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The ASO contains important information on safety and may contain recommendations for actions to be taken by operators. However, even if a recommendation is published in an ASO, an alternative action may be as or more efficient for the specific case of each operator and its particularities. The content of this document is for guidance purposes only, has no legal force and effect, and is not intended to bind the public.

Analysis of Loss of Control In-Flight (LOC-I), System Component Failure - Powerplant (SCF-PP), and Runway Excursion (RE) Occurrences in General Aviation (Operations under RBAC No. 91) in Brazil.

This Safety Alert (ASO) is intended for all owners, operators, pilots, mechanics, and maintenance organizations involved with aircraft operating under the [Brazilian Civil Aviation Regulation \(RBAC\) No. 91](#).

Objective of the ASO

This Safety Alert (ASO) aims to alert the general aviation community to the three main operational risks identified from the analysis of data from accidents and serious incidents that occurred between the years 2021 and 2024 in Brazil.

The analysis indicates a significant concentration of occurrences in three main risk categories:

- **System Component Failure - Powerplant (SCF-PP):** This is the category with the highest number of accidents in the period, totaling **63 occurrences**.
- **Runway Excursion (RE):** This category shows a high frequency of events, totaling **51 accidents** and **42 serious incidents** in the analyzed period.
- **Loss of Control In-Flight (LOC-I):** Although it is the third most frequent cause with **48 accidents**, this category stands out as the most critical and lethal.

The analysis of fatalities reveals that, despite the higher frequency of SCF-PP and RE occurrences, accidents due to Loss of Control In-Flight (LOC-I) resulted in **76 fatalities** between the years 2021 and 2024, representing the most severe risk to life in Brazilian general aviation.

In aggregate, these three categories were responsible for a total of **153 accidents** in the period from 2021 to 2024. The geographical analysis indicates a significant concentration of these occurrences in the following states:

- **Mato Grosso (MT):** Stands out with the highest number of accidents (25) among the three analyzed categories.



- São Paulo (SP): Concentrates the highest overall volume of occurrences, totaling 46 events (accidents, serious incidents, and incidents).
- Paraná (PR), Bahia (BA), Pará (PA), and Rio Grande do Sul (RS) also feature a high recurrence of events.

Furthermore, an upward trend is observed in the number of accidents and, more sharply, in the fatalities associated with these risks in the years 2023 and 2024, when compared to the two preceding years of the period. This scenario reinforces the need for attention from the general aviation community.

The purpose of this ASO is, therefore, to increase situational awareness about these three types of occurrences, detailing their contributing factors and recommending mitigation actions to reduce their frequency and, especially, their severity.

Considerations on Safety Management

Safety Management is a dynamic process that requires continuous adaptation to changes in the aviation environment. Effective safety management is designed to proactively detect emerging hazards, assess the associated level of risk, and implement appropriate barriers and mitigations to keep it at an acceptable level.

Such mitigations may include, but are not limited to, changes in processes, revision of operational or maintenance procedures, and reinforcement of training for the professionals involved.

It is recommended that operators under [RBAC No. 91](#), even those not required to have a formal Safety Management System (SMS), adopt the principles of risk management. This includes the constant evaluation of their own operations, the recording and analysis of adverse events to identify hazards, as well as the promotion of effective safety communication among all involved.

The safety policies and procedures adopted by each operator must be robust and, at the same time, flexible to adjust to new threats and changes in the operational environment, ensuring resilience and continuous safety improvement.



Recommended Actions for Safety

Based on the data analysis, the National Civil Aviation Agency (ANAC) recommends that owners, operators, pilots, and mechanics review their procedures and practices, with a special focus on the following areas, to mitigate the risks of Loss of Control In-Flight (LOC-I), System Component Failure - Powerplant (SCF-PP), and Runway Excursion (RE). The recommended actions are in accordance with the responsibilities and requirements established in [RBAC No. 91](#).

A. For the Prevention of Loss of Control In-Flight (LOC-I):

a. Proficiency and Continuous Training:

- It is recommended to conduct periodic training with a qualified instructor, focusing on unusual attitude recovery maneuvers, stalls in various configurations, and spin prevention, in line with the continuous improvement of pilot competencies.

b. Flight Planning and Management:

- Before each flight, ensure that all pre-flight duties, as per section 91.103, are fulfilled, with special attention to weight and balance calculations and their impact on the aircraft's flight characteristics.
- Maintain high situational awareness, in accordance with the pilot in command's final responsibility for the safety of the operation, as stipulated in section 91.3. Actively manage distractions and use automation systems as aids, always remaining prepared to take manual control of the aircraft.

c. Technology and Aircraft Knowledge:

- Consider the installation and use of Angle of Attack (AOA) indicators, where applicable, as a valuable tool to increase awareness of the safety margin to stall.

B. For the Prevention of System Component Failure - Powerplant (SCF-PP):

a. Preventive Maintenance and Inspections:

- It is the owner's or operator's responsibility to ensure that the aircraft is maintained in an airworthy condition, as per Subpart E of [RBAC No. 91](#). Strict adherence to the maintenance program and required inspections (91.405 and 91.409) is mandatory.
- Perform complete and thorough pre-flight inspections, in accordance with the pilot in command's responsibility to verify the aircraft's condition before flight, as established in section 91.7(b).
- For engines that have not undergone an overhaul within the interval recommended by the manufacturer, use a trend monitoring program to evaluate it over time and detect any degradation or performance loss in advance.
- Read [IS 91.409-002](#), which provides details on how to prevent in-flight engine failures.

b. Operational Procedures:

- Ensure that the aircraft operation is always conducted within the limitations specified in the approved flight manual (91.9).
- Review and practice emergency procedures for engine failure, including the selection of emergency landing sites, as part of pre-flight duties (91.103).



C. For the Prevention of Runway Excursion (RE):

a. Landing and Approach Planning:

- Always calculate and respect the landing and takeoff distances reported in the aircraft's flight manual, considering the actual conditions of the runway, weather, and weight, as required by section 91.103(b).
- The pilot in command must ensure that the approach and landing are conducted in a stabilized manner. The decision to go-around is a safety action and must be taken whenever the flight parameters are not within the safe limits for the operation.

b. Landing Technique:

- Execute the touchdown in the designated landing zone. A touchdown beyond the touchdown zone drastically reduces the available runway distance for braking.
- After touchdown, apply deceleration procedures (brakes, reversers, etc.) immediately and effectively, as recommended by the aircraft's flight manual, in accordance with section 91.9.
- Avoid performing low-angle approaches, as they do not provide consistent advantages in landing distance. On the contrary, they have been proven to increase the dispersion of the touchdown point and, consequently, the risk of occurrences such as touching down before the runway threshold, loss of control, and material and personal damage.

c. Inoperative Equipment:

- It is prohibited to take off with inoperative equipment or instruments unless what is established in section 91.213 is complied with, which provides for, among other things, the use of a Minimum Equipment List (MEL) approved by ANAC. Operating with inoperative equipment related to braking or aircraft control significantly increases the risk of a runway excursion.

Guidance Materials (in Portuguese)

- A. BGAST - [SE LOC-I 01 - Aproximação Estabilizada](#)
- B. BGAST - [SE LOC-I 02 - Reação a situações adversas](#)
- C. BGAST - [SE LOC-I 03 - Sistema de ângulo de ataque \(AoA\)](#)
- D. BGAST - [Vídeo: Indicadores de AOA para Aviação Geral](#)
- E. BGAST - [SE SCF-PP 01 - Bomba de Combustível](#)
- F. ANAC - [Cartilha Orientativa sobre Bielas de Motores a Pistão](#)
- G. BGAST - [SE SCF-PP-02 - Magnetos](#)
- H. ANAC - [Cartilha Orientativa sobre Válvulas de Admissão e de Exaustão de Motores a Pistão](#)

References (in Portuguese)

- A. Annual Safety Reports (RASO)
 - a. [Relatório Anual de Segurança Operacional \(RASO\) 2024](#)
 - b. [Relatório Anual de Segurança Operacional \(RASO\) 2023](#)



- c. [Relatório Anual de Segurança Operacional \(RASO\) 2022](#)
- d. [Relatório Anual de Segurança Operacional \(RASO\) 2021](#)
- B. [SIPAER Panel](#)
- C. Regulations:
 - a. [Regulamento Brasileiro da Aviação Civil \(RBAC\) nº 91](#)
 - b. [IS 91.409-002 - Prevenção de acidentes por perda de potência em voo e monitoramento de tendências de motores convencionais.](#)

