KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA

PRELIMINARY

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Aircraft Accident Investigation Report

PT. Trigana Air Service

B737-400F; PK-YSF

Halim Perdanakusuma Airport, Jakarta

Republic of Indonesia

20 March 2021

2021

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

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

The preliminary report consists of factual information collected until the preliminary report published. This report will not include analysis and conclusion.

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Jakarta, 30 April 2021
KOMITE NASIONAL
KESELAMATAN TRANSPORTASI
CHAIRMAN

SOERJANTO TJAHJONO

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ABBREVIATIONS AND DEFINITIONS

AFE	:	Above Field Elevation
AMC	:	Apron Movement Control
AMO	:	Approved Maintenance Organization
AOC	:	Air Operator Certificate
ARFF	:	Aircraft Rescue and Fire Fighting
ATM	:	Assumed Temperature Method
ATPL	:	Airline Transport Pilot License
ATS	:	Air Traffic Service
C	:	Celsius
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
CCTV	:	Closed – Circuit Television
CPL	:	Commercial Pilot License
CVR	:	Cockpit Voice Recorder
DH	:	Decision Height
EGPWS	:	Enhanced Ground Proximity Warning System
EGT	:	Exhaust Gas Temperature
FCOM	:	Flight Crew Operation Manual
FCTM	:	Flight Crew Training Manual
FDR	:	Flight Data Recorder
FOO	:	Flight Operation Officer
g	:	Gravity
GPWS	:	Ground Proximity Warning System
ICAO	:	International Civil Aviation Organization
ILS	:	Instrument Landing System
kg	:	kilogram
km	:	kilometer
km/h	:	Kilometers per hour
KNKT	:	Komite Nasional Keselamatan Transportasi
lbs	:	Libs (pound)
LT	:	Local Time
mbs	:	Millibars
MDA	:	Minimum Descent Altitude
MEA	:	Minimum Enroute Altitude
MORA	:	Minimum Off Route Altitude
MSA	:	Minimum Sector Altitude

N1	:	the speed of the engine's low pressure rotor assembly
NDB	:	Non – Directional Beacon
Nm	:	Nautical Mile
NTSB	:	National Transportation Safety Board
^{o}C	:	Celcius
OM-A	:	Operation Manual part A
PACK	:	Pneumatic Air Conditioning Kit
PF	:	Pilot Flying
PIC	:	Pilot in Command
PM	:	Pilot Monitoring
QNH	:	Query Nautical Height. The pressure set on the subscale of the altimeter so that the instrument indicates its height above sea level and will read the runway elevation when the aircraft is on the runway.
QRH	:	Quick Reference Handbook
RPM	:	Rotation per Minute
SIC	:	Second in Command
STAR	:	Standard Terminal Arrival Route
VDP	:	Visual Descent Point
VMC	:	Visual Meteorogical Conditions
VMCA	:	Minimum Control Speed Air
VMCG	:	Minimum Control Speed Ground

SYNOPSIS

On 20 March 2021, a Boeing 737-400F, registered PK-YSF, was being operated by Trigana Air Services on a non-schedule cargo flight from Halim Perdanakusuma International Airport, (WIHH), Jakarta with intended destination of Sultan Hasanuddin International Airport (WAAA), South Sulawesi, Indonesia.

On board in this flight was two pilots, one engineer and one Flight Operation Officer (FOO). According to the weight and balance sheet, the flight carried 16,672 kgs of general cargo and the take-off weight was 60,695 kgs (133,835 lbs). The Pilot in Command (PIC) acted as Pilot Flying (PF) and the Second in Command (SIC) acted as Pilot Monitoring (PM).

At 1051 LT, the aircraft departed Runway 24 of Halim and about two minutes later, the PM reported to the controller that the right engine failed and requested to return.

The aircraft approached landing with one engine inoperative and configured with flap 15 for landing, with the aircraft weight was about 131,000 lbs.

At 1126 LT, the aircraft touched down with 1.79 G vertically and -0.54 G laterally then shortly the right main landing gear failed. The aircraft stopped on the left runway shoulder about 2,200 meters from the beginning Runway 24 and all landing gears collapsed. No one injured in this accident. The aircraft substantially damage.

Komite Nasional Keselamatan Transportasi (KNKT) conducted investigation to this accident according to ICAO Annex 13 and Indonesia Aviation Law.

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 which has appointed the accredited representatives to participate in this investigation in accordance with the provisions in ICAO Annex 13.

As the investigation is ongoing, 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 FACTUAL INFORMATION

1.1 History of the Flight

On 20 March 2021, a Boeing 737-400F, registered PK-YSF, was being operated by Trigana Air Service[1] on a non-schedule cargo flight from Halim Perdanakusuma International Airport (WIHH)[2], Jakarta, Indonesia with intended destination of Sultan Hasanuddin International Airport (WAAA), South Sulawesi, Indonesia.

On board in this flight was two pilots, one engineer and one Flight Operation Officer (FOO). According to the weight and balance sheet, the flight carried 16,672 kgs of general cargo, takeoff fuel of 11,100 kg and the takeoff weight was 60,695 kg (133,835 lbs). The Pilot in Command (PIC) acted as Pilot Flying (PF) and the Second in Command (SIC) acted as Pilot Monitoring (PM).

At 0328 UTC[3] (1028 LT), the PM requested clearance to Halim Tower controller (the controller) to pushback and start the engines. At 1031 LT, the PM requested to the controller for taxi clearance. There was no report of aircraft system abnormality prior to the aircraft departure.

At 1047 LT, the controller issued clearance to the PK-YSF pilot to enter and to backtrack Runway 24.

At 1051 LT, the PM reported ready for departure to the controller. The controller issued takeoff clearance with additional departure clearance that after takeoff, turn left to heading 180° and initially climb to altitude of 3,000 feet. The PM acknowledged the clearance.

The takeoff was conducted with reduced takeoff thrust by assumed temperature of 40°C and the aircraft became airborne at 10:52:57 LT.

At 1055 LT, the controller advised the pilot to report when established on heading 180°. The PM reported that they were experiencing right engine failure and requested to fly to AL NDB[4]. The controller advised the PM to turn left heading 060° and to climb to 2,500 feet.

Furthermore, the controller asked the pilot intention whether to hold over AL NDB or direct for landing approach. The PM replied that they would hold over AL NDB and added the information that no fire was detected. The controller issued clearance to fly to AL NDB at altitude of 2,500 feet.

The controller assumed that PK-YSF would return to Halim and advised the Airport Rescue and Fire-Fighting (ARFF) personnel that PK-YSF experienced right engine failure and would return to Halim.

At 1058 LT, the controller requested the information of time required for holding over AL NDB and was replied by the PM that holding would require about 15 minutes. Furthermore, the controller requested whether the pilot able to hold at a point about 15 to 20 Nm from AL NDB and was replied by the PM that they did not

1 Trigana Air Service will be named as Trigana for the purpose of this report.

2 Halim Perdanakusuma International Airport(WIHH), Jakarta will be named as Halim for the purpose of this report.

3 The 24-hours clock in Local Time (LT) is used in this report. Local time is Universal Time Coordinated (UTC) +7 hours.

4 Non-Directional Beacon (NDB) is radio beacon operating in medium frequency or low frequency band width. AL is the NDB transmitted at frequency 215 KHz, located at 11 miles from Halim.

objection to the proposal. The controller instructed the pilot to maintain outbound heading up to 15 Nm, at altitude of 2,500 feet. This was intended by the controller to manage the departure and arrival aircraft to and from Halim.

At 1116 LT, the PM reported that they were ready to turn left for approach. The controller advised the pilot to turn left and to intercept localizer of the Instrument Landing System (ILS) Runway 24.

At 1125 LT, the PM reported to the controller that the Runway was in sight. The controller advised that the wind was from 060° at velocity of 6 knots, QNH 1,007 mbs and issued landing clearance.

The aircraft touched down on the touchdown zone and shortly after, both wheels of the right main landing gear detached. The controller noticed spark appeared from the aircraft and pressed the crash bell.

At 1127 LT, the controller informed pilots of the other aircraft that the runway blocked by the landing aircraft and identified fire on one of the engines. Few seconds later, the PM called the controller whether any fire and was replied by the controller that fire was visible on the left side of the aircraft.

1.2 Injuries to Persons

There were no injuries to persons as a result of this occurrence.

1.3 Damage to Aircraft

The aircraft was substantially damaged. All three landing gears collapsed. Both engines mounting broken. Two tires and one brake assembly of the right main landing gear were detached while the left main landing gear wheels remained intact until the aircraft stopped.

1.4 Other Damage

Two cars that were parked near the tower building had minor damaged after impacted with detached main wheel tire.

One runway light and one taxiway light were found broken.

1.5 Personnel Information

1.5.1 Pilot in Command

Gender	:	male
Age	:	34 years
Nationality	:	Indonesia
Marital status	:	Married
Date of joining company	:	1 May 2012
License	:	ATPL
Date of issue	:	5 April 2018
Aircraft type rating	:	B737-300/400/500

Instrument rating validity	:	31 December 2021
Medical certificate	:	First class
Last of medical	:	12 March 2021
Validity	:	12 September 2021
Medical limitation	:	None
Last line check	:	30 June 2020
Last proficiency check	:	18 December 2020

Flying experience

Total hours	:	6,228:45 hours
Total on type	:	5,208:45 hours
Last 90 days	:	270:32 hours
Last 30 days	:	58 hours 37 minutes
Last 7 days	:	8 hours 52 minutes
Last 24 hours	:	6 hours 29 minutes
This flight	:	49 minutes

1.5.2 Second in Command

Gender	:	Male
Age	:	22 years
Nationality	:	Indonesia
Marital status	:	Single
Date of joining company	:	2 September 2019
License	:	CPL
Date of issue	:	23 July 2018
Aircraft type rating	:	B737-300/400/500
Instrument rating validity	:	31 August 2021
Medical certificate	:	First class
Last of medical	:	16 March 2021
Validity	:	16 September 2021
Medical limitation	:	None
Last line check	:	3 September 2020
Last proficiency check	:	4 September 2020

Flying experience

Total hours	:	1,255: 45 hours
Total on type	:	1,084:15 hours
Last 90 days	:	202 hours 34 minutes
Last 30 days	:	57 hours 59 minutes
Last 7 days	:	5 hours 8 minutes
Last 24 hours	:	3 hours 58 minutes
This flight	:	49 minutes

1.5.3 Flight Operation Officer

Gender	:	Male
Age	:	58 years
Nationality	:	Indonesia
Date of joining company	:	1 November 2006
License	:	FOO License
Date of issue	:	22 August 2001
Validity	:	31 March 2021
Aircraft type rating	:	B737-200, B737-300/400/500/, DHC-6, ATR 42/72
Medical certificate	:	Third class
Last of medical	:	3 September 2019
Validity	:	10 September 2021
Medical limitation	:	Holder shall possess corrective glass for near vision

1.6 Aircraft Information

1.6.1 General

Registration Mark	:	PK-YSF
Manufacturer	:	Boeing
Country of Manufacturer	:	United States of America
Type/Model	:	Boeing 737- 400 F
Serial Number	:	23869
Year of Manufacture	:	1988
Certificate of Airworthiness		
Issued	:	25 August 2020
Validity	:	25 August 2021
Category	:	Transport
Limitations	:	None

Certificate of Registration

Number	:	3368
Issued	:	23 September 2019
Validity	:	22 September 2022
Time Since New	:	55,982:31 hours
Cycles Since New	:	65,005 cycles
Last Major Check	:	1C 4,000 flight hours performed on 18 August 2020
Last Minor Check	:	A 250 flight hours, performed on 4 March 2021

1.6.2 Engines

Manufacturer	:	CFM International
Serial number left engine	:	727455
▪ Type/Model	:	CFM 56-3C1
▪ Installation date	:	18 August 2020
▪ Time Since New	:	43,642:08 hours
▪ Cycles Since New	:	30,678 cycles
Serial number right engine	:	721302
▪ Type/Model	:	CFM 56-3B2
▪ Installation date	:	18 August 2020
▪ Time Since New	:	61,741:8 hours
▪ Cycles Since New	:	46,113 cycles

1.6.3 Landing gears

Manufacturer	:	Boeing
Left Main Landing Gear		
Part Number	:	65-73761-115
Serial Number	:	LG0178
▪ Installation date	:	20 July 2020
▪ Cycles Since New	:	69,706 cycles
▪ Cycles Since Overhaul	:	699 cycles
Right Main Landing Gear		
Part Number	:	65-73761-122
Serial Number	:	XC91921
▪ Installation date	:	20 July 2020
▪ Cycles Since New	:	43,596 cycles

- Cycles Since Overhaul : 699 cycles

Nose Landing Gear

Part Number : 65-73762-21

Serial Number : T3036P1826

- Installation date : 23 July 2020
- Cycles Since New : 47,220 cycles
- Cycles Since Overhaul : 699 cycles

All three landing gears were installed after completion of the overhauled at Approved Maintenance Organization (AMO) of PT. Indo Aero Semesta and were released on 14 January 2020.

1.6.4 Weight and balance

According to the weight and balance sheet the aircraft weight calculation is as follows:

Basic weight	32, 183 kg	
Crew + Pantry	740 kg	
Dry Operating weight	32,923 kg	
Total traffic load	16,672 kg	
Actual zero fuel weight	49,595 kg (109,368 lbs)	Maximum 113,000 lbs
Takeoff fuel (block fuel – taxi fuel)	11,100 kg	
Actual takeoff weight	60,695 kg (133,835 lbs)	Maximum 142,500 lbs
Trip fuel	6,198 kg	
Actual landing weight	54,497 kg 120,166 (lbs)	Maximum 121,000 lbs
Takeoff (% MAC)	14	
Landing (% MAC)	13.6	

1.7 Meteorological Information

Weather report from Halim, issued on 20 March 2021 were as follows:

Time (LT)	1000	1030	1100
Wind (/km/h)	Easterly / 6	South easterly / 6	South easterly / 14
Visibility (km)	4	4	3
Weather	haze	haze	haze
Cloud[5]	few	few	few
QNH (mbs)	1008	1008	1007

1.8 Aids to Navigation

Halim has Instrument Landing System (ILS) on Runway 24. The detail of the ILS approach procedure is shown below:

5 Amount of cloud are assesses based on the part of the sky that are covers by the cloud. Few is when the 1/8 up to 2/8 of sky ore covers by clouds.

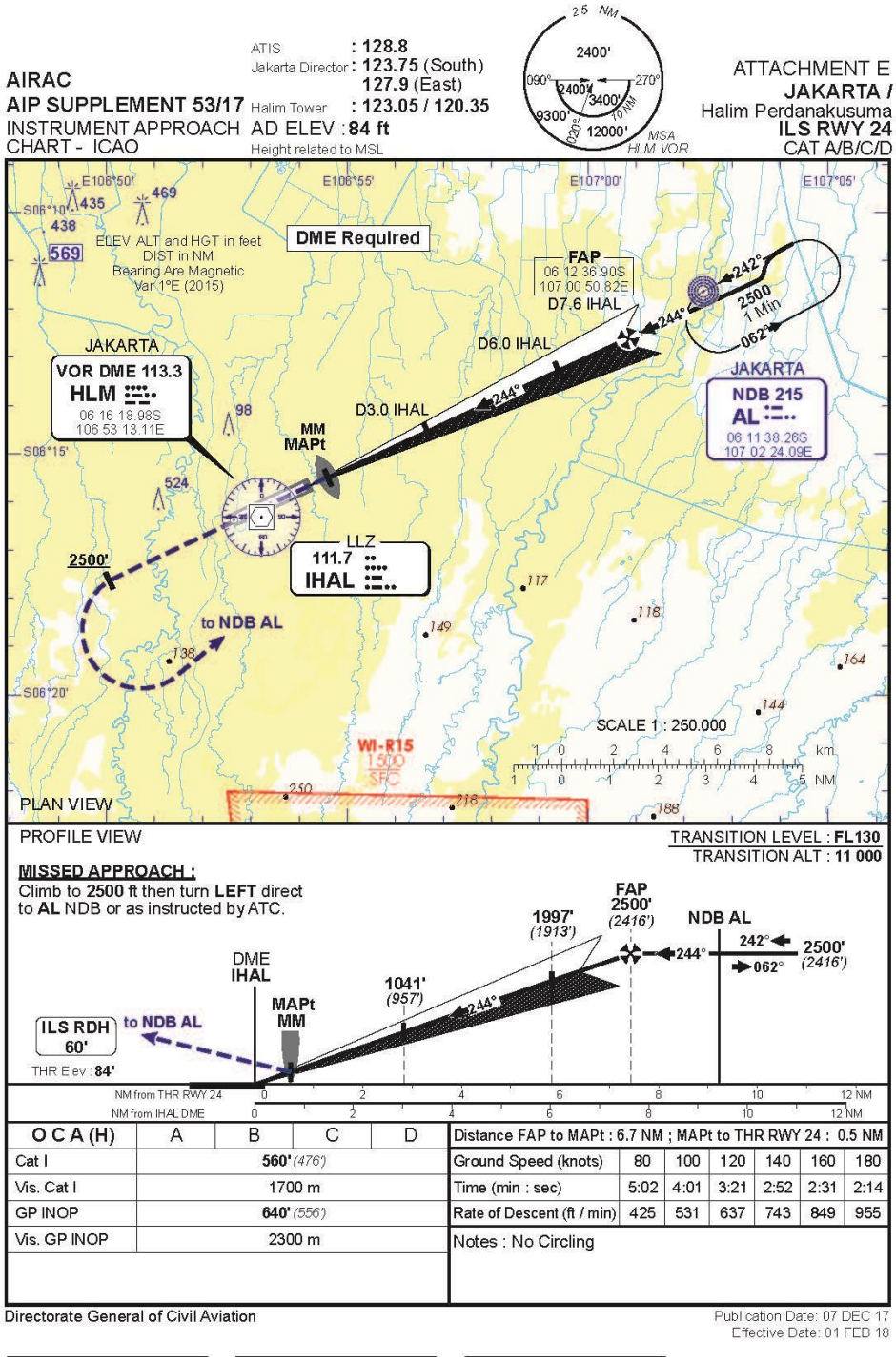

Figure 1: Instrument Landing System Runway 24 of Halim

1.9 Communications

All communications between the controller and the pilot were recorded by ground based automatic voice recording equipment for the duration of the flight. The quality of the aircraft's recorded transmissions was good. The excerpt of the communication is discussed in this report in the chapter 1.11.2 Cockpit Voice Recorder.

1.10 Aerodrome Information

Airport Name	:	Halim Perdanakusuma
Airport Identification	:	WIHH
Airport Operator	:	PT. Angkasa Pura II
Airport Certificate	:	008/SBU-DBU/XII/2020
Validity	:	7 July 2025
Coordinate	:	06° 16’ 03” S; 106° 53’ 11” E
Elevation	:	84 feet
Runway Direction	:	06 – 24
Runway Length	:	3,000 meters
Runway Width	:	45
Surface	:	Asphalt concrete

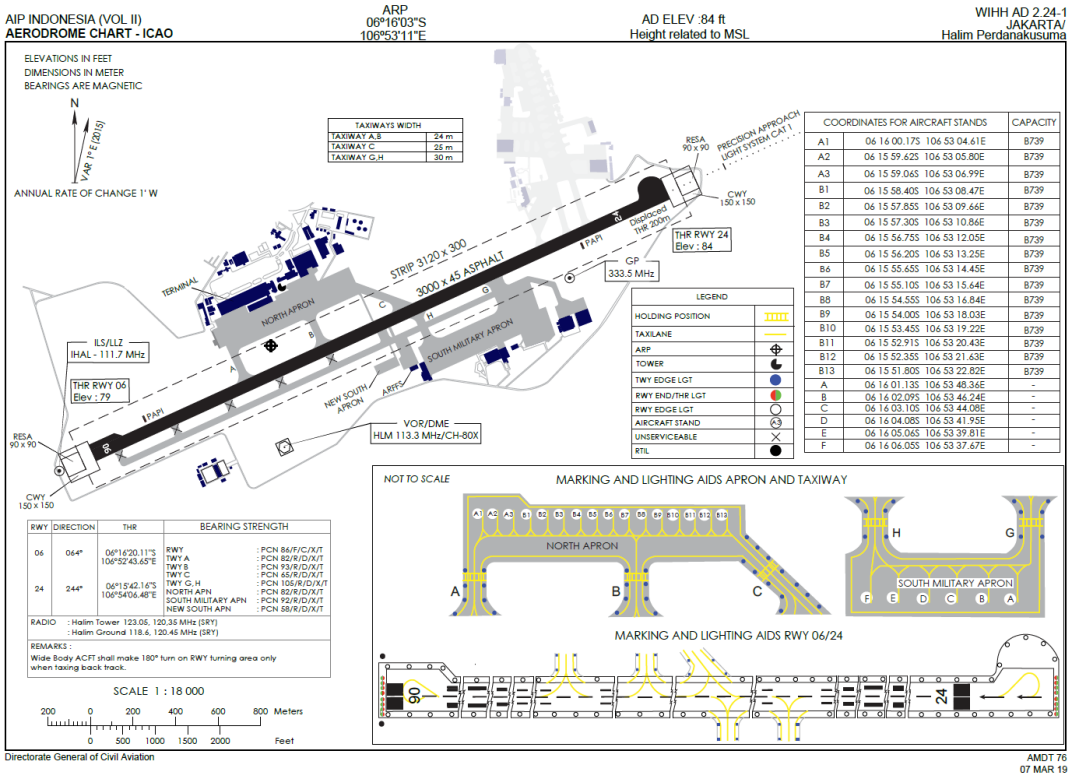

Figure 2: The Halim airport layout

1.11 Flight Recorders

The aircraft equipped with Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR). After the accident, both recorders were transported to KNKT recorder facility for data download process.

Both recorders were in good condition and the recorded data were successfully downloaded.

1.11.1 Flight Data Recorder

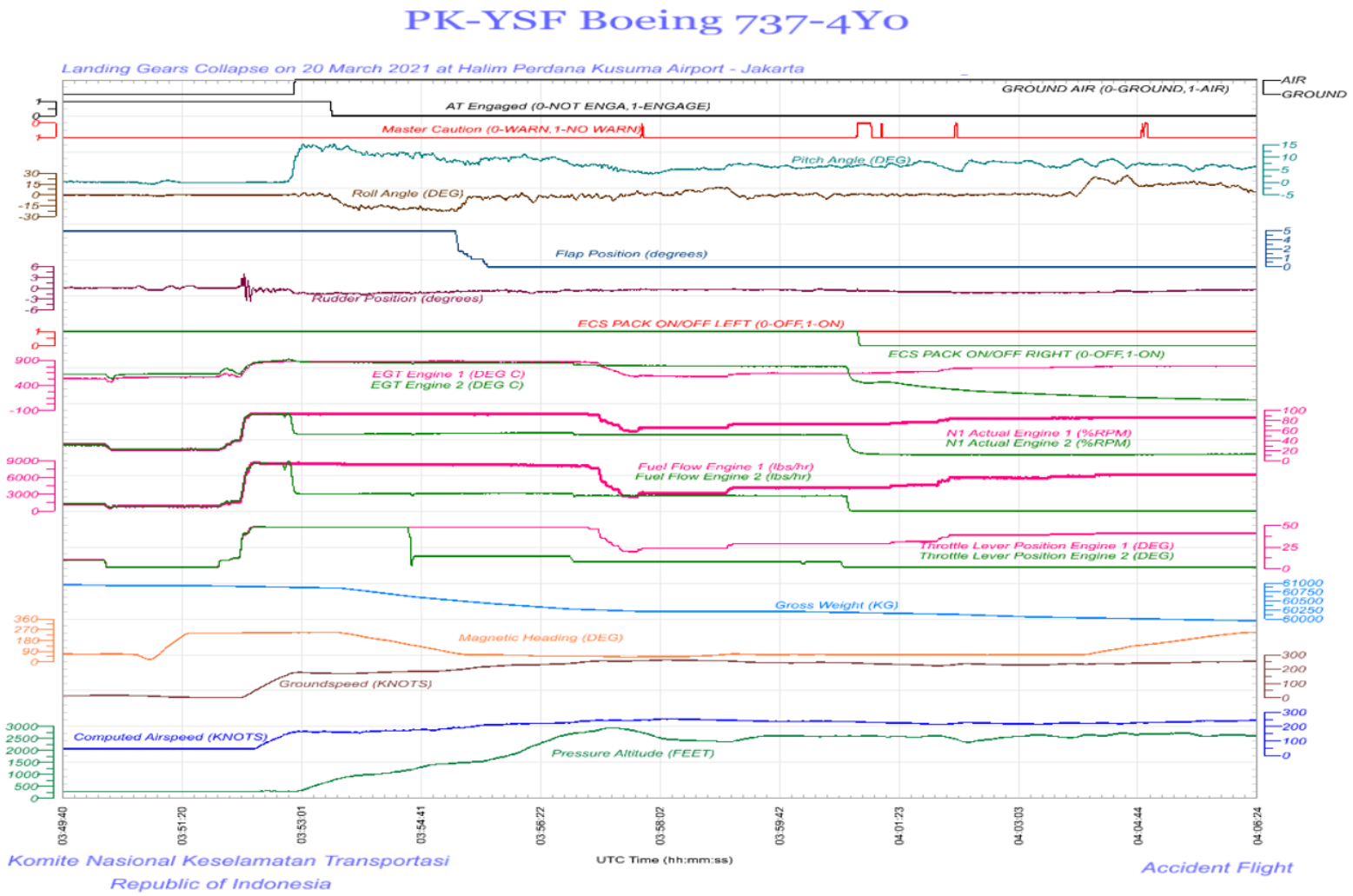

Figure 3: The FDR data of the departure phase

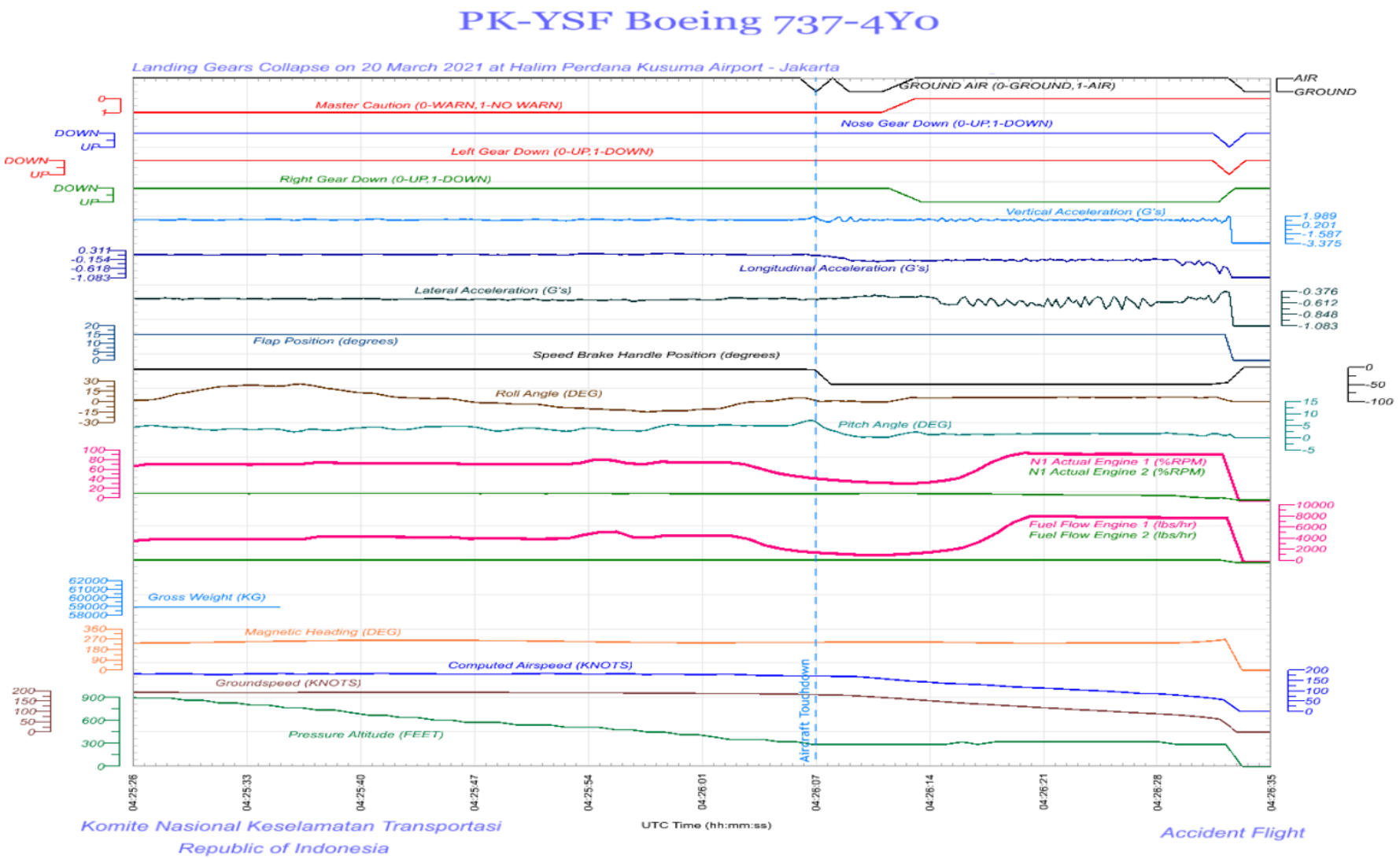

Figure 4: The FDR data of approach and landing

The FDR data showed that:

- The aircraft gross weight on initial taxi was 134,320 lbs (60,926 kgs);
- At 10:51:55 LT, the aircraft initiated the takeoff as indicated by the increment of both engines N1 up to 93% Rotation per Minute (RPM) and both throttle levers position to about 48°. The flap was configured at 5.
- At 10:52:51 LT, the computed airspeed recorded 145 knots, the right engine N1[6] increased to 94% RPM and the EGT increased up to 921°C, thereafter at 10:52:53 LT, the right engine N1 decreased to 54% and the Exhaust Gas Temperature (EGT) decreased to about 910°C.
- At 10:52:57 LT, the aircraft became airborne. The computed airspeed recorded 161 knots. The N1 of the left engine recorded at 92.5% RPM and the fuel flow about 8,500 lbs/hour, while the N1 of the right engine recorded 55.8% RPM, the fuel flow about 3,400 lbs/hour, and the EGT recorded 880°C. The Throttle Lever Position of both throttle levers recorded about 48°.
- At 10:54:37 LT, the right throttle lever decreased from 48° to 14°. There were no significant changes on the right engine N1, fuel flow and EGT.
- At 10:56:52 LT, the right throttle lever decreased to 7°, the N1 decreased from 55% to 52% RPM, the fuel flow decreased from about 3,100 to 2,600 lbs/hour, and the EGT decreased from about 810°C to 805°C.
- At 10:57:19 LT, the aircraft reached the highest altitude recorded of 2,950 feet which then gradually descent.
- At 11:00:40 LT, the right engine N1 gradually decreased to 12% RPM, the fuel flow decreased to about 10 lbs/hour.
- At 11:00:50 LT, the PACK switch turned to off position.
- At 11:16:56 LT, the flap extended to 1, the aircraft gross weight was 130,960 lbs or 59,402 kg, the pressure altitude was recorded 2,600 feet, the computed airspeed was 230 knots, and the aircraft heading was 065°.
- At 11:17:37 LT, the flap extended to 5, the pressure altitude was 2,600 feet, the aircraft was turning left passed heading 038° and the computed airspeed was 215 knots.
- At 11:23: 38 LT, the flap extended to 15, the pressure altitude was 2,600 feet, the heading was 250° and the computed airspeed was 175 knots. The aircraft gross weight was recorded 129,760 lbs or 58,858 kg.
- At 11:23:56 LT, the aircraft started to descend leaving altitude of 2,600 feet, the heading was 250°, and the computed airspeed was 165 knots.
- At 11:25:36 LT, the aircraft on descend passed altitude of 800 feet (pressure altitude), the computed airspeed was 181 knots, and the heading was 250° and the roll angle was 22° to the right.

6 N1 is the speed of the engine's low pressure rotor assembly.

- At 11:25:59 LT, the aircraft on descend passed pressure altitude of 448 feet, the computed airspeed was 178 knots, the heading was 240° and the roll angle was 15° to the left.
- At 11:26:09 LT, the aircraft touched down the runway at pressure altitude of 288 feet, the computed airspeed was 171 knots, the aircraft heading was 241° and the roll angle was 3° to the right, the left engine thrust reverser deployed, the speed brake handle extended, and the vertical acceleration was 1.79 g.
- At 11:26:15 LT, the air/ground sensor indicated "AIR", and the computed airspeed recorded 146 knots.
- At 11:26:33 LT, the aircraft heading of 266°, computed airspeed 56 knots, vertical acceleration 1,99 g, longitudinal acceleration -0.6 g, the lateral acceleration -0.39 g, the N1 of the left engine recorded 91% RPM and the fuel flow recorded 7,645 lbs/hour. Thereafter the FDR data became erroneous.

1.11.2 Cockpit Voice Recorder

The excerpt of the Cockpit Voice Recorder (CVR) is as follows:

Time (LT)	Excerpt of the recorded data
1055	The pilot reported that the right engine had failed without any sign of fire and requested to hold over AL NDB at altitude of 2,500 feet. The request was approved by the controller.
1057	Both pilots discussed that the engine was surge stall and did not fail. The discussion mentioned that the N1 did not gradually stop. The PIC stated that the procedures would have the same result.
1058	The controller advised the pilot to hold at a point about 15 up to 20 miles from AL NDB and was accepted by the pilot.
1102	The PM read the One Engine Inoperative Landing Non-Normal Checklist.
1105	The PF briefed to the PM that the approach would be performed as what they usually do. The PF added that they were 34 miles from AL NDB and would direct to approach landing.
1109	The PM informed the dispatcher on the ground via radio communication, that they were returning to Halim after experienced engine compressor stall.
1112	Both pilots discussed that considering the aircraft weight, would require very long time for holding. The pilots discussed with the FOO on board and informed that the current aircraft weight was 131,500 lbs, while the maximum landing weight was 121,000 lbs. The FOO informed that the runway was sufficient for landing with the existing aircraft condition.
1114	The PF advised to complete the checklist. The PM stated that the autobrake set to 3 and the target threshold speed was 163 knots.

Time (LT)	Excerpt of the recorded data
1116	The PM reported to the controller that they were ready for approach and the controller advised to turn left, and cleared for ILS approach Runway 24.
11:18:59	The PM reminded the PF to fly left and to check the speed.
11:19:32	The PM reported to the controller that the position was 12 miles from AL NDB and had been established on localizer of ILS Runway 24. The controller advised to report when leaving AL NDB.
11:20:13	The PM advised to the PF that the fuel imbalance was 1,000 lbs.
11:23:12	The landing gears were extended and the flap set to 15. The PF commanded to perform the "Landing Checklist" and the PM performed the Landing Checklist Deferred Items.
11:24:15	The PM reported to the controller that the position was leaving AL NDB. The controller advised to report when the runway in sight.
11:25:35	The PM informed to the controller that the runway was in sight. The controller issued landing clearance with additional information of the wind was from 060° at 6 knots, and QNH 1007 mbs.
11:25:36	The EGPWS altitude call out 500
11:25:53	The EGPWS alert GLIDESLOPE (4 times)
11:25:59	The EGPWS alert TOO LOW TERRAIN (3 times)
11:26:07	The PM called "speed brake up" followed by "no reverser engine number 2"
11:26:10	The sound of broken part
11:26:22	The PM called "auto brake disarms"
11:26:32	End of CVR recording

1.12 Wreckage and Impact Information

The first tire mark was found about 580 meters from the beginning Runway 24 and identified as the mark of the right main wheels, then followed by the tire mark of the left main wheels. All tire marks indicated zigzag movement of the wheels. The zigzag tire marks of the right main wheels ended about 380 meters and continued by zigzag scratch on runway, followed by paint marks. The zigzag tire marks of the left main wheels and the paint marks continued until the aircraft travelled off runway pavement.

One tire of the right main landing gear was found on the right side of the Runway 24, near the tower building after impacted to two cars that were parked. The other wheel was found on the left side of the Runway 24, after impacted to Airport Rescue and Fire Fighting (ARFF) fence. One of the brake assembly of the right main landing gear was found on the left side of the Runway 24, near the wind sock.

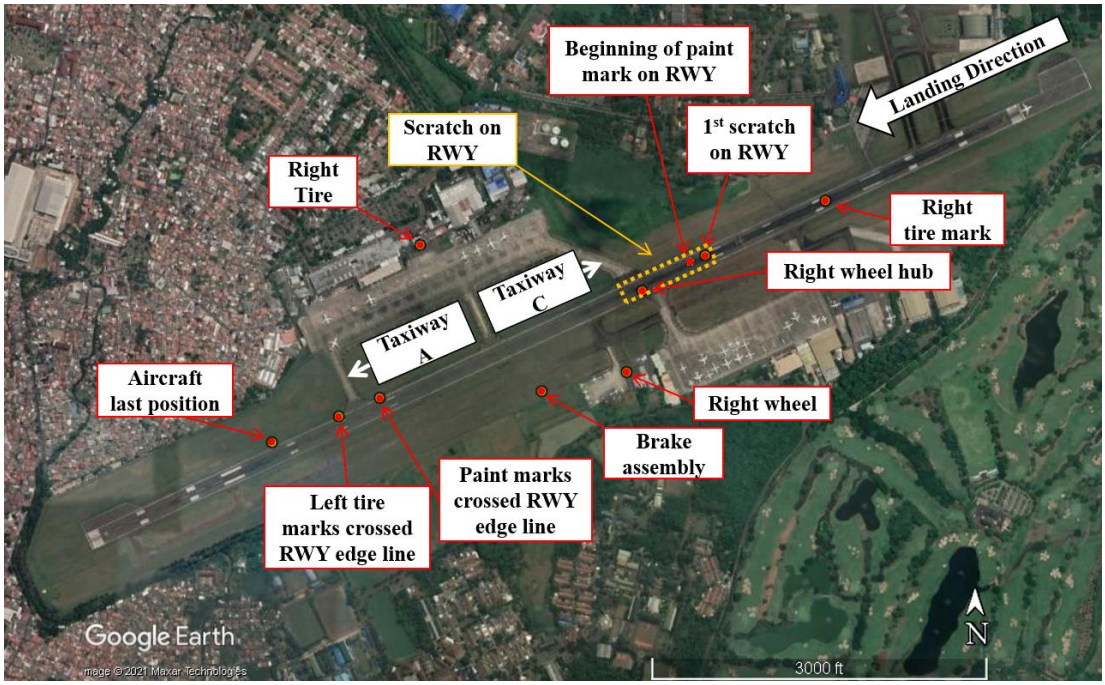

Figure 5: The wreckage and impact information

Figure 6: The zigzag tire marks of the right main wheels

The first scratch of the runway surface was found about 360 meters after the first right tire mark, or about 20 meters before the beginning of the zigzag scratch marks of the right main landing gears. Several scratches on the runway were also found after the first scratch until near the Taxiway C.

Figure 7: The zigzag scratch marks

Approximately 1,900 meters from the beginning Runway 24, the paint mark crossed the right's runway edge line.

The tire marks of the left landing gear travelled off runway pavement about 2,050 meters and the aircraft stopped about 2,200 meters from the beginning Runway 24 on heading 320°.

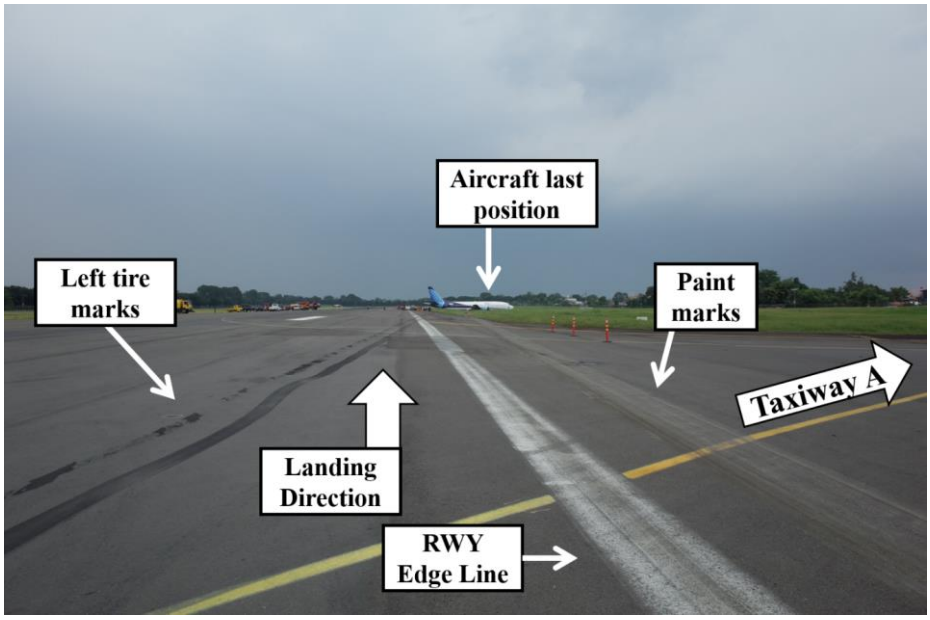

Figure 8: The left tire marks and the paint marks

1.13 Medical and Pathological Information

After the occurrence, medical examination performed to all crewmember at the Indonesia Airforce hospital (dr. Esnawan Antariksa Hospital). The result of the examination stated that no serious injury to all crewmember and no indication of alcohol nor drug.

1.14 Fire

After received information from the controller regarding the PK-YSF flight which experienced right engine failure and would return, the ARFF prepared one rescue car, one ambulance, and two foam tenders (Foam Tender 02 and Foam Tender 04).

After the aircraft touched down and passed the ARFF station, the controller pressed the crash bell and the ARFF team deployed to the accident site.

An amateur video recorded sparks appeared on the right side of the aircraft, shortly after the aircraft touched down.

Figure 9: The sparks on the right side of the aircraft on landing as recorded by the amateur video

The aircraft stopped about 1126 LT and the ARFF team arrived about one minute later. After the aircraft stopped, the controller informed to the pilots that the fire was visible on the left side of the aircraft. The airport Closed-Circuit Television (CCTV) recorded that the black smoke was visible on the left side of the aircraft.

About 1129 LT, the ARFF team had extinguished fire using roof-mounted water canon from the Foam Tender 4 and nozzle from the Foam Tender 2.

Figure 10: The black smoke as recorded in the airport CCTV

1.15 Survival Aspects

After the aircraft stopped, the engineer opened the aft left door and noticed the black smoke, thereafter the engineer opened the forward right door. No escape slides deployed while opening these doors. The crew were assisted by the Apron Movement Control (AMC) personnel and jumped onto the AMC car.

Thereafter, all crewmember were taken to the hospital for medical examination.

1.16 Tests and Research

Until the publishing this Preliminary Report, no test or research has been conducted. The investigation planned to conduct examination on the landing gear to identify the cause of the failure to the landing gears. The result of the examination will be included in the Final Report.

Should any other test and research conducted will be included in the Final Report.

1.17 Organizational and Management Information

1.17.1 Aircraft Operator

AOC Number	:	121 - 006
Validity	:	January 14, 2023
Aircraft Owner	:	PT. Trigana Air Service
Aircraft Operator	:	PT. Trigana Air Service
Address	:	Komplek Puri Sentra Niaga Jl. Wiraloka Blok D68 – 69 – 70 Kelurahan Cipinang Melayu Kecamatan Makasar Jakarta Timur – 13620 Indonesia

Trigana operated a total of 17 aircraft consisted of one Boeing 737-400 F, seven Boeing 737-300, one Boeing 737-500, five ATR 42, and three ATR-72.

1.17.2 Operation Manual Part A

8.3.19.3.3. APPROACH BRIEFING

Upon receiving the appropriate approach information, the PF shall nominate the procedures to be used for the approach. Normally 10 minutes prior to descent and not later than 10,000 ft. AFE.

Threat and Error management concept is used in the Approach Briefing and will include the following items:

- *Crew member condition*
- *The aircraft status*
- *Aerodrome status*
- *MORA, MEA & MSA*
- *STAR (if applicable) and Type of approach*
- *Runway of intended landing*
- *Landing distance required*
- *Minimum Descent Altitude (MDA), Decision Height (DH)*
- *Visual Descent Point (VDP) for Non-Precision Approach*
- *Landing Flap and Speed*
- *Missed Approach Procedure*
- *Runway information and taxi routing.*
- *Visual Approach Briefings may be abbreviated to the following items:*
  - *Airport MSA*
  - *Traffic Pattern Altitude*
  - *Runway in use*
  - *Landing Flaps and Speed*

The PM is required to add to the briefing the relevant performance data applicable for the approach and also the remaining fuel/time before initiating diversion.

8.3.19.12.5. OVERWEIGHT LANDING

At the discretion of the PIC, an aircraft may be landed that exceeds the maximum certified landing weight. This would normally be performed only in the case of an emergency.

If landing an aircraft above its maximum certified landing weight, consider carefully all factors such as runway length available, wind direction, turbulence, windshear etc., to ensure a smooth touchdown.

All overweight landings must be reported in the Maintenance Log Book with sufficient information regarding sink rate (whether low, low to moderate or medium to high) as well as any other pertinent information such as side loading, blown tires etc. This information enables ground engineers to perform the correct category of inspection.

A low sink rate smooth landing can save valuable time and inconvenience during the ensuing maintenance requirements.

1.17.3 Flight Crew Training Manual (FCTM)

Engine Failure During a Reduced Thrust (ATM) Takeoff (FCTM page 3.36)

Since the reduced thrust (ATM) takeoff must still comply with all regulatory takeoff performance requirements, it is not necessary to increase thrust beyond the reduced level on the operating engine in the event of an engine failure. However, if more thrust is needed during an ATM takeoff, thrust on the operating engine may be increased to full rated takeoff thrust by manually advancing the thrust lever. This is because the takeoff speeds consider VMCG and VMCA at the full rated takeoff thrust.

Increasing thrust on the operating engine to full rated takeoff thrust provides additional performance margin. This additional performance margin is not a requirement for the reduced thrust takeoff and its use is at the discretion of the flight crew.

Overweight Landing (FCTM page 6.37)

Overweight landings may be safely accomplished by using normal landing procedures and techniques. There are no adverse handling characteristics associated with overweight landings. Landing distance is normally less than takeoff distance for flaps 30 or 40 landings at all gross weights. However, wet or slippery runway field length requirements should be verified from the landing distance charts in the PI chapter of the QRH. Brake energy limits will not be exceeded for flaps 30 or 40 normal landings at all gross weights.

Note: Use of flaps 30 rather than flaps 40 is recommended to provide increased margin to flap placard speed.

If stopping distance is a concern, reduce the landing weight as much as possible. At the captain's discretion, reduce weight by holding at low altitude with a high drag configuration (gear down) to achieve maximum fuel burn-off.

Analysis has determined that, when landing at high gross weights at speeds associated with non-normal procedures requiring flaps set at 15 or less, maximum effort stops may exceed the brake energy limits. The gross weights where this condition can occur are well above maximum landing weights. For these non-normal landings, maximize use of the available runway for stopping.

Observe flap placard speeds during flap extension and on final approach. In the holding and approach patterns, maneuvers should be flown at the normal maneuver speeds. During flap extension, airspeed can be reduced by as much as 20 knots below normal maneuver speeds before extending to the next flap position. These lower speeds result in larger margins to the flap placards, while still providing normal bank angle maneuver capability, but do not allow for a 15° overshoot margin in all cases.

Use the longest available runway, and consider wind and slope effects. Where possible avoid landing in tailwinds, on runways with negative slope, or on runways with less than normal braking conditions. Do not carry excess airspeed on final. This is especially important when landing during an engine inoperative or other non-normal condition. At weights above the maximum landing weight, the final approach maximum wind additive may be limited by the flap placards and load relief system.

Fly a normal profile. Ensure that a higher than normal rate of descent does not develop. Do not hold the airplane off waiting for a smooth landing. Fly the airplane onto the runway at the normal touchdown point. If a long landing is likely to occur, go-around. After touchdown, immediately apply maximum reverse thrust using all of the available runway for stopping to minimize brake temperatures. Do not attempt to make an early runway turnoff.

Autobrake stopping distance guidance is contained in the PI chapter of the QRH. If adequate stopping distance is available based upon approach speed, runway conditions, and runway length, the recommended autobrake setting should be used.

1.17.4 Quick Reference Handbook (QRH)

1.17.4.1 Engine Fire or Engine Severe Damage or Separation

ENGINE FIRE
or
Engine Severe Damage or Separation

Condition: One or more of these occur:
- Engine fire warning
- Airframe vibrations with abnormal engine indications
- Engine separation.

1 Autothrottle (if engaged) . . . . . .Disengage

2 Thrust lever
(affected engine) . . . . . .Confirm . . . . . Close

3 Engine start lever
(affected engine) . . . . . .Confirm . . . CUTOFF

4 Engine fire switch
(affected engine) . . . . . .Confirm . . . . . Pull

To manually unlock the engine fire switch, press the override and pull.

5 **If** the engine fire switch or ENG OVERHEAT light is illuminated:

Engine fire switch . . . . . Rotate to the stop and hold for 1 second

If after 30 seconds the engine fire switch or ENG OVERHEAT light stays illuminated:

Engine fire switch. . . . . .Rotate to the other stop and hold for 1 second

▼ Continued on next page ▼

▼ENGINE FIRE or Engine Severe Damage or Separation continued▼

6 Choose one:

◆High airframe vibration **occurs** and **continues** after the engine is shut down:

Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level.

Note: If high vibration returns and further airspeed reduction and descent are not practical, increasing airspeed may reduce the vibration.

►►Go to step 7

◆High airframe vibration does **not** occur or does **not** continue after the engine is shut down:

►►Go to step 7

7 ISOLATION VALVE switch . . . . . CLOSE

8 PACK switch (affected side) . . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

9 APU BLEED air switch . . . . . OFF

▼ Continued on next page ▼

▼ENGINE FIRE or Engine Severe Damage or Separation continued▼

10 Choose one:

◆APU is **available** for start:

APU . . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . . .ON

►►Go to step 11

◆APU is **not** available:

►►Go to step 11

11 Balance fuel as needed.

12 Transponder mode selector . . . . . TA

This step prevents climb commands which can exceed single engine performance capability.

13 ISOLATION VALVE switch
(after the fire has been extinguished) . . . . . AUTO

This ensures bleed air is available to both wings if wing anti-ice is needed.

14 Plan to land at the nearest suitable airport.

Note: Do not use FMC fuel predictions.

►►Go to the One Engine Inoperative Landing checklist on page 7.30

■ ■ ■ ■

1.17.4.2 Engine Limit or Surge or Stall

Engine Limit or Surge or Stall

Condition: One or more of these occur:

- Engine indications are abnormal
- Engine indications are rapidly approaching or exceeding limits
- Abnormal engine noises are heard, possibly with airframe vibration
- There is no response to thrust lever movement or the response is abnormal
- Flames in the engine inlet or exhaust are reported.

Objective: To attempt to recover normal engine operation or shut down the engine if recovery is not possible.

1 Autothrottle (if engaged) . . . . . .Disengage

2 Thrust lever
(affected engine) . . . . Confirm. . . . .Retard until engine indications stay within limits or the thrust lever is closed

3 Choose one:

◆Engine indications are **stabilized and** EGT is **stabilized or decreasing**:

►►**Go to step 4**

◆Engine indications are **abnormal or** EGT continues to **increase**:

►►**Go to step 7**

▼ Continued on next page ▼

▼Engine Limit or Surge or Stall continued▼

Check that RPM and EGT follow thrust lever movement.

4 ⚠ Thrust lever (affected engine). . . . . Advance slowly

5 Run the engine normally or at a reduced thrust setting that is surge and stall free.

6 Choose one:

◆Engine runs **normally**:

■ ■ ■ ■

◆Engine runs at **reduced** thrust:

Transponder mode selector. . . . . TA

This step prevents climb commands which can exceed reduced thrust performance capability.

■ ■ ■ ■

7 Engine start lever (affected engine) . . . . Confirm. . . . . CUTOFF

8 PACK switch (affected side) . . . . . OFF

This causes the operating pack to regulate to high flow in flight with flaps up.

▼ Continued on next page ▼

▼Engine Limit or Surge or Stall continued▼

9 Choose one:

◆APU is **available** for start:

APU . . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . . .ON

►►**Go to step 10**

◆APU is **not** available:

►►**Go to step 10**

10 Balance fuel as needed.

11 Transponder mode selector . . . . . TA

This step prevents climb commands which can exceed single engine performance capability.

12 ISOLATION VALVE switch . . . . . Verify AUTO

This will ensure bleed air is available to both wings if wing anti-ice is needed.

13 A restart may be attempted if there is N1 rotation and no abnormal airframe vibration.

▼ Continued on next page ▼

▼Engine Limit or Surge or Stall continued▼

14 Choose one:

◆Restart **will** be attempted:

►►**Go to the Engine In-Flight Start checklist on page 7.22**

■ ■ ■ ■

◆Restart will **not** be attempted:

►►**Go to step 15**

15 Plan to land at the nearest suitable airport.

Note: Do not use FMC fuel predictions.

►►**Go to the One Engine Inoperative Landing checklist on page 7.30**

■ ■ ■ ■

1.17.4.3 One Engine Inoperative Landing

One Engine Inoperative Landing

Condition: Landing must be made with one engine inoperative.

1 Plan a flaps 15 landing.

2 Set VREF 15.

3 Check the Non-Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

4 Maintain VREF 15 + wind additive on final approach to assure sufficient maneuver margin and speed for go-around. The minimum wind additive is 5 knots.

5 When engine anti-ice is needed, use on the operating engine only.

6 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

PP433, PW005

Pressurization . . . . . .CAB ALT ___, LAND ALT ___

PS863

Pressurization . . . . . .LAND ALT ___

Recall . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 15 ___, Minimums ___**

Approach briefing . . . . . Completed

▼ Continued on next page ▼

▼One Engine Inoperative Landing continued▼

Additional Go-Around Thrust

Choose one:

- Additional go-around thrust is **needed**:

  ►►**Go to No Engine Bleed Landing below**

- Additional go-around thrust is **not** needed:

  ►►**Go to Go-Around Procedure Review below**

No Engine Bleed Landing

When below 10,000 feet:

WING ANTI-ICE switch . . . . . OFF

ISOLATION VALVE switch . . . . . CLOSE

BLEED 1 air switch . . . . . OFF

Do not open the APU bleed air valve if the engine fire switch is illuminated.

⚠ APU BLEED air switch . . . . . ON

Left PACK switch . . . . . AUTO

BLEED 2 air switch . . . . . OFF

Go-Around Procedure Review

Do the normal go–around procedure except:

Use flaps 1.

▼ Continued on next page ▼

▼One Engine Inoperative Landing continued▼

Maintain VREF 15 + 5 knots until reaching flap retraction altitude.

Limit bank angle to 15° when airspeed is less than VREF 15 + 15 knots or the minimum maneuver speed, whichever is lower.

Accelerate to flaps 1 maneuvering speed before flap retraction.

Approach Checklist

Altimeters . . . . . ___

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . . FLAP INHIBIT

Landing Checklist

ENGINE START
switch (operating engine) . . . . . CONT

Speedbrake . . . . . ARMED

Landing gear . . . . . Down

Flaps . . . . . **15, Green light**

■ ■ ■ ■

1.17.4.4 Ground Proximity Warning System Response

Ground Proximity Warning System (GPWS) response was described in the QRH subchapter MAN 1.4 as follow:

GPWS Caution

Do the following maneuver for any of these aural alerts:

- *SINK RATE*
- *TERRAIN*
- *DON'T SINK*
- *TOO LOW FLAPS*
- *TOO LOW GEAR*
- *TOO LOW TERRAIN*
- *GLIDESLOPE*
- *BANK ANGLE*
- *AIRSPEED LOW (as installed)*
- *CAUTION TERRAIN*
- *CAUTION OBSTACLE*

Pilot Flying	*Pilot Monitoring*
Correct the flight path, airplane configuration, or airspeed	

The below glideslope deviation alert may be cancelled or inhibited for:

- *localizer or backcourse approach*
- *circling approach from an ILS*
- *when conditions require a deliberate approach below glideslope*
- *unreliable* glideslope signal.

***Note**: If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.*

1.17.5 Flight Crew Operation Manual

The Flight Crew Operation Manual (FCOM) subchapter Limitation page L.10.13 described fuel balance limit as follows:

Lateral imbalance between main tanks 1 and 2 must be scheduled to be zero. Random fuel imbalance must not exceed 1,000 lbs for taxi, takeoff, flight or landing.

1.18 Additional Information

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

- Understanding the cause of the right engine failure;
- Understanding the cause of the landing gears failure
- Reviewing the history of the right engine and landing gears serviceability and maintenance records;
- Reviewing the pilot's performance and their training on one engine inoperative handling;
- Reviewing operations – human factors issues in this occurrence;
- Reviewing organizational issues in this occurrence.

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.

1.19 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with the KNKT approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 FINDINGS

Findings are statements of all significant conditions, events or circumstances in the accident sequence. The findings are significant steps in the accident sequence, but they are not always causal, or indicate deficiencies. Some findings point out the conditions that pre-existed the accident sequence, but they are usually essential to the understanding of the occurrence, usually in chronological order.

According to factual information during the investigation, the KNKT identified initial findings as follows:

1. The aircraft had valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R). There was no aircraft system abnormality reported prior to the flight.
2. The controller and the pilots held valid licenses and medical certificates.
3. The takeoff on Runway 24, conducted with reduced takeoff thrust by assumed temperature of 40°C and became airborne at 10:52:57 LT.
4. About 6 seconds prior to airborne, the computed airspeed recorded 145 knots, the right engine N1 increased to 94% RPM and the EGT increased up to 921°C, thereafter about 3 seconds prior to airborne, the right engine N1 decreasing to 54% and the EGT decreasing to about 870°C.
5. About two minutes after takeoff, the PM reported that they were experiencing right engine failure and requested to fly to AL NDB. The aircraft climbed to and maintained altitude of 2,500 feet.
6. The right throttle lever decreased from 48° to 14° at 10:54:37 LT, without any significant changes on the right engine N1, fuel flow and EGT. Thereafter, at 10:56:52 LT, the right throttle lever decreased to 7°, the N1 decreased from 55% to 52% RPM, the fuel flow 2,614 lbs/hour, and the EGT 796°C.
7. At 11:00:40 LT, the N1 of the right engine N1 gradually decreased to 12% RPM, the fuel flow to about 10 lbs/hour and the EGT 773°C, and at 11:00:50 LT, the PACK switch turned to off position.
8. At 1102 LT, the CVR recorded the PM read the “One Engine Inoperative Landing Non-Normal Checklist”.
9. The QRH of an engine failure might refer to “Engine Fire or Severe Damage or Separation” or “Engine Limit or Surge or Stall” which required memory items that should be performed by memory. The memory items included requirement to retard the throttle lever of the effected engine until the engine parameters within limit or to idle. Both aforesaid procedures also required to switched off the PACK switch of the affected side and to monitor the fuel balance.
10. The FDR recorded the right engine throttle was reduced about two minutes after airborne and further reduction about two minutes later. About 8 minutes after takeoff, the right engine was shut down and the PACK switch turned to off position.
11. At 1105 LT, the PF briefed the PM that the approach would be performed as what they usually do.

12. At 1112 LT, both pilots discussed that considering the aircraft weight, would require very long time for holding. The pilots discussed with the FOO on board and informed that the current aircraft weight was 131,500 lbs, while the maximum landing weight was 121,000 lbs. The FOO informed that the runway was sufficient for landing with the existing aircraft condition.
13. The aircraft was performed the approach landing procedure of ILS Runway 24, with flap 15 configuration, the autobrake set to 3, and the target threshold speed was 163 knots.
14. During the approach, the PM advised to the PF that the fuel imbalance reached the maximum limitation of 1,000 lbs, about five minutes later, the EGPWS altitude call out “500”, and then the EGPWS warning of “GLIDESLOPE” was active 4 times and “TOO LOW TERRAIN” was active 3 times.
15. At 11:26:09 LT, the aircraft touched down the runway, the computed airspeed recorded 171 knots, aircraft heading 241° and roll angle 3° to the right, the left engine thrust reverser deployed, the speed brake handle extended, and the vertical acceleration was 1.79 g.
16. After the aircraft stopped, the controller informed to the pilots that the fire was visible on the left side of the aircraft. The airport Closed-Circuit Television (CCTV) recorded that the black smoke was visible on the left side of the aircraft.
17. The ARFF team arrived about one minute after the aircraft stopped and extinguished the fire.
18. After the aircraft stopped, the FOO opened the aft left door and noticed the black smoke, thereafter the FOO opened the forward right door. No escape slides deployed while opening these doors. The crew were assisted by the Apron Movement Control (AMC) personnel and jumped onto the AMC car.

3 SAFETY ACTION

Prior to the issuance of this Preliminary Report, the Komite Nasional Keselamatan Transportasi (KNKT) has been informed safety actions taken by PT Trigana Air Service which consisted of:

1. reminder for pilots to improve safety awareness, comply to the safety regulations and to maintain proficiency and qualification as pilot B737.
2. working order to conduct engine run up to all B737 fleet to monitor the engine performances.

4 SAFETY RECOMMENDATIONS

Komite Nasional Keselamatan Transportasi (KNKT) acknowledged the safety issues taken by PT Trigana Air Services, however there are still safety issues remaining. Therefore, the KNKT issued safety recommendations to address safety issues identified in this report.

4.1 Trigana Air Service

- **04.O-2021-05.01**

  The QRH of an engine failure might refer to "Engine Fire or Severe Damage or Separation" or "Engine Limit or Surge or Stall" which required memory items, which should be performed by memory. The memory items included requirement to retard the throttle lever of the effected engine until the engine parameters within limit or to idle. Both aforesaid procedures also required to switched off the PACK switch of the affected side and to monitor the fuel balance.

  The FDR recorded the right engine throttle was reduced about two minutes after airborne and further reduced about two minutes later. About 8 minutes after takeoff, the right engine was shut down and the PACK switch turned to off position.

  During the approach, after established on localizer ILS Runway 24, the fuel imbalance was 1,000 lbs, which was the maximum imbalance fuel according to the aircraft limitation described in the FCOM.

  The delay of the throttle reduction, switching off the PACK switch, and fuel imbalance up to the maximum limitation indicated that the QRH procedure did not executed properly.

  Therefore, the KNKT recommends the Trigana Air Service to ensure pilot execute QRH procedure properly.

- **04.O-2021-05.02**

  The Operation Manual Part A (OM-A) subchapter 8.3.19.3.3 required pilot to conduct approach briefing using Threat and Error management concept.

  Prior to the approach, the PF briefed to the PM that the approach would be performed as what they usually do. The CVR did not record approach briefing as required by the OM-A.

  Therefore, the KNKT recommends the Trigana Air Service to ensure pilot conduct approach briefing as required in the OM-A.

- **04.O-2021-05.03**

  The Quick Reference Handbook subchapter MAN 1.4 described procedure to response Ground Proximity Warning System (GPWS). The procedure required Pilot Flying and Pilot Monitoring to correct the flight path, aircraft configuration, or airspeed if the GPWS provided caution, including aural alerts of "GLIDESLOPE" and "TOO LOW TERRAIN".

During the approach, after the EGPWS altitude call out “500”, the EGPWS warning of “GLIDESLOPE” was active 4 times and “TOO LOW TERRAIN” was active 3 times. Those prolong activation of the EGPWS warnings indicated that the action to correct the glide slope was not performed.

Therefore, the KNKT recommends the Trigana Air Service to ensure pilot response the GPWS as required in the QRH.

5 APPENDICES

5.1 Notice to Pilots

Trigana Air

NOTICE TO PILOT

N O M O R	:	**010 / TAS-CPJ / III / 2021**
EFFECTIVE DATE	:	**20 MARET 2020**
ATTENTION	:	**ALL PILOT B 737-CL**
SUBJECT	:	***ACCIDENT PK-YSF***
CC	:	***- OPERATION DIRECTOR*** ***- SAFETY DIRECTOR*** ***- OPERATION MANAGER*** ***- SAFETY MANAGER*** ***- STANDARD MANAGER*** ***- FILE***

Mengacu terhadap kejadian ***Accident PK-YSF*** pada tanggal 20 Maret 2021 di bandara Halim Perdana Kusuma. Maka disampaikan kepada Pilot B 737CL agar pada saat melaksanakan tugas terbang untuk :

1. **Senantiasa meningkatkan *Safety awareness***
2. **Mematuhi peraturan keselamatan penerbangan**
3. **Tetap menjaga Kecakapan dan Kualifikasi sebagai PIC maupun SIC B737CL**

Demikian Notice To Pilot ini dibuat agar dapat dilaksanakan dengan penuh tanggungjawab.Terimakasih atas perhatian dan kerja samanya.

SALAM SEHAT & *SAFE FLIGHT*

ISSUED BY **CHIEF PILOT JET**	**ACKNOWLEDGE BY** **OPERATION MANAGER**

5.2 Engine run up reports

Trigana Air

Date : 06 APR 2021 Reason of Run Up : WO 017/YRA/III/2021 Performed By
Station : HLP
A/C Type : B737-300F
Eng Type : CFM 56-3B1/ C1
A/C Reg : PK-YRA According to performed (AMM) : AMM 71-00-00
Eng S/N

#1 : 727205
#2 : 858727 Wind Velocity : 12 KNOT Fuel used : 990 LBS
Eng Cycle Wind Direction : 240 Start : 00.47 LT
#1 : A/C Nose Dir : 42 Finish : 01.50 LT
#2 : Field Elev : 100 Duration : 63 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	4820 Lbs	3800 Lbs
CTR Tank	0 Lbs	0 Lbs
RH Tank	3460 Lbs	3490 Lbs
Total	8280 Lbs	7290 Lbs

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	410	402
Gen Volt	117	116
Air Press (80% N1)	80	80
Eng Anti Ice	OK	OK
CSD Temp In (C°)	79	79
CSD Temp Rise (C°)	0	4
Bleed S/W Over (85-90 %N2)	86	85
Throttle Spool Up (Sec)	5	7
DECC	6	7
T/R Interlock	OK	OK
CSD Disconnect	OK	OK
CSD Reconnect	OK	OK

DESCRIPTION	ENG #1	ENG #2
OAT	28 Deg. C	28 Deg. C
BAR	29.83 Inch Hg	29.83 Inch Hg
Ignition	BOTH	BOTH
Light Up	3 Sec	3 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	689 Deg. C	655 Deg. C
Initial Max F/F	520 Kg/ Hrs.	430 Kg/ Hrs.
Start Time	32 Sec	37 Sec
Fuel Used	755 Kg	755 Kg
Duration	48 Minute	48

NOTE:

Engine #1 EGT margin: 834 – (817 + 2) = 15

Engine #1 N2 margin: 98.0 – (96.2 + 0.09) = 1.71

Engine #1 EGT margin: 834 – 790 = 44

Engine #1 N2 margin: 97.0 – 96.2 = 0.8

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	62.0	71.3	91.2 N2	74.0 N1	86.8	834	98.0	93.2	TARGET	62.0	72.5	93.4 N2	73.0 N1	86.8	834	97.0	92.2
N1	22.4	30.2	71.2	74.9		86.6		93.3	N1	22.6	31.5	80.6	75.9		86.8		93.3
EGT	567	561	659	721		817		869	EGT	567	555	734	707		790		834
N2	62.1	70.9	90.6	91.6		96.2		98.5	N2	61.5	73.1	93.7	92.1		96.2		98.6
F/F	380	490	1680	2140		3090		3850	F/F	350	500	2480	2110		2940		3650
OIL PRS	25	26	35	50		45		50	OIL PRS	30	30	50	48		50		52
OIL TMP	50	60	100	90		100		100	OIL TMP	50	95	100	100		104		100
OIL QTY	90	91	76	68		66		71	OIL QTY	62	66	65	62		59		60
VIB	0.2	0.2	0.9	0.5		0.8		0.9	VIB	0.4	0.4	0.9	0.8		0.8		0.8
HYD PRS	3000	3000	3000	3000		3000		3000	HYD PRS	3000	3100	3000	3100		3100		3100
HYD QTY	99	99	100	95		100		100	HYD QTY	96	96	95	95		87		87

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 30 MAR 2021 Reason of Run Up : WO 003/III/YRD/2021 Performed By
Station : BTO
A/C Type : B737-300F
Eng Type : CFM 56-3B1/ B2
A/C Reg : PK-YRD According to performed (AMM) : AMM 71-00-00
Eng S/N

#1 : 722423
#2 : 722127 Wind Velocity : 0.5 KNOT Fuel used : 1110 KG
Eng Cycle Wind Direction : 040 Start : 08.00 LT
#1 : A/C Nose Dir : 192 Finish : 09.00 LT
#2 : Field Elev : 1006 Duration : 60 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	4320 Kg	3800 Kg
CTR Tank	490 Kg	490 Kg
RH Tank	4290 Kg	3750 Kg
Total	9100 Kg	7990 Kg

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	403	400
Gen Volt	117	115
Air Press (80% N1)	44	44
Eng Anti Ice	OK	OK
CSD Temp In (C°)	90	80
CSD Temp Rise (C°)	2	6
Bleed S/W Over (85-90 %N2)		
Throttle Spool Up (Sec)	7	7
DECC		
T/R Interlock	OK	OK
CSD Disconnect	OK	OK
CSD Reconnect	OK	OK

DESCRIPTION	ENG #1	ENG #2
OAT	27 Deg. C	27 Deg. C
BAR	29.55 Inch Hg	29.55 Inch Hg
Ignition	BOTH	BOTH
Light Up	2 Sec	2 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	624 Deg. C	628 Deg. C
Initial Max F/F	430 Kg/ Hrs.	490 Kg/ Hrs.
Start Time	45 Sec	55 Sec
Fuel Used	520 Kg	535 Kg
Duration	60 Minute	60 Minute

NOTE:

Engine #1 EGT margin: 831 – 780 = 51

Engine #1 N2 margin: 97.8 – 96.3 = 1.5

Engine #1 EGT margin: 828 – 816 = 12

Engine #1 N2 margin: 97.1 – 96.3 = 0.8

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	62.0 N2	71.3 N2	91.2 N2	74.1 N1	86.6	831	97.8	93.5 N1	TARGET	62.0	71.3	91.2 N2	74.1 N1	86.5	828	97.1	93.5 N1
N1	22.3	30.5	73.5	74.5		86.6		93.5	N1	22.9	23.9	78	75.1		86.5		92.9
EGT	566	563	675	712		780		840	EGT	573	587	683	741		816		866
N2	62	73.3	91.7	92.2		96.3		100	N2	61.6	71.2	92.8	91.7		96.3		98.4
F/F			2030			2950		3810	F/F			2390			3090		3710
OIL PRS	32	32	41	55		50		55	OIL PRS	23	24	34	50		55		50
OIL TMP	80	90	100	100		110		110	OIL TMP	75	80	100	100		110		100
OIL QTY	80	80	72	65		66		70	OIL QTY	9068	91	78	69		67		70
VIB	0.2	0.2	0.9	0.5		0.8		0.9	VIB	0.1	0.1	0.3	0.2		0.3		0.3
HYD PRS	3000	3000	3000	3000		3000		3000	HYD PRS	3000	3000	3000	3000		3000		3000
HYD QTY	OK	OK	OK	OK		OK		OK	HYD QTY	OK	OK	OK	OK		OK		OK

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 04 APRIL 2021 Reason of Run Up : WO 017/YSC/III/2021 Performed By
Station : HLP
A/C Type : B737-500
Eng Type : CFM 56-3-B1/-C1
A/C Reg : PK-YSC According to performed (AMM) : AMM 71-00-00
Eng S/N

#1 : 722298
#2 : 860137 Wind Velocity : CALM Fuel used : 1110 KG
Eng Cycle Wind Direction : Start : 23.44 LT
#1 : A/C Nose Dir : 060 Finish : 00.25 LT
#2 : Field Elev : 70 Duration : 41 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	2480 Kg	1990 Kg
CTR Tank	0 Kg	0 Kg
RH Tank	2570Kg	1950 Kg
Total	5050 Kg	3940 Kg

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	375	405
Gen Volt	118	114
Air Press (80% N1)	52	54
Eng Anti Ice		
CSD Temp In (C°)	60	65
CSD Temp Rise (C°)	-	6
Bleed S/W Over (85-90 %N2)	-	-
Throttle Spool Up (Sec)	7.0	6.0
DECC	-	-
T/R Interlock	OK	OK
CSD Disconnect	OK	OK
CSD Reconnect	OK	OK

DESCRIPTION	ENG #1	ENG #2
OAT	28 Deg. C	28 Deg. C
BAR	29.80 Inch Hg	29.80 Inch Hg
Ignition	BOTH	BOTH
Light Up	2 Sec	2 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	660 Deg. C	667 Deg. C
Initial Max F/F	430 Kg/ Hrs.	220 Kg/ Hrs.
Start Time	30 Sec	35 sec
Fuel Used	490 Kg	620 Kg
Duration	41 Min	45 Min

NOTE:

Engine #1 EGT margin: 834 – (791+2) = 50

Engine #1 N2 margin: 97 – (96.3+0.09) = 0.61

Engine #2 EGT margin: 834 – (779+2) = 62

Engine #2 N2 margin: 97 – (96.5+0.09) = 0.41

Both EGT & N2 adjusted

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	62.0 N2	72.5 N2	93.4 N2	75.0 N1	86.8	834	97	93.2	TARGET	62.0 N2	72.5 N2	93.4 N2	75.0 N1	86.8	834	97	93.2
N1	23.0	30.2	75.4	76.4		86.6		93.2	N1	23.2	31.5	79.9	75.5		86.6		93.2
EGT	610	581	714	722		791		837	EGT	560	537	718	686		779		818
N2	62.7	71.4	92.5	92.6		96.3		98.2	N2	62.7	72.6	93.6	92.5		96.5		99.4
F/F	380	490	2120	2140		2980		3650	F/F	390	520	2450	2110		3020		3780
OIL PRS	30	39	55	55		60		60	OIL PRS	31	38	55	54		55		60
OIL TMP	60	80	85	95		100		105	OIL TMP	60	60	90	85		100		100
OIL QTY	69	70	70	70		67		67	OIL QTY	73	74	77	73		75		76
VIB	0.4	0.4	0.9	0.9		1.2		1.4	VIB	0.4	0.3	0.8	0.9		0.9		1.5
HYD PRS	3000	3000	3000	3000		3000	3000	3000	HYD PRS	3000	3000	3000	3000		3000		3000
HYD QTY	100	100	100	100		100		100	HYD QTY	100	100	100	100		100		100

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 31 MAR 2021 Reason of Run Up : WO 011/YSG/III/2021 Performed By
Station : DJJ
A/C Type : B737-300F
Eng Type : CFM 56-3B1/ B2
A/C Reg : PK-YSG According to performed (AMM) : AMM 71-00-00
Eng S/N

#1 : 721785
#2 : 723160 Wind Velocity : Fuel used : 1540 KG
Eng Cycle Wind Direction : Start : 09:30 UTC
#1 : A/C Nose Dir : Finish : 10.10 LT
#2 : Field Elev : Duration : 40 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	4310 Kg	3800 Kg
CTR Tank	50 Kg	10 Kg
RH Tank	4360 Kg	3370 Kg
Total	8720 Kg	7180 Kg

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	397	400
Gen Volt	118	118
Air Press (80% N1)	OK	OK
Eng Anti Ice	OK	OK
CSD Temp In (C°)	60	90
CSD Temp Rise (C°)	1	4
Bleed S/W Over (85-90 %N2)	OK	OK
Throttle Spool Up (Sec)	-	-
DECC	-	-
T/R Interlock	-	-
CSD Disconnect	-	-
CSD Reconnect	-	-

DESCRIPTION	ENG #1	ENG #2
OAT	26 Deg. C	26 Deg. C
BAR	29.65 0Inch Hg	29.65 0Inch Hg
Ignition	R	R
Light Up	3 Sec	3 Sec
Starter Cut Off	46.3 %N2	46.3 %N2
Peak EGT	628 Deg. C	611 Deg. C
Initial Max F/F	0.82 Kg/ Hrs.	0.84 Kg/ Hrs.
Start Time	80 Sec	40 sec
Fuel Used	770 Kg	760 Kg
Duration	40 Min	40 Min

NOTE:

Engine #1 EGT margin: 828 – (797 – 1) = 32

Engine #1 N2 margin: 97.1 – (94.9 – 0.045) = 2.24

Engine #2 EGT margin: 828 – 770 = 58

Engine #2 N2 margin: 97.1 – 95.8 = 1.3

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	61.9	71.2	93.2 N2	75.0 N1	86.5	828	97.1	93.3	TARGET	61.9	71.2	93.2 N2	75.0 N1	86.5	828	97.1	93.3
N1	21.8	30.4	77.3	74.3		86.6		93.3	N1	21.6	31.5	76.8	75.0		86.5		93.3
EGT	617	590	740	757		797		840	EGT	619	561	713	685		770		823
N2	60.8	71.3	94.4	91.4		94.9		98.4	N2	61.4	75.2	91.6	90.8		95.8		99.1
F/F	420	550	2340	2320		3100		3870	F/F	500	500	2120	2010		2760		3750
OIL PRS	26	34	50	50		42		55	OIL PRS	26	35	49	48		51		54
OIL TMP	80	85	100	100		125		121	OIL TMP	81	85	100	98		120		122
OIL QTY	OK	OK	OK	OK		OK		OK	OIL QTY	OK	OK	OK	OK		OK		OK
VIB	0.1	0.1	0.1	0.1		0.3		0.4	VIB	0.2	0.2	1.2	1.2		0.9		1.1
HYD PRS	OK	OK	OK	OK		OK		OK	HYD PRS	OK	OK	OK	OK		OK		OK
HYD QTY	OK	OK	OK	OK	F	OK		OK	HYD QTY	OK	OK	OK	OK		OK		OK

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 02 APRIL 2021 Reason of Run Up : WO 004/YSH/III/2021 Performed By
Station : HLP
A/C Type : B737-300F
Eng Type : CFM 56-3C1
A/C Reg : PK-YSH According to performed (AMM) : AMM 71-00-00
Eng S/N

	#1 : 858709				
	#2 : 724414	Wind Velocity	: CALM	Fuel used	: 1100 KG
Eng Cycle		Wind Direction	:	Start	: 00.20 LT
	#1 :	A/C Nose Dir	: 060	Finish	: 01.05 LT
	#2 :	Field Elev	:	Duration	: 45 MIN
				Cycle	: 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	2700 Kg	2150 Kg
CTR Tank	0 Kg	0 Kg
RH Tank	2700 Kg	2150 Kg
Total	5400 Kg	4300 Kg

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	400	400
Gen Volt	115	115
Air Press (80% N1)	OK	OK
Eng Anti Ice		
CSD Temp In (C°)	56	60
CSD Temp Rise (C°)	4	3
Bleed S/W Over (85-90 %N2)	85	87
Throttle Spool Up (Sec)	7.0	7.0
DECC	6.8	7.0
T/R Interlock	OK	OK
CSD Disconnect	OK	OK
CSD Reconnect	OK	OK

DESCRIPTION	ENG #1	ENG #2
OAT	27 Deg. C	27 Deg. C
BAR	30.0 OInch Hg	29.74 Inch Hg
Ignition	BOTH	BOTH
Light Up	2 Sec	2 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	660 Deg. C	667 Deg. C
Initial Max F/F	200 Kg/ Hrs.	220 Kg/ Hrs.
Start Time	35 Sec	40 sec
Fuel Used	- Kg	- Kg
Duration	45 Min	45 Min

NOTE:

Engine #1 EGT margin: 831 – 764 = 67

Engine #1 N2 margin: 96.9 – 96.7 = 0.2

Engine #2 EGT margin: 831 – 801 = 30

Engine #2 N2 margin: 96.9 – 96.0 = 0.9

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	T/O		LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	T/O
TARGET	61.9	72.4	93.2 N2	74.8 N1	86.6	831	96.9	93.1	TARGET	61.9	72.4	93.2 N2	74.8 N1	86.6	831	96.9	93.1
N1	21.8	31.3	68.7	76.0		86.7		93.1	N1	22.9	31.5	80.3	75.9		86.6		93.1
EGT	580	542	622	662		764		829	EGT	560	541	728	707		801		855
N2	61.7	73.8	90.8	93.3		96.7		99.3	N2	62.5	72.6	93.3	92.1		96.0		98.6
F/F	370	520	1670	2120		2980		3780	F/F	330	520	2430	2150		3010		3740
OIL PRS	38	35	48	53		51		56	OIL PRS	30	30	51	52		50		54
OIL TMP	90	80	90	95		100		100	OIL TMP	70	70	90	90		100		100
OIL QTY	80	80	80	80		72		68	OIL QTY	71	71	70	70		68		66
VIB	0.2	0.3	0.4	0.8		1		0.8	VIB	0.5	0.2	0.9	0.9		1		1
HYD PRS	3000	3000	3000	3000		3000	3000	3000	HYD PRS	3000	3000	3000	3000		3000		3000
HYD QTY	F	F	F	F		F		F	HYD QTY	F	F	F	F		F		F

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 02 APR 2021 Reason of Run Up : WO 026/YSN/III/2021 Performed By
Station : HLP Name OTR Sign
A/C Type : B737-300F 1.
Eng Type : CFM 56-3C1 2.
A/C Reg : PK-YSN According to performed (AMM) : AMM 71-00-00 3.
Eng S/N

	#1 : 725485				
	#2 : 858526	Wind Velocity	: 5	Fuel used	: 2500 KG
Eng Cycle		Wind Direction	:	Start	: 23.23 LT
	#1 :	A/C Nose Dir	: 06	Finish	: 23.58 LT
	#2 :	Field Elev	:	Duration	: 35 MIN
				Cycle	: 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	4400 Lbs	3200 Lbs
CTR Tank	0 Lbs	0 Lbs
RH Tank	4600 Lbs	3300 Lbs
Total	9000 Lbs	6500 Lbs

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	404	405
Gen Volt	118	118
Air Press (80% N1)		
Eng Anti Ice		
CSD Temp In (C°)	58	55
CSD Temp Rise (C°)	4	4
Bleed S/W Over (85-90 %N2)		
Throttle Spool Up (Sec)	7	6
DECC	-	-
T/R Interlock	-	-
CSD Disconnect	-	-
CSD Reconnect	-	-

DESCRIPTION	ENG #1	ENG #2
OAT	29 Deg. C	29 Deg. C
BAR	29.74 OInch Hg	29.74 OInch Hg
Ignition	BOTH	BOTH
Light Up	2 Sec	2 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	635 Deg. C	574 Deg. C
Initial Max F/F	109 Kg/ Hrs.	101 Kg/ Hrs.
Start Time	32 Sec	27 sec
Fuel Used	Kg	- Kg
Duration	35 Min	35 Min

NOTE:

Engine #1 EGT margin: 838 – 811 = 27

Engine #1 N2 margin: 97.7 – 96.5 = 1.2

Engine #2 EGT margin: 838 – 761 = 77

Engine #2 N2 margin: 97.7 – 96.1 = 1.6

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	T/O		LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	T/O
TARGET	62.1	72.7	93.5	75.1	86.9	838	97.7	93.4	TARGET	62.1	72.7	93.5	75.1	86.9	838	97.7	93.4
N1	22.3	31.4	80.2	77.0		86.9		93.4	N1	22.2	30.6	81.7	76.6		86.9		93.4
EGT	581	544	762	725		811		857	EGT	549	506	710	681		761		807
N2	61.6	73.1	93.6	92.7		96.5		99.3	N2	61.1	72.1	93.7	92.4		96.1		98.9
F/F	84	115	545	491		662		825	F/F	84	112	563	479		651		828
OIL PRS	28	35	34	50		52		58	OIL PRS	30	35	55	52		55		60
OIL TMP	60	80	90	85		100		100	OIL TMP	70	80	90	95		100		100
OIL QTY	79	79	80	83		78		78	OIL QTY	78	76	71	73		70		70
VIB	0.3	0.3	0.4	0.6		0.7		0.7	VIB	0.4	0.2	0.4	0.4		0.4		0.7
HYD PRS	OK	OK	OK	OK		OK		OK	HYD PRS	OK	OK	OK	OK		OK		OK
HYD QTY	OK	OK	OK	OK		OK		OK	HYD QTY	OK	OK	OK	OK		OK		OK

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 31 MARCH 2021 Reason of Run Up : WO 011/YST/III/2021 Performed By
Station : HLP N
A/C Type : B737-300F 1.
Eng Type : CFM 56-3B2 2.
A/C Reg : PK-YST According to performed (AMM) : AMM 71-00-00 3.
Eng S/N

#1 : 727464
#2 : 721762 Wind Velocity : 7 KNOT Fuel used : 1510 KG
Eng Cycle Wind Direction : 270 Start : 16:44 UTC
#1 : A/C Nose Dir : 64 Finish : 17.32 UTC
#2 : Field Elev : Duration : 48 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	3970 Kg	3270 Kg
CTR Tank	50 Kg	40 Kg
RH Tank	4000 Kg	3200 Kg
Total	8020 Kg	6510 Kg

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	404	400
Gen Volt	116	116
Air Press (80% N1)	OK	OK
Eng Anti Ice	OK	
CSD Temp In (C°)	60	60
CSD Temp Rise (C°)	4	3
Bleed S/W Over (85-90 %N2)	85	87
Throttle Spool Up (Sec)	7.0	7.2
DECC	6.8	7.0
T/R Interlock	OK	OK
CSD Disconnect	OK	OK
CSD Reconnect	OK	OK

DESCRIPTION	ENG #1	ENG #2
OAT	26 Deg. C	26 Deg. C
BAR	29.74 Inch Hg	29.74 Inch Hg
Ignition	BOTH	BOTH
Light Up	2 Sec	2 Sec
Starter Cut Off	46 %N2	46 %N2
Peak EGT	677 Deg. C	536 Deg. C
Initial Max F/F	0.52 Kg/ Hrs.	0.45 Kg/ Hrs.
Start Time	35 Sec	40
Fuel Used	755 Kg	755 Kg
Duration	48 Minute	48

NOTE:

Engine #1 EGT margin: 783 – 756 = 27

Engine #1 N2 margin: 97.1 – 95.6 = 1.5

Engine #1 EGT margin: 783 – 805 = (-) 22

Engine #1 N2 margin: 97.1 – 94.8 = 2.3

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	61.8	71.1	93.0 N2	74.7 N1	86.5	783	97.1	96.2	TARGET	61.8	71.1	93.0 N2	74.7 N1	86.5	783	97.1	96.2
N1	23.3	30.3	85.0	77.3		86.5		96.2	N1	24.5	32.6	83.6	77.0		86.5		96.2
EGT	590	562	771	684		756		850	EGT	520	517	740	691		805		865
N2	63.4	72.2	94.9	92.6		95.6		98.9	N2	63.1	72.2	94.1	92.1		94.8		98.2
F/F	390	500	3920	2230		3300		4000	F/F	38	53	2850	2270		3100		4250
OIL PRS	25	32	55	50		53		56	OIL PRS	24	30	51	50		52		55
OIL TMP	70	85	100	100		110		110	OIL TMP	80	85	104	102		100		104
OIL QTY	35	3.4	3.0	3.0		3.0		3.0	OIL QTY	3.0	3.2	3.1	3.0		3.0		3.0
VIB	0.2	0.2	0.4	0.4		0.6		0.5	VIB	0.3	0.3	0.9	0.8		0.8		0.9
HYD PRS	3100	3100	3100	3100	3100	3100		OK	HYD PRS	3000	3000	3000	3000		3000		3000
HYD QTY	F	F	F	F	F	F		F	HYD QTY	F	F	F	F		F		F

Original: PPC (Recording) Copy : Engineering and Quality

Trigana Air

Date : 30 MAR 2021 Reason of Run Up : WO 015/YSZ/III/2021 Performed By
Station : DJJ Name OTR Sign
A/C Type : B737-300F 1.
Eng Type : CFM 56-3B1/ B2 2.
A/C Reg : PK-YSZ According to performed (AMM) : AMM 71-00-00 3.
Eng S/N

#1 : 727252
#2 : 720959 Wind Velocity : CALM Fuel used : 3400 Lbs
Eng Cycle Wind Direction : 120 Start : 18.30 LT
#1 : A/C Nose Dir : 120 Finish : 19.05 LT
#2 : Field Elev : Duration : 35 MIN
Cycle : 1

FUEL QUANTITY		
POSITION	BEFORE	AFTER
LH Tank	10200 Lbs	7800 Lbs
CTR Tank	0 Lbs	0 bs
RH Tank	7800 Lbs	6800 Lbs
Total	18000 Lbs	1450 Lbs

SYSTEM TEST	ENG #1	ENG #2
Gen Freq	402	399
Gen Volt	120	120
Air Press (80% N1)	OK	OK
Eng Anti Ice	OK	OK
CSD Temp In (C°)	40	45
CSD Temp Rise (C°)	3	4
Bleed S/W Over (85-90 %N2)	OK	OK
Throttle Spool Up (Sec)	OK	OK
DECC	-	-
T/R Interlock	-	-
CSD Disconnect	-	-
CSD Reconnect	-	-

DESCRIPTION	ENG #1	ENG #2
OAT	27 Deg. C	27 Deg. C
BAR	29.63 Inch Hg	29.63 Inch Hg
Ignition	L	L
Light Up	3 Sec	3 Sec
Starter Cut Off	46.2 %N2	46.3 %N2
Peak EGT	671 Deg. C	604 Deg. C
Initial Max F/F	980 Lbs/ Hrs.	990 Lbs/ Hrs.
Start Time	65 Sec	60 sec
Fuel Used	1750 Lbs	1750 Lbs
Duration	35 Min	35 Min

NOTE:

Engine #1 EGT margin: 831 – (795 + 4) = 32

Engine #1 N2 margin: 96.9 – (95.4 + 0.18) = 1.32

Engine #2 EGT margin: 831 – (790 + 3) = 38

Engine #2 N2 margin: 96.9 – (95.1 + 0.135) = 1.66

#1	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O	#2	IDLE		PART POWER		MPA 80 OR 85 OR 90			STATIC T/O
	LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2			LOW	HI	PMC OFF	PMC ON	MAX N1	MAX EGT	MAX N2	
TARGET	62.0	72.4	93.4 N2	73.1 N1	86.6	831	96.9	93.5	TARGET	62.0	72.4	93.4 N2	73.1 N1	86.6	831	96.9	93.5
N1	23.5	32.3	73.7	75.6		86.2		96.6	N1	24.7	33.7	70.4	76.7		86.3		93.4
EGT	523	523	696	708		795		842	EGT	515	512	658	694		790		860
N2	61.6	71.9	91.2	92.3		95.4		97.2	N2	62.7	72.6	89.5	91.8		95.1		96.8
F/F	820	1150	4440	4730		6700		8620	F/F	870	1220	3920	4820		6680		8530
OIL PRS	26	31	48	52		46		54	OIL PRS	30	36	51	53		55		58
OIL TMP	80	80	85	100		120		115	OIL TMP	90	90	110	115		125		120
OIL QTY	OK	OK	OK	OK		OK		OK	OIL QTY	OK	OK	OK	OK		OK		OK
VIB	0.8	0.7	0.5	0.5		0.4		0.6	VIB	0.6	0.6	0.5	0.5		0.4		0.4
HYD PRS	OK	OK	OK	OK		OK		OK	HYD PRS	OK	OK	OK	OK		OK		OK
HYD QTY	OK	OK	OK	OK	F	OK		OK	HYD QTY	OK	OK	OK	OK		OK		OK

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