even days before the accident (*Kenedi, Appel & Friedman, 2019*).

The central element of the system is suffering, to the point of expressing thoughts of death. This information suggests that there are possibilities to reduce the risk of these death thoughts progressing to suicidal action, whether by means of the aircraft or not. At this point, CRM may no longer be the appropriate containment, but as previously mentioned, medical certification procedures begin to play a predominant role and should be employed.

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However, CRM should more broadly address work-related stressors (work overload, low wages, shift/schedule work), contextual conditions (organizational culture, negative interpersonal relationships), and human limitations (stress and fatigue), which favor the emergence of psychopathologies (anxiety and depression), indicating signs and symptoms, comorbidities, and coping techniques.

In addition to these factors, personal stressors are also addressed (moving house or city, marriage, divorce, loss of a family member, among others), as well as self-induced stress, its conditions and effects on the body and mind, which are part of the training. All facets of the human element in the aviation system are the subject of study in CRM, which, in a continuous and progressive manner, explores with participants self-management strategies to preserve health and well-being, both for personal benefit and to enhance each individual's participation in their operational teams. Coping techniques for stress, fatigue, and substance misuse are discussed, giving each participant the opportunity to reflect on the importance of maintaining regular and restorative sleep, engaging in physical activity, and strengthening social and family bonds. These reinforce the sense of belonging, which is extremely relevant for crew members, as they are often separated from this social environment due to flight schedules and missions.

Currently, in addition to assisting in threat and error management, CRM plays an important role in strengthening a company's safety culture. Its philosophy considers that each team member is fallible, and that the system must be resilient to human error, creating conditions for the establishment of a just and non-punitive culture, in which individuals feel comfortable reporting issues related to flight safety without fear of reprisal.

Another concept addressed in CRM training is leadership. An individual hierarchically superior to their subordinates must improve their leadership skills, such as the ability to complete a collective task with a motivated and operational team through effective coordination and communication. The leader also considers signs of stress and fatigue in workload management, redistributing it, if necessary, for operational safety (*Van Avermaete, 1988*). Just as important as the leader's ability to detect these signs is the ability of other crew members or organizational personnel to recognize signs of stress, whether of personal or occupational origin, among other signs related to fatigue that may raise concern. *Flin and Yule (2004)* emphasize that an important foundation for effective leadership is the monitoring of safe behaviors among team members, aiming for better individual and collective performance.

Through a positive, just, and non-punitive culture aligned with CRM philosophy, a favorable scenario for reporting signs and symptoms indicative of psychopathologies can be established. Crew support programmes, whether peer-based or otherwise, aimed at offering financial support to pilots who need to take time off work to care for their mental health, are preventive measures against underreporting of psychological suffering/disorders by pilots.

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All those involved in aviation activities—including crews, their families, and flight organizations, both civil and military—need to be more aware of the mental health issue in aviation. We conclude this subsection with a few words from the final report on the Germanwings accident:

Even though CRM is not a pilot assistance programme per se, it provides tools that can help identify an individual who is struggling with any type of emotional or mental issue that may impair their ability to effectively function as a crew member. (Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile, 2016, p. 40).

8.3 Proactive Prevention

Although suicide by means of aircraft is rare, its rate within the Brazilian population is a growing phenomenon (*Palma, 2021; Bonadiman, Navaghi & Melo, 2022*). We can mention a 46% increase in suicide deaths in Brazil, compared to a 2.7% increase in the rest of the world, based on data from 2000 to 2019 (*Bonadiman, Navaghi & Melo, 2022*).

The *Global Burden of Disease* study identified depression as the second leading cause of disability, estimating that it affects 350 million people worldwide (*Mendoza, 2015*). Suicide can occur without prior warning, and research shows that only 22% of individuals who take their own lives communicate their intention during their last contact with a healthcare team (*Isometsa, 1995*). Therefore, it is noteworthy that data from the NTSB database suggest that in 63% of aircraft suicides recorded in the United States between 2003–2012 (between 2003 and 2012), someone was aware of the suicidal thoughts (*Vuorio, 2014*).

In the past, a pilot with depression would be grounded. However, in 2010, the United States Federal Aviation Administration (FAA) approved the use of four types of selective serotonin reuptake inhibitors (SSRIs) for pilots in active flight duty. The four SSRIs are: Fluoxetine (Prozac), Sertraline (Zoloft), Citalopram (Celexa), and Escitalopram (Lexapro) (*AOPA, 2010*), provided that the pilot complies with the established policies and protocols. Many in the aviation community praised this FAA measure, concerned about the underreporting of mental health issues or self-medication (*Winter et al., 2017*). The CRM culture, in this regard, makes a significant contribution, as it should be non-punitive.

Since the regulation of these SSRIs in aviation, interviews conducted with crew members after events of any nature commonly reveal individuals using SSRIs and even sleep-inducing medications that lack certification or follow-up studies for use during aviation activities. With this information, many crew members report such situations in search of assistance, either for medical leave from flight duty or to adjust their medication to those suitable for use during aviation activity. These medications can also be identified during informal conversations, recurrent training classes, or other opportunities for dialogue with crew members.

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The number of scientific studies on suicide in the fields of human sciences, statistics, bioethics, and neuroscience has increased significantly (*Botega, 2015*). In the modern era, from a scientific perspective, moral judgment and legal and religious sanctions related to the suicidal act have given way to the recognition of a large-scale social problem. In aviation, even though the numbers are not alarming, prevention remains the best option.

The World Health Organization (*Botega, 2015*) emphasizes that suicidal behavior is still surrounded by taboos, stigma, and shame, which discourages people from seeking help from health services. Prevention can be achieved through proactive confrontation of these challenges, public awareness, and support from health systems and society at large. Suicide prevention must be a daily practice, especially by emphasizing and maintaining the hope that it is possible to welcome human suffering—particularly in aviation, a sector that demands quality, high reliability, and safety.

From the perspective of always adopting preventive actions against suicide and not attempting to “hide,” we can mention the work of Dr. Neury Botega (*2015*), who reinforces that even laypeople can perceive symptoms and signs in those they live with. He also highlights that, through assertive communication, knowledge, and empathy, it is possible to help a person overcome an acute state of psychological distress, since the root of suicide is related to this feeling.

8.4 Discussion

Silveira and Barros (2019) examine the Germanwings accident from a psychiatric perspective. The authors highlight that psychiatrists outside the airline had recommended Andreas Lubitz be removed from duty several times in the periods immediately preceding the accident, but such recommendations never reached Germanwings. The authors emphasize that Andreas possibly exhibited some of the symptoms described in the International Classification of Diseases – 10th Edition (ICD-10, code F32), such as: lowered mood, reduced energy, altered ability to experience pleasure, loss of interest, decreased concentration capacity, sleep disturbances, reduced appetite, feelings of guilt and/or worthlessness, psychomotor retardation, agitation, and loss of libido.

It is further noted that, days before the accident, as described in the Final Investigation Report, the pilot exhibited psychotic symptoms such as hallucinations and delusional ideas, classified under code F32.3 by ICD-10 or 296.24 by the Diagnostic and Statistical Manual of Mental Disorders – 5th Edition (DSM-V). Thus, Silveira and Barros (2019) raise the following question: “How did the co-pilot’s mental state and behavior in the days leading up to the accident not raise any concern among his colleagues and family members?”

It is known that general medical care services fail to identify 30 to 50% of depression cases (*Rost et al., 1998; Ronalds et al., 1997*). If healthcare teams face

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challenges in detecting mental health issues, it is likely that among aircrew members the difficulty is even greater. Therefore, Silveira and Barros (2019) suggest that basic notions for “identifying indicative signs and symptoms” of mental disorders be included in CRM training.

Pilots develop a strong professional identity throughout their careers. Peer support networks play a relevant role in crew members’ mental health. Peer groups engage with pilots and provide access to specialized mental health assistance programmes without the risk of potential complications from the airline. It is well known that pilots will speak more openly with their colleagues and, therefore, will feel more willing to discuss issues such as financial problems, illness and death in the family, relationship conflicts, and various professional tensions.

In an open communication environment, crew members who have closer relationships with one another (whether for work-related or personal reasons) are more likely to identify behaviors that deviate from the usual in a given individual, seeking to approach them for conversation, or even directly informing the company about such behavior so that the individual can be referred to a specialist physician for help.

It is possible that testing pilots to assess mental disorders may be fruitless due to prior preparation and consequent symptom concealment. Hussain (2015) proposes a much more flexible approach, which would be to persuade individuals to be honest about their psychiatric conditions by offering various incentives.

However, for various reasons, organizations do not always value this training. There is a lack of experienced CRM facilitators with adequate knowledge of human factors or with limited understanding of the context in which the operation occurs. It is not always possible to plan training needs so that CRM is tailored to participants, due to time constraints or lack of knowledge within training departments, which often deal with work overload and/or lack of updates in the field of human factors.

Early communication to companies regarding these behaviors could potentially lead to timely medical and psychological assistance. If necessary, after identification by a specialist physician, medical leave could be granted. During this period, financial expenses could be covered by the airline. Furthermore, in addition to creating a favorable scenario for seeking help, the individual who eventually seeks such support would not be penalized by financial losses, since it is known that a large portion of commercial airline pilots’ income comes from their flight hours. Once recovered, the individual who sought help should be authorized to return to duty, and a close relationship should be maintained between the occupational physician responsible for their return and the company’s operational safety department, so that individual monitoring is maintained.

Another ongoing task within companies should be fatigue management. In Brazil, compliance with measures for managing human fatigue risk among crew members has been required since February 2020, under Brazilian Civil Aviation Regulation RBAC No.

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117. It establishes operational limitations related to fatigue management for crew members and air operators, including provisions for proactive, predictive, and reactive measures to manage fatigue-related risks.

Regarding fatigue, individuals who are overloaded and performing activities in an environment conducive to fatigue suffer impairments in their cognitive and social abilities, becoming tolerant of their own errors and avoiding interactions with others, distancing themselves from them.

8.5 Final Considerations

It is essential to identify stressors, recognize psychological and physiological symptoms and their effects on performance, and implement personal and organizational strategies for proper stress management (CAVALCANTI et al., 2021). All these elements are part of CRM in the classroom and reach different organizational levels through the CRM philosophy. The more the organization contributes to strengthening the safety culture and incorporates human factors knowledge into procedures and actions, the more it encourages a reporting culture and can act promptly in pursuit of improvements.

Establishing a more open, transparent, and tolerant environment is fundamental to preventing the tragedies mentioned in this chapter. One of the key pillars in suicide prevention is reducing the stigma associated with mental health issues and encouraging those facing difficulties to seek help. CRM plays an important role in reducing stigmas and stereotypes, promoting an environment of human-centered information that other aviation sector courses do not offer. CRM employs various pedagogical techniques, including case studies, which should be applied through proper planning, allowing participants to collectively assess and discuss human limits and capabilities. It is advisable to address disasters such as Germanwings and LAM when participants have already received prior training in stress management, fatigue management, and the use and abuse of alcohol and other drugs and their effects on performance, which can enrich the study.

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References

- AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL. (2019). *Brazilian Civil Aviation Regulation. RBAC No. 117 – Amendment No. 00: Requirements for Human Fatigue Risk Management*. Brasília, DF: ANAC.
- AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL. (2021). *Brazilian Civil Aviation Regulation. RBAC No. 120 – Amendment No. 03: Program for the Prevention of Risks Associated with the Misuse of Psychoactive Substances in Civil Aviation*. Brasília, DF: ANAC.
- AIR LINE PILOTS ASSOCIATION ENGINEERING AND AIR SAFETY. (ca. 1978). *Aircraft accident report: [Human factors report on the Tenerife accident]*. Washington, DC. Available at: <https://www.skybrary.aero/sites/default/files/bookshelf/312.pdf>. Accessed May 26, 2023.
- AEROSPACE MEDICAL ASSOCIATION & AD HOC WORKING GROUP ON PILOT MENTAL HEALTH. (2012). Pilot mental health: Expert working group recommendations. *Aviation, Space, and Environmental Medicine*, 83(12), 1184–1185. <https://doi.org/10.3357/asem.3539.2012>.
- AIRCRAFT OWNER’S AND PILOT’S ASSOCIATION (AOPA). (2010, April). FAA approves SSRIs for medical certification. *AOPA ePublishing Staff, MD-USA*. Available at: <http://www.aopa.org/News-and-Video/All-News/2010/April/2/FAA-approves-SSRIs-for-medical-certification>. Accessed April 15, 2025.
- BALDAÇARA, L., ROCHA, G. A., LEITE, V. D. S., PORTO, D. M., GRUDTNER, R. R., DIAZ, A. P., MELEIRO, A., CORREA, H., TUNG, T. C., QUEVEDO, J., & DA SILVA, A. G. (2021). Brazilian Psychiatric Association guidelines for the management of suicidal behavior. Part 1. Risk factors, protective factors, and assessment. *Brazilian Journal of Psychiatry*, 43(5), 525–537. <https://doi.org/10.1590/1516-4446-2020-0994>. Available at: <https://pubmed.ncbi.nlm.nih.gov/33111773/>. Accessed April 15, 2025.
- BONADIMAN, C. S. C., NAGHAVI, M., & MELO, A. P. S. (2022). The burden of suicide in Brazil: Findings from the Global Burden of Disease Study 2019. *Revista da Sociedade Brasileira de Medicina Tropical*, 55(Suppl 1). <https://doi.org/10.1590/0037-8682-0299-2021>. Available at: <https://pubmed.ncbi.nlm.nih.gov/35107538/>. Accessed April 15, 2025.
- BUREAU D’ENQUÊTES ET D’ANALYSES POUR LA SÉCURITÉ DE L’AVIATION CIVILE (France). (2016, March). *Final report: Accident on 24 March 2015 at Prads-Haute-Bléone (Alpes-de-Haute-Provence, France) involving Airbus A320-211 registered D-AIPX operated by Germanwings*. France: BEA. Available at: https://bea.aero/uploads/tx_elydbrapports/BEA2015-0125.en-LR.pdf. Accessed May 31, 2023.

8. Corporate Resource Management (CRM) as a Tool for Preventing Aircraft-Assisted Suicide

CAVALCANTI, A. L. D. S. R., BAGAROLLO, M. F., LIPP, M. E. N., & CONSTANTINI, A. C. (2021). Lipp's stress control training: An integrative literature review. *Boletim Academia Paulista de Psicologia*, 41(100), 37–47. Available at: https://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415711X2021000100005. Accessed April 15, 2025.

CENIPA. (2021). *CRM Manual*.

DEKKER, S. (2007). *Just Culture: Balancing Safety and Accountability*. Ashgate Publishing.

FLIN, R., & YULE, S. J. (2004). Leadership for safety: Industrial experience. *Quality and Safety in Health Care*, 13, 45–51. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC1765800/>. Accessed April 15, 2025.

HUSSAIN, S. A., MALIK, M. Z., & MENEZES, R. G. (2015). The airplane crash in the French Alps: A preventable tragedy. *Asian Journal of Psychiatry*, 17, 109–110.

INTERNATIONAL CIVIL AVIATION ORGANIZATION. (1998). *DOC 9683: Human factors training manual* (1st ed.). Montreal: ICAO.

INTERNATIONAL CIVIL AVIATION ORGANIZATION. (2002). *DOC 9806: Human factors guidelines for safety audits manual* (1st ed.). Montreal: ICAO.

ISOMETSÄ, E. T., HEIKKINEN, M. E., MARTTUNEN, M. J., HENRIKSSON, M. M., ARO, H. M., & LÖNNQVIST, J. K. (1995). The last appointment before suicide: Is suicide intent communicated? *American Journal of Psychiatry*, 152(6), 919–922. <https://doi.org/10.1176/ajp.152.6.919>

KENEDI, C. A., APPEL, J. M., & FRIEDMAN, S. H. (2019). Medical privacy versus public safety in aviation. *The Journal of the American Academy of Psychiatry and the Law*, 47(2), 224–232. <https://doi.org/10.29158/JAAPL.003839-19>

MENDOZA, J. (2015, March 28). Germanwings crash: How do airlines screen pilots for mental illnesses? Available at: <http://www.csmonitor.com/World/Global-News/2015/0328/Germanwings-crash-How-do-airlines-screen-pilots-for-mental-illnesses-video>. Accessed May 18, 2015.

MILNER, A. J., NIVEN, H., & LAMONTAGNE, A. D. (2015). Occupational class differences in suicide: Evidence of changes over time and during the global financial crisis in Australia. *BMC Psychiatry*, 21, 215–223. <https://doi.org/10.1186/s12888-015-0608-5>

PAN AMERICAN HEALTH ORGANIZATION. (2020, June). *COVID-19: Recommended mental health and psychosocial support (MHPSS) interventions during the pandemic*. OPAS/BRA/NMH/MH/COVID-19/20-0026. Available at: <https://iris.paho.org/handle/10665.2/53017>. Accessed May 29, 2023.

8. Corporate Resource Management (CRM) as a Tool for Preventing Aircraft-Assisted Suicide

PALMA, D. C. A., OLIVEIRA, B. F. A., & IGNOTTI, E. (2021). Suicide rates between men and women in Brazil, 2000–2017. *Cadernos de Saúde Pública*, 37(12), e00281020. <https://doi.org/10.1590/0102-311X00281020>

PASHA, T., & STOKES, P. R. A. (2018). Reflecting on the Germanwings disaster: A systematic review of depression and suicide in commercial airline pilots. *Frontiers in Psychiatry*, 9, 86. <https://doi.org/10.3389/fpsyt.2018.00086>

PINSKY, H. M., GUINA, J., BERRY, M., CHESANOW, C., & PINALS, D. A. (2019). Psychiatry and fitness to fly after Germanwings. *The Journal of the American Academy of Psychiatry and the Law*, 48(1), 65–76. <https://doi.org/10.29158/JAAPL.003889-20>

POLITANO, P. M., & WALTON, R. O. (2016). Analysis of NTSB aircraft-assisted pilot suicides: 1982–2014. *Suicide and Life-Threatening Behavior*, 46(2), 234–238. <https://doi.org/10.1111/sltb.12187>

RICE, S., WINTER, S. R., KRAEMER, K., MEHTA, R., & OYMAN, K. (2015). How do depression medications taken by pilots affect passengers' willingness to fly? A mediation analysis. *Review of European Studies*, 7(11), 200–212.

RONALDS, C., CREED, F., STONE, K., WEBB, S., & TOMENSON, B. (1997). Outcome of anxiety and depressive disorders in primary care. *British Journal of Psychiatry*, 171, 427–433. <https://doi.org/10.1192/bjp.171.5.427>

ROST, K., ZHANG, M., FORTNEY, J., SMITH, J., COYNE, J., & SMITH, G. R. Jr. (1998). Persistently poor outcomes of undetected major depression in primary care. *General Hospital Psychiatry*, 20(1), 12–20. [https://doi.org/10.1016/s0163-8343\(97\)00095-9](https://doi.org/10.1016/s0163-8343(97)00095-9)

SILVEIRA, D. G., & BARROS, C. C. L. (2019). Andreas Lubitz: A psychiatric perspective on the co-pilot of Germanwings flight 9525. *Revista Conexão SIPAER*, 9(3), 2–11.

STADLER, K. (2022). The psychological impact of COVID-19 on pilot mental health and wellbeing—quarantine experiences. *Transportation Research Procedia*, 66, 179–186. <https://doi.org/10.1016/j.trpro.2022.12.019>. Available at: <https://www.sciencedirect.com/science/article/pii/S2352146522007372>. Accessed May 25, 2023.

WINTER, S. R., et al. (2017). A longitudinal study on the alteration of consumer perceptions and the use of pilot medication. *Journal of Air Transport Management*, 59, 100–106. Available at: <https://ideas.repec.org/a/eee/jaitra/v59y2017icp100-106.html>

WU, A. C., et al. (2016). Airplane pilot mental health and suicidal thoughts: A cross-sectional descriptive study via anonymous web-based survey. *Environmental Health*, 15(1), 1–12. <https://doi.org/10.1186/s12940-016-0200-6>

8. Corporate Resource Management (CRM) as a Tool for Preventing Aircraft-Assisted Suicide

VAN AVERMAETE, J. A. G. (1998). NOTECHS: Non-technical skill evaluation in JAR-FCL. Amsterdam: NLR, 25–40.

VUORIO, A., et al. (2014). Aircraft-assisted pilot suicides: Lessons to be learned. *Aviation, Space, and Environmental Medicine*, 85(8), 841–846. <https://doi.org/10.3357/ASEM.4000.2014>

VUORIO, A., & BOR, R. (2020). Black swan pandemic and the risk of pilot suicide. *Frontiers in Public Health*, 8, 573006. <https://doi.org/10.3389/fpubh.2020.573006>

VUORIO, A., LAUKKALA, T., NAVATHE, P., BUDOWLE, B., EYRE, A., & SAJANTILA, A. (2014). Aircraft-assisted pilot suicides: Lessons to be learned. *Aviation, Space, and Environmental Medicine*, 85(8), 841–846. <https://doi.org/10.3357/ASEM.4000.2014>

FLIN, R., MEARNES, K., O'CONNOR, P., & CRICHTON, M. (2008). *Safety at the Sharp End*. Burlington: Publishing Company.

REASON, J. (1997). *Managing the Risks of Organizational Accidents*. Aldershot: Ashgate Publishing.

SUN, Y., et al. (2023). Comparison of mental health symptoms before and during the COVID-19 pandemic: Evidence from a systematic review and meta-analysis of 134 cohorts. *The BMJ*, 380, e074224. <https://doi.org/10.1136/bmj-2022-074224>

ZAKIA, H., PRADANA, K., & ISKANDAR, S. (2023). Risk factors for psychiatric symptoms in patients with long COVID: A systematic review. *PLoS One*, 18(4). <https://doi.org/10.1371/journal.pone.0284075>

9. Investigation of Aircraft Accidents with Suspected Aircraft-Assisted Suicide

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9.1 Introduction

Aircraft accidents in Brazil are thoroughly investigated. CENIPA, the SIPAER Investigation Authority responsible for investigating aeronautical occurrences under Brazilian jurisdiction, employs multidisciplinary teams with extensive training for this function.

According to a scientific article published in Germany in 2008, there is a lack of data on suicides involving aircraft in that country (SCHWARK; SEVERIN; GRELLNER, 2008), and it can be stated that the same applies to Brazil. The authors affirm that the number of scientific publications on the subject is low and, in most cases, concentrated on occurrences in the United States.

Vuorio et al. (2014) emphasize that the risks of suicide in aviation are minimal due to the strict health requirements imposed on crew members, who undergo medical examinations both at the time of hiring and during periodic evaluations. The authors highlight a plausible explanation for the relatively low number of scientific studies addressing the use of aircraft as a means to commit suicide: the difficulty in classifying the cause of death, specifically defined as “the manner in which death occurred.” “Traditionally, mortality statistics by cause of death are produced by assigning a single cause to the death, called the underlying cause, previously defined” (FUNASA, p. 24, 2001), and in Brazil, suicide is recorded within the group that encompasses deaths from external causes, under “probable circumstances of unnatural death,” with information of a “strictly epidemiological” nature, which hinders the establishment of causal links. Botega (2014) specifies that, to determine a suicide, it is necessary to establish whether there was intent to die, and this cannot always be unequivocally defined.

The complexity of an accident of this nature, although rare, requires that investigative bodies be capable of collecting data immediately, remaining attentive to the specificities of the occurrence due to the possibility of losing important information that will be relevant to the conclusion of the investigation. As examples, two occurrences can be highlighted with characteristics indicating the possibility of aircraft-assisted suicide. First, Malaysian Airlines flight MH370, which disappeared on March 8, 2014, shortly after a routine transfer to Vietnamese air traffic control and, despite extensive searches, the aircraft was never located. Second, China Eastern Airlines flight 5735, which on March 21, 2022, abruptly descended during cruise flight and collided with the ground.

According to Schwark, Severin, and Grellner (2008), there is a high probability that cases of suicides involving aircraft are considerably more numerous than currently known. The authors suggest that autopsy results, forensic analyses, and accident site examinations may be imprecise, leading investigations to deviate from suicide and receive various classifications, such as pilot incapacitation, spatial disorientation, among other possibilities.

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In this regard, it is essential that the investigator be aware of these particularities, capable of quickly obtaining the necessary information and distributing responsibilities among the members of the Investigation Committee, a team composed of professionals qualified by CENIPA, such as physicians, psychologists, engineers, among others.

9.2 Common Contributing Factors

There are several factors commonly cited in the literature on aircraft accident investigations in which pilot suicide is at least suspected. Some of the most notable factors include:

- **Mental health:** In some cases, the pilots involved were struggling with mental health issues such as depression and anxiety. In the case of Germanwings flight 9525, it was discovered that co-pilot Andreas Lubitz suffered from depression (NTSB, 2002; BEA, 2016). Alongside a previous suicide attempt, having an untreated or inadequately treated mental illness are, according to the Brazilian Psychiatric Association – ABP (2014), the two main risk factors for suicide. ABP (2014) also considers that nearly all individuals who commit suicide had a mental illness.
- **Access and opportunity:** Pilots have access to aircraft and the ability to operate them. In some cases, pilots also had the opportunity to act without being prevented, often during a period when they were alone in the cockpit (NTSB, 2002; BEA, 2016).
- **Limitations of the mental health monitoring system:** Potential failures or inherent limitations in the system for monitoring pilots' mental health. This includes both the lack of regular mental health assessments and pilots' reluctance to report mental health issues due to fear of career impact (BEA, 2016).
- **Cockpit security controls:** After the terrorist attacks of September 11, 2001, security rules were changed to make cockpit doors inaccessible from the outside. Although this change was made to prevent hijackings, it also had the unintended consequence of allowing one pilot to lock the other out of the cockpit, as occurred in the Germanwings accident (BEA, 2016).
- **Identification and reporting of suspicious behavior:** In cases where there were prior signs of problems, there were often failures to recognize the severity of the situation or to report concerns to the appropriate authorities (BEA, 2016).
- **Personal problems:** In some cases, pilots were dealing with significant personal issues such as divorce, debt, or legal problems, which may have contributed to the decision to commit suicide (NTSB, 2002; BEA, 2016).

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Regarding the last point, Mulder and De Rooy (2018), in an article analyzing findings from aviation accident and incident reports involving mental health issues, state:

“Our main finding is that negative life events appear to be related to mental health risks in the highly selected and trained population of airplane pilots. In particular, relationship difficulties and divorce, as well as work-related, legal, and financial problems, seem to be significant. Therefore, when assessing pilots for mental health risks, it is important to pay attention to recent negative life events.” (MULDER; DE ROOY, 2018, p.47)

It is important to note, however, that although negative life events may be considered a risk factor, they should never be used as evidence of a mental disorder. Merely having experienced a negative life event should not necessarily be grounds for restricting a pilot from their aviation-related privileges. Suicidal thoughts and/or behaviors as a reaction to negative life events are likely the result of impaired coping mechanisms due to personality traits or an underlying mental disorder (MULDER; DE ROOY, 2018).

9.3 Challenges

Issues related to mental health are significantly more difficult to investigate than specific, measurable physiological variables, such as cardiac, pulmonary, renal problems or known neurological factors. Multidisciplinary work, especially involving aviation and human factors specialists—known as Human Factors Link – Medical and Psychological—is extremely necessary for better diagnosis. Through the work of these specialists, it is possible to obtain information from sources beyond those available at the crash site, such as the biopsychosocial aspects of the individuals involved in the occurrence (KFOURI; CASSIANO, 2019).

In the case of psychologists’ work, interviews with family members and colleagues are essential to understand the pilot’s personal and professional life context at the time. These interviews may reveal data such as expressions of death wishes and aggressive statements regarding the work environment.

Studies suggest that pilots do not share all their health problems with aviation medical examiners (VUORIO et al., 2023; VUORIO et al., 2018). This may be related to fear of being removed from flight duty, negative career impacts, and social stigma (MEDEIROS, 2021), such as derogatory labeling and shame in exposing vulnerabilities during emotional distress.

9.4 Psychological Autopsy

Death is a complex and multifaceted phenomenon, with a variety of possible causes, including physical, biological, and psychological factors. While traditional autopsy is a valuable tool for identifying the physical causes of death, it often fails to explore the psychological aspects that may have contributed to the fatal event.

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Psychological autopsy fills this gap, providing a more complete and holistic view of death (SHNEIDMAN, 1996).

Psychological autopsy is a forensic assessment that retrospectively studies the mental condition of the deceased. This assessment may include structured interviews with family and friends, review of flight simulator scenarios, and the social and financial circumstances of the crew member under investigation (VUORIO et al., 2023). The goal of a psychological autopsy is to attempt to identify the motive and cause of death, analyze the conditions surrounding the death, examine factors that impacted suicide risk, and assist family members and others with restorative coping mechanisms (KHABIBAH; ULA; MAHOJWALA, 2022).

Psychological autopsy offers several significant contributions and benefits. First, it helps identify individual and social risk factors and vulnerabilities associated with suicide and violent deaths, which can be useful in developing more effective prevention strategies. Additionally, psychological autopsy provides information for intervention in cases of complicated grief, trauma, and support for victims' families. It also contributes to the improvement of public policies related to mental health and safety (LESTER; YANG, 2013).

Obviously, the psychological autopsy method has limitations; however, it can be especially useful in investigations of suicides involving aircraft (VUORIO et al., 2023; KHABIBAH; ULA; MAHOJWALA, 2022). Psychological autopsy may be one of the most relevant tools for the study of completed suicide (ISOMETSÄ, 2001). Although it is highly relevant in accidents with suspected suicide, non-psychiatric pathology history and toxicological studies must not be disregarded for a complete understanding of the case.

9.5 Witness Interview

Witness interviews should not be conducted intuitively or without prior planning. Interviewing relatives of victims is always challenging: grief over the loss of a loved one, anger, perhaps guilt, anxiety regarding financial matters, or even confusion caused by social media and the press (ICAO, 1998). Due to this complexity, interviews must be conducted in a technical manner, by qualified personnel.

The success of an interview will depend on the planning carried out beforehand. Some specific points must be taken into consideration: interviews should be conducted as soon as possible after the occurrence to avoid the loss of perishable information, as well as the weakening of memory or rationalization of information. The passage of time also allows for information contamination, which occurs when witnesses compare notes with each other, or hear or read reports in the media. Effective interviews are characterized by a logical structure designed to maximize the quality and quantity of relevant information. The right question, asked in the right way and at the right time, is a powerful tool; it focuses on important information; ends unproductive conversations;

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helps people organize their thoughts; and allows the interview to proceed smoothly (ICAO, 1998).

It is strongly discouraged—unless no other option is available—that interviews be conducted at the crash site, or in locations exposed to sunlight, standing, or in noisy environments. It is essential that witnesses feel comfortable, and for this, the investigator must choose a quiet, reasonably comfortable location, free from interruptions. It is important that the investigator avoids filling the conversation with too many pauses and interruptions (ICAO, 1998), allowing the interviewee to develop their reasoning as freely as possible. Rapport is also fundamental—a method used to establish a bond between interviewer and interviewee (CORAZZARI, 2020).

The ideal rapport is one in which both parties feel safe and comfortable with each other (BORGES, 2006). This contributes to the witness being more willing to share what they have to say. This bond should be established in the interviewer's initial remarks.

In post-accident moments, it is absolutely understandable that people may feel cornered, stressed, and possibly in shock. It is necessary for the Lead Investigator to have the sensitivity to understand all the psychological aspects involved.

Recording the interview may present both benefits and drawbacks. In terms of benefits, it allows the investigator to fully focus on what the witness has to say and later calmly analyze all the points addressed. However, there are also drawbacks, as the person aware of the recording may be more cautious when providing information, seeking to conceal aspects they consider harmful, believing they could be used against them in the future. It is up to the interviewer to decide the best course of action.

An effective approach is to conduct the interview with two investigators: one dedicated to asking questions and paying attention to the responses, while the other records all the information (ICAO, 1998). It is of utmost importance to respect the principle of informed consent, never recording anything without the prior knowledge and consent of the interviewee. The discovery of such a practice could, in some way, compromise the credibility of the entire investigation.

Most witnesses are likely experiencing being interviewed by an investigator for the first time. It is natural for them to feel apprehensive and have doubts regarding the interview and its final outcome. To ensure a trustworthy environment, it is essential to eliminate as many uncertainties as possible. In this regard, the investigator must provide each witness with a clear explanation of the investigator's role, the witness's role and rights (including informing them that they will have access to the transcript), the purpose of the interview, and the process itself (ICAO, 1998). It is relevant to clearly inform that the interviews conducted cannot be used for judicial purposes, as they are protected under the Brazilian Aeronautics Code (Brazilian Code of Aeronautics) (Law No. 7.565, of December 19, 1986).

It is essential that witnesses understand that their participation is extremely important for a more accurate understanding of the occurrence and the prevention of

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future recurrences. By clarifying these points, the investigator creates an environment in which witnesses feel valued and engaged in the investigation process (ICAO, 1998).

A frequent, simple, and effective way to begin an interview is through a free recall question, in which witnesses have the opportunity to tell their story without interruptions. During this moment, the investigator must pay close attention to what is being said, avoiding gestures or behaviors that could influence the witnesses in any way. This approach is non-intimidating, allowing witnesses to believe that their words are valued. Furthermore, it establishes a bond between the investigator and the witness, while providing the investigator with an initial base of uncontaminated information (ICAO, 1998). When it becomes evident that a witness has nothing more to add, the investigator may begin asking about points that remain unclear, using their prior planning.

The “closed” question (one that elicits a “yes” or “no” response) produces limited information and should be avoided unless specifically intended. This practice is strongly discouraged by ICAO (ICAO, 1998). An indirect approach in delicate situations also eliminates the possibility of abruptly ending the interview, as might happen with a more direct question such as “were you and your husband having marital problems?” Questions should be brief, clear, and unequivocal. They must be relevant to the necessary information and presented one at a time. Another important point is that jargon, terminology, or overly technical aspects may confuse and intimidate witnesses and should therefore be avoided.

At the end of an interview, it is important to ask witnesses whether there is any additional information they wish to share or if they have any unresolved questions. It is essential to assure the witness that their contribution was valuable to the investigation. Additionally, it is important to establish the investigator’s availability for future contact, if necessary (ICAO, 1998). This demonstrates ongoing support and interest in the investigation. The investigator should also indicate openness to receiving additional information or answering questions should the witness wish to provide further details or seek updates on the progress of the investigation. This openness and willingness to engage in dialogue help strengthen the relationship between the investigator and the witness, as well as obtain relevant information for the investigative process. It is also important to offer the witness the possibility of a private, individual interview with the human factors professional from the Investigation Committee, if necessary.

None of the information obtained during an interview should be accepted without careful analysis. It is essential to verify health-related issues through medical records, while fatigue and work schedules, attitudes toward management, training, and maintenance can be confirmed with coworkers and the company or organization involved. By comparing the information obtained in interviews with data from other sources, the investigator will be able to piece together the puzzle more accurately and establish the credibility of different witnesses (ICAO, 1998). When assessing the validity and relevance of the information, the investigator must be aware that both the witnesses and the investigator themselves are influenced by their own personal beliefs.

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The Lead Investigator must never forget that, although it is possible to conduct additional interviews, there is no substitute for the first effective interview. In the first interview, the information is fresher and less susceptible to bias. If the investigator needs to conduct subsequent interviews, other strategies will be necessary to obtain more complete responses.

9.6 Investigation Techniques

The accident investigation process is, by itself, a highly complex and multidisciplinary activity, requiring investigators to possess deep knowledge as well as keen perception. In this context, when suicidal ideation involving the use of aircraft is added, the process becomes even more complex, representing a major challenge for investigators (VUORIO et al., 2023).

Therefore, it is important to emphasize that, at the beginning of the investigative process, investigators must be alert to any indication that may suggest the possibility of suicide. To this end, all available flight-related data must be analyzed as promptly as possible, as such information allows for the hypothesis of suicidal ideation aboard the aircraft to be either ruled out or confirmed, guiding the process toward the most appropriate line of investigation. Data from cockpit and flight recorders—the Cockpit Voice Recorder (CVR) and the Flight Data Recorder (FDR)—as well as communications between pilots and air traffic control agencies, the navigation profile, and the aircraft's behavior in the final moments of flight, provide valuable information that greatly assists the investigative process. On the other hand, it is noted that in many cases, there are difficulties in obtaining such data, which can significantly complicate the investigation.

Once indications of an accident caused by suicidal actions involving aircraft are identified, a series of actions focused on human factors related to the investigation must be initiated, seeking pertinent information through numerous possibilities. Therefore, “the investigator must be a chameleon, capable of adapting to various scenarios,” as stated in the *Human Factors Training Manual* (ICAO, 1998). In an investigation involving suicide, the most reliable data may be obtained by combining information derived from autopsies, the physical and mental medical history of the crew members, while keeping in mind the risk factors for suicide (VUORIO et al., 2014). That is, the investigator will be required to have extensive knowledge and skill across various fields, in addition to knowing how to delegate tasks to qualified professionals.

It is essential to understand that the advances of recent decades in experimental research in the fields of medicine (specifically psychiatry, toxicology, traumatology, and forensic medicine), psychology, ergonomics, and sociology can fundamentally assist an investigation. The Lead Investigator must rely on these professionals for a proper understanding of the occurrence as a whole.

Furthermore, immediate actions must be taken to conduct structured interviews with family members, survivors, coworkers, and friends of the crew members. It is

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emphasized that such interviews should involve a multidisciplinary team, with pre-established questions and conducted in an appropriate setting. For such structuring, it is recommended to use the guidelines expressed in *Human Factors Digest No. 3* (ICAO, 1991) and *Human Factors Digest No. 10* (ICAO, 1998), which, despite being published three decades ago, contain highly relevant information to this day regarding structured interviews.

Investigators must be alert to the possible existence of personal farewell letters, emails (depending on the impact of the accident, consider requesting access through judicial means), notes containing information about suicide (VUORIO et al., 2014). Special attention should be given to information collected by third parties, such as personal documents obtained by firefighters, police officers, or records from forensic medical examiners.

Vuorio et al. (2014) highlight the lack of standardization in the information recorded by forensic examiners, which may hinder investigations involving suicide. Therefore, it is imperative that the Lead Investigator provide prior guidance to the forensic examiners, with the assistance of a member of the Investigation Committee who has completed the Human Factors – Medical Aspects course.

A forensic medical examiner can assess with reasonable accuracy suicides committed by poisoning, sharp instruments, hanging, firearms, or falls from heights. However, in cases involving aircraft, the damage to the human body is so extensive that it becomes highly unlikely to determine the cause of death through physical examination. Thus, psychological evaluation conducted by trained psychologists and psychiatrists becomes essential (VUORIO et al., 2014).

It is important that these professionals analyze the entire medical and psychological history of the crew members. For this, the Lead Investigator must have basic knowledge of aspects involving suicide. The investigator must pay special attention to pre-existing personality issues and behavioral patterns, as these factors are reasonable predictors of future behaviors that may shed light on the current accident (VUORIO et al., 2023). The physician involved in the investigation must be alert to possible interactions between psychiatric medications, or even with other drugs, which may cause behavioral changes and must be taken into account (BUTLER, 2018).

The checklists contained in the *Human Factors Training Manual* (ICAO, 1998) are not rigid protocols for conducting a Human Factors investigation, but they can assist in organizing and guiding the investigation of Human Factors. They may help verify the thoroughness of the investigation into relevant Human Factors issues and assist the Lead Investigator in organizing and prioritizing the collection of evidence.

Professional ethical issues involving investigations must follow professional principles and include the consent of the victims' descendants, in the case of fatalities, for the inclusion of data in reports and technical documents produced. Psychological Autopsy itself, within its scope, already provides for interviews with family members and

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the documentation of their consent, to ensure that the confidentiality of information is preserved according to the families' interests.

In cases involving multiple victims, large-scale disasters, or other situations in which public interest may override individual interest regarding personal data, it is very important to have legal counsel to ensure that the investigation process does not adopt professional practices contrary to current legal regulations, especially those related to Professional Councils, such as the Federal Council of Psychology and the Federal Council of Medicine. It is recommended that body identification be carried out based on the methodology established by Interpol in its *Disaster Victim Identification Guide*, which standardizes internationally recognized procedures. These procedures are based on the analysis of dental records, DNA, fingerprinting, and medical characteristics.

This entire process also includes institutional cooperation among the technical personnel involved, through representatives of national and international institutions, so that they can work together in obtaining data that will compose the report, aiming at the prevention of future accidents or occurrences and avoiding the repetition of undesirable situations.

Psychological observations may be associated with certain medical aspects described in this chapter. Physicians and other professionals must keep in mind that not all behavioral changes result exclusively from psychological issues. There are a number of medications—whose details will not be listed here—that are included in various international guidelines across different fields and whose effects may be psychological in nature. For example, anti-inflammatory drugs from the corticosteroid class can cause significant effects, occasionally even presenting psychotic symptoms. Several antihypertensive medications may also cause fatigue and dizziness, as another example, directly interfering with the cognitive abilities and behavior of crew members and other individuals on board.

Thus, it is essential to pay special attention to the full list of illnesses related to the individuals being examined in the investigation, even if they died as a result of the accident, and to identify which medications were in regular, routine use. This reasoning also includes occasional medications, such as benzodiazepines and other “calming” drugs, which are usually prescribed by specialists from other fields, such as cardiologists, general practitioners, orthopedists, or gynecologists, for example. Often, the patient's family or the patient themselves may not know the specific purpose of these medications, not associating them directly with possible behavioral changes, which are extremely important in accident investigations.

Far beyond merely confirming whether the individual was undergoing treatment or not, in relation to consultations with specialists (psychiatrists or psychologists), the investigation team must pay close attention to the entire medical history in detail, and to all behavioral changes, which may be documented in different ways across various professional categories. It is common to find records from cardiologists noting symptoms

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of stress, with annotations about family and professional disputes, and from orthopedists, symptoms more related to pain and physical overload reported as associated with recent life events, such as intensified back pain following family arguments.

In the same context, there is the important phase of collecting biological material from the deceased or living individual, depending on the situation, which can and should be carried out as quickly as possible, within the bounds of professional ethical permissions, and which may provide significant contributions regarding the use of psychoactive substances by the individual. This material must follow a strict chain of custody to avoid potential future challenges regarding identification, analysis, and results. Usually, a good psychological autopsy and interviews with family members or the individual themselves may yield many indications of substance use, but documenting the biological levels present in the body can be very important in attempting to associate behaviors and decisions prior to the aeronautical outcome under investigation. Furthermore, it may also guide which substances should be analyzed, avoiding testing the entire material for the full panel of available substances, which may not be technically feasible.

9.7 Discussion

The collection and analysis of Human Factors information must be as methodical, systematized, and thorough as the collection and analysis of information related to the aircraft, its systems, or any other traditional area of investigation (ICAO, 1998). The investigation itself should be viewed as a process that requires training and disciplined investigators who apply their skills systematically.

The study by Patterson et al. (2001) evaluated 14 military crew members who attempted suicide between 1981 and 1996, and in most cases, the identified risk factors were: serious interpersonal relationship problems, administrative or legal issues, psychiatric disorders, death of a spouse or workplace conflicts, and evidence of alcohol or other substance abuse observed in 54% of the cases. The information from this study is important for the Lead Investigator to keep in mind when faced with the possibility of suicide in an occurrence, as the evaluation of the crew members' history will be essential to understanding the dynamics of the accident.

Analysis plays a central role in understanding cases of suicide involving aircraft. The collection and analysis of evidence, including medical records, psychological reports, and the pilot or crew's history, are essential to reconstruct the events that led to the suicide. The process also involves the analysis of communication records, flight recordings, data from the Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR), as well as toxicological examinations and autopsies. The integration of this information is crucial to obtain a comprehensive understanding of the contributing factors and circumstances surrounding suicide in aviation.

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In most cases, the underlying stress factors included failed intimate interpersonal relationships, administrative or legal problems, psychiatric disorders, death of a spouse, or workplace conflicts. Evidence of alcohol or other substance abuse was found in 54% of a previous and larger dataset of suicide attempts. Some data regarding completed suicides by crew members were available and are reported.

9.8 Final Considerations

The Brazilian State, through CENIPA, is accustomed to employing multidisciplinary approaches in the investigation of aircraft accidents. It is fundamentally important that Lead Investigators be knowledgeable about the content presented in this chapter so that, in the event of an aeronautical occurrence with suspected suicide, the appropriate actions can be taken in a timely manner.

It is important to emphasize that this is not an investigation aimed merely at determining whether the individual was undergoing treatment for a mental illness, but rather a detailed search for information that may suggest factors associated with behavioral changes. Ultimately, such changes may indicate symptoms that could be correlated with suicide or mental illness.

Moreover, understanding the basic aspects involved in suicidal ideation is essential for fully comprehending an occurrence involving suicide, since important data must be identified and analyzed.

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References

- Associação Brasileira de Psiquiatria [ABP]. (2014). *Suicide: Informing to Prevent*. Brasília, DF: CFM/ABP.
- Baldaçara, L., Weber, C. A. T., Gorender, M., Grudtner, R. R., Peu, S., Teles, A. L. S., Cavalcante, I. P., Quevedo, J., & Silva, A. G. (2022). Epidemiology of suicides in Brazil: A systematic review. *Global Psychiatry Archives*, 5(1).
- Borges, M. C. A. (2006). *The making of a psychotherapist: Training and skills* (Undergraduate thesis). Department of Psychology, Pontifical Catholic University of Rio de Janeiro, Brazil.
- Butler, M. G. (2018). Pharmacogenetics and psychiatric care: A review and commentary. *Journal of Mental Health & Clinical Psychology*, 2(2), 17–24. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6291002/>. Accessed March 12, 2025.
- Botega, N. J. (2014). Suicidal behavior: Epidemiology. *Psychology USP*, 25, 231–236.
- Brazil. Ministry of Health. (2001). *Instruction manual for completing the death certificate* (3rd ed.). Brasília: National Health Foundation.
- Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile – BEA. (2016). *Final report: Accident on 24 March 2015 at Prads-Haute-Bléone (Alpes-de-Haute-Provence, France) involving Airbus A320-211 registered D-AIPX operated by Germanwings*. Available at: https://www.bea.aero/uploads/tx_elydbrapports/BEA2015-0125.en-LR.pdf. Accessed May 11, 2023.
- Corazzari, C. (2020, February 3). Rapport: Scientific and contemporary aspects. In *Meta Visão 4D. Science and Update*. São Paulo. Available at: <https://metavisao4d.com.br/rapport-aspectos-cientificos-e-contemporaneos/>. Accessed June 13, 2023.
- Gur, R. E. (2014). Early detection of psychosis: Challenges and opportunities. *Current Behavioral Neuroscience Reports*, 1, 117–124. <https://doi.org/10.1007/s40473-014-0012-3>. Available at: <https://link.springer.com/article/10.1007/s40473-014-0012-3#citeas>. Accessed March 12, 2025.
- Isometsä, E. T. (2001). Psychological autopsy studies – A review. *European Psychiatry*, 16, 379–385.
- Kfoury, V. V. D., & Cassiano, S. K. (2019). The challenges of investigating human factors – Psychological aspects in aircraft accidents in Brazil. *Revista Conexão SIPAER*, 10(3), 18–25.
- Khabibah, S. U., Ula, M., & Mahojwala, G. (2022). Psychological autopsy: Future implementation in Indonesia? *Forensic Science International: Mind and Law*, 3, 100107. <https://doi.org/10.1016/j.fsimpl.2022.100107>. Available at: https://www.researchgate.net/publication/364272728_Psychological_autopsy_Future_implementation_in_Indonesia. Accessed March 12, 2025.

9. Investigation of Aircraft Accidents with Suspected Aircraft-Assisted Suicide

Lester, D., & Yang, B. (2013). The association between psychological autopsy rates and suicide rates: A systematic review. *Suicide and Life-Threatening Behavior*, 43(5), 491–502.

Medeiros, P. T. A. (2021). *Contributions of psychology to the mental health of aircrew* (Bachelor's thesis). School of Exact and Computer Sciences, Aeronautical Sciences Program, Pontifical Catholic University of Goiás, Goiânia, Brazil.

Mulder, S., & De Rooy, D. (2018). Pilot mental health, negative life events, and improving safety with peer support and a just culture. *Aerospace Medicine and Human Performance*, 89(1), 41–51. <https://doi.org/10.3357/AMHP.4903.2018>. Accessed May 28, 2023.

National Transportation Safety Board – NTSB. (2002). *Aircraft accident brief: EgyptAir Flight 990 Boeing 767-366ER, SU-GAP, 60 miles south of Nantucket, Massachusetts, October 31, 1999*. Washington, D.C.: NTSB.

International Civil Aviation Organization. (1991). *Human Factors Digest No. 3: Training of Operational Personnel in Human Factors* (59 p.).

International Civil Aviation Organization. (1998). *Human Factors Digest No. 10*.

Patterson, J. C., Jones, D. R., Marsh, R. W., & Drummond, F. E. (2001). Aeromedical management of U.S. Air Force aviators who attempt suicide. *Aviation, Space, and Environmental Medicine*, 72(12), 1081–1085.

Sérvio, S. M. T., & Cavalcante, A. C. S. (2013). Portraits of psychosocial autopsies on elderly suicides in Teresina. *Psychology: Science and Profession*, 33(Special Issue), 164–175.

Schwark, T., Severin, K., & Grellner, W. (2008). “I am flying to the stars” – Suicide by aircraft in Germany. *Forensic Science International*, 179(2–3), e75–e78. <https://doi.org/10.1016/j.forsciint.2008.06.004>

Shneidman, E. S. (1996). The psychological autopsy. *Suicide and Life-Threatening Behavior*, 26(1), 1–3.

Vuorio, A., Laukkala, T., Navathe, P., Budowle, B., Eyre, A., & Sajantila, A. (2014). Aircraft-assisted pilot suicides: Lessons to be learned. *Aviation, Space, and Environmental Medicine*, 85(8), 841–846. <https://doi.org/10.3357/ASEM.4000.2014>

Vuorio, A., Bor, R., Sajantila, A., Suhonen-Malm, A.-S., & Budowle, B. (2023). Commercial aircraft-assisted suicide accident investigations revisited – Agreeing to disagree? *Safety*, 9(1), 17. <https://doi.org/10.3390/safety9010017>. Available at: <https://www.mdpi.com/2313-576X/9/1/17>. Accessed March 12, 2025.

Vuorio, A., Budowle, B., Sajantila, A., Laukkala, T., Junttila, I., Kravik, S. E., & Griffiths, R. (2018). Duty of notification and aviation safety – A study of fatal aviation accidents in the United States in 2015. *International Journal of Environmental Research and Public Health*, 15. Available at:

9. Investigation of Aircraft Accidents with Suspected Aircraft-Assisted Suicide

https://www.researchgate.net/publication/325742378_Duty_of_Notification_and_Aviation_Safety-A_Study_of_Fatal_Aviation_Accidents_in_the_United_States_in_2015.
Accessed March 12, 2025.

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