

BUREAU OF AIRCRAFT SAFETY INVESTIGATION PAKISTAN

FINAL INVESTIGATION REPORT



INCIDENT

DIVERSION DUE TO DUAL ENGINE BLEED FAULT AND CABIN PRESSURIZATION FAILURE

Aircraft Type & Registration	Airbus A320-214, AP-BLS (MSN 3060)
Operator	Pakistan International Airlines (PIA)
Flight	PK-260, Muscat (MCT) to Peshawar (PEW)
Date of Occurrence	29 September 2024
Location	23 NM South of Panjgur, Baluchistan, Pakistan
Diverted To	Jinnah International Airport, Karachi (JIAP / OPKC)
Classification	Incident
Report Status	FINAL INVESTIGATION REPORT
Report Reference	HQ BASIP/1000/463/INV
Date of Report	30 April 2026
Aircraft Type & Registration	Airbus A320-214, AP-BLS (MSN 3060)
This report is issued pursuant to Pakistan Aircraft Safety Investigation (PASI) Act, 2023, Air Safety Rules 2025 and ICAO Annex 13	

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SCOPE

At Bureau of Aircraft Safety Investigation Pakistan (BASIP), investigations are conducted in accordance with Pakistan Aircraft Safety Investigation (PASI) Act, 2023, Air Safety Rules 2025, and International Civil Aviation Organization (ICAO) Annex-13.

The sole objective of the investigation and its final report is to prevent future accidents, serious incidents, and incidents of similar nature, without apportioning blame or liability. Accordingly, it is inappropriate to use BASIP investigation reports to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for judiciary or administrative purposes.

This report contains facts which are based on information that came to the knowledge of BASIP during the investigation up to the time of publication. Such information is published to inform the aviation industry and the public about the general circumstances of civil aviation serious incidents.

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INTRODUCTION

This incident was reported to Bureau of Aircraft Safety Investigation Pakistan (BASIP) by Pakistan Airports Authority (PAA) vide Incident Occurrence and Unserviceability Report (IOU)¹. This incident was notified² to International Civil Aviation Organization (ICAO), Bureau of Enquiry and Analysis (BEA) for Civil Aviation Safety, France in line with Annex-13. The investigation has been conducted by BASIP.

¹ PAA IOU Report dated 29th September, 2024 – **Appendix ‘A’**

² Notification to ICAO – **Appendix ‘B’**

SYNOPSIS

On 29 September 2024, Pakistan International Airlines (PIA) Flight PK-260, an Airbus A320-214 aircraft, registration AP-BLS (MSN 3060), was operating a scheduled commercial passenger flight from Muscat International Airport (MCT) to Bacha Khan International Airport, Peshawar (PEW) with 76 persons on board.

At approximately 01:14 UTC, while cruising at Flight Level (FL) 370, approximately 23 nautical miles (NM) south of Panjgur, Baluchistan, the flight crew received ECAM warnings indicating an Air Bleed 1+2 fault, followed by a cabin pressure warning and excess cabin altitude alert. The crew declared an emergency, changed transponder to squawk 7700, initiated an emergency descent to FL100, and requested diversion to Jinnah International Airport (JIAP), Karachi.

During the emergency, the crew manually deployed cabin oxygen masks as a preventive measure due to a delay in receiving a lower altitude clearance from ATC. The aircraft landed safely at JIAP Karachi. No injuries were sustained by any person on board. No aircraft damage was reported.

The investigation determined that the cause of the occurrence was a deficient leak check performed on the L/H Air Conditioning Pack (#1 Pack) on 28 September 2024, combined with the premature removal of the pack from Carry Forward (C/F) status without reviewing the full maintenance history. These maintenance errors, compounded by the pre-existing unresolved R/H engine bleed system defect due to non-availability of required Pressure Regulating Valve (PRV), led to dual bleed fault and consequent cabin pressurization failure during cruise.

ABBREVIATIONS

ACM	Air Cycle Machine
AMM	Aircraft Maintenance Manual
AOG	Aircraft on Ground
ATPL	Airline Transport Pilot License
ATLB	Aircraft Technical Log Book
ATC	Air Traffic Control
BASIP	Bureau of Aircraft Safety Investigation Pakistan
BEA	Bureau of Enquiry and Analysis (France)
BMC	Bleed Monitoring Computer
C/F	Carry Forward
CPC	Cabin Pressure Controller
CSP	Component Support Program
CVR	Cockpit Voice Recorder
ECAM	Electronic Centralized Aircraft Monitor
EEC	Engine Electronic Controller
FDR	Flight Data Recorder
FL	Flight Level
GVI	General Visual Inspection
HFACS	Human Factors Analysis and Classification System
ICAO	International Civil Aviation Organization
IOU	Incident Occurrence and Unserviceability Report
IPC	Illustrated Parts Catalogue
ISI	Inspection Service Information
JIAP	Jinnah International Airport, Karachi
MEL	Minimum Equipment List
MOC	Maintenance Operations Center
MSN	Manufacturer Serial Number
NM	Nautical Miles
OHDS	Overheat Detection System
PAA	Pakistan Airports Authority

PASI	Pakistan Aircraft Safety Investigation
PCAA	Pakistan Civil Aviation Authority
PEW	Bacha Khan International Airport, Peshawar (IATA)
PF	Pilot Flying
PIA	Pakistan International Airlines
PM	Pilot Monitoring
PRV	Pressure Regulating Valve
SOP	Standard Operating Procedure
TSM	Troubleshooting Manual
TSE-LM	Technical Services Engineering – Line Maintenance
UTC	Universal Time Coordinated

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SECTION 1 – FACTUAL INFORMATION

1.1. History of the Flight

1.1.1. On 29 September 2024, a Pakistan International Airlines (PIA) Airbus A320-214, registration AP-BLS (MSN 3060), operating Flight PK-260, departed Muscat International Airport (MCT/OOMS) bound for Bacha Khan International Airport, Peshawar (PEW/OPPS). The aircraft was carrying 76 persons on board (crew and passengers).

1.1.2. At approximately 01:14 UTC, while the aircraft was cruising at Flight Level (FL) 370, approximately 23 nautical miles (NM) south of Panjgur, Baluchistan, the flight crew received ECAM warning messages on the bleed and pressurization system. According to the evidences available, the following sequence of events occurred:

1.1.3. The Left Hand (L/H) engine bleed leak message was first displayed on ECAM during cruise. This was followed by a dual engine bleed fault (Air Bleed 1+2 fault) — both engine bleed systems were indicating faults. Subsequently, a Cabin Pressure warning appeared, followed by Excess Cabin Altitude warning, indicating that the aircraft's cabin pressurization was failing.

1.1.4. The flight crew took immediate corrective action in accordance with applicable emergency procedures, as follows:

1.1.5. Actioned applicable ECAM procedures for bleed and pressurization failure.

1.1.6. Changed the transponder code from the assigned squawk 4043 to 7700 (Emergency).

1.1.7. Declared an emergency and requested immediate descent to FL100 from Air Traffic Control (ATC).

1.1.8. **Manually deployed cabin oxygen masks** as a preventive measure due to a delay in receiving descent clearance from ATC.

1.1.9. Requested diversion to Jinnah International Airport (JIAP), Karachi.

1.1.10. The aircraft performed an emergency descent from FL370 to FL100. ATC provided radar vectors for the diversion to JIAP, Karachi. The aircraft landed safely at JIAP Karachi without further incident. No emergency ground assistance was required upon landing.

1.1.11. Upon arrival at Karachi, the aircraft was subjected to comprehensive maintenance investigation and rectification actions (detailed in Sections 1.17 and 2).

1.2. Injuries to Persons

1.2.1. No injury was reported to any person on board the aircraft or on the ground. Details are as follows:

Injuries	Crew	Passengers	Total on Aircraft	Others
Fatal	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil
Minor	Nil	Nil	Nil	Nil
None / Total	6	70	76	Nil

Table 1 Injuries Details

1.3. Damage to Aircraft

1.3.1. No structural damage to the aircraft was reported at the time of the occurrence. Post-diversion maintenance inspection revealed pre-existing leaking seals/gaskets in the air conditioning pack system, which were rectified.

1.4. Other Damage

1.4.1. No other damages to property or third parties were reported.

1.5. Personnel Information

1.5.1. Detailed personnel information for the flight crew was not provided to BASIP at the time of this report. BASIP notes that crew licensing, qualifications, flight and duty time records should be formally provided by PIA for completeness of the investigation dossier.

1.5.2. Captain:

1.5.2.1. The Captain held valid qualifications as detailed below:

Age / Nationality / Gender	51 Years / Pakistani / Male
License Type / Validity	ATPL / Valid to 31-07-2029
Medical Certificate Validity	Valid to 20-08-2028
Total Flying Hours	8,399 Hours
Hours on Aircraft Type (A320)	1,109 Hours
Flying Hours – Previous 24 Hours	Day Off (Rested)
Role During Occurrence	Pilot Flying (PF)

Table 2 Captain details

1.5.3. First Officer:

1.5.3.1. The First Officer held valid qualifications as detailed below:

Age / Nationality / Gender	42 Years / Pakistani / Male
License Type / Validity	CPL / Valid to 31-08-2029
Medical Certificate Validity	Valid to 31-01-2025
Total Flying Hours	18,004 Hours
Hours on Aircraft Type (A320)	5,777 Hours
Flying Hours – Previous 24 Hours	Day Off (Rested)
Role During Occurrence	Pilot Monitoring (PM)

Table 3 First Officer details

1.6. Aircraft Information

1.6.1. Aircraft details are as follows:

Aircraft Make & Model	Airbus A320-214
Registration Marking	AP-BLS
Manufacturer Serial Number (MSN)	3060
Year of Manufacture	01 March 2007
Owner / Operator	Pakistan International Airlines (PIA)
Total Aircraft Flight Hours	55,378 Hours
Total Aircraft Landings	26,127 Cycles
Last Check Performed	Transit Check, 28 September 2024
Maximum Take-off Weight	77,000 Kilograms
Maximum Landing Weight	66,000 Kilograms
ATA System Involved	ATA 3611 – Engine Bleed Supply System; ATA 21 – Air Conditioning

Table 4 Aircraft Details

1.6.2. The following pre-existing Minimum Equipment List (MEL) items were active on aircraft AP-BLS at the time of the occurrence:

1.6.2.1. **R/H Engine (#2) Bleed System.** Carry Forward (C/F) under MEL since 22 September 2024. Pressure Regulating Valve (PRV) replacement was required but the component was not in stock. PRV is a Component Support Program (CSP) item; the CSP

program for PIA A320 fleet had been suspended, creating supply chain challenges. AOG procurement was initiated from Turkish Technic on 27 August 2024.

1.6.2.2. **L/H Air Conditioning Pack (#1 Pack).** Previously deferred under MEL dated 22 September 2024 in heat exchanger cooling mode.

1.6.2.3. **Aircraft APU.** Carry Forward (Category D) due to APU generator defect

1.7. Meteorological Information

1.7.1. The meteorological conditions at JIAP, Karachi at the time of arrival were as follows:

METAR	OPKC 020000Z 02004KT 4000 FU NSC 18/08 Q1017 NOSIG
Station	JIAP, Karachi (OPKC)
Date/Time (UTC)	02 October 2024, 0000 UTC
Wind	020° at 04 knots
Visibility	4,000 meters
Weather Phenomena	Smoke (FU)
Cloud	No Significant Cloud (NSC)
Temperature / Dew Point	18°C / 08°C
Altimeter Setting	1017 hPa
Significant Change	NOSIG – No significant weather change expected

Table 5 METAR details AIIAP, Lahore

1.7.2. Meteorological conditions along the route at the time of the occurrence (cruise altitude FL370, area of Panjgur, Baluchistan) were not reported as a contributing factor. The event was of a purely technical/maintenance nature

1.8. Aids to Navigation

1.8.1. Navigational aids for JIAP, Karachi were serviceable and available at the time of the incident. No abnormality in navigational aids was reported. ILS, VOR, and DME facilities were operational.

1.9. Communications

1.9.1. Communication between the flight crew and ATC was established and maintained throughout the occurrence. The crew communicated the emergency via standard radio frequencies. No communication anomalies were reported.

1.9.2. The crew noted a delay in receiving descent clearance from ATC during the emergency, which contributed to the crew's decision to deploy oxygen masks preventively

1.10. Aerodrome Information

1.10.1. JIAP Karachi (OPKC) served as the diversion aerodrome. At the time of landing, the aerodrome was operational with Runway 25L/07R available. No abnormality in aerodrome infrastructure was reported. No emergency ground assistance was required.

1.11. Flight Recorders

1.11.1. The aircraft was equipped with a Cockpit Voice Recorder (CVR) and a Flight Data Recorder (FDR) in accordance with regulatory requirements.

1.11.2. FDR and CVR data were not extracted and analysed for this investigation. Extraction and analysis of flight recorder data is recommended to validate the sequence of events and bleed/pressurization system parameters.

1.12. Wreckage and Impact Information

1.12.1. Not applicable. The aircraft landed safely without impact damage.

1.13. Medical and Pathological Information

1.13.1. Both the Captain and the First Officer held valid medical certificates and were reported fit to undertake the flight.

1.14. Fire

1.14.1. No fire was reported during or after the occurrence.

1.15. Survival Aspects

1.15.1. Not applicable. All 76 persons on board survived without injury.

1.16. Tests and Research

1.16.1. Post-diversion maintenance actions were performed at JIAP Karachi. These included functional tests, leak checks, and component replacements as detailed in Section 1.17.

1.16.2. Airbus was consulted regarding the cause of the L/H Wing Air Leak at cruising altitude and provided a technical assessment of the OHDS wing loop behavior (see Section 1.18.1).

1.17. Organizational and Management Information

1.17.1. Maintenance Actions Performed After Diversion (Post-Occurrence)

1.17.1.1. The following maintenance actions were performed at JIAP, Karachi for troubleshooting and rectification of reported defects:

1.17.1.1.1. No. 2 Engine bleed status was C/F as per MEL. R/H engine Pressure Regulating Valve (PRV) was replaced ex-PIA store as per AMM 36-11-52 PB401 for rectification of the C/F defect. Leak check carried out – found satisfactory.

1.17.1.1.2. As per TSM 36-22-00-810-801-A regarding left leak ECAM message, functional test of No. 1 engine bleed supply system carried out as per AMM 36-11-00-720-005-A.

1.17.1.1.3. Left wing panels opened; bleed ducts physical condition and leak check carried out – found satisfactory. **However, during leak check of No. 1 pack, ACM square seal/gasket and heat exchanger outlet duct seal were found leaking.** Both seals replaced as per AMM 21-52-21 PB 401.

1.17.1.1.4. **No. 1 pack discharge temperature sensor was replaced.** Leak check and operational check of No. 1 pack carried out – found satisfactory.

1.17.1.1.5. No. 2 engine pack leak check carried out – **leak observed on primary heat exchanger primary duct seal; same replaced** as per IPC 21-52-41-29H. Leak check of No. 2 pack carried out as per AMM 12-33-21-618-001 – found satisfactory.

1.17.1.1.6. As per TSE-LM requirement, both engine bleed duct GVI and leak check carried out as per AMM 36-11-49-200-041-A / AMM 36-11-00-720-003-A – found satisfactory. R/H wing bleed duct leak check and physical condition checked as per AMM 36-22-00-790-802-A – no abnormality observed. Wing panels closed after inspection/leak check.

1.17.1.1.7. GVI of electrical connections, wiring conduits, and overheat detector loops in both packs area carried out – no abnormality found.

1.17.1.1.8. Operational test of cockpit and cabin temperature control carried out – found satisfactory.

1.17.1.1.9. Both BMC-1 and BMC-2 BITE tests carried out – found satisfactory.

1.17.1.1.10. **Aircraft APU was carry forward as per MEL (Category D) due to APU generator defect.** APU generator plug found **contaminated** – cleaned. APU generator operational check was satisfactory. APU declared serviceable.

1.17.1.1.11. During both engine ground run, no ECAM messages regarding wing air leak observed – considered satisfactory (AMM 71-00-00-710-008-B). Aircraft declared serviceable.

1.17.2. Maintenance History Prior to Occurrence

1.17.2.1. The following maintenance history is directly relevant to the occurrence:

1.17.2.1.1. 27 August 2024: AOG procurement of PRV for R/H engine bleed system initiated from Turkish Technic.

1.17.2.1.2. 22 September 2024: R/H Engine (#2) PRV defect identified and deferred under MEL (C/F status). PRV is a CSP component; procurement on AOG basis confirmed.

1.17.2.1.3. 22 September 2024: L/H Pack (#1) defect reported and deferred under MEL in heat exchanger cooling mode.

1.17.2.1.4. 27 September 2024: Single reporting of R/H wing air leak noted in WINGS ATLB.

1.17.2.1.5. 28 September 2024 (02:45 hrs): Aircraft grounded at KHI for troubleshooting/ rectification of No. 1 pack defect. Aircraft arrived 00:48 hrs; towed to LM Hangar at 02:45 hrs. Departure planned on PK-300 at 07:00 hrs (later delayed to 09:00 hrs).

1.17.2.1.6. 28 September 2024 (morning): No. 1 pack ACM and pack flow control valve replaced. L/H pack operation check and leak check performed – snag persisted; pack remained C/F.

1.17.2.1.7. 28 September 2024: No maintenance performed on R/H engine bleed system as PRV was nil in stock.

1.17.2.1.8. 28 September 2024: Aircraft operated 4 sectors (PK-300/301, PK-308/309). Pack regulation fault reported by crew on PK-308/309 – cleared by certifying staff with reference to ACM C/F status.

1.17.2.1.9. 28 September 2024 (evening): Captain on PK-225/KHI-MCT was initially reluctant to accept aircraft with R/H bleed C/F and L/H pack C/F. Certifying staff attempted C/F defect rectification. No. 1 pack temperature control BITE test performed – turbine bypass valve issue identified. L/H pack C/F removed; pack declared serviceable. Aircraft operated PK-225/28-09-2024 with nil reporting.

1.17.2.1.10. 29 September 2024: Next flight (PK-260/MCT-PEW) diverted to KHI due to dual bleed fault.

1.18. Additional Information

1.18.1. Airbus Technical Assessment

1.18.1.1. Event details were shared with Airbus to establish the cause of the L/H Wing Air Leak at cruising altitude.

1.18.1.2. AIR L WING LEAK can be triggered due to a LEAK detected by both loops or due to a LEAK detected on one loop and a LOOP INOP detected on the other loop.

1.18.1.3. Based on the Post-Flight Report (PFR) of Flight PK-260, at 00:46 a **leak was detected by Loop A. Thirty minutes later the F/W AIR L WING LEAK was triggered**, but no F/M related to Loop B was triggered as per design.

1.18.1.4. Airbus indicated they were not in a position, with just the PFR, to confirm that the L/H Pack system duct leak was the only contributor to the L WING LOOP A followed by AIR L WING LEAK. Nevertheless, after troubleshooting findings and corrective actions, the leaking seals are considered to be the root cause of the bleed air leak on the left wing.

1.18.1.5. Airbus provided guidelines to PIA to perform an inspection of both OHDS Wing loop installations as per ISI 36.22.0004, with particular attention to:

1.18.1.5.1. Minimum distance between structure and sensing element; and

1.18.1.5.2. Venting holes and muffler installation.

1.19. Use of Effective Investigation Techniques

1.19.1. Standard ICAO Annex 13 compliant investigation procedures and techniques were applied. These included factual data collection, maintenance record analysis, crew interviews, technical system analysis, Airbus consultation, and Human Factors Analysis and Classification System (HFACS) methodology.

1.19.2. Physical examination of the aircraft and components was conducted by PIA Engineering & Maintenance and reviewed by BASIP investigators.

SECTION 2 – ANALYSIS

2.1. General

2.1.1. The Airbus A320-214 pneumatic system receives compressed air from pneumatic air sources (engine compressor bleed air and/or APU bleed air) and supplies it to user systems including the air conditioning packs, wing anti-ice, and engine start systems. The ducts are installed in the fuselage, belly fairing and wings.

2.1.2. The air conditioning system uses two independent pack systems (L/H Pack No. 1 and R/H Pack No. 2) driven by engine bleed air. Each pack conditions air and supplies it to the cabin for pressurization and temperature control. The cabin pressurization system maintains a safe cabin altitude, typically below 8,000 ft, by regulating the outflow valve using signals from Cabin Pressure Controllers (CPCs).

2.1.3. Overheat sensing elements continuously monitor bleed duct areas for overheat conditions. Each wing has two loops (Loop A and Loop B) of overheat sensing elements. An ECAM 'AIR L/R WING LEAK' message is generated when an overheat/bleed leak condition is detected by the sensing loops in the wing area.

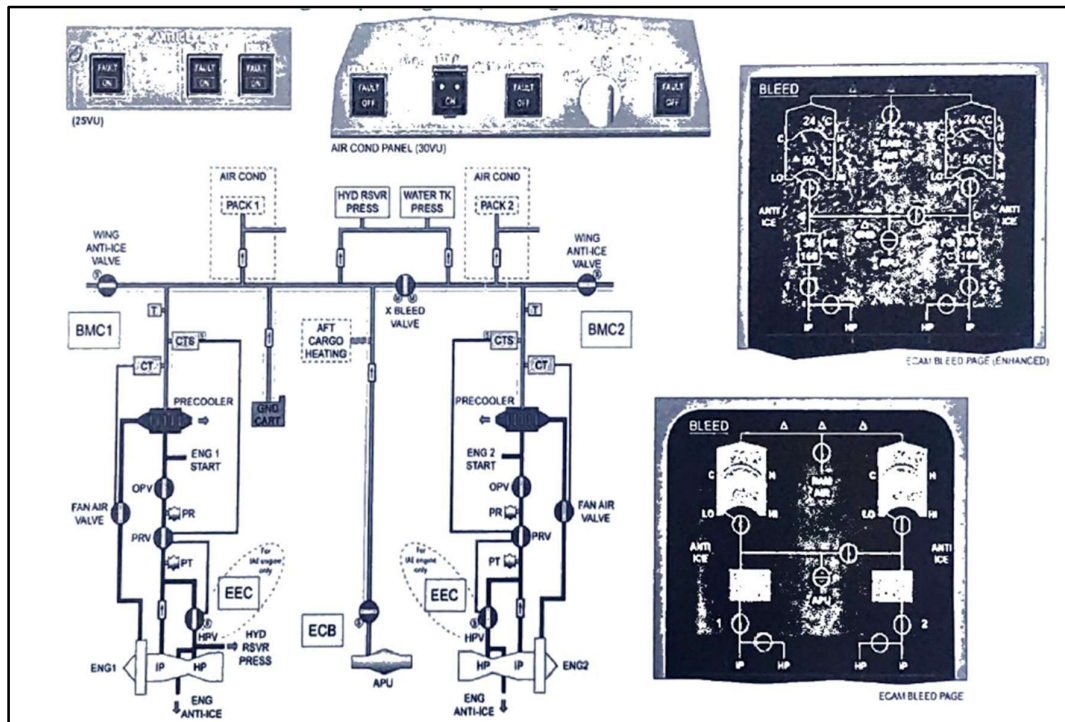


Figure 1 Cabin Pressurization System Diagram

2.1.4. On aircraft AP-BLS, the following system states existed at the time of the occurrence:

2.1.4.1. **R/H Engine Bleed.** The PRV was defective and deferred under MEL since 22 September 2024. With PRV C/F, the R/H engine bleed supply capability was reduced, making the aircraft dependent on L/H engine bleed and No. 1 Pack for pressurization.

2.1.4.2. **L/H Pack (No. 1).** During rectification on 28 September 2024, the ACM and flow control valve were replaced. However, the leak check was performed deficiently, and the actual source of the leak (ACM square seal/gasket and heat exchanger outlet duct seal – confirmed leaking post-diversion) was not identified. The pack was prematurely removed from C/F status.

2.1.4.3. At cruise (FL370), the undetected L/H pack duct leak triggered the OHDS Wing Loop A, generating the L/H wing bleed leak ECAM warning. With R/H engine bleed already deferred under MEL, this L/H bleed fault resulted in a dual bleed fault message, causing loss of both bleed sources, and consequently cabin pressurization failure.

2.2. Maintenance History and Pre-Occurrence Defects

2.2.1. The investigation identified a critical confluence of pre-existing defects that created a vulnerable technical state for the aircraft.

2.2.2. R/H Engine Bleed PRV Defect (C/F since 22 September 2024)

2.2.2.1. The PRV on the R/H engine bleed system was defective and required replacement. The PRV is designated as a CSP (Component Support Program) component.

2.2.2.2. PIA's A320 CSP program had been suspended, severely limiting the availability of CSP components.

2.2.2.3. Despite efforts by PIA's Rotable Planning (MOC) to procure the PRV on AOG basis from Turkish Technic (initiated 27 August 2024), the component remained unavailable at the time of the occurrence.

2.2.2.4. This pre-existing defect was known and properly deferred under MEL, but it created a single-point dependency on the L/H bleed and No. 1 Pack for pressurization.

2.2.3. L/H Pack No. 1 Defect History

2.2.3.1. The L/H pack had an earlier reported defect and was deferred under MEL on 22 September 2024 in heat exchanger cooling mode.

2.2.3.2. Troubleshooting was attempted at KHI on 28 September 2024, with replacement of the ACM and flow control valve. However, the actual leaking components (ACM square seal/gasket and heat exchanger outlet duct seal) were not identified or replaced during this maintenance visit, as the leak check was performed deficiently.

2.2.4. Cumulative Risk Assessment

2.2.4.1. The simultaneous MEL deferral of both the R/H engine bleed and the L/H pack created a critical vulnerability.

2.2.4.2. The MEL permits individual deferrals with specific conditions; however, the combination of both defects, with the L/H pack returned to service without proper verification

of full rectification, eliminated the system redundancy that would otherwise have prevented a pressurization event.

2.3. Maintenance Actions on 28 September 2024 – Critical Events

2.3.1. Deficient Leak Check

2.3.1.1. The investigation determined that the maintenance team working on No. 1 pack on 28 September 2024 **performed a deficient leak check**.

2.3.1.2. As confirmed by the certifying staff's own statements, the team: concentrated only on the system BITE test and operational check; did not review the HILL ATLB (maintenance history) of the pack system; and did not perform a thorough leak check before declaring the pack serviceable.

2.3.1.3. This is a **direct deviation from the applicable AMM procedures** and constitutes an unsafe act.

2.3.2. Departure Time Pressure

2.3.2.1. The maintenance team was operating **under significant time pressure**. The aircraft was parked in the hangar at 02:45 hrs and was scheduled to operate PK-300 at 07:00 hrs (later delayed to 09:00 hrs), allowing approximately 4 hours 15 minutes for maintenance.

2.3.2.2. Team members acknowledged that the **departure time pressure resulted in the deficient leak check**. This is classic human factors trigger (time pressure inducing task shortcuts) and represents a latent organizational factor.

2.3.3. Premature Removal from C/F Status

2.3.3.1. The Engine Electronic Controller (EEC) was replaced post-incident after an 'OUTPUT DRIV. TEST FAILED' message was recorded during EEC operational testing. A new EEC was installed and post-installation operational test confirmed satisfactory.

2.3.3.2. On the same day (28 September 2024), prior to the MCT flight (PK-225), the Captain was reluctant to accept the aircraft with both the R/H bleed and L/H pack in C/F status.

2.3.3.3. The certifying staff then attempted rectification. A BITE test identified a **turbine bypass valve issue**; the C/F status was removed and the pack was declared serviceable.

2.3.3.4. **This action was taken without a complete leak check and without reviewing the maintenance history, constituting misinterpretation of the underlying defect and non-adherence to SOPs.**

2.3.4. No Maintenance on R/H Bleed System

2.3.4.1. Throughout this period, no maintenance actions were performed on the R/H engine bleed system because the required PRV remained unavailable.

2.3.4.2. This organizational resource deficiency (non-availability of a critical spare part) was a persistent contributing factor that increased the aircraft's vulnerability to the pressurization failure.

2.4. Human Factor Analysis (HFACS Framework)

2.4.1. The following Human Factors Analysis and Classification System (HFACS) analysis was conducted across four levels:

2.4.1.1. Level 1 – Unsafe Acts

2.4.1.1.1. Active Failures. Certifying Staff

2.4.1.1.1.1. **Deficient leak check performed on L/H Pack (#1) on 28 September 2024.** The leak check did not identify the actual leaking components (ACM square seal and heat exchanger outlet duct seal).

2.4.1.1.1.2. **Non-adherence to SOP.** Pack returned to serviceable status without reviewing aircraft maintenance history (HILL ATLB) and without performing a thorough leak check, in direct contravention of AMM procedures.

2.4.1.1.1.3. **Misinterpretation of MEL Defect.** The certifying staff who declared the pack serviceable (removing C/F status) did not properly review or understand the extent of the pre-existing defect and maintenance history

2.4.1.2. Level 2 – Preconditions for Unsafe Acts

2.4.1.2.1. **Time Pressure.** The maintenance team was under departure time pressure (02:45 hrs parking vs. 07:00 hrs scheduled departure – approximately 4 hours 15 minutes). This created an **environment conducive to shortcuts** and incomplete task execution.

2.4.1.2.2. **Communication Breakdown.** The history of the pack defect and prior maintenance actions were not adequately communicated between maintenance shifts/teams.

2.4.1.2.3. **Complacency.** The successful BITE test and operational check may have induced complacency, causing the certifying staff to bypass the leak check step.

2.4.1.3. Level 3 – Unsafe Supervision

2.4.1.3.1. **Inadequate Oversight.** The **maintenance supervisory chain did not ensure that the defect rectification process for a MEL-deferred component was complete and properly documented before C/F status removal.**

2.4.1.3.2. **Failure to Mandate History Review. No supervisory check was in place** to ensure the ATLB history was reviewed before clearing a deferred defect

2.4.1.4. Level 4 – Organizational Influences (Latent Failures)

2.4.1.4.1. **Improper installation** during the most recent engine build or maintenance intervention on the 5th stage HPC assembly.

2.4.1.4.2. **Resource Deficiency (Latent)**. Non-availability of the R/H engine PRV due to CSP program suspension created a prolonged single-bleed-system dependency and increased overall system vulnerability.

2.4.1.4.3. **Organizational Culture / Scheduling Pressure. The tight scheduling of maintenance-intensive aircraft created systemic time pressure** on maintenance teams, increasing the probability of task shortcuts.

2.4.1.4.4. **Spare Parts Supply Chain**. Suspension of the PIA A320 CSP program and failure to maintain adequate spare float for bleed system components represents a systemic organizational deficiency.

2.5. Operational and Flight Crew Analysis

2.4.1. The flight crew's response to the dual bleed fault and pressurization emergency was timely, appropriate, and in accordance with standard operating procedures and manufacturer guidelines.

2.4.2. The following aspects of crew performance were noted:

2.4.2.1. **Recognition**. The crew correctly identified and acted upon the ECAM warnings for bleed fault and excess cabin altitude.

2.4.2.2. **Emergency**. Declaration: The crew appropriately declared an emergency and changed transponder to squawk 7700.

2.4.2.3. **Emergency Descent**. The crew initiated an emergency descent from FL370 to FL100 in accordance with Airbus FCOM emergency procedures.

2.4.2.4. **Oxygen Mask Deployment**. The **crew manually deployed cabin oxygen masks** as a preventive safety measure when ATC clearance for descent was delayed – this demonstrates sound airmanship and proactive passenger safety management.

2.4.2.5. **Diversion Decision**. The decision to divert to JIAP Karachi rather than continue reflects a conservative, **safety-first approach consistent with good airmanship**.

2.4.2.6. **Crew Coordination**. The safe outcome indicates effective Cockpit Resource Management (CRM) and procedural discipline throughout the event.

2.4.2.7. The crew's handling of this emergency was not a contributing factor to the occurrence. Their actions mitigated the consequences and ensured passenger safety.

2.6. Organizational Factors

2.6.1. CSP Program Suspension.

2.6.1.1. The suspension of PIA's A320 CSP (Component Support Program) resulted in **chronic non-availability of critical bleed system components**, including the PRV.

2.6.1.2. This organizational decision had a direct operational impact, creating a situation where a mandatory maintenance action (PRV replacement) could not be completed in a timely manner, forcing **MEL deferral for an extended period** (over five weeks prior to the incident).

2.6.2. Spare Parts Inventory Management

2.6.2.1. The absence of a PRV in PIA's serviceable spares inventory, compounded by the absence of adequate spare float planning for bleed system components, represents a significant organizational deficiency in technical resource management.

2.6.2.2. Airlines operating ageing fleets are particularly vulnerable to component supply failures if proactive inventory management is not maintained.

2.6.3. Quality Assurance

2.6.3.1. The post-occurrence re-assessment of certifying staff by PIA's Quality Assurance Division indicates recognition of the **QA oversight gap**.

2.6.3.2. The QA processes in place did not prevent the deficient maintenance from occurring or detect it before return to service.

SECTION 3 – CONCLUSIONS

3.1. Findings

3.1.1. The following findings are presented in accordance with ICAO Annex 13 requirements. Findings reflect established facts and safety-relevant conditions identified during the investigation.

3.1.2. Aircraft and System Status

3.1.2.1. Aircraft AP-BLS (Airbus A320-214, MSN 3060) was airworthy and dispatched under MEL with two pre-existing deferred defects; R/H Engine #2 Bleed PRV C/F since 22 September 2024; and L/H Air Conditioning Pack (#1) C/F since 22 September 2024.

3.1.2.2. The R/H engine PRV was deferred under MEL because the component was not available in PIA's stock. The PRV is a CSP component; the PIA A320 CSP program had been suspended, making component procurement challenging. AOG procurement was initiated on 27 August 2024 from Turkish Technic.

3.1.2.3. The simultaneous deferral of both the R/H engine bleed PRV and the L/H pack created a system vulnerability where any additional fault in the L/H pack would result in dual bleed fault and pressurization failure, as normal redundancy was unavailable.

3.1.3. Maintenance Actions – 28 September 2024

3.1.3.1. During rectification of the L/H Pack (#1) defect at KHI on 28 September 2024, the ACM and pack flow control valve were replaced. The actual root cause of the defect – leaking ACM square seal/gasket and heat exchanger outlet duct seal – was not identified or corrected.

3.1.3.2. The certifying staff performed a deficient leak check on the No. 1 pack system. The BITE test and operational check were performed, but a thorough leak check per AMM requirements was not conducted. The maintenance history (HILL ATLB) was not reviewed before declaring the pack serviceable.

3.1.3.3. The maintenance team was under departure time pressure during the KHI maintenance visit (02:45 hrs tow to hangar vs. 07:00 hrs scheduled departure). This time pressure was identified by the certifying staff as a contributing factor to the deficient leak check.

3.1.3.4. Later on 28 September 2024, the L/H pack C/F status was prematurely removed and the pack declared serviceable by certifying staff without performing a complete leak check and without reviewing the pack's maintenance history, in non-adherence to SOPs.

3.1.3.5. No maintenance actions were performed on the R/H engine bleed system during the 28 September 2024 maintenance visit, as the required PRV remained unavailable.

3.1.4. The Occurrence

3.1.4.1. At FL370, the undetected L/H pack duct leaks triggered the OHDS Loop A, generating an AIR L WING LEAK ECAM warning. With R/H engine bleed already deferred, this resulted in a dual engine bleed fault message.

3.1.4.2. The dual bleed fault resulted in loss of both pressurization sources, leading to cabin pressure warning and excess cabin altitude alert. The crew correctly identified the malfunction and followed emergency procedures.

3.1.4.3. The crew declared an emergency (squawk 7700), initiated an emergency descent to FL100, and diverted to JIAP Karachi. Cabin oxygen masks were **manually deployed** as a preventive measure due to delay in ATC descent clearance.

3.1.4.4. The aircraft landed safely at JIAP Karachi. No injuries were sustained. No aircraft damage was reported.

3.1.5. Post-Occurrence Rectification

3.1.5.1. Post-diversion inspection confirmed leaking ACM square seal/gasket and heat exchanger outlet duct seal on No. 1 pack, and a leaking primary heat exchanger primary duct seal on No. 2 pack. Both were rectified.

3.1.5.2. The R/H engine PRV was replaced post-diversion. Both bleed systems were restored to full serviceable status. Aircraft declared serviceable after comprehensive maintenance.

3.1.5.3. Airbus assessment indicated that the OHDS Wing Loop A behavior was consistent with an L/H pack duct leak. Airbus recommended inspection of OHDS wing loop installations on MSN 3060 as per ISI 36.22.0004.

3.2. Cause / Contributory Factors

3.2.1. Cause

3.2.1.1. The cause of this incident was a dual engine bleed fault and subsequent cabin pressurization failure resulting from deficient maintenance of the L/H Air Conditioning Pack (#1) on 28 September 2024, specifically:

3.2.1.2. A thorough and compliant leak check was not performed on the L/H Pack system per AMM requirements, leaving the actual leaking components (ACM square seal/gasket and heat exchanger outlet duct seal) unidentified and unrectified.

3.2.1.3. The pack was prematurely removed from Carry Forward (C/F) status and declared serviceable without reviewing the aircraft maintenance history and without performing a complete leak check, in non-adherence to Standard Operating Procedures.

3.2.1.4. At cruise altitude, the undetected pack duct leaks triggered the Overheat Detection System Loop A, generating the L/H Wing Air Leak warning. With the R/H engine bleed already deferred under MEL due to PRV non-availability, the L/H bleed fault created

a dual bleed system fault, removing both pressurization sources and causing cabin pressurization failure.

3.2.2. Contributory Factors

3.2.2.1. **Non-availability of R/H Engine PRV (Organizational / Resource Factor).** The PRV for the R/H engine bleed system was unavailable due to suspension of the PIA A320 CSP program and inadequate spare float management. The resulting extended MEL deferral created a single-system dependency that amplified the consequences of any subsequent L/H bleed deficiency.

3.2.2.2. **Departure Time Pressure (Human Factors / Organizational Factor).** The maintenance team was subjected to significant time pressure during the 28 September 2024 maintenance visit, which contributed to the deficient leak check and premature clearance of the pack.

3.2.2.3. **Inadequate Quality Assurance Oversight (Organizational Factor).** The QA processes in place failed to detect or prevent the premature return to service of an inadequately rectified MEL-deferred component.

3.2.2.4. **Deficient Maintenance Knowledge / SOP Non-Adherence (Human Factor).** Certifying staff did not review the maintenance history of the deferred pack system before clearing the defect, indicating a gap in understanding of SOP requirements for MEL deferred item rectification.

3.2.2.5. **Possible OHDS Installation Condition (Organizational Factor).** Airbus indicated a 30-minute delay between F/M and E/W triggering, suggesting a possible OHDS wing loop installation issue that may have contributed to delayed or a typical fault triggering.

SECTION 4 – SAFETY RECOMMENDATIONS

4.1. Safety Recommendations

4.1.1. The following safety recommendations are issued in accordance with ICAO Annex 13 requirements. These recommendations are addressed to the responsible parties as indicated and are aimed at preventing recurrence of similar occurrences.

4.1.1.1. OHDS Wing Loop Inspection	
Addressed To	PIA Engineering & Maintenance / TSE (B1/B2)
Recommendation	PIA Engineering & Maintenance have issued a Technical Service Requirement (TSR) for inspection of both OHDS Wing loop installations on aircraft AP-BLS (MSN 3060) and all other PIA A320 family aircraft, as per Airbus ISI 36.22.0004. Particular attention on minimum distance between structure and sensing element and venting holes and mufflers installation.
Safety Rationale	Airbus analysis identified a 30-minute delay between OHDS F/M and E/W triggering, suggesting possible installation anomaly. Improper OHDS installation may cause delayed or spurious fault triggering, affecting crew response time to genuine bleed leaks.

4.1.1.2. Re-assessment and Recurrent Training of Certifying Staff	
Addressed To	PIA Quality Assurance Division (Q.A Audit)
Recommendation	PIA QA Division should: <ul style="list-style-type: none"> (a) Complete re-assessment of certifying staff who performed maintenance on AP-BLS during the relevant period; (b) Conduct recurrent training on Bleed/Pack system duct leak check AMM procedures; (c) Institute mandatory ATLB history review requirement before removal of any MEL-deferred defect from C/F status. Evidence of compliance to be submitted to BASIP within 45 days.
Safety Rationale	The investigation identified critical SOP non-compliance and inadequate task execution by certifying staff, including failure to review maintenance history and performing an incomplete leak check. Systemic training and assessment gaps must be addressed to prevent recurrence.

4.1.1.3. MEL Dual Deferral Risk Assessment Procedure	
Addressed To	PIA Engineering & Maintenance / PCAA (AWD Oversight)
Recommendation	PIA E&M should review and implement a Dual MEL Deferral Risk Assessment Procedure. When two or more MEL-deferred defects exist on interdependent systems (such as bleed and pressurization), a formal risk assessment should evaluate cumulative safety impact before continued operation. Any proposed amendments by PIA is to be approved by PCAA.
Safety Rationale	The simultaneous deferral of both R/H engine bleed and L/H pack – both providing pressurization capability – eliminated system redundancy. MEL provisions permit individual deferrals but may not adequately address the cumulative risk of multiple interdependent deferrals.

4.1.1.4. Spare Parts Inventory and Component Support Program	
Addressed To	PIA Executive Management
Recommendation	PIA Management and Engineering should: (a) Prioritize reinstatement of A320 CSP program or equivalent spares support for safety-critical components; (b) Maintain adequate spare float for A320 bleed system components at all main bases; (c) Implement escalation review process when AOG procurement of safety-critical MEL-deferred components is prolonged. Corrective action plan to be submitted to BASIP within 45 days.
Safety Rationale	Non-availability of R/H PRV for over five weeks was a direct organizational contributing factor. Suspension of the CSP program for an ageing fleet creates chronic airworthiness risk and disproportionate reliance on AOG procurement for routine safety-critical components.

4.1.1.5. Maintenance Time Pressure Management and Scheduling	
Addressed To	PIA Engineering & Maintenance / Ground Operations / PCAA
Recommendation	<p>PIA E&M should establish a formal policy for maintenance task scheduling that:</p> <ul style="list-style-type: none"> (a) Ensures adequate time allocation for deferred MEL defect rectification on complex systems; (b) Empowers maintenance teams to delay departure when safety-critical maintenance cannot meet full AMM standards; (c) Requires supervisory sign-off confirming full AMM compliance before clearing any safety-critical MEL-deferred defect for dispatch
Safety Rationale	Departure time pressure was a direct contributing factor to the deficient maintenance that led to this incident. Aviation maintenance must be insulated from commercial scheduling pressures when the integrity of safety-critical systems is at stake.

4.1.1.6. FDR/CVR Data Extraction and Analysis for Incidents	
Addressed To	BASIP
Recommendation	BASIP should establish a standing protocol to secure and analyses FDR and CVR data for all incidents involving aircraft systems failures at the earliest opportunity. Procurement of FDR and CVR software's is essential for validating system performance, crew actions, and fault progression timelines in incident investigations involving complex aircraft system failures.
Safety Rationale	FDR/CVR data was not extracted due to non-availability FDR and CVR software's with BASIP for this investigation. Such data is essential for Quality Analysis purposes, validating system performance, crew actions, and fault progression timelines in incident investigations involving complex aircraft system failures.

4.2. Summary of Safety Recommendations

4.2.1 The following table summarizes all safety recommendations issued in this report:

Para	Subject	Addressed To	Status
4.1.1.1	OHDS Wing Loop Inspection	PIA Engineering & Maintenance / TSE (B1/B2)	Partially Complied
4.1.1.2	Re-assessment and Recurrent Training of Certifying Staff	PIA Quality Assurance Division (Q.A Audit)	Partially Complied
4.1.1.3	MEL Dual Deferral Risk Assessment Procedure	PIA Engineering & Maintenance / PCAA (AWD Oversight)	OPEN
4.1.1.4	Spare Parts Inventory and Component Support Program	PIA Executive Management	OPEN
4.1.1.5	Maintenance Time Pressure Management and Scheduling	PIA Engineering & Maintenance / Ground Operations / PCAA	OPEN
4.1.1.6	FDR/CVR Data Extraction and Analysis for Incidents	BASIP	OPEN

END OF REPORT

Bureau of Aircraft Safety Investigation Pakistan (BASIP)

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30 April, 2026