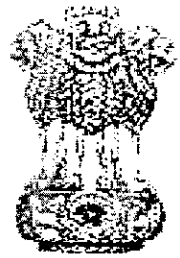


FINAL REPORT ON INCIDENT TO M/s SPICE JET AIRLINE DASH Q400 AIRCRAFT VT-SUI AT SHAMSHABAD AIRPORT ON 17/03/2015

GOVT OF INDIA
CIVIL AVIATION DEPARTMENT
O/O DIRECTOR AIR SAFETY
NORTHERN REGION
SAFDARJUNG AIRPORT
NEW DELHI-03

INDEX

FINAL REPORT ON INCIDENT TO M/s SPICE JET AIRLINE DASH Q400 AIRCRAFT VT-SUI AT SHAMSHABAD AIRPORT ON 17/03/2015

1.	Aircraft Type	: DHC-8-402
	Nationality	: INDIAN
	Registration	: VT - SUI
2.	Owner	: Maple Leaf Financing Ltd, Ireland
3.	Operator	: Spicejet Ltd.
4.	Commander – in –Command	: ATPL holder on type
	Extent of injuries	: Nil
5.	First Officer	: ATPL Holder
	Extent of injuries	: Nil
6.	Place of Incident	: Rajiv Gandhi International Airport, Shamshabad
7.	Date & Time of Incident	: 17th March 2015, 14:40 UTC
8.	Last point of Departure	: Madurai Aerodrome
9.	Point of intended landing Shamshabad	: Rajiv Gandhi International Airport,
10.	Type of operation	: Schedule Operation
11.	Crew on Board	: 5
	Extent of injuries	: Nil
12.	Passengers on Board	: 66
	Extent of injuries	: Nil
13.	Phase of operation	: Taxi
14.	Type of incident	: System Component failure – Power plant Smoke from No.2 engine

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY:

On 17.03.2015, M/s Spicejet Ltd, aircraft DHC-8-402, VT-SUI was scheduled to operate flight SG 3313/3314 on sector Hyderabad /Madurai/Colombo/Madurai/Hyderabad. All the three sectors were uneventful. However during the fourth sector i.e Madurai- Hyderabad, after landing on runway 09R, during taxing to the bay fuel smell was felt by the cockpit and cabin crew. After reaching the bay crew noticed dense white smoke from No. 2 engine and commander announced evacuation. Passenger evacuation was carried out and during evacuation none of the passenger and crew received any injury. There were total 66 passengers on board the flight along with 05 crew members.

The incident was reported by M/S Spicejet to DGCA. DGCA ordered Inquiry into incident under rule 13(1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012 by appointing Inquiry officer to investigate into the cause of the incident.

The incident occurred due failure of fuel heater as its oil circuit was found to be contaminated with fuel. The fuel circuit also showed contamination during bench check at vendor facility.

1. FACTUAL INFORMATION

1.1 History of the flight

Spicejet Q-400 aircraft VT-SUI was engaged in a scheduled flight (Hyderabad-Madurai-Colombo-Madurai-Hyderabad) on 17.03.2015. Before the incident flight aircraft had operated three sectors which were uneventful. The aircraft was under the command of ATPL Holder as PIC with First Officer who was also holding ATPL. Both the cockpit crew were duly qualified on the aircraft.

During last sector i.e Madurai- Hyderabad, aircraft landed uneventfully on runway 09R. During taxing, one of the cabin crew seated at L2 door noticed some fuel vapours and informed the same to CICC seated on L1 through intercom. The CICC also felt the fuel vapours in the cabin and informed the cockpit crew immediately. The Aircraft reached the bay at 1440 UTC. PIC checked for any warning/cautions in cockpit however there were no warnings/ caution light in the cockpit neither there was any other indication in the cockpit. After reaching the bay, ground staff started running and gave hand signals to the cockpit crew to evacuate and showed some urgency in their behaviour. As a precautionary action PIC called

for evacuation to CICC. There was an AME on board the aircraft seated on 1B who operated the front RH emergency exit (R1 Door) without any command from CCIC/Cockpit. The evacuation of passengers was carried out from both the front doors i.eR1 and L1. None of the passenger was injured during the evacuation. After evacuation the PIC physically observed smoke coming out of #2 engine. Some fuel had also spilled out of the engine. However there was no fire. The Airport fire services arrived in time. In the pilot special report it was mentioned that all engine parameters were normal except that he observed low fuel level on Engine no.2 by approx 200 kgs. The weather at the time of incident was fine.

As per AME who was on board the aircraft, after evacuation of passengers, he observed dense white smoke coming from RH engine and fuel dripping from RH engine drain mast.

As per marsheller, no smoke was observed when he was marshalling the aircraft to the bay. After the aircraft stopped and the engineering staff was putting the chocks, he observed heavy smoke from #2 engine. He immediately gave signal to pilot for smoke and inform ground staff to call the fire vehicle.

Due change in wind direction it was not clear from which side the smoke was coming out. At first he assumed that smoke is from left side of the #2 engine but later it was observed that it was from RH side of the #2 engine. There was no actual fire only white smoke from No.2 engine was observed.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
MINOR	Nil	Nil	Nil
NIL	05	66	Nil

1.3 Damage to Aircraft: Nil

1.4 Other damage: Nil

1.5 Personnel information

1.5.1 Pilot – in – Command

Gender &Age	: Male 47 years 10 months 17 days
Date of Birth	: 28-April-1967
Licence	: ATPL
Date of Issue	: 23-12-2011
Validity	: 22-12-2020
Endorsements as PIC	: 26-04-2013
Date of Med. Exam.	: 11-FEB-2015
Med. Exam valid upto	: 10-AUG-2015
Refresher Course	: 08-DEC-2014
IR & LR Check	: 11-MAR-2015
Monsoon Route Check	: 30-MAY-2013 (SIMULATOR)
RTR (A) Validity	: 02-May-2032

Flying Experience

Total flying experience	: 4316 hrs
Experience on type	: 1601:43
Experience as PIC on type	: 1446
Total flying experience during last 90 Days	: 191:42 hrs
Total flying experience during last 30 Days	: 60:39 hrs
Total flying experience during last 07 Days	: 16:51 hrs
Total flying experience during last 24 Hours	: 06:48 hrs

1.5.2 Co-Pilot

Gender &Age	: Male 28 years 10 months 18 days
Date of Birth	: 27-APR-1986
Licence	: ATPL
Date of Issue	: 07-11-2014
Valid up to	: 06-11-2016
Date of Med. Exam	: 01-MAY-2014
Med. Exam valid up to	: 30-APR-2015
IR & LR Check	: 06-MAR-2015

Flying Experience

Total flying experience	: 2593.54 hrs
Experience on type	: 2333.54 hrs
Total flying experience during last 90 days	: 96:02 hrs
Total flying experience during last 30 days	: 28:13 hrs
Total flying experience during last 07 Days	: 13:31 hrs
Total flying experience during last 24 Hours	: 05:36 hrs

1.6 Aircraft information:

1.6.1 General

i.	Name of Owner	: M/s SpiceJet Ltd.
ii.	Aircraft	: DASH-8 Q400
iii.	Aircraft Registration	: VT-SUI
iv.	MSN Sl. No.	: 4395
v.	Year of Manufacture	: 2011
vi.	C of A and validity	: 6444/ 13-05-2017
vii.	C of R and validity	: 4335/ CAT-A/ 27-06-2024
viii.	Max All up Weight	: 29257 Kgs
ix.	Engine Type	: Turbo-prop
x.	Engine Sl No.	: PCE-FA0823 #1, : PCE-FA0832 #2
xi.	Max AUW	: 29257Kg
xii.	Acft. Hrs (Since New)	: 7748:53 Hrs(IXM-HYD)
xiii.	Engine Hrs (Since New)	: 8965:34 Cycle- 8407 (LH) : 8527:44 Cycle-7945 (RH)
xiv.	Aircraft Station	: Base Station HYD
xv.	Last Major inspections (All	: Base Check / Aug 14
xvi.	Total aircraft cycles	: 7378 (IXM-HYD)

During inspection, Fuel leak was observed from No.2 engine. The engine cowling were opened and it was observed that fuel had mixed with oil and the oil level had increased. During rectification, the fuel oil heat exchanger was suspected to be faulty and the same was replaced. Oil flushing was carried out and main and scavenge oil filter replaced. Compressor wash carried out and engine idle run up was carried out. During run up fuel leak was observed again in FMU collector drain. Subsequently, the FMU was suspected to be faulty and the same was replaced. Thereafter, power assurance check was carried out and all the parameters were observed normal and no fuel leak was observed. Consequently the aircraft was declared serviceable.

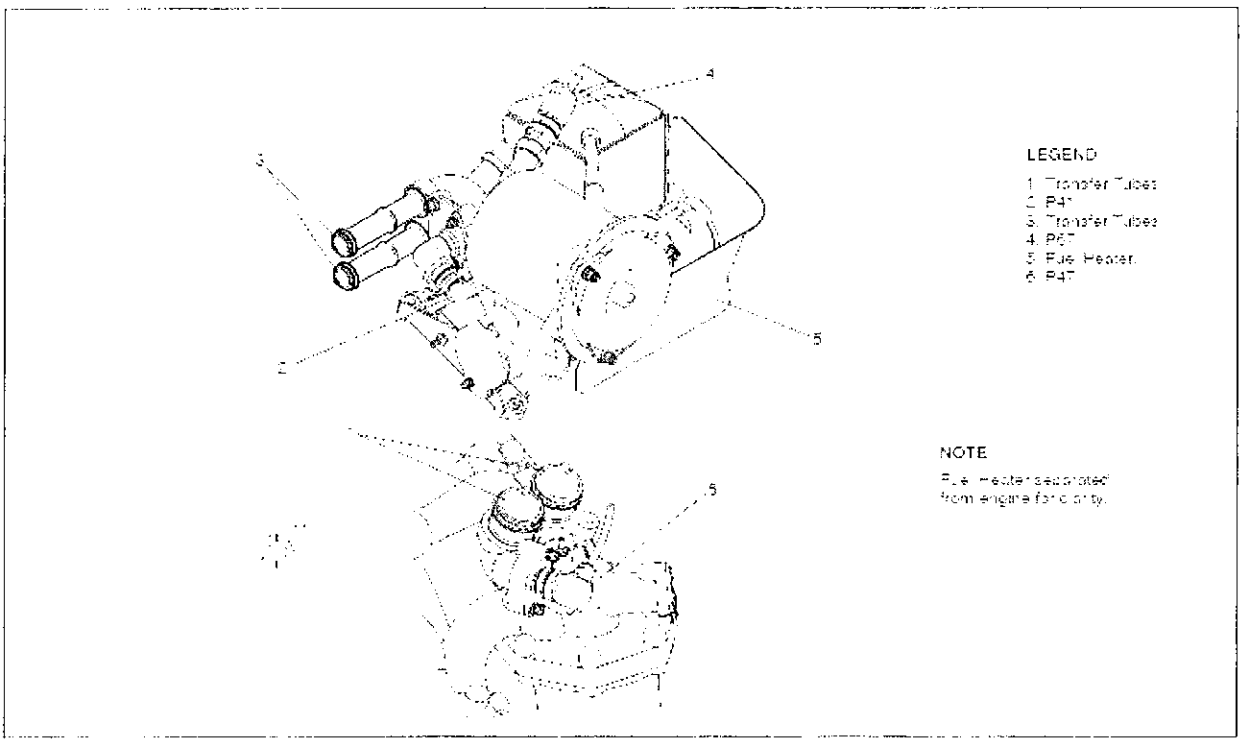
1.6.2 Fuel heater description:

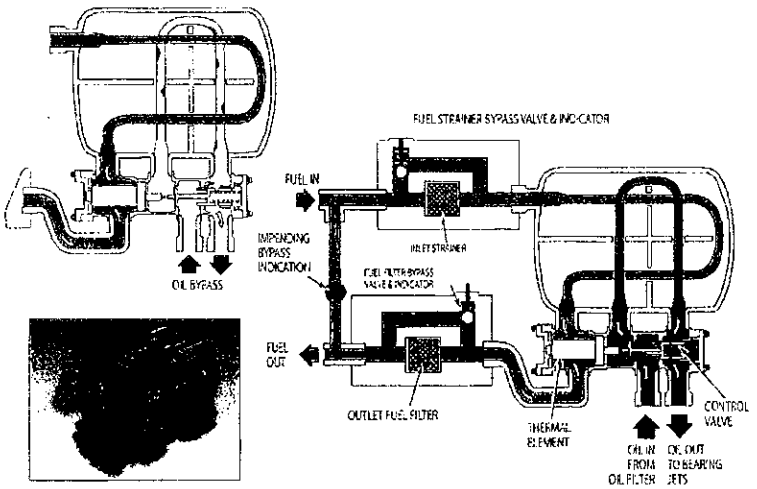
The purpose of the fuel heater is to heat the fuel to prevent the formation of ice crystals. The fuel heater is an integral assembly made of aluminium castings consisting of a heater assembly and a filter assembly. Both assemblies are welded together and reinforced with struts.

The fuel heater is installed on the left side of the engine on the LP compressor case. It is connected to the Fuel Metering Unit (FMU) through two transfer tubes located on the forward face of the fuel heater. Two transfer tubes located at the bottom of the heater connect it to the main oil–filter–housing.The heat transfer matrix has an aluminium plate/fin that has separate oil and fuel passages. Heat from the oil is conducted through the walls of the passages and heats the fuel that flows through the adjacent fuel passages. An impending bypass switch reads the pressure drop across the whole unit and sends a signal to the Caution and Warning panel in the flight compartment when one of the filtration components needs to be replaced. The switch indicates an impending bypass when the pressure differential is 18 to 21 psid (124.1 to 145 kPad).

A 150 micron absolute strainer is installed upstream of the heat transfer matrix. It is sized to prevent contamination of the matrix while being resistant to freezing of the water contained in the fuel. This strainer is protected by a bypass valve equipped with a bypass indicator. The fuel heater incorporates an oil bypass valve on the oil side of the unit which is both pressure and temperature controlled. The oil bypass valve is pressure sensitive and will bypass oil when the oil pressure reaches 28 ±3 psid (193 ±21 kPad). This protects the fuel heater in the event that oil passages are blocked in the fuel heater, or if the oil pressure

becomes too high. The oil bypass valve is also equipped with a thermal sensor on the fuel side. The thermal sensor keeps the valve fully opened when the fuel temperature is below 90°F (32 °C). As the fuel temperature increases above 90 °F (32 °C), the thermal sensor starts closing the oil bypass valve. When the fuel temperature reaches 120 °F (49 °C), the valve is fully closed and theoil bypasses the heater. The unit also has a fuel temperature probein the port at the fuel filter outlet.





At the time of incident Fuel heater P/No 108797, S/No. WA 42147 was fitted which has accumulated total 2998:21/2868 hrs/cycles since new. As per history card the said unit was fitted on the aircraft with modified thermal actuator on 16.2.2014 and was removed on 21.9.2014 at 1560:22/1473 hrs/cycles for removal and installation of engine and same was fitted on No.2 engine on 25.9.2014. Thereafter the unit was removed when the incident occurred. Fuel heater is an on condition item and is modified one.

There was no snag reported on the system since last one week prior to the incident flight of 17.3.2015.

Scrutiny of the Spice Jet Engineering data revealed that in the year 2013 there was only one failure of fuel heater which was premature. In year 2014 there was only one removal which was preventive. In year 2015 there were 08 removals. Out of 8, three were failure removals and 5 were of preventive type. In year 2016 only one fuel heater which was of preventive maintenance.

M/S Spice Jet MTBUR of fuel heater is 17504 hours against target MTBUR of 20000 unit hours. Global fleet 12 months MTBUR December end 2015 of unit is 24111 unit hours as per Manufacturer Bombardier. Therefore unit is delivering 87% of designed life.

As per Spice Jet Engineering, Fuel heater malfunctions many times due to Fuel inlet temperature rise and this rise in temperature is noted in the EMU (Engine monitoring Unit). The fuel inlet temperature is indicated on engine display in the cockpit. This unit falls in condition monitoring and is monitored by their reliability cell. Spice Jet reliability cell is monitoring the Fuel inlet temperature rise through their data base analysis from EMU at every 50 hours. Based on the monitoring of fuel inlet temperature Qty 6 fuel heater thermal actuator were replaced in the year 2016 due preventive maintenance.

Based upon the data, Spice Jet approached Bombardier for support of additional Fuel heaters. Bombardier supplied qty 12 Thermal actuators (As per AMM it is LRU sub assembly inside the fuel heater and is the root cause of most failures). Out of 12 thermal elements, 09 elements are replaced and the rest engines in the fleet are not showing any deterioration or any kind of fuel exceedance.

1.6.3 Service Bulletin PW 150 72 35257

As per the Pratt and Whitney Canada engine manufacturer Service Bulletin No. PW 150 72 35257 was issued on 13th May 2011 on the subject of fuel temperature exiting the fuel heater can be higher than the required because the durability of fuel heater thermal actuator is not optimal. The subject SB calls for replacing the fuel heater with a new one that has an improved thermal actuator. Compliance category of the SB is 6. M S P& W recommends to do this SB when the sub assembly is disassembled and access is available to the necessary part. The said SB has been complied on all fuel heater in the Spice Jet Q 400 aircraft fleet.

The involved fuel heater is fitted with new thermal actuator as per the SB 35257 of M/S P & W which asked for replacement of new thermal actuator in the fuel heater. The said SB was complied on the involved fuel heater on 21.11.2013 when the unit visited the shop in USA due report of fuel temp out of limits

From the above it is inferred that thermal actuator in the fuel heater is required to be replaced frequently by the Spice Jet Engineering and is an issue which requires attention from M/S Bombardier.

1.7 Meteorological information:

As per the Met report of time 1410 UTC winds were 120/06 Kts with visibility 6000 meters. The clouds were 2SC 020. At the time of incident there was no change in the weather except the wind direction which changed to 110/06 kts.

1.8 Aids to navigation

The airport is equipped with ILS, DVOR, MSSR, DME and SMR navigational facilities for the aircraft operations.

1.9 Communications

The aircraft remained in contact with ATC, RGIA, Shamshabad before and after the incident.

1.10 Aerodrome information

Rajiv Gandhi International Airport (IATA: **HYD**, ICAO: **VOHS**), also known as Hyderabad International Airport, or simply **RGIA**, is an international airport serving the metropolis of Hyderabad located at Shamshabad, about 22 km (14 mi) south of Hyderabad. It replaced the former international airport at Begumpet and commercial flight operations began on 23 March 2008. Rajiv Gandhi International Airport is India's second public-private partnership airport venture and is the sixth-busiest airport in India by international and overall passenger traffic.

The Aerodrome Reference point (ARP) of this airport is 17 deg 14' 26" N and 078 deg 25' 44" E. The airport elevation is 2024 feet. It has two one main runways 09R/27 L having length of 13976 feet and other is parallel taxiway 09L/27 R having length of 12162 feet can be used in case of exigencies. The runway surface is made of asphalt material.

The Airport has tower frequency of 118.450 MHz with ground frequency of 121.850 MHz. The airport is cleared for VFR/IFR operations.

Rescue and fire fighting services for the airport is Category 9. Metrological reports are available every half an hour.

1.11 Flight recorders:

The aircraft is fitted with the Digital Flight Data Recorder (DFDR) whose specifications are as under:

1. Name of Manufacturer : Universal
2. Part Number : 1607-00-00SCN 2001.0.1
3. Serial Number : 324
4. Duration of recording : 533Hrs (Data rate of 128 Words per second)
5. No. Of parameters : 270

As per the DFDR readout aircraft landed with flaps 15 degrees at Shamshabad Airport on R/W 09 R at 14:35:40UTC. All the DFDR parameters were recorded normal and no warning was recorded in the DFDR.

CVR:

1. Name of Manufacturer- : Universal
2. Part Number : 1606-00-01
3. Serial Number : 313
4. Duration of recording : 02 Hrs

The aircraft is fitted with a CVR which is capable of recording conversations in the cockpit for 2 hrs of flight duration. As per CVR tape transcript the aircraft was cleared to land on R/W 09R by Shamshabad ATC when aircraft was at 1000 feet. The landing checklist was carried outby the crew at 500 feet. The aircraft was allotted bay no.43 by the ATC. About 2 minutes before parking, while the aircraft was taxying and approaching the stand no.43, cabin crew made calls to cockpit stating that fuel vapours are felt in the cabin especially in aft galley to which cockpit crew also agreed. Thereafter another aircraft reported that they can see smoke coming from the aircraft and requested emergency services. ATC asked the aircraft its parking bay to which they replied bay 43 and crew requested fire services on bay no.43. Simultaneously there was command for evacuation from cabin crew and passenger evacuation took place.

1.12 Wreckage and impact information: Nil

1.13 Medical and pathological Information

Both the flight crew had undergone the breath analyser check for alcohol before operating the first sector of the day at Hyderabad, and same was recorded as negative.

1.14 Fire

PIC after evacuating from the aircraft noticed smoke emanating from no.2 engine, he went in again and pulled the fire handle in the cockpit even though there was no indication of fire in the cockpit. ARFF vehicles rushed to bay no.43 for assistance. However no fire extinguisher agent was used by the fire crew as was not required and natural cooling was observed by the ARFF crew. Fuel leak was spread over an area of 2x3 square meters. The same was cleaned using chemical and water spray.

1.15 Survival aspects

The incident was survivable.

1.16 Tests and research:

The removed fuel heater P/No. 10879T, S/No. WA 42147 was sent to vendor M/S Meggitt, New Zealand for shop investigation. The unit failed during function test with High Fuel Temperature (HFT). All internal components showed excess wear. On receipt of unit Oil circuit found to be contaminated with fuel. Fuel circuit showed some contamination with oil. The unit found to have hidden damage.Nicks and scratches at edge of chamfer of fuel out port and on fuel port face. The new thermal element was changed and unit was overhauled.

1.17 Organizational and management information

M/s Spicejet is a scheduled airline operator having the Operating permit No. S-16 which is valid till 16.5.2018. The Airlines have 22 aircraft of Boeing B737-800, B737-900ER and 14 aircrafts of Q400 series DHC-8-402. There are total 429 pilots in the organisation for the operations of 36 aircraft. For the maintenance of these aircraft there are 262 AMEs in the organisation. The Maintenance base of the Boeing 737 aircraft is at Delhi whereas the Q-400 Maintenance base is located at Hyderabad. The Spicejet is possessing the CAR 145 approval for the Maintenance of their aircraft. Fight safety department is headed by approved Chief of flight safety who directly reports to CEO. There are total 63 personnel in the technical services

(18 staff including 2 persons in reliability cell), planning, and Airworthiness and quality assurance department of the airline.

1.18 Additional information: Nil

1.19 Useful or effective investigation techniques: Nil

2 ANALYSIS

2.1 Serviceability of the aircraft:

The aircraft had valid certificate of airworthiness and ARC at the time of incident. There was no snag pending before the incident flight and all the mandatory modifications were complied with. After landing on runway 09R when aircraft was taxing to the bay fuel vapours were felt by the cockpit and cabin crew. After reaching the bay crew noticed dense smoke from No. 2 engine and commander called for evacuation. After the incident fuel leak was observed from No.2 engine. Subsequently, No.2 engine cowling were opened and observed fuel had mixed with oil and the oil level had risen. The fuel oil heat exchanger was suspected to be faulty and the same was replaced.

The said unit was sent to vendor's facility and it failed during function test with H.F.T (High fuel temperature). All internal components showed excess wear. Oil circuit found to be contaminated with fuel n receipt of unit. Fuel circuit also showed some contamination.

During investigation it was observed that the MTBUR of the fuel heater is high than the manufacturer limit and unit is delivering 87% of its designed life. The subject fuel heater is fitted with a modified thermal actuator as per P& W SB 35257 in November 2013. As per the engineering data while monitoring of fuel inlet temperature, Qty 6 fuel heater thermal actuator were replaced in the year 2016 due preventive maintenance. Therefore, thermal actuator in the fuel heater is required to be replaced frequently by the Spicejet Engineering and is an issue which requires attention from M/ S Bombardier.

From the above it is inferred that the system component failure is a factor which caused the incident to occur.

2.2 Pilot handling the aircraft:

Crew had valid licenses before operating the incident flight and no snag was reported on the fuel heater system prior to the flight. When the aircraft approached to the allotted bay after landing no abnormal indications/warning reported by the crew. During taxing cabin crew noticed some fuel vapour and informed CICC through intercom. CICC also felt the same and informed the cockpit crew of the same. After reaching the bay the ground staff noticed smoke from #2 engine and gave hand signals to the PIC for evacuation. PIC called for evacuation to CICC. The AME on board the aircraft, without any instructions from the cabin operated the front RH emergency exit door for evacuation. The passenger evacuation was carried out from both the front doors. There was no injury to any of the passengers on board the aircraft.

From the above it is evident that the pilot handling of the aircraft is not a factor to the incident. As the failure occurred while the aircraft was being parked on the bay. Also the component failure in the engine caused generation of dense white smoke outside the aircraft long with the fuel vapours which were felt in the aircraft cabin by the cabin crew and also by the cockpit crew.

3. CONCLUSIONS:

3.1 Findings

1. The aircraft had valid Certificate of Airworthiness and no snag was pending for rectification before the incident.
2. Crew had appropriate licenses and valid ratings to undertake the subject flight.
3. This was the fourth sector of the involved crew and no snag was reported on the aircraft prior to the incident flight.
4. During taxing one of the cabin crew seated at L2 door noticed some fuel smell and informed CICC seated on L1 through intercom. CICC also felt the same and informed the cockpit crew regarding the same.
5. PIC checked in the cockpit, there were no warnings/ caution lights in the cockpit neither was any other indications in the cockpit.
6. Ground staff started running here and there and started giving some hand signals to come out of the cockpit.
7. As a preventive action, PIC called for evacuation verbally to CICC. However PIC did not inform from which side evacuation to be carried out.

8. The AME on board the aircraft seated on 1B who operated the front RH emergency exit and L1 exit was opened by cabin crew for passenger emergency evacuation.
9. The AME without any instructions from CCIC or Cockpit operated the RH emergency exit.
10. After coming down only PIC physically observed smoke coming out of #2 engine and some fuel was also spill out of the engine.
11. After evacuation the AME observed dense white smoke from RH engine and fuel dripping from RH engine drain mast.
12. The No. 2 engine cowling was opened and observed fuel had mixed with oil and the oil level had risen. Subsequently the fuel heater was replaced.
13. The removed fuel heater was found faulty during bench check as unit failed during function test with High fuel Temperature. All internal components showed excess wear. Oil circuit found to be contaminated on receipt of unit. Fuel circuit also showed some contamination.
14. As the number of thermal actuator failures are frequent due high fuel inlet temperature therefore the reliability of thermal actuator in fuel heater is an issue which requires attention from Manufacturer.

3.2 Probable cause of the Incident:

The cause for the fuel vapours in the aircraft cabin and dense white smoke from #2 engine was attributed to the faulty fuel heater.

4. SAFETY RECOMMENDATIONS:

4.1 Organisation should ensure that all onboard staff should adhere to the instructions from PIC/CCIC before taking any action in case of emergency.

4.2 Matter to be taken up with the manufacturer for improvement of material of thermal actuator in the fuel heater.

(M.L.Singh)
Deputy Director of Air Safety
Inquiry Officer, VT-SUI

Date: 11.07.2016