



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA**

1st INTERIM STATEMENT

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Aircraft Accident Investigation Report

PT Sriwijaya Air

Boeing 737-500; PK-CLC

Kepulauan Seribu District, DKI Jakarta

Republic of Indonesia

9 January 2021

2022

This Interim Statement was published by the Komite Nasional Keselamatan Transportasi (KNKT), Transportation Building, 3rd Floor, Jalan Medan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The Interim Statement is based upon the investigation carried out by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

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Jakarta, 13 January 2022

**KOMITE NASIONAL
KESELAMATAN TRANSPORTASI
CHAIRMAN**



SOERJANTO TJAHOJONO

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ABBREVIATIONS AND DEFINITIONS

AAIB	:	Air Accidents Investigation Branch
AD	:	Airworthiness Directive
AML	:	Aircraft Maintenance Logbook
AMPM	:	Aircraft Maintenance Procedure Manual
ATC	:	Air Traffic Control
ATO	:	Approved Training Organization
ATS	:	Air Traffic Services
AUPRTA	:	Airplane Upset Prevention & Recovery Training Aid
BITE	:	Built-in Test Equipment
CCA	:	Circuit Card Assemblies
CMM	:	Company Maintenance Manual
C of A	:	Certificate of Airworthiness
CRM	:	Crew Resources Management
CSMU	:	Crash Survivable Memory Unit
CVR	:	Cockpit Voice recorder
BNPP	:	<i>Badan Nasional Pencarian dan Pertolongan</i> is the Indonesian Search and Rescue agency
DETRESFA	:	Distress phase is a situation wherein there is a reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger and require immediate assistance
DGCA	:	Directorate General of Civil Aviation
DKI Jakarta	:	<i>Daerah Khusus Ibukota Jakarta</i> (Special Capital Territory Jakarta)
DMI	:	Deferred Maintenance Item
EGPWS	:	Enhanced Ground Proximity Warning System
EWIS	:	Electrical Wiring Interconnection System
EZAP	:	Enhanced Zonal Analysis Procedure
FAA	:	Federal Aviation Administration
FCC	:	Flight Control Computer
FDA	:	Flight Data Analysis
FDR	:	Flight Data Recorder
FIM	:	Fault Isolation Manual
FOTB	:	Flight Operation Technical Bulleting
GE	:	General Electric
Hz	:	Hertz
ICAO	:	International Civil Aviation Organization
INCERFA	:	uncertainty phase is a situation wherein uncertainty exists as to the safety of an aircraft and its occupants
IPC	:	Illustrated Part Catalogue

KNKT	:	<i>Komite Nasional Keselamatan Transportasi</i> is the independent investigation authority of Indonesia, also known as National Transportation Safety Committee.
MOM	:	Multi Operator Message
NTSB	:	National Transportation Safety Board
SID		Standard Instrument Departure
TSIB	:	Transport Safety Investigation Bureau
UK	:	United Kingdom
UPRT		Upset Prevention and Recovery Training
USA	:	United States of America

SYNOPSIS

On 9 January 2021, a Boeing 737-500 aircraft operating as flight number SJY182, registration PK-CLC, was on a scheduled passenger flight from Soekarno-Hatta International Airport (WIII), Jakarta, with intended destination of Supadio International Airport (WIOO), Pontianak.

The flight departed Runway 25R at 0736 UTC (1436 LT) and was cleared via Standard Instrument Departure (SID) ABASA 2D to Flight Level (FL) 290 (altitude 29,000 feet). After take-off, the autopilot was engaged at an altitude of about 2,000 feet. The pilots subsequently requested a heading change to 075° to enable them to deviate from weather conditions. The Air Traffic Control (ATC) responded with a clearance for heading 075° and the flight began a turn to the right. ATC then instructed the flight to stop climbing at 11,000 feet due to conflicting departure traffic from Runway 25L.

When the aircraft climbed through an altitude of about 8,150 feet, the left engine thrust lever started reducing, while the right engine thrust lever remained. About 10,600 feet, the aircraft heading started turning to the left. About 10,900 feet, the aircraft reached a left bank angle of more than 45° and the autopilot disengaged. At the same time, the Enhanced Ground Proximity Warning System (EGPWS) “bank angle” alert was activated, and the aircraft started to descend.

At 14:40:37 LT, the radar target of the aircraft disappeared from the ATC radar screen.

About 1455 LT, the Air Traffic Services (ATS) provider reported the occurrence to the Indonesian Search and Rescue Agency (*Badan Nasional Pencarian dan Pertolongan*/BNPP), and declared the uncertainty phase (INCERFA) of SJY182 at 1542 LT. The distress phase of SJY182 (DETRESFA) was subsequently declared at 1643 LT.

The *Komite Nasional Keselamatan Transportasi* (KNKT) was informed of the safety actions undertaken by the Directorate General of Civil Aviation (DGCA), Boeing, Sriwijaya Air and Garuda Maintenance Facility (GMF) which were considered relevant to improve safety.

This investigation involved the participation of the National Transportation Safety Board (NTSB) of the United States of America as the State of Design and, the State of Manufacture, and the Transport Safety Investigation Bureau (TSIB) of Singapore and Air Accidents Investigation Branch (AAIB) of United Kingdom as States providing assistance. All agencies have appointed their accredited representatives to assist in this investigation in accordance with the provisions of the ICAO Annex 13.

The investigation is ongoing and will continue to focus on, but not limited to the following:

- Understanding the cause of the split thrust levers,
- Reviewing the history of the aircraft system serviceability and maintenance records,
- Reviewing the pilot’s performance and their training on upset prevention and recovery,
- Reviewing human factors issues relating to flight operations,
- Reviewing organizational issues.

Should further safety issues emerge during the course of the investigation, KNKT will bring the issues to the attention of the relevant parties and issue safety recommendation(s) as required.

1. UPDATE OF THE INVESTIGATION

Since the publication of the Preliminary Report on 10 February 2021, the investigation is continuing, with participation of the National Transportation Safety Board (NTSB) of the United States of America as the State of Design and the State of Manufacture, and the Transport Safety Investigation Bureau (TSIB) of Singapore and Air Accidents Investigation Branch (AAIB) of United Kingdom as States providing assistance. The agencies have appointed their accredited representatives to assist in this investigation in accordance with the provisions in ICAO Annex 13.

The following are the summary on the progress of the investigation:

1.1. CVR Crash Survivable Memory Unit Recovery

On 30 March 2021, the Cockpit Voice Recorder (CVR) Crash Survivable Memory Unit (CSMU) was recovered by the search team. The CVR CSMU was transported to the KNKT recorder facility for data downloading.

The CVR data was successfully downloaded by KNKT investigators and contained four separate channels with two hours of audio data recorded in each channel. The CVR captured audio recorded from the flight preparation until the end of the accident flight.

The configuration of the audio channels was as follow:

- Channel 1 recorded the passenger announcement system,
- Channel 2 recorded the SIC station audio,
- Channel 3 recorded the PIC station audio,
- Channel 4 recorded the cockpit area microphone.

The CVR download revealed that:

- Channel 1 recorded is the same as Channel 2.
- Channel 2 recorded all SIC voice communications throughout the flight and the communications between tower with another aircraft.
- Channel 3 recorded the PIC voice communication with the ground engineer. During the flight, the PIC voice was not recorded. The PIC voice was recorded in Channel 2 from the SIC's headset microphone when the PIC's voice was loud enough.
- Channel 4 recorded a prominent tone with frequency of around 400 Hz. This tone interfered with all other audio signals and the recorded audio data was unintelligible.

The data from CVR with part number 2100-1020-00 and serial number 000286507 was downloaded in 2019 and 2020 for renewal of the Certificate of Airworthiness (C of A). The CVR download was performed at Garuda Maintenance Facility in 2019, the downloaded audio from the Channel 4 recorded noise with a frequency of 400 Hz. In 2020, the download was performed at Sriwijaya Air facility. The results for both recordings were stated as normal.

1.2. Test of the Enhanced Ground Proximity Warning System

On 16 January 2021, the Enhanced Ground Proximity Warning System (EGPWS) installed in the accident aircraft was recovered. The unit was sent to Honeywell Aerospace facility in Redmond, Washington, USA for examination.

On 8 April 2021, the examination was conducted. The examination revealed that the unit was severely damaged with sections of the chassis and circuit card assemblies missing, deformed, and scratched. The mounting tray was still in place around the unit and could not be removed by hand. Rivets holding the mounting tray were removed and a section of the tray was cut by the Honeywell machine shop, which allowed the EGPWS unit to be removed from the tray.

The EGPWS Circuit Card Assemblies (CCA) were removed from the chassis and inspected. In this EGPWS version, the flight history data is stored in the memory chip on the A2 CCA controller. As components were missing from the A2 CCA, which includes the memory chip, there was no further examination conducted on the unit.

1.3. Test of the previously installed Autothrottle Computer that was removed prior to the accident

The autothrottle computer was sent to Ontic facility in United Kingdom (UK).

On 16 February 2021, the AAIB of UK arranged to perform the autothrottle computer test in Oakenhurst Aircraft Services Ltd. facility. The participants of the test were KNKT, Boeing, NTSB, Federal Aviation Administration (FAA), and the AAIB.

The objectives of the test were as follows:

1. To download fault log data to assist the investigation in understanding the condition of the aircraft prior to the accident,
2. To identify any faults from the unit that may assist the investigation in understanding the aircraft operator's maintenance and troubleshooting program,
3. To demonstrate the effect of a signal wire that is separated from the flap position synchro.

The result of the test will be included in the final report.

1.4. Test of the previously installed Autothrottle Servo that was removed prior to the accident

The test was conducted on 9 December 2021 at Ontic Cheltenham facility where an operational test facility was constructed specifically for the testing. The objective of the test was to identify any faults in the unit and assist with understanding of the operator maintenance and troubleshooting program.

The result of the test will be included in the final report.

1.5. Test of the previously installed Flight Control Computer that was removed prior to the accident

The Flight Control Computer (FCC) of part number 4051600-914 was manufactured by Honeywell International Inc.

The FCC with serial number 94103655 (previously installed in the aircraft for autopilot A) was removed from the aircraft on 18 March 2020 following the reported problem of autopilot inoperative. The FCC part number with serial number 96083964 (previously installed in the aircraft as autopilot B) was removed from the aircraft on 18 March 2020 following the reported problem of autopilot could not engage.

Both FCCs were transported to the Honeywell facility in United States of America in February 2021 for examination. The examination of the FCCs took place at the Honeywell Deer Valley facility in Phoenix, Arizona, on 30 March and 14 June 2021.

The examination included downloading of stored faults to determine any fault that was associated with the aircraft spoiler position signal to the autothrottle computer.

The result of the examination will be included in final report.

1.6. Spoiler Angle Examination

The investigation developed an on-aircraft test to correlate the flight spoiler surface position to the flight spoiler position signal that is received by the autothrottle computer. The test utilized a Boeing 737-400 aircraft of an operator in the UK.

Additional data was also collected to characterize the relationship between the control wheel position, aileron surface position, and spoiler surface positions during the test. The rigging of the flight spoiler position sensor was also considered in the test.

On 15 August 2021 the test was witnessed by the KNKT, AAIB (UK), NTSB, FAA, Boeing, General Electric (GE) and Ontic.

The test result will be included in final report.

1.7. Aircraft Simulation

The investigation conducted simulations of the accident based on the FDR and CVR data in flight training simulator.

The objectives of the simulations were:

1. Understanding the activation of cruise thrust split monitor,
2. Information available to the flight crew related to the aircraft system malfunctioned,
3. The pilot activities and workload during flight,
4. The recovery from an aircraft upset condition.

The first simulation attempt was conducted in Las Vegas Flight Academy in Henderson, Nevada, USA on 27 October 2021. The simulation session was attended by KNKT, NTSB, FAA, and Boeing. It was found that the simulator did not react similarly to the accident flight, during an asymmetric thrust event. The simulation revealed that the thrust lever console was not closely monitored by the pilots.

The investigation repeated the simulation session in NAM Training Center in Jakarta on 7 December 2021. The simulation session was attended by KNKT and Sriwijaya Air. The second simulation session has the same objective and scenario as the first session in Nevada. The simulation was successfully in recreating the accident flight. However, some objectives could not be achieved due to the difference in configuration between the simulator and the accident aircraft.

The details of the simulation result will be included in the final report.

1.8. Safety Actions taken by Involved Parties

1.8.1. Aircraft Manufacturer

On 15 February 2021, the aircraft manufacturer issued a Flight Operation Technical Bulletin (FOTB) 737-12-2 Rev.1 regarding to Airplane Upset Prevention and Recovery.

On 30 March 2021, the aircraft manufacturer issued a Boeing Multi Operator Message (MOM) number MOM-MOM-21-0145-01B9(R2) regarding the Potential for Latent Flap Indication System Wiring Failure and Impacts to the Autothrottle System. Following issuance of this MOM, the Federal Aviation Administration (FAA) issued Airworthiness Directive AD-2021-08-14.

1.8.2. Aircraft Operator

1. Issued Quality Notice to maintenance personnel on 1 February 2021 to remind:
 - a. the handling of repetitive problem to be performed in accordance with the company procedures as stated in the Company Maintenance Manual (CMM) and Aircraft Maintenance Procedure Manual (AMPM),
 - b. the troubleshooting to be performed in accordance with the current Aircraft Maintenance Manual (AMM), Fault Isolation Manual (FIM) and Illustrated Part Catalogue (IPC),
 - c. filling the Aircraft Maintenance Log (AML) correctly in accordance with the AMPM,
 - d. the robbing part to be performed in accordance with the AMPM.
2. Reviewed the existing Upset Recovery Training (URT) and initiated the implementation of Upset Prevention Recovery Training (UPRT) program on 11 February 2021. The UPRT started to be conducted for all pilots on 18 November 2021 in cooperation with a consultant from Netherland. The UPRT program involved the DGCA.
3. Disseminated the Boeing Flight Operation Technical Bulletin (FOTB) related to UPRT on 22 February 2021.
4. Issued Notice to Pilots on 21 May 2021 to remind the pilots of the handling and monitoring of the automation systems.
5. Reviewed the Crew Resources Management (CRM) training program to include operational events taken from Sriwijaya Air reporting system.
6. Quality Safety and Security Directorate conducted special audit to the Operation and Maintenance Directorates to identify safety deficiencies.
7. Revised the Flight Data Analysis (FDA) event to include thrust asymmetry and Loss of Control in flight events.

8. Issued Security Notices to remind the aviation security personnel related to the procedure of passenger identification and to improve the security on the check in counter and boarding process.
9. Amended the CMM and AMPM related to the repetitive defect including the definition, management, control and record, and issuance of special task.
10. Conducted special weekly meeting to discuss the significant problems, DMI, repetitive defect, availability of spare part, manpower and operational issues.
11. Improved the engineer training including Enhanced Zonal Analysis Procedure (EZAP) and Electrical Wiring Interconnection System (EWIS), and Principle of Troubleshooting during the engineer recurrent training in 2022.
12. Amended the approved maintenance program to include fidelity test during annual Cockpit Voice Recorder (CVR) test in accordance with ICAO Document 10104.
13. Implemented maintenance software for the maintenance management which included enhancement of reliability control program and repetitive defect control.
14. Performed Autothrottle System Bite Test which refers to Aircraft Maintenance Manual (AMM) to all Boeing 737 aircraft and no faults were found.
15. Issued Engineering Order (EO) to perform thorough check to the Autothrottle mechanical wiring to all Boeing 737 aircraft which will be conducted within 250 hours after issuance of the EO and will be repeated during the C Check.
16. Evaluated the maintenance personnel workload based on the number of flights on each station and relocated the maintenance personnel to ensure proper workload, duty limitation, and rest requirement.

1.8.3. Aircraft Maintenance Organisation

In November 2021, Garuda Maintenance Facility amended the checklist on Cockpit Voice Recorder readout. The checklist includes the requirement to check the waveform quality and audio duration for each channel.

1.9. Response to KNKT Safety Recommendation

On 10 February 2021, KNKT issued two safety recommendation addressed to the Indonesia Directorate General of Civil Aviation (DGCA) as follows:

- ***04.R-2021-01.01***

The ICAO Annex 6 (Part I – International Commercial Air Transport – Aeroplanes) required the aircraft operators to establish and maintain upset prevention and recovery training (UPRT) program. The ICAO Doc 9868 (Procedure for Air Navigation Services – Training) provided procedures in the delivery of upset prevention and recovery training for aeroplane pilots.

The ICAO Doc 10011 (Manual on Aeroplane Upset Prevention and Recovery Training) also provided guidance to civil aviation authorities, aircraft operators and approved training organization (ATOs) for instituting best practices into the UPRT. The ICAO Doc 10011 described that the UPRT should focus on the areas of heightened awareness of the potential threats from events, conditions or situations; effective avoidance at early indication; and effective and timely recovery.

ICAO also provided Airplane Upset Prevention & Recovery Training Aid (AUPRTA), as an effort to increase effectiveness of UPRT.

The CASR Part 121 required aircraft operators to have initial and recurrent for “Aircraft Flight Training” which included upset recovery training that might be accomplished in an aircraft or aircraft type simulator, as described in the Appendix C.

In 2018, the DGCA published a safety circular that required an aircraft operator to conduct upset prevention and recovery training. The requirement for upset prevention training has not been included in CASR Part 121.

The investigation was unable to find guidance from the DGCA to aircraft operator and/or approved training organization (ATO) to enable and support the implementation of effective upset prevention and recovery training.

Therefore, KNKT recommends the DGCA to include a requirement of UPRT in the CASR and to develop guidance to increase the effectiveness of UPRT.

Responding to this safety recommendation, the DGCA had accelerated the UPRT program by assigning a special task force to implement the UPRT on 25 June 2021. The UPRT task force included the participation of DGCA Inspectors, DGCA Test Pilot, aircraft operator flight instructors, and aircraft operator UPRT instructors. The UPRT task force has duties as follows:

1. Review and develop guidance for UPRT implementation in Indonesia,
2. Review and develop regulations related to UPRT in Indonesia,
3. Implement UPRT program in Indonesia,
4. Develop a technical guidance and accelerate UPRT implementation in Indonesia,
5. Arrange agreement with internationally recognized UPRT expert.

The UPRT task force has completed several actions as follows:

1. On 17 June 2021, completed the draft Advisory Circular for UPRT,
2. On June 2021, completed the draft of amendment of the CASR Part 121 including the provision related to UPRT,
3. On 8 September 2021, completed initial review of UPRT Implementation Plan proposed by an international UPRT expert,
4. On 21 October 2021, completed reviewing of international UPRT expert proposal.

- **04.R-2021-01.02**

The ICAO Annex 11 subchapter 5.2 described the state of emergency that requires notification to the rescue coordination center, this standard was adopted in the CASR Part 170 subpart 5.2. However, the adoption of determination of the state of emergency did not include the alternative conjunction (or), which was not in accordance with the Standard 5.2 described in the ICAO Annex 11. The absence of the conjunction may confuse the determination of the state of emergency and may delay the activation the search and rescue activity.

Therefore, KNKT recommends the DGCA to review the requirements of notification of rescue coordination center in the CASR Part 170 to ensure that the requirement is in accordance with the standards in ICAO Annex 11.

Responding to this safety recommendation, the DGCA had reviewed and initiated the process to amend the CASR Part 170 refer to ICAO Annex 11 subchapter 5.2.

2. PLAN OF THE INVESTIGATION

The investigation is continuing with the collection of data and analysis of the available information. The activities cover but not limited to:

- Understanding the cause of the split thrust levers,
- Reviewing the history of the autothrottle system serviceability and maintenance records,
- Reviewing the pilot's performance and their training on upset prevention and recovery,
- Reviewing human factor operational issues, and
- Reviewing organizational issues.

The investigation is planning to publish the final report no later than January 2023.

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