
# INVESTIGATION REPORT ON INCIDENT TO M/S SPICEJET BOEING 737-8 AIRCRAFT VT-MXE ON 09.12.2021 AT MUMBAI

## DIRECTORATE GENERAL OF CIVIL AVIATION

## GOVERNMENT OF INDIA

## NEW DELHI

## FOREWORD

This document has been prepared based upon the evidences collected during the investigation and laboratory examinations of various components.

The investigation has been carried out in accordance with Annex 13 to the convention on International Civil Aviation and under Rule 13(1) of Aircraft (Investigation Accidents and Incidents) Rules, 2017.

The sole objective of the investigation of an incident shall be the prevention of accidents and incidents and not apportion blame or liability.

## ABBREVIATIONS

| Abbreviation | Expanded Form |
|---|---|
| AGB | Accessory Gear Box |
| AMM | Aircraft Maintenance Manual |
| APU | Auxiliary Power Unit |
| ATC | Air Traffic Control |
| ATPL | Airline Transport Pilot License |
| CSN | Cycle Since New |
| CVR | Cockpit Voice Recorder |
| DME | Distance Measuring Equipment |
| DVOR | Doppler Very High Frequency Omni Range |
| EDP | Engine Driven Pump |
| ELT | Emergency Locator Transmitter |
| FDR | Flight Data Recorder |
| FL | Flight Level |
| FO | First Officer |
| FRTO | Flight Radio Telephony Operator |
| IDG | Integrated Drive Generator |
| IFR | Instrument Flight Rules |
| IFSD | In-Flight Shut Down |
| ILS | Instrument Landing System |
| IR | Instrument Rating |
| MLG | Main Landing Gear |
| MMR | Multi Mode Receiver |
| ODMS | Oil Debris Monitoring System |
| OEM | Original Equipment Manufacturer |
| PAPI | Precision Approach Path Indicator |
| PF | Pilot Flying |
| PIC | Pilot-In Command |
| PM | Pilot Monitoring |
| TCAS | Traffic Collision Avoidance System |
| TGB | Transfer Gear Box |
| TSN | Time Since New |
| UTC | Coordinated Universal Time |
| VFR | Visual Flight Rules |
| VOR | Very High Frequency Omni Directional Range |

## INDEX

# Investigation Report on Incident to M/s Spicejet Boeing 737-8 Aircraft VT-MXE on 09.12.2021 at Mumbai

| | | | |
|---|---|---|---|
| 1 | Aircraft | Type | Boeing 737-8 |
| | | Nationality | Indian |
| | | Registration | VT-MXE |
| 2 | Owner | M/s Wilmington Trust Sp Services (Dublin) Limited, Irish | |
| 3 | Operator | M/s Spicejet Limited, Indian | |
| 4 | Pilot-in-Command<br>Extent of injuries | ATPL<br>Nil | |
| | Co-Pilot<br>Extent of injuries | | |
| 5 | Place of Incident | In Flight | |
| 6 | Co-ordinates of Incident site | During climb after take-off from Mumbai | |
| 7 | Date & Time of Incident | 09.12.2021at 13:32UTC (approximately) | |
| 8 | Last Point of Departure | Chhatrapati Shivaji Maharaj International Airport, Mumbai (VABB) | |
| 9 | Intended place of landing | Netaji Subhash Chandra Bose International Airport , Kolkata (VECC) | |
| 10 | Type of Operation | Scheduled Operation | |
| 12 | No. of Passengers on Board | 189 | |
| 13 | Phase of Operation | Climb | |
| 14 | Type of Incident | Failure of Engine Driven Pump (System Component Failure) | |

(All timings in the report are in UTC)

## Synopsis

On 09.12.2021,M/s SpicejetB737 Max 8 aircraft VT-MXE was operating a scheduled passenger flight SG-467 from Mumbai to Kolkata.The aircraft took off from Mumbai at 13:25UTC. While climbing at approx. FL139, Hydraulic System B Engine #2 Low Pressure triggered. Flight crew carried out the required action as per checklist and switched off engine #2 EDP. Crew continued the climb and at approx. FL316, OIL FILTER BYPASS indication flashed. Flight crew followed the required checklist and brought Engine # 2throttle slowly to idle however, light did not extinguish. Flight crew declared PAN PAN and subsequently Engine #2 shut down was carried. Aircraft returned back to Mumbai and landed safely at 14:19 UTC on runway 27.

The occurrence was classified as incident and DGCA instituted investigation by appointing Investigation-In-Charge under Rule 13(1) of the Aircraft (Investigation of Accidents and Incidents) Rule 2017.

The root cause for Engine #2 EDP overheat which further lead to EDP failure, could not be established due supporting and refuting evidence identified for multiple failure mode during analysis.

## 1. Factual Information

### 1.1. History of Flight

On 09.12.2021, M/s Spicejet B737-8 aircraft VT-MXE was operating a scheduled passenger flight SG-467 from Mumbai to Kolkata.

Flight SG-467 was the fifth flight of the day by VT-MXE aircraft and for the both flight crew it was first flight of the day. There was total 8950 kg of fuel on board the aircraft and NIL defects noted before flight. The flight preparation was done by approved AME as per the requirement.

The Pilot in Command (PIC) was Pilot Flying (PF) and the First Officer (FO) was Pilot Monitoring (PM). There were a total of 195 persons on board the aircraft including 06 crew members (2 Pilots and 4 Flight Attendants).

Aircraft chocks off at 13:10 UTC. The aircraft took off from Mumbai runway 27 at 13:25 UTC and flew uneventfully till climbing FL130.While climbing at approx. FL139, Hydraulic System B Engine #2 Low Pressure triggered. As prescribed in checklist, flight crew switched off engine #2 EDP. During further climb at approx. FL316, OIL FILTER BYPASS indication flashed, flight crew stopped climbing at FL330 after informing to ATC. Crew disengaged auto throttle and Engine #2throttle brought slowly to idle however, oil filter bypass light did not extinguished. Crew declared PAN PAN and informed ATC about their intention of returning back to Mumbai. Crew switched off Engine #2 and informed the

flight attendant of thesituation to secure cabin for returning back to Mumbai.

Crew carried out Flap 15 Overweight landing. Aircraft landed safely at14:19 UTC on runway 27 at Mumbai.

There was no injury to any persons on board or any damage to the aircraft.

There was no sign of fire at any stage of flight.

### 1.2. Injuries to Person

| Injuries | Crew | Passengers | Others |
|---|---|---|---|
| Fatal | Nil | Nil | Nil |
| Serious | Nil | Nil | Nil |
| Minor/None | Nil/06 | Nil/189 | |

### 1.3. Damage to Aircraft

No damage to aircraft, except Aircraft Engine # 2 EDP and AGB seal were found damaged.

### 1.4. Other Damage

There was no other damage.

### 1.5. Personal Information

#### 1.5.1. Cockpit Crew Details

**Pilot in Command:**

| | |
|---|---|
| Age & Gender | : 31 Years, Male |
| License | : ATPL |
| Category | : Aeroplane |
| Date of License Issue and validity | : 15-04-2015 - 14-04-2025 |
| Date of medical examination and validity | : 24-05-2021 - 29-05-2022 |
| IR Check | : 28-10-21 |
| FRTO license renewal and validity | : 18-03-2020 – 17-03-2025 |

Total flying experience : 7629.53 Hrs

Total Experience on type : 7379.53 Hrs

Total Experience as PIC on type : 4176.29 Hrs

Total flying experience during last 1 year : 456.55 Hrs

Total flying experience during last 6 months : 170.25Hrs

Total flying experience during last 30 days : 51.35 Hrs

Total flying experience during last 07 Days : 08.00 Hrs

Total flying experience during last 24 Hours : 05.35Hrs

Duty time last 24 Hours : 05:45 Hrs

Rest before flight : 17:30 Hrs

**First Officer:**

Age & Gender : 30 Years & Male

License : ATPL

Category : Aeroplane

Date of License Issue and validity : 20.09.2021 – 19.09.2026

Date of medical examination and validity : 14-07-2021 – 24-07-2022

IR Check : 21-10-21

FRTO license issue and validity : 01-11-2018 – 31-10-2023

Total flying experience : 3318.07 Hrs

Total Experience on type : 3092.27Hrs

Total flying experience during last 1 year : 527.04 Hrs

Total flying experience during last 6 months : 260.26 Hrs

Total flying experience during last 30 Days : 87.11 Hrs

Total flying experience during last 07 Days : 30.55 Hrs

Total flying experience during last 24 Hours : 08.00 Hrs

Duty time last 24 Hours : 03:25 Hrs

Rest before flight : 19:40 Hrs

## 1.6. Aircraft Information

### 1.6.1. General

Registration Mark : VT-MXE

Manufacturer : Boeing Aircraft Company

Type/Model : Boeing 737-8

Serial Number 64939

Year of Manufacture 2018

Certificate of Airworthiness:-

Issued : 16.11.2018

Category : Normal

Sub-Division : Passenger/Mail/Goods

Certificate of Registration:-

Issued : 15.11.2018

Validity : 11.11.2028

Time Since New : 1327:03

Cycles Since New 742

### 1.6.2. Engines

Manufacturer : CFM International

Type/Model : Leap 1B

Engine 1:

- Time Since New : 1327:03
- Cycles Since New 742

Engine 2:

- Time Since New : 1327:03
- Cycles Since New 742

### 1.6.3. Engine #2 EDP

| | |
|---|---|
| Part Number | 849589 |
| Serial Number | : MX817297 |
| Model Code | : PV3-240-18 |
| Time Since New (hours) | 1327 |
| Cycles Since New | 742 |

### 1.6.4. Grounding of B737-8 Aircraft by DGCA:

Following two fatal accidents involving Boeing 737MAX, the Director General, in exercise of the power conferred by Section 5A of the aircraft ACT, 1934 (XXII of 1934), had directed, for the purpose of securing safety, that operation of Boeing Company Model 737-8 and Boeing Company Model 737-9 would not take place from/to Indian airports and transit or enter into Indian airspace effective from 13.03.2019

Aircraft VT-MXE released to service after DGCA order: DGCA -25011(02)/2/21 dated 26th August 2021. During grounding period aircraft was preserved under service and protection on 30-day active storage procedure, which includes carrying out hydraulic system AMM task steps- servicing the hydraulic systems, replacing hydraulic system filters, pressurize and system leak check. Post release to service; aircraft completed 1326:09 hours (TSN) and 741 landing (CSN) before the subject incident dated December 9, 2021.

### 1.6.5. Post Incident Observations:

During initial evaluation observed hydraulic fluid quantity of System B depleted to zero and residual hydraulic fluid was dripping from the Engine #2 EDP pad drain. Oil quantity in number 2 engine oil tank found overfilled and hydraulic fluid odour was also felt. Performed ODMS sensor inspection, observed magnetic particles.

There were no pending Snags and MELs on aircraft before the incident flight. Also there were no pending ADs and SBs on aircraft before the incident flight.

### 1.6.6. Description of M/s Eaton Engine Driven Pump (Refer Figure 1):

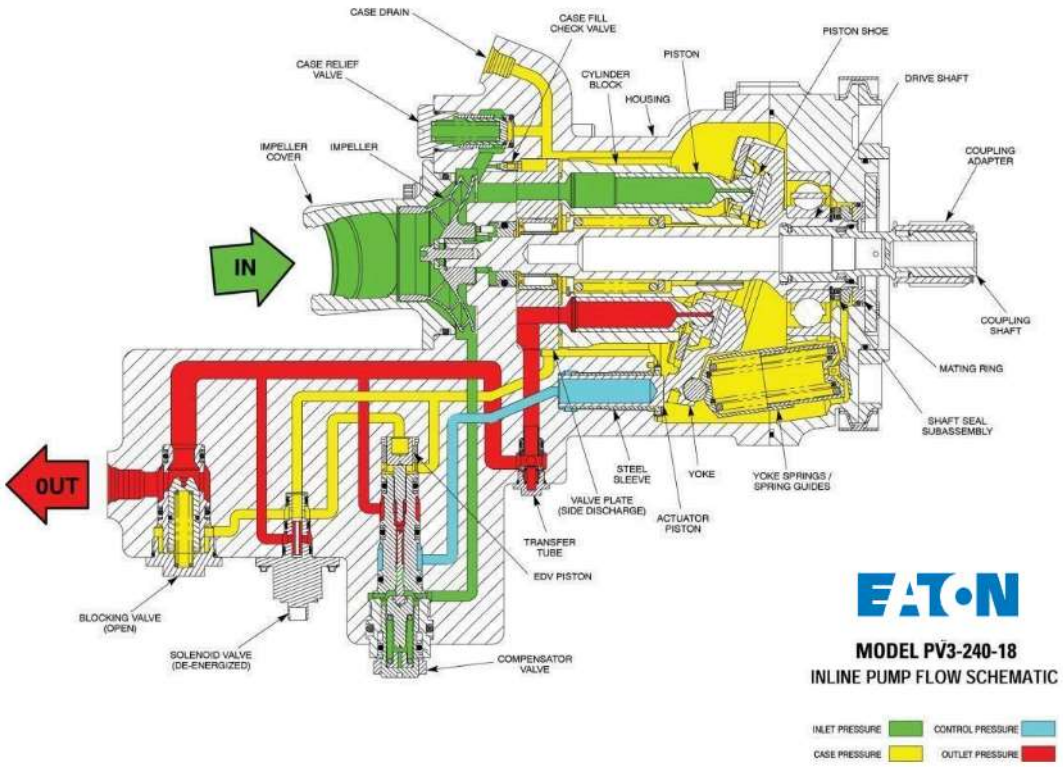



Figure 1

The aircraft's engine rotates the pump drive shaft, and the connected cylinder block and pistons. Pumping action is generated by piston shoes which are restrained and slide on the shoe bearing plate in the yoke assembly. Because the yoke is at an angle to the drive shaft, the rotary motion of the shaft is converted to piston reciprocating motion.

As the piston begins to withdraw from the cylinder block, system inlet pressure forces fluid through a porting arrangement in the valve plate into the cylinder bore. The piston shoes are restrained in the yoke by a piston shoe retaining plate and hold-down retainer during the intake stroke.

As the drive shaft continues to turn the cylinder block, the piston shoe continues following the yoke bearing surface. This begins to return the piston into its bore, toward the valve block. The fluid contained in the bore is pre-compressed then expelled through the valve block outlet port. Discharge pressure holds the piston shoe against the yoke bearing surface during the discharge stroke and also provides the shoe pressure balance and fluid film through on orifice in the piston and shoe sub-assembly.

## 1.6.7. MAIN HYDRAULIC SYSTEMS - ENGINE-DRIVEN PUMP

Purpose:-The engine-driven pumps (EDPs) supply hydraulic pressure for the hydraulic systems A and B.

Location:- The EDP mounts with a pump attach clamp to the front face of the engine accessory gearbox on the left side of the engine.

Physical Description:- The EDP is an axial-piston, variable-displacement, yoke-actuated, pressure compensated hydraulic pump with a solenoid-operated depressurization valve.
The pump has these three lines that attach to it:

- Hydraulic fluid supply line
- Output pressure line
- Case drain line.

The pressure and supply hydraulic line connections at the pump have a self-sealing, quick release disconnect to prevent leakage and keep air out of the hydraulic system. The case drain lines are threaded type fitting. Quick disconnects on the engine service disconnect panel support beam permit engine maintenance or removal. The pump weight (wet) is 32 lb (15 kg).

Functional Description:-
The pump has a rotating cylinder barrel that has nine pistons. The pistons ride on an inclined yoke surface. As the barrel rotates, the pistons reciprocate within the barrel. Change to the incline of the yoke changes the stroke of each piston and changes the variable-displacement of the pump. During the intake stroke of each piston, hydraulic fluid is drawn in the top of the barrel and into the piston cylinder bores.

During the discharge stroke of each piston, hydraulic fluid is forced out of the piston cylinder bores and into the output pressure line. Some of the supply fluid in the pump becomes case drain fluid. The case drain fluid cools and lubricates the pump before it goes to the heat exchanger and reservoir through the case drain connection.

A pressure compensator in the pump maintains a preset pressure by control of the fluid flow out of the pump in response to changes in system demands. The pump operates in the pressurized or depressurized mode. In the depressurized mode, the pump is isolated from the hydraulic system and runs at a zero output flow. The solenoid operated depressurization valve controls the pressurized or depressurized modes of the pump. Both EDPs are rated at 36 gallons per minute (136 litres per minute) at 3000 pounds per square inch (20,684 kilopascals).

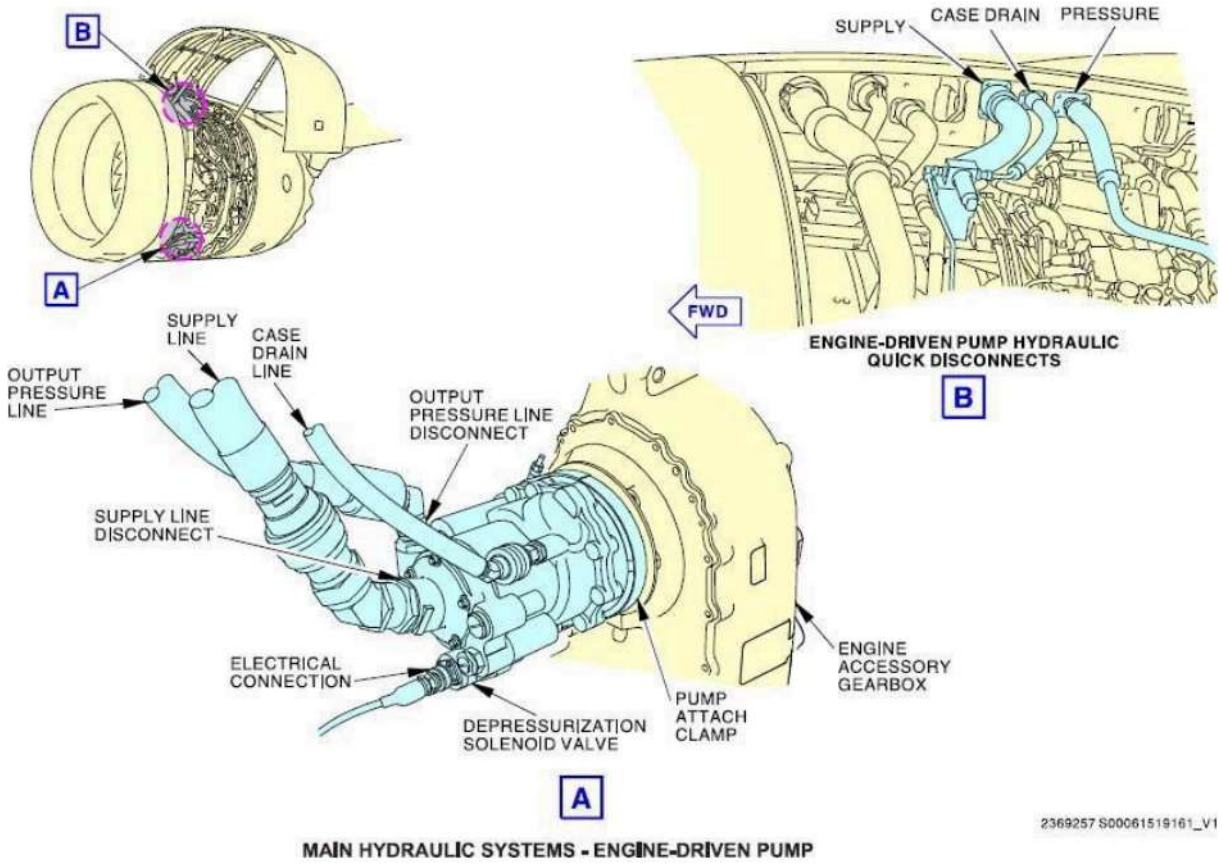



Figure 2

### 1.6.8. Accessory Gearbox Rotating Seals - General

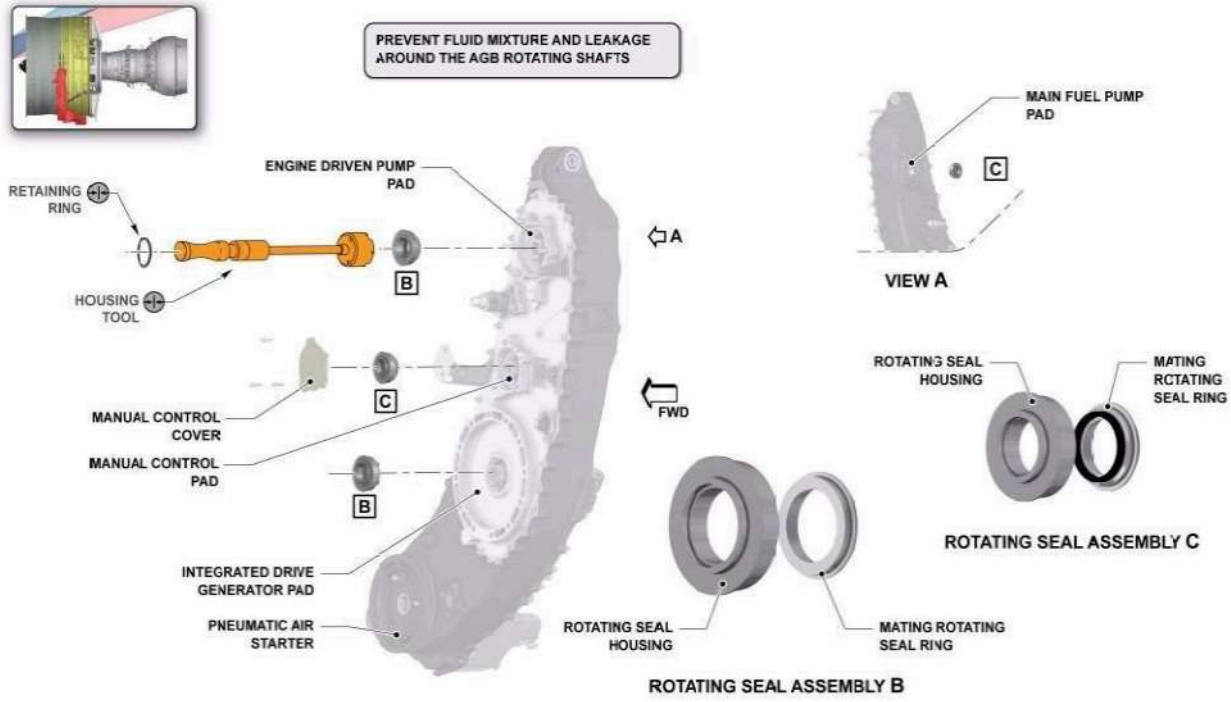
There are 4 different rotating seals installed on the Accessory Gearbox (Refer Figure 3).

Three rotating seals are located on the AGB front face:
- at the Engine Driven Pump (EDP) pad,
- at the manual control pad,
- at the Integrated Drive Generator (IDG) pad.

A rotating seal is located on the AGB rear face:
- at the Main Fuel Pump (MFP) pad.

Purpose:- The AGB rotating seals prevent fluid mixture and leakage around the AGB rotating shafts.

Interfaces:- The rotating seals are the interface between the gears, the shafts and the AGB housing and front cover. They are kept in position by retainer rings.




***Accessory Gearbox Rotating Seals - General***

**Figure 3**

### 1.6.9. EDP failure / removal data of EATON in last 3 years in M/s Spicejet:

| Removal Date | Details | REMARKS (ROOT CAUSE FOR REMOVALS) |
|---|---|---|
| 05-02-2023 | **Part No:** 849589<br>**SN:** MX817067<br>**A/C:** VT-MXJ | On inspection found system 'A' EDP pressure low, as a precaution system 'A' EDP case drain filter & EDP replaced with serviceable one and removed EDP unit sent to shop. During SHOP visit, replaced: 00-971663 VALVE, SOLENOID -ELECTRICAL FAULT. |
| 11-12-2021 | **Part No:** 849589<br>**SN:** MX817297<br>**A/C:** VT-MXE<br>(Incident Case) | Engine #2 Engine Driven Pump removed,issued with an U/S tag & handed over to store on inspection found #2 engine EDP shaft having play in forward & AFT and shaft rotating by hand. Removed unit sent to shop. IFSD event. The exact root cause for Engine #2 |

| | | |
|---|---|---|
| | | EDP overheat could not be established due supporting and refuting evidence was identified for each failure mode during analysis, leading to a no findings root cause. |
| 20-09-2021 | **Part No:** 849589<br>**SN:** MX626961<br>**A/C:** VT-SYS | Hydraulic leak observed from #2 EDP drive pad drain. Hence, EDP replaced with a serviceable one. Removed unit sent to shop. Exchanged Out Unit with Turkish Technic as per Pool maintenance. Shop report not available. |

### 1.7. Meteorological Information:

Aircraft took off at 1325 UTC from Mumbai airport and weather was conducive for the flying operation.

### 1.8. Aids to Navigation

Mumbai airport is equipped with PAPI, Localiser, Glide path, DME ILS, DVOR/DME. Navigational aids fitted in aircraft are ILS/MMR (Localiser, Glide path & Marker receivers), VOR Receiver, DME Receiver, ATC Transponder, TCAS, Weather Radar, Radio Altimeter and ELT.

### 1.9. Communication

Aircraft was always in two way communication with ATC.

### 1.10. Aerodrome Information

Chhatrapati Shivaji Maharaj International Airport (VABB) is an international airport located in Mumbai, Maharashtra. The airport is permitted for both IFR and VFR traffic. The airport has two intersected runways made of Asphalt (09/27 & 14/32).

### 1.11. Flight Recorders

The aircraft was equipped with Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR).

#### 1.11.1 Cockpit Voice Recorder (CVR)

The significant events from the CVR are as follow:

| CVR Elapsed Time (HH:MM) | Details relevant to the incident only |
|---|---|
| 00:57 | Flight crew carried out checklist for EDP ENG 2 HYD LOW PRESSURE light illumination. |
| 01:10 | Flight crew carried out checklist for OIL FILTER BYPASS indication. |
| 01:13 | Flight crew informed to ATC their intention of returning back to Mumbai and PAN PAN declared. |
| 01:14 | Flight crew carried out Engine Failure or Shutdown checklist. |
| 01:40 | Flight crew carried out Approach & landing checklist. |
| 01:43 | Aircraft landed at Mumbai. |

### 1.11.2 Flight Data Recorder (FDR)

The significant events from the FDR are as follows:

| Time (UTC) | Altitude (feet) | Details |
|---|---|---|
| 13:25:37 | 0 | Aircraft took off |
| 13:32:55 | 13898 | HYD SYS B LOW PRESS triggered |
| 13:42:28 | 27775 | During climb, HYD SYS B QTY started dropping from 109 units slowly |
| 13:45:27 | 31073 | During climb, HYD SYS B QTY dropping rate increased and reached from 93.8 to 1.9units in approx. 2 minutes |
| 13:45:40 | 31307 | During climb, Engine #2 oil quantity started increasing |
| 13:46:03 | 31678 | During climb, RIGHT LOW OIL PRESS AMB, OIL FILTERBYPASS, OIL FILTER IMP BYPASS |
| 13:49:36 | 32994 | During climb, HYD SYS B ELEC & FLT CONT B HYD LOW PRESSURE |
| 13:50:56 | 31523 | During descent, Engine #2 cut off |
| 13:51:16 | 31072 | During descent, APU ON |
| 13:52:23 | 29984 | During descent, Engine #2 oil QTY reached 24.5units |
| 14:15:20 | 3157 (RA) | During descent, Flap 15 was selected. |
| 14:18:10 | 840 (RA) | Autopilot was disengaged. |
| 14:19:08 | 0 | Aircraft MLG wheels touched ground first with vertical acceleration of 1.33G. |

### 1.12. Wreckage and Impact Information

Aircraft made a safe landing and there was no impact and there was no wreckage.

### 1.13. Medical and Pathological Information

No injury to any crew or passenger. Crew submitted the undertaking for not under the influence of alcohol prior to the operating of flight on 09.12.2021.

### 1.14. Fire

There was no fire.

### 1.15. Survival Aspects

The incident was survival.

### 1.16. Test and Research

Removed Engine #2 EDP (P/N 849589, S/N MX817297) was sent to OEM for investigation. The investigation report received from OEM has following findings:

Assembly/ Disassembly inspections:

The Engine Driven Pump (EDP) was disassembled and visually inspected with externally visible observations indicating evidence of overheating.

Disassembly revealed substantial damage to the interior of the EDP; additionally, all the rotating group components were severely damaged.

Disassembly observations reveal that the unit had overheated. Most notably, the integral Case Relief Valve has darkened debris on upstream (high-pressure) side and on downstream (low pressure) side. Visual inspections revealed severe wear to the running surfaces. Thepiston shoe shad the bronze material worn away with only the steel shoe material remaining; in conjunction with this wear the shoe bearing plate was also severely worn with steel-on-steel contact. Five of the nine Piston and Shoe Subassemblies had piston shoes separated from their respective pistons. There was heavy wear at the sliding bearing interfaces, particularly to the piston shoes to bearing plate interface and the pintle bearing supports.

Because of the overall poor condition of the EDP there are no definitive conclusions as

to there as on for the EDP degradation and subsequently no conclusive evidence to determine root cause of failure.

The condition of the parts suggests that there wasan overheating event that lasted for an undetermined period before the EDP failure.

Various failure scenarios were evaluated based on pump hardware observations as well as observations made at the aircraft level.

**Conclusion:**

Based upon the overall poor condition of the EDP, multiple failure modes were evaluated. Due to the supporting and refuting evidence there is no definitive root cause determined.

## 1.17. Organizational & Management Information

Spicejet is scheduled airline based in Delhi, India and operates domestic and international air transport services. Spicejet present fleet is a composition of B737 (Passenger & Freighter) and DHC-8 Q400 aircraft Spicejet has Accountable Manager, Head of Flight Operations**,** Chief of Flight Safety (CoFS), Quality Manager (QM), Continuous Airworthiness Manager (CAM)post holders.

## 1.18. Additional Information

### 1.18.1. M/s Boeing - Fleet Team Digest:

All IFSD events have been associated PN 849589 (one of two approved suppliers). Both approved EDP suppliers have experienced failures associated with overheat events, however contamination of the engine oil system and subsequent commanded IFSD has only been associated to the PN: 849589 supplier.

Multiple 737NG and 737 MAX airplanes have reported these events, a majority have been attributed to maintenance induced errors such as incorrectly coupled quick disconnect or collapsed flexible hose.

EDP cooling is accomplished via an unrestricted exchange of fluid from EDP through the case-drain flow path returning to the aircraft hydraulic system.

**Status:** Boeing is working in coordination with the supplier of the EDP, Eaton and the engine manufacturer, CFM to investigate the cause of the commanded IFSD events.

The EDP failed due to overheat, Boeing has not established a definitive root cause for the overheat. Boeing is aware of events with known failure modes associated with human factors, associated to hydraulic quick disconnects, and its installation (creating a

restriction).

**Investigation:** Distressed Fluid (evidence of coking indicates temp above 350F), allowing fluid to coke and creating a restriction.

**Interim Action:** Boeing has updated the 737NG/MAX AMM EDP removal procedures to enhance the warning and caution notes to help mitigate maintenance induced EDP events.

Boeing is updating the 737MAX AMM to provide detailed hydraulic quick-disconnect installation verification checks (including reminders not to pull the rotating sleeve (axially) - to not inadvertently pull the locking tab out of the slot of the hoses).

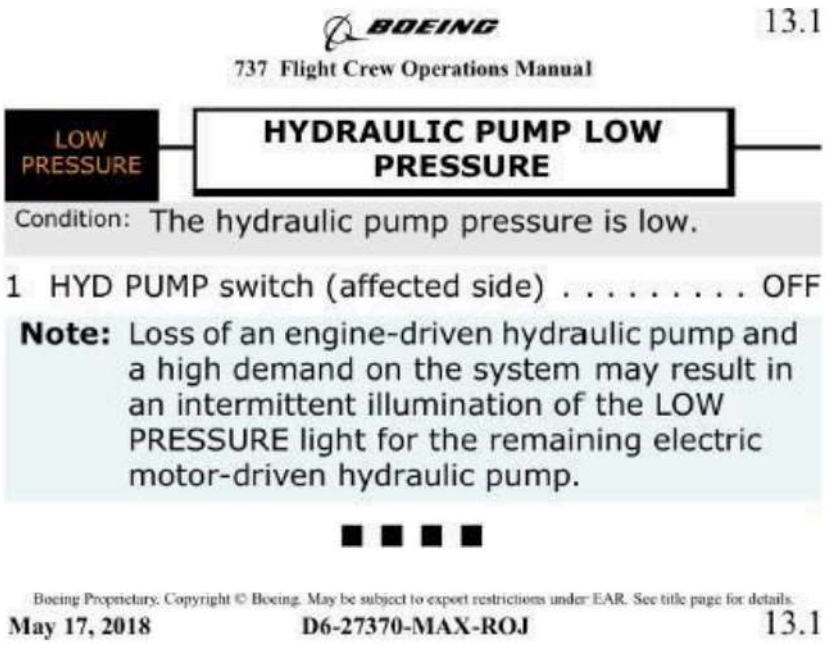
Boeing has updated the 737NG/MAX AMM to note it is not necessary to remove the case drain filter hose at the strut during a case drain filter change.

Additionally, Boeing is assessing potential design solutions to mitigate IFSDs (in absence of definitive root cause) and Boeing has added another hydraulic quick-disconnect inspection prior to new airplane deliveries.

**Final Action:** The root cause to EDP pump overheat events that are not related to improper maintenance are unknown at this time. Boeing is moving forward with the 737 MAX AGB drain line resizing to accommodate a greater hydraulic fluid flow.

At this time, Boeing does not recommend any proactive fleet action.

### 1.18.2. Flight Crew Operating Manual Checklist:



BOEING 13.1

737 Flight Crew Operations Manual

LOW PRESSURE

**HYDRAULIC PUMP LOW PRESSURE**

Condition: The hydraulic pump pressure is low.

1 HYD PUMP switch (affected side) . . . . . OFF

**Note:** Loss of an engine-driven hydraulic pump and a high demand on the system may result in an intermittent illumination of the LOW PRESSURE light for the remaining electric motor-driven hydraulic pump.

■ ■ ■ ■

OIL FILTER BYPASS

## ENGINE OIL FILTER BYPASS

Condition: The OIL FILTER BYPASS alert indicates oil filter contamination can cause oil to bypass the oil filter.

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

2 Thrust lever
(affected engine) . . . . . Confirm . . . . . Retard slowly until the OIL FILTER BYPASS alert extinguishes or the thrust lever is closed

3 Choose one:

◆OIL FILTER BYPASS alert **extinguishes**:

►►**Go to step 4**

◆OIL FILTER BYPASS alert **stays illuminated**:

►►**Go to the Engine Failure or Shutdown checklist on page 7.18**

■ ■ ■ ■

4 Run the engine at reduced thrust to keep the alert extinguished.

**Note:** Do not use FMC performance predictions.

5 Transponder mode selector . . . . . .TA only

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

■ ■ ■ ■

### 1.19. Useful and Effective Techniques

NIL

## 2. ANALYSIS

### 2.1. Operational Aspect:

On 09.12.2021, M/s Spicejet B737 Max 8 aircraft VT-MXE was operating a scheduled passenger flight SG-467 from Mumbai to Kolkata. Flight SG-467 was the fifth flight of the day for VT-MXE aircraft and for the both flight crew it was first flight of the day. Both the crew operating the flight were appropriately qualified. PIC carried out aircraft external checks. The Pilot in Command (PIC) was Pilot Flying (PF) and the First Officer (FO) was Pilot Monitoring (PM). The weather at Mumbai was conducive for the flying operation.

Aircraft chocks off at 13:10 UTC. The aircraft took off from Mumbai runway 27 at13:25 UTC and flew uneventfully till climbing FL130. While climbing at approx. FL139, Hydraulic System B Engine #2 Low Pressure triggered. Flight crew followed required checklist and switched off engine #2 EDP. During further climb at approx. FL316, OIL FILTER BYPASS indication flashed. Flight crew stopped climbing at FL330 after informing to ATC and further followed required checklist for OIL FILTER BYPASS which includes auto throttle disengage and subsequently Engine # 2 throttle brought slowly to idle. Since oil filter bypass light did not extinguish flight crew informed their intention to ATC of returning back to Mumbai and PAN PAN was declared. Flight crew performed Engine Failure or Shutdown checklist and engine #2 was switched off. Flight crew informed the flight attendant of the situation to secure cabin for returning back to Mumbai.

Flight crew carried out overweight landing. Aircraft landed safely at14:19 UTC on runway 27 at Mumbai. Aircraft did not make any hard landing during overweight landing. There were no injuries to any of the crew members and passengers on board the aircraft.

Crew actions were in accordance with the FCOM procedures and not the contributory factor to the incident.

### 2.2. Engineering Aspect:

Aircraft was Indian registered and having valid C of A. The flight preparation was done by approved AME and the aircraft was airworthy. There were no pending Snags and MELs on aircraft before the incident flight. Also there were no pending ADs and SBs on aircraft before the incident flight.

Post incident, during initial evaluation observed hydraulic fluid quantity of System B depleted to zero and residual hydraulic fluid was dripping from the Engine #2 EDP pad drain. Engine oil quantity in number 2 tank found overfilled and hydraulic fluid odour was also felt. During ODMS sensor inspection, observed magnetic particles. Scavenge screen plugs inspection carried out, observed few minute metallic particles and silver colour non-magnetic particle in AGB scavenge screen plug. Also, observed magnetic particles in TGB rear and minor magnetic particle in TGB front. Engine #2 EDP & AGB cavity inspection carried out, traces of hydraulic fluid was observed, few black deposits (cocking) due high temperature exposure found. Engine #2 EDP removed and on inspection found EDP shaft having play in forward & aft and shaft rotating by hand. Engine #2 EDP AGB seal also found damaged.

Engine #2 EDP (P/N 849589, S/N MX817297) was sent to OEM i.e M/s EATON for detail investigation. It has completed TSN 1327 hours and CSN 742 including incident flight. As per OEM, Engine #2 EDP report, during visual inspection of EDP evidence of overheating was noted. Disassembly revealed substantial damage to the interior of the EDP. Additionally, all the rotating group components were severely damaged. The condition of the parts suggests that there was an overheating event that lasted for an undetermined period before the EDP failure.

Investigation of failed EDP by OEM revealed that they evaluated multiple failure modes in view of overall poor condition of EDP. During the evaluation OEM could not determine root cause of failure of EDP due to the supporting and refuting evidences during investigation.

M/s Boeing also monitors commanded IFSD due to hydraulic fluid contamination to engine oil resulting from EDP failure. The resent update issued by M/s Boeing vide its Fleet Team Digest has identified that the root cause to EDP pump overheat events that are not related to improper maintenance are unknown at this time.

In view of the above deliberation it is evident that the exact cause of EDP failure leading to commanded IFSD could not be established.

## 3. CONCLUSION

### 3.1. Findings

**3.1.1.** Aircraft was having valid C of A and no snag was pending before the incident flight. All the ADs/SBs were also complied with.

**3.1.2.** The flight preparation was done by approved AME and the aircraft was declared airworthy.

**3.1.3.** Flight crew were appropriately qualified on type.

**3.1.4.** Flight SG-467 was the fifth flight of the day by VT-MXE aircraft and for the both flight crew it was first flight of the day. PIC carried out aircraft external checks.

**3.1.5.** The Pilot in Command (PIC) was Pilot Flying (PF) and the First Officer (FO) was Pilot Monitoring (PM).

**3.1.6.** Weather was conducive for the flying operation.

**3.1.7.** During climb, at approx. FL139, Hydraulic System B Low Pressure triggered. Flight crew carried out required checklist and switched off engine #2 EDP.

**3.1.8.** At approx. FL316, OIL FILTER BYPASS indication flashed. Flight crew carried out required checklist. Oil filter bypass light did not extinguish, subsequently flight crew carried out Engine Failure or Shutdown checklist and engine #2 was switched off.

**3.1.9.** Flight crew carried out a safe overweight landing with flap 15 configuration at Mumbai.

**3.1.10.** Post landing failed EDP was sent to M/s EATON (EDP OEM) for detailed investigation to establish the root cause of failure.

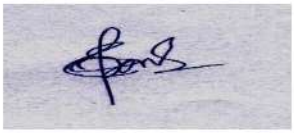
**3.1.11.** During investigation, the OEM could not determine root cause of failure of EDP due to the supporting and refuting evidences.

### 3.2. Probable Cause of the Incident

The root cause for Engine #2 EDP overheat which further lead to EDP failure, could not be established due supporting and refuting evidence identified for multiple failure mode during analysis.

## 4. SAFETYRECOMMENDATION

Nil as M/s Boeing/OEM has not issued any further recommendation.



**(Vallamsetty Suryavardhan)**
**Air Safety Officer (Member)**

**(Shashi Paul)**
**Deputy Director Air Safety& IIC**

**---End of Report---**