International Civil Aviation Organization
Asia and Pacific Office

Twenty-third Meeting of the Asia Pacific Regional Aviation Safety Team (APRAST/23)

(Bangkok, Thailand, 7 to 11 April 2025)

Agenda Item 5: Presentations – State / Industry / ICAO

FLIGHT SAFETY FOUNDATION REGIONAL AIRWORTHINESS NEEDS ANALYSIS STUDY – FINAL PROGRESS REPORT AND PROPOSED FOLLOW UP ACTIONS

(Presented by the Flight Safety Foundation, Co-sponsored by AAPA)

SUMMARY

In January 2024, the Flight Safety Foundation embarked on a comprehensive Regional Airworthiness Needs Analysis Study aimed to identify underlying issues contributing to system component failures or malfunctions for non powerplant as well as powerplant (SCF-NP, SCF-PP). Additionally, the study assessed the effectiveness of the flow of continuing airworthiness information among regulatory authorities, air operators, and maintenance organizations. This paper presents FSF’s final progress report and summary of results including recommendations.

1. INTRODUCTION

1.1 In January 2024, the Flight Safety Foundation, through its Asia Pacific Centre for Aviation Safety (AP-CAS), initiated a comprehensive regional airworthiness needs analysis. This study aimed to identify underlying issues contributing to System Component Failures or Malfunctions — Non-Powerplant (SCF-NP) and System Component Failures or Malfunctions—Powerplant (SCF-PP) in the Asia Pacific region. Additionally, the study assessed the effectiveness of the flow of continuing airworthiness information among regulatory authorities, air operators, and maintenance organizations. The analysis, conclusions, and recommendations will inform and enable aviation stakeholders and FSF AP-CAS to prioritize their regional engagement, including, but not limited to, outreach, technical assistance, and training activities.

1.2 It is notable that, when combined the occurrences the SCF NP and SCF PP occurrences, comprised the greatest number of non-fatal accidents and serious incidents in the region during the analysis period (2017 to 2023) based on absolute numbers, The combination of these two occurrence categories accounts for approximately one-fourth of all occurrences in the region over a seven-year period. Non-fatal accidents are often survivable events, provided pilots take appropriate actions, underscoring the critical role of training and operational preparedness. Notably, the global increase in SCF-NP occurrences over the past five years is now reflected as one of the targets in Goal 1 of the draft Global Aviation Safety Plan (GASP 2026-2028) which will be submitted to the ICAO Assembly in 2025 for approval.

1.3 Progress reports of this study was presented as a working paper at the ICAO Asia Pacific Regional Aviation Safety Team (APRAST) meeting in October 2024 outlining the objectives, progress and results to date. The Meetings supported the Study and encouraged participants to support FSF in its ongoing efforts in advancing the project. Further, the meeting requested that FSF present its ongoing progress reports and final results and recommendations at future meetings.

1.4 Furthermore, during the 59th Directors General of Civil Aviation Conference (October 2024, Cebu, Philippines), FSF reported on the progress made on this study to date. The Conference FSF's ongoing safety projects, including the Airworthiness Needs Analysis, and the critical importance of accuracy and analysis, and invited FSF to present their findings at the next AP-RAST meeting

2. DISCUSSION

2.1 The study has been completed, and the final report will be made available to APAC States shortly after this meeting. Throughout this project, deliverables included the collection and organization of all relevant safety data that could contribute to the analysis, taking into consideration ICAO Universal Safety Oversight Audit Program (USOAP) results, Aviation Safety Network (ASN) information on accidents and serious incents, Online Airworthiness Information Network – AIN (i.e., system replacing Circular 95) and other information gathered by engaging with safety partners.

2.2 The study focused on identifying the underlying factors associated with the high number of SCF-NP and PP (when combined together) in the Asia Pacific Region as reported by State accident investigation authorities. Data concerning the nature of failures, as identified during the AP-CAS Regional Safety Assessment, was further supplemented by engaging with a cross section of airlines, maintenance and repair organizations (MROs) as well as regulators from various States of Design. The study identifies some of the underlying factors that may contribute to shortcomings in areas such as maintenance practices, instructions for continued airworthiness, potential shortages in skilled human resources, training of maintenance personnel as well as the flow of continuing airworthiness information.

2.3 The AIN, located within ICAO's Integrated Safety Trend Analysis and Reporting System, was created in 2014 to assist States of Registry and States of the Operator in ensuring the continuing airworthiness of aircraft. This database was carefully reviewed to assess its level of use by APAC States and industry in inputting the necessary information fields to support States, air operators, as well as OEMS in the flow of continuing airworthiness information, including fault defect reporting.

2.4 A survey was conducted with the support of AAPA, which facilitated participation by reaching out to both member and non-member airlines to ensure broader industry representation to enhance this analysis. The outcomes of this analysis for SCF-NP, SCF-PP, and the flow of continuing airworthiness information have been compiled into Fact Sheets. The Fact Sheets are attached to this WP and are also an integral part of the final draft report. The draft report, along with the Fact Sheets, has been shared with AAPA, IATA, FAA, EASA, and ICCAIA for their feedback and review, where possible.

3. FINDINGS

3.1 <u>SCF-NP (System Component Failures or Malfunction– Non-Powerplant)</u>

3.1.1 SCF-NP accounted for a significant proportion of non-fatal accidents and serious incidents, with cabin pressure system failures (48 percent), hydraulic and landing gear failures (34 percent), and electrical failures (9 percent) being the most common issues. Inadequate maintenance practices were identified as contributing factors in 24 percent of these occurrences, often preventable through adherence to manufacturers recommended scheduled maintenance and OEM bulletins.

3.1.2 Fifty-six percent of APAC States have low Effective Implementation (EI) scores in key airworthiness oversight areas, including technical personnel qualifications, certification and approvals, surveillance obligations, and resolution of safety concerns.

3.1.3 These results indicate areas requiring increased safety oversight to address systemic issues such as defect rectification and control, MEL compliance, recurring defects, root cause analyses, and maintenance program approvals. Furthermore, inadequacies in regulatory surveillance, including MEL approvals and monitoring of reliability programs, contribute to recurring issues that may impact operational safety. A "Fact Sheet" summarizing the findings is at Appendix A to this Working Paper.

3.2 SCF-PP (System Component Failures or Malfunction – Powerplant)

3.2.1 Turbine blade failures (41 percent) and other critical component failures (32 percent) were the most common component failures of SCF-PP incidents involving reported accidents and serious incidents. Inadequate maintenance practices were identified as contributing factors in 35 percent of investigated SCF-PP events, and 41 percent of these events were coordinated with engine manufacturers for corrective actions. Despite a decline in global SCF-PP events, the APAC region continues to report the highest number of occurrences, averaging nine per year.

3.2.2 Survey data conducted with the support from AAPA highlighted persistent challenges in engine component failures, parts shortages, and operational disruptions, with 70 percent of respondents experiencing significant aircraft downtime due to component unavailability. A "Fact Sheet" summarizing the findings is at Appendix B to this Working Paper.

3.3 Flow of Continuing Airworthiness Information

3.3.1 The AIN remains underutilized, with only 12 percent of APAC regulators consistently updating their information since its launch in 2014. Additionally, only nine APAC States currently have valid email contact information on the platform. Outdated or missing contact details for continuing airworthiness matters hinder effective communication and coordination between the State of Design, State of Registry, and operators. Gaps in regulatory oversight impact fault defect reporting and root cause analyses and may limit the ability of regulators to monitor and mitigate airworthiness concerns effectively. A Fact Sheet summarizing the findings is at Appendix C to this Working Paper.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 The study underscores the urgent need for regulatory enhancements in SCF-NP and SCF-PP oversight, improved coordination between States and air operators, and a revitalized approach to continuing airworthiness information sharing. Strengthening engagement with ICAO's airworthiness reporting tools and implementing structured training for regulators and operators will be critical in ensuring a more effective and proactive approach to airworthiness management in the region.

4.2 The following recommendations are included in the final report of the Airworthiness Needs Analysis Study:

4.2.1 Regulators identifying SCF-NP and SCF-PP events among their air operators should enhance safety oversight to address systemic issues, including defect rectification and control, MEL compliance, recurring defects, root cause analyses, and maintenance program approvals.

4.2.2 Regulators with low EI scores or with an increase in reported SCF-NP and SCF-PP events should provide specialized training for their inspectors, focusing on defect rectification and control, MEL compliance, recurring defects, root cause analyses, and maintenance program approvals.

4.2.3 ICAO RASG-APAC should consider recognizing SCF-NP as well as SCF-PP as additional occurrence categories of importance in its APAC Regional Aviation Safety Plan (RASP) and develop safety enhancement initiatives (SEIs) including the SEI Outputs to help reduce aviation risk.

4.2.4 ICAO should reassess the AINs usability and accessibility by conducting a user experience review to identify challenges States have faced in entering and retrieving information. ICAO should also provide technical assistance and a streamlined interface to encourage broader participation. Consideration should be given to modernize and simplify the AIN platform, making it more user-friendly and widely adopted. States should be encouraged to adopt electronic systems for airworthiness reporting and provide technical assistance where necessary. Finally, ICAO should consider developing targeted training and guidance materials to help States understand the importance and use of AIN. The conduct of regional workshops and webinars to ensure regulatory personnel are aware of AINs benefits and functionalities could promote the use of the AIN.

4.2.5 Operators and MROs in collaboration with their regulators should adopt protocols to ensure consistency in reporting. Training programs focused on Service Difficulty Reporting (SDR) completion and root cause analysis are essential to enhance the quality of submissions.

4.2.6 Regulators, operators, and MROs should establish or enhance existing mechanisms for continuous feedback to improve fault detection and resolution. Operators and MROs should implement or strengthen internal systems to systematically analyze and address recurring issues, ensuring that data shared with regulators and OEMs is accurate, comprehensive, and actionable.

4.2.7 Regulators should actively update and validate contact details in the AIN, ensuring reliable communication channels for airworthiness reporting and establish systems to monitor and manage fault defect reporting from operators and MROs.

4.2.8 Regulators to strengthen regulatory safety oversight by prioritizing the integration of SDR reviews into their State Safety Program (SSP) frameworks. This involves analysing collected data to identify trends, resolve recurring issues, and implement risk management strategy.

5. ACTION BY THE MEETING

5.1 The Meeting is invited to:

a) encourage ICAO, APAC States, air operators, aircraft maintenance and repair organizations to take into consideration the conclusions and recommendations reflected in Paragraph 4 and review the final report and recommendations of the Airworthiness Needs Analysis Study, when available; and

b) recommend that the Flight Safety Foundation make the final report available to RASG-APAC, its subgroups, as well as States, as a means to assist stakeholders in prioritizing their regional engagement and to update the existing Regional Aviation Safety Plan and, where necessary National Aviation Safety Plans.

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SYSTEM COMPONENT FAILURE OR MALFUNCTION NON POWERPLANT

FACT SHEET APAC REGION 2017-2023

1.0 Definition

1.1 System / Component Failure or Malfunction (Non-Powerplant) (SCF-NP): The CAST/ICAO Common Taxonomy Team (CICTT), formed by the U.S. Commercial Aviation Safety Team (CAST) and the International Civil Aviation Organization (ICAO) defines SCF -NP as, *"an event in which a failure or malfunction occurs of an aircraft system or component other than the powerplant"*.

2.0 Analysis

Accidents		Accidents/Serious Incidents
Fatal	Fatal/Non-Fatal	Non-Fatal
CFIT	TURB	RE
LOC-I	RE	SCF-NP
RE	ARC	SCF-PP
ARC	CFIT	MAC
	GCOL+RAMP	ARC
	LOC-I	TURB
	SCF-NP	RI
	RI	GCOL+RAMP
	SCF-PP	LOC-I
	USOS	CFIT

2.1 SCF-NP is ranked second highest accident/serious incident (non-fatal) occurrence category in the APAC region after runway excursions and accounts for 14 percent of all accidents and serious incidents in the region.

2.2 The ASN database shows there were 8 SCF-NP events in the APAC region in 2023 and 9 in 2022, which is consistent with the average number of SCF-NP events year-over-year from 2017-2023. Even during the period of the pandemic, SCF-NP events averaged nine each year during which much of the commercial aviation industry was shut down.

2.3 During the reporting period all SCF-NP events were non-fatal and 9 percent were classified as accidents. Interestingly, half of the SCF-NP events in 2023 were classified as accidents, however no accident report, or preliminary reports have been filed so far as they are still in the investigation process. 72 percent of all SCF-NP events in the region occurred on jet aircraft, the rest were on turboprop aircraft. Approximately 60 percent of all SCF-NP events occurred during the en-route phase of flight and 17 percent occurred during the landing phase and ground and take off phase respectively.

2.4 Over the seven-year period, cabin pressure system failures have been the leading system component failures, non powerplant with 48 percent of all reported incidents were the result of pressure system failures followed by 34 percent hydraulic and landing gear system failures and 9 percent electrical system failures. Five events were the result of structural or corrosion related failures. 28 percent of all SCF-NP can be attributed to poor maintenance practices or could have been prevented by adhering to manufacturers recommended scheduled maintenance as well as OEM bulletins. 37 percent of all SCF-NP events accidents or serious incidents were investigated during this reporting period. All events that were investigated included recommendations including consultation with the OEM.

2.5 Accidents and Serious incidents in the APAC region resulting from hydraulic and landing gear system failures were mainly caused by:

- Wear and tear on the wheels, tires, axles, and other parts including corrosion resulting in failure of components.
- Leaking hydraulic fluid
- Damaged or malfunctioning hydraulics
- Malfunctions in the locking mechanisms
- Jamming of the wheels

2.6 When comparing to the global accident and serious incident results in 2023, there were 22 SCF-NP events, which is below the 25.4 per year on a five year rolling average seen during 2017-2023. The APAC region averages 10.0 SCF-NP accidents/serious incidents per year for the same time period, making it the highest region with SCF-NP events. The comparison of the 5-year average for each ICAO region for SCF-NP events is the following:

	APAC	NACC	EURNAT	SAM	ESAF	WACAF	MID
# of SCF-NP accidents / serious incidents	72	40	66	18	5	12	9
5 year rolling avg	10.0	5.8	7.4	2.6	1.0	2.2	1.2

3.0 Analysis of ASN results correlated with the AP-CAS Dashboard

3.1 Fifty-six percent of APAC States currently have low effective implementation (EI) scores in the area of the airworthiness of aircraft for any or all of the following; technical personnel qualifications and training (CE-4), Certification and approvals (CE-6), surveillance obligations (CE-7), or resolution of safety concerns (CE-8). Surveillance activities performed by regulatory authorities in the areas of airworthiness have been particularly low for some States.

4.0 ICAO Global Aviation Safety Plan (GASP)

4.1 The GASP has not highlighted SCF-NP as a global risk and therefore is not reflected in the latest version of the GASP.

4.2 The Global aviation safety roadmap serves as an action plan to assist the APAC aviation community in developing the RASP and NASPs by outlining safety enhancement initiatives (SEIs) associated with the global HRCs. Since SCF-NP is not reflected as an HRC, no guidance is given to the regions or States in the form of actions that can be considered for the RASP and NASPs.

5.0 APAC Regional Aviation Safety Plan (RASP)

5.1 The RASP recognizes that SCF-NP has contributed to accidents and serious incidents in the APAC region that resulted in substantial damage to aircraft, but no fatal accidents. As a result, SCF-NP was not identified as a regional HRC.

6.0 National Aviation Safety Plans

Fifteen APAC States have published National Aviation Safety Plans. No State has reflected SCF-NP as a national operational risk.

7.0 Precursors /Contributory Factors and actions that can be taken to eliminate or mitigate system component failures (non powerplant).

7.1 Precursors and contributing factors: While poor aircraft maintenance practices can certainly contribute to SCF-NP, it is not the only reason. Aircraft maintenance is a critical aspect of aviation safety and reliability, and inadequate maintenance practices can lead to a higher risk of failures. However, it is essential to recognize that various factors can contribute to SCF-NP.

- **Environmental Conditions**: Exposure to harsh environmental factors, such as extreme temperatures, humidity, or corrosive substances, can accelerate component degradation and failure.
- **Deterioration due to ageing components:** Components naturally degrade over time due to wear and tear, leading to reduced performance and eventual failure. The age of an aircraft fleet is also a factor.
- **Repair Issues**: Compatibility issues between components or improper repairs can cause failures in the system. This can occur from unapproved modification or repairs made to in an aircraft.
- **Mechanical overload and Stress**: Components can fail if subjected to excessive loads, stress, or vibration beyond their designed limits.
- **Improper Handling and shipping of parts**: Mishandling during installation, maintenance, or repairs can damage components and lead to failures as well as damage caused by shipping.
- **Human performance including human factors issues**: Errors made by maintenance personnel or operators during maintenance or operation can result in component failures.
- **Lack of Training**: Insufficient training of maintenance personnel may lead to improper maintenance practices, increasing the risk of failures.
- **Maintenance programs:** Being approved by State of Registry but not adhering to a manufacturer's recommended maintenance schedule and / or Chapter 5 airworthiness limitations may impact the airworthiness of the aircraft. Additionally, the maintenance program intervals may not be adjusted to reflect the environment, role and utilization rate of the aircraft.
- **Improper implementation of reliability programs and condition monitoring.**
- **Damage:** Accidental Damage (AD) and/or Environmental Damage (ED).
- **Inadequate maintenance practices:** If components are not inspected thoroughly and regularly, potential issues may go undetected, leading to unexpected failures.
- **Inadequate oversight**: Inability to properly oversee operations due to poor training, operation procedure, and/or maintenance.

- **Major component degradation** as a result of fatigue, fretting, wear, corrosion, or creep, depending on the component or system operation.
- **Suspected unapproved parts (SUPS)**

7.2 Actions:

- Approve operator maintenance programs taking into consideration changes to the maintenance programme to reflect operator experience, environment of operation, utilization rate.
- Approve operator maintenance programs to include when applicable, Condition Monitoring or Condition Based maintenance (CBM), based on Predictive Maintenance (PdM).
- Establish the requirements for, and ensure oversight of Defect Control and deviations from the Approved Minimum Equipment List,
- Training and Human Factors: Train operators and maintenance personnel on proper procedures, handling, and troubleshooting techniques.
- Establish the requirements for training of operators and maintenance personnel on Human Factors, Environmental Protections, Root Cause Analysis, Software and Firmware Updates, and Supplier Quality Assurance. Train operators and maintenance personnel on proper procedures, handling, and troubleshooting techniques.
- Perform thorough root cause analysis/study to understand the underlying reasons and implement corrective actions
- Facilitate the sharing of continuing airworthiness information between State of Design, State of Manufacture, and State of Registry and complete the necessary information on the ICAO Online Airworthiness Information Network (formerly Circular 95).
- Oversight of Supplier's Quality Assurance programs.

8.0 Accident / Serious Incident Reports

Link	Date	AC Type	Country of occurrence	Type of SCF
ASN	09-Apr-17	ATR 72-600	New Zealand	Landing gear system
ASN	13-May-17	Boeing 787-8	Singapore	Landing gear system
ASN	27-May-17	DHC-6 Twin Otter	Maldives	Landing gear system
ASN	13-Jun-17	Boeing 737-800	Indonesia	Landing gear system
ASN	04-Aug-17	Dash-8-100	P.N. Guinea	Landing gear system
ASN	01-Oct-17	ATR 72-600	Philippines	Unknown
ASN	15-Oct-17	Airbus A320	Australia	Pressure System
ASN	18-Oct-17	Airbus A320	Pakistan	Pressure System
ASN	16-Jan-18	HS-748	Bangladesh	Structural
ASN	05-Mar-18	Airbus A320	Pakistan	Pressure System
ASN	14-Mar-18	Boeing 737-800	Australia	Hydraulic system
ASN	28-Mar-18	ATR 72-600	India	Landing gear system
ASN	01-Apr-18	Boeing 737-900	Indonesia	Pressure System

ASN	14-May-18	Airbus A319	China	Structural
ASN	29-Jun-18	Boeing 777-300	Japan	Landing gear system
ASN	15-Aug-18	Boeing 737-300	Australia	Pressure System
ASN	06-Sep-18	Boeing 737-400	Australia	Electrical system
ASN	20-Sep-18	Boeing 737-800	India	Pressure System
ASN	19-Oct-18	Boeing 747-400	Singapore	Landing gear system
ASN	25-Dec-18	Airbus A320	Vietnam	N/A
ASN	09-Jan-19	Airbus A320	Thailand	N/A
ASN	03-Feb-19	Dash-8-200	Australia	Pressure System
ASN	24-Mar-19	Airbus A320	Taiwan	Pressure System
ASN	11-May-19	Dash-8-400	Australia	Pressure System
ASN	14-May-19	Airbus A330-200	Australia	Electrical System
ASN	05-Jun-19	Boeing 737-400	Singapore	Hydraulic system
ASN	30-Oct-19	CRJ700	Japan	Pressure System
ASN	21-Nov-19	Fokker 70	P.N. Guinea	Pressure System
ASN	27-Nov-19	Airbus A320	Thailand	Pressure System
ASN	02-Dec-19	Boeing 737-900	Indonesia	Pressure System
ASN	23-Dec-19	ERJ-190	Japan	Electrical System
ASN	26-Feb-20	Boeing 737-800	India	Pressure System
ASN	18-Mar-20	Fokker 100	P.N. Guinea	Pressure System
ASN	14-Jun-20	Airbus A330-300	Taiwan	Electrical System
ASN	03-Jul-20	ATR 72	Indonesia	Electrical System
ASN	10-Aug-20	Fokker 100	Australia	Pressure System
ASN	03-Oct-20	ATR 72	Indonesia	Electrical System
ASN	18-Oct-20	DHC-6 Twin Otter	P.N. Guinea	Hydraulic system
ASN	05-Nov-20	Airbus A320neo	Thailand	Pressure System
ASN	02-Dec-20	Airbus A321neo	India	Pitot Static System
ASN	05-Feb-21	Airbus A330-200	Australia	Pressure System
ASN	06-Mar-21	Airbus A320	Indonesia	Landing gear system
ASN	14-May-21	ATR 72	India	Landing gear system
ASN	13-Sep-21	Beech 1900	Australia	Pressure System
ASN	18-Sep-21	Airbus A330-300	India	Pressure System
ASN	08-Nov-22	Dash-8-200	Australia	Hydraulic System
ASN	17-Nov-21	Boeing 737-800	India	pressure system
ASN	17-Nov-21	ATR 72	Bangladesh	Landing gear system
ASN	13-Dec-21	Boeing 737-900	Indonesia	Pressure System
ASN	30-Jan-22	Dash-8-300	Australia	Pressure system
ASN	24-May-22	Airbus A320	Australia	Pressure System

ASN	05-Jun-22	ATR 42-300	Bangladesh	landing gear system
ASN	05-Jun-22	Airbus A320	Thailand	Pressure System
ASN	18-Jun-22	Airbus A320	Australia	Pressure system
ASN	04-Jul-22	Fokker 100	Australia	Pressure System
ASN	16-Sep-22	Dash-8-100	Australia	Pressure System
ASN	25-Oct-22	Dash-8-100	Australia	Hydraulic system
ASN	04-Nov-22	SAAB 340	Australia	Hydraulic system
ASN	08-Jan-23	DHC-8-300	Australia	Pressure System
ASN	20-Feb-23	Fokker 70	PNG	Pressure system
ASN	21-Apr-23	A330-200	Sri-Lanka	Pressure system
ASN	11-May-23	Cessna 208	Indonesia	Landing Gear System
ASN	19-Jun-23	Boeing 787-9	Taiwan	Landing Gear System
ASN	28-Jun-23	Airbus A330-300	Thailand	Landing Gear System
ASN	08-Oct-23	Airbus A330-200	Pakistan	Pressure System
ASN	08-Dec-23	SAAB 340	Tonga	Hydraulic System

References

Annex 6
Annex 8
ICAO Doc 9760
ICAO Circular 95
EASA Part-ORO.MLR.105(f), CS MMEL.135 and TCCA CASA 2022-02 for repair intervals B, C and D
https://skybrary.aero/sites/default/files/bookshelf/2125.pdf
FAA OpsSpecD095 for repair intervals B and C https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.information/documentID/1042194
Closing MEL Items: Why Sooner is Better https://safetyfirst.airbus.com/closing-mel-items-why-sooner-is-better/
A Recall on the Correct Use of the MEL https://safetyfirst.airbus.com/a-recall-on-the-correct-use-of-the-mel/
System Reset: Use with Caution
https://safetyfirst.airbus.com/system-reset-use-with-caution/

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SYSTEM COMPONENT FAILURE OR MALFUNCTION POWERPLANT

FACT SHEET APAC REGION 2017-2023

1.0 Definition

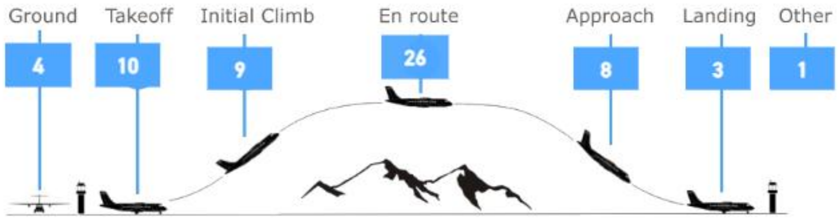
1.1 System / Component Failure or Malfunction (Powerplant) (SCF-PP): The CAST/ICAO Common Taxonomy Team (CICTT), formed by the U.S. Commercial Aviation Safety Team (CAST) and the International Civil Aviation Organization (ICAO) defines SCF -PP as, *"an event in which a failure or malfunction occurs of an aircraft system or component related to the powerplant".*

2.0 Analysis

Accidents		Accidents/Serious Incidents
Fatal	Fatal/Non-Fatal	Non-Fatal
CFIT	TURB	RE
LOC-I	RE	SCF-NP
RE	ARC	SCF-PP
ARC	CFIT	MAC
	GCOL+RAMP	ARC
	LOC-I	TURB
	SCF-NP	RI
	RI	GCOL+RAMP
	SCF-PP	LOC-I
	USOS	CFIT

2.1 SCF-PP is ranked third highest accident/serious incident (non-fatal) occurrence category in the APAC region after runway excursions and SCF-NP and accounts for 11 percent of all accidents and serious incidents in the region.

2.2 The ASN database shows there were 4 SCF-PP events in the APAC region in 2023 and 7 in 2022, which is below the average number of SCF-PP events year-over-year from 2017-2023.



2.3 During the reporting period all SCF-PP events were non-fatal and only two events were classified as accidents. 69 percent of all SCF-PP events in the region occurred on jet aircraft, the rest were on turboprop aircraft. 44 percent of all SCF-PP events occurred during the en-route phase of flight and 19 percent occurred during the take-off phase.

2.4 Over the seven-year period, Turbine blade failures have been the leading critical component failure with 41 percent of all reported events followed by 32 percent for other component failures such as Propellor shaft failures, pumps, gears, bearings etc. 67 percent of all SCF-PP accidents or serious incidents were investigated or in the process of being investigated during this reporting period. 41 percent of the events involved coordination with the engine manufacturers. 35 percent of all SCF-PP events that were investigated, it was determined that poor maintenance practices were a contributing factor to the accident or serious incident.

2.5 According to accident and serious incident investigation reports, maintenance practices that did contribute to accidents and serious incidents in the APAC region included:

- Lack of adherence to the MRO checklist.
- Inadequate technical record keeping.

- Incomplete inspections performed.
- Additional borescope inspections recommended that were not performed.
- Poor maintenance
- The engine improperly returned to service.
- Not adhering to OEM procedures.
- Improper maintenance or non-adherence to recommended maintenance practices.
- Did not hold the necessary approval to sign the maintenance release.
- Engine not in compliance with OEM service bulletins.
- Miss assembly during previous shop visit.

2.6 When comparing to the global accident and serious incident results in 2023, there were 12 SCF-PP events, which is below the 21.0 per year on a five-year rolling average seen during 2017-2023. The APAC region averages 9 SCF-PP accidents/serious incidents per year for the same time period, making it the highest region with SCF-PP events. The comparison of the 5-year average for each ICAO region for SCF-PP events is the following:

	APAC	NACC	EURNAT	SAM	ESAF	WACAF	MID
# of SCF-PP accidents / serious incidents	59	21	26	7	10	6	6
5 year rolling avg	9.0	2.8	4.0	2.3	1.8	1.3	1.3

3.0 Analysis of ASN results correlated with the AP-CAS Dashboard

3.1 Fifty-six percent of APAC States currently have low effective implementation (EI) scores in the area of the airworthiness of aircraft for any or all of the following: technical personnel qualifications and training (CE-4), Certification and approvals (CE-6), surveillance obligations (CE-7), or resolution of safety concerns (CE-8). Surveillance activities performed by regulatory authorities in the areas of airworthiness have been particularly low for some States.

4.0 ICAO Global Aviation Safety Plan (GASP)

4.1 The GASP has not highlighted SCF-PP as a global risk and therefore is not reflected in the latest version of the GASP.

4.2 The Global aviation safety roadmap serves as an action plan to assist the APAC aviation community in developing the RASP and NASPs by outlining safety enhancement initiatives (SEIs) associated with the global HRCs. Since SCF-PP is not reflected as an HRC, no guidance is given to the regions or States in the form of actions that can be considered for the RASP and NASPs.

5.0 APAC Regional Aviation Safety Plan (RASP)

5.1 SCF-PP has not been identified as an accident occurrence category nor as a regional High Risk Category (HRC) in the APAC RASP 2023-2025.

6.0 National Aviation Safety Plans

Fifteen APAC States have published National Aviation Safety Plans. No State has reflected SCF-PP as a national operational risk.

7.0 Precursors /Contributory Factors and actions that can be taken to eliminate or mitigate system component failures (powerplant).

7.1 Precursors and contributing factors: While inadequate aircraft maintenance practices can certainly contribute to SCF-PP, it is not the only reason. Aircraft maintenance is a critical aspect of aviation safety and reliability, and inadequate maintenance practices can lead to a higher risk of failures. However, it is essential to recognize that various factors can contribute to SCF-PP.

- **Environmental Conditions**: Exposure to harsh environmental factors, such as extreme temperatures, humidity, or corrosive substances, can accelerate component degradation and failure.
- **Deterioration due to ageing components:** Components naturally degrade over time due to wear and tear, leading to reduced performance and eventual failure. The age of an aircraft fleet is also a factor.
- **Repair Issues**: Compatibility issues between components or improper repairs can cause failures in the system. This can occur from unapproved modification or repairs made to in an aircraft.
- **Mechanical overload and Stress**: Components can fail if subjected to excessive loads, stress, or vibration beyond their designed limits.
- **Improper Handling and shipping of parts**: Mishandling during installation, maintenance, or repairs can damage components and lead to failures as well as damage caused by shipping.
- **Human performance including human factors issues**: Errors made by maintenance personnel or operators during maintenance or operation can result in component failures.
- **Lack of Training**: Insufficient training of maintenance personnel may lead to improper maintenance practices, increasing the risk of failures.
- **Maintenance programs:** Being approved by State of Registry but not adhering to a manufacturer's recommended maintenance schedule and / or Chapter 5 airworthiness limitations may impact the airworthiness of the aircraft. Additionally, the maintenance program intervals may not be adjusted to reflect the environment, role and utilization rate of the aircraft.
- **Improper implementation of reliability programs and condition monitoring.**
- **Damage:** Accidental Damage (AD) and/or Environmental Damage (ED).
- **Inadequate maintenance practices:** If components are not inspected thoroughly and regularly, potential issues may go undetected, leading to unexpected failures.
- **Inadequate oversight**: Inability to properly oversee operations due to poor training, operation procedure, and/or maintenance.
- **Major component degradation** as a result of fatigue, fretting, wear, corrosion, or creep, depending on the component or system operation.
- **Suspected unapproved parts (SUPS)**

7.2 Actions:

- Approve operator maintenance programs taking into consideration changes to the maintenance programme to reflect operator experience, environment of operation, utilization rate.
- Approve operator maintenance programs to include when applicable, Condition Monitoring or Condition Based maintenance (CBM), based on Predictive Maintenance (PdM).
- Establish the requirements for, and ensure oversight of Defect Control and deviations from the Approved Minimum Equipment List,
- Training and Human Factors: Train operators and maintenance personnel on proper procedures, handling, and troubleshooting techniques.
- Establish the requirements for training of operators and maintenance personnel on Human Factors, Environmental Protections, Root Cause Analysis, Software and Firmware Updates, and Supplier Quality Assurance. Train operators and maintenance personnel on proper procedures, handling, and troubleshooting techniques.
- Perform thorough root cause analysis/study to understand the underlying reasons and implement corrective actions
- Facilitate the sharing of continuing airworthiness information between State of Design, State of Manufacture, and State of Registry. And complete the necessary information on omplete the necessary information on the ICAO Online Airworthiness Information Network (formerly Circular 95).
- Oversight of Supplier's Quality Assurance programs

8.0 **Accident / Serious Incident Reports**

Link	Date	AC Type	Country of occurrence	Type of SCF
ASN	January 14, 2017	ATR 72	Indonesia	engine fire
ASN	March 17, 2017	SAAB 340	Australia	propellor separation
ASN	June 9, 2017	ATR 42-500	Pakistan	component failure - uncomanded engine shut down
ASN	July 23, 2017	ATR 72-600	Mongolia	component failure- crew shut down the engine
ASN	July 25, 2017	Airbus A320	Thailand	Cowl door detached during takeoff
ASN	August 26, 2017	Boeing 747-200	India	Separated turbine blades on takeoff.
ASN	September 4, 2017	ATR 72-600	Pakistan	propellor electronic control fault- engine flame out
ASN	September 5, 2017	Boeing 777-300ER	Japan	blade failure - engine fire
ASN	March 7, 2018	ATR 42-500	Pakistan	erroneous engine indicators (NP indication at flight idle)

ASN	March 29, 2018	Boeing 747-8	Hong Kong, China	Engine fire on final
ASN	November 1, 2018	ATR 72-600	Philippines	Engine Fire after takeoff, IFSD
ASN	December 6, 2018	ATR 72-500	India	engine fire, after takeoff IFSD
ASN	December 13, 2018	ATR 72	Australia	engine flame out
ASN	January 3, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	January 21, 2019	Airbus A320neo	India	stall detected with engine vibration
ASN	March 7, 2019	Airbus A320neo	India	CIFSD
ASN	March 24, 2019	Airbus A320neo	India	
ASN	March 29, 2019	Boeing 787-8 Dreamliner	Japan	power surge both engines, fuel related
ASN	April 1, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	April 2, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	April 23, 2019	de Havilland Canada DHC-8-300	Australia	
ASN	May 30, 2019	Airbus A330-300	Hong Kong, China	engine fire
ASN	June 27, 2019	ATR 72-600	Pakistan	
ASN	June 29, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	July 15, 2019	Airbus A320neo	India	
ASN	July 19, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	September 8, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	October 24, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	October 25, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	October 26, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure
ASN	October 30, 2019	Airbus A320neo	India	damage determined after landing.
ASN	November 8, 2019	Airbus A321	India	CIFSD
ASN	December 22, 2019	Airbus A320neo	India	Loud bang and engine stall. Blade failure

ASN	December 23, 2019	Airbus A320neo	India	excessive vibrations and engine stall. Blade failure
ASN	January 7, 2020	Airbus A320neo	India	CIFSD
ASN	March 18, 2020	Airbus A321	Vietnam	Uncontained HPT stage one disk failure, penetrated engine case and cowl.
ASN	July 9, 2020	Boeing 737-800	China	CIFSD
ASN	October 1, 2020	Airbus A330-200	Pakistan	CIFSD
ASN	November 29, 2020	Airbus A320neo	Thailand	
ASN	December 4, 2020	Boeing 777-200	Japan	big bang component failure (bade failure)
ASN	December 23, 2020	ATR 72-600	Papua New Guinea	
ASN	April 5, 2021	Airbus A330-200	Pakistan	CIFSD
ASN	May 4, 2021	de Havilland Canada DHC-6 Twin Otter	Wallis and Futuna	
ASN	July 28, 2021	Boeing 747-400	China	
ASN	November 22, 2021	de Havilland Canada DHC-8-400	India	forward cowl detachment
ASN	April 5, 2022	SAAB 340	Australia	
ASN	May 11, 2022	Airbus A319	Thailand	
ASN	June 6, 2022	Airbus A320	India	CIFSD
ASN	August 2, 2022	Airbus A321	Pakistan	
ASN	August 3, 2022	ATR 72	Indonesia	
ASN	August 6, 2022	Boeing 737-800	Australia	
ASN	August 30, 2022	Airbus A321	Pakistan	CIFSD
ASN	January 3, 2023	Boeing 767-300	South Korea	CIFSD, fire
ASN	September 27, 2023	Cessna 208 Caravan	Australia	engine failure after takeoff.
ASN	October 6, 2023	de Havilland Canada DHC-6 Twin Otter	Maldives	

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Flow of Continuing Airworthiness of Aircraft

FACT SHEET APAC REGION

1.0 Background

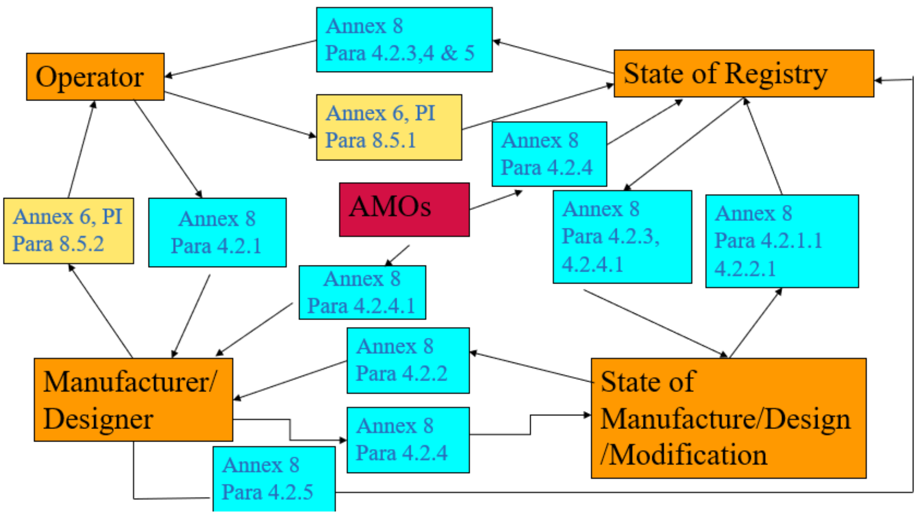
1.1 The Continuing Airworthiness of Aircraft in Service Circular (Cir) 95 contains useful information for States of Registry and States of Operator to ensure the continuing airworthiness of aircraft, particularly when an aircraft is transferred from one Registry to another and when issuing the Certificate of Airworthiness to an aircraft. It was created to facilitate sharing continuing airworthiness information between the State of Design, the State of Manufacture, and the State of Registry.

1.2 The enhanced/ online version of Circular 95 was introduced in 2014 to assist States to meet their continuing airworthiness responsibilities and facilitate the import and export as well as the exchange of aircraft for lease, charter or interchange and to facilitate the operation of aircraft in international air navigation. The online version replaces and expands on Cir 95.

1.3 A large number of States operate aircraft that have been manufactured and/or certificated in another State. To continue to maintain aircraft at a safe level of airworthiness it is necessary that the State of Registry regularly receive all continuing airworthiness information relating to aircraft on its register. Such information pertaining to the continuing airworthiness of aircraft and their equipment includes ADs issued by the State of Design or Manufacture and Service Bulletins (SBs) issued by the manufacturer.

2.0 Reporting requirements

Flow of Continuing Airworthiness Information



2.1 Annex 8 provides that the State of Registry, when it first enters on its register an aircraft of a particular type for which it is not the State of Design, advises the State of Design that it has entered such an aircraft on its register. States should establish direct contact with the authorities responsible for continuing airworthiness of aircraft and their equipment and agree upon the method of communication for the required information.

2.2 As reflected in the chart above, Annex 8 and supporting guidance material in the ICAO Airworthiness Manual, Doc 9760 establishes reporting requirements for the State of Design, State of Manufacturer, State of Registry as well as a requirement for all States to establish a reporting system for its air operators, approved maintenance organizations, organizations responsible for type design, manufacturing as well as organizations responsible for modifications.

2.3 ICAO Annex 6 as well as ICAO Doc 9760 requires air operators to report on faults, malfunctions and defect reporting and other significant maintenance and operational information by the operator to the type design organization as well as to the State of Registry.

3.0 Analysis of Cir 95 results, correlated with the AP-CAS Dashboard

3.1 Fifty-six percent of APAC States currently have low effective implementation (EI) scores in the area of the airworthiness of aircraft for technical personnel qualifications and training (CE-4), Certification and approvals (CE-6), surveillance obligations (CE-7), or resolution of safety concerns (CE-8). Surveillance activities performed by regulatory authorities in the areas of airworthiness have been particularly low for some States.

3.2 Only twelve percent of the States in the APAC region have updated CIR 95 at least once since 2014. When the Web platform was first launched in 2014, it was initially populated by ICAO with input received by States through State Letter. At that time, forty five percent of the APAC States were reflected with a focal point responsible for continuing airworthiness matters including an email address for contact. Today, only twenty-two percent of the original forty-five percent providing email contacts are valid. Therefore, only nine States in the APAC region currently have valid email contact information on the Airworthiness Information Network (AIN) platform.

3.3 During its operational life, aircraft may experience faults, malfunctions, defects and other occurrences, which cause or might cause adverse effects on the continuing airworthiness of aircraft. States are required to establish systems where information on such faults, malfunctions and defects, are transmitted to the organization responsible for the type design, reported to the State's authority and transmitted to the State of Design for appropriate action. Based on the analysis of the AIN platform, thirty five percent of the APAC States have some form of system in place, however, only twenty five percent have an online system for reporting, with correct emails and valid links.

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