FINAL INVESTIGATION REPORT OF TAIL STRIKE INCIDENT TO M/s SPICEJET LTD, DASH 8 Q-400 AIRCRAFT, VT-SUH AT TUTICORIN AIRPORT ON 28.07.2013 AT 03:07 UTC.			
	AIRCRAFT	Type	DASH 8 Q-400
		Nationality	Indian
		Registration	VT-SUH
2	Owner		Maple Leaf Financing Limited 5 Harbormaster place, International financial services center, Dublin 1, Ireland.
3	Operator		M/s Spicejet Ltd, Chennai
4	Pilot – in –Command		FATA & ATPL (A) Holder
		Extent of injuries	None.
5	Co Pilot		CPL Holder
		Extent of injuries	None.
6	No. of Passengers on board		50
	Extent of Injuries		None
7	Last point of Departure		Chennai (MAA) Airport.
8	Intended landing place		Tuticorin (TCR) Airport.
9	Place of Incident		Tuticorin Airport, N08^{0}43'20.22" E078^0 01'34.20"
10	Date & Time of Incident		28.07.2013; 03:07 UTC.

SYNOPSIS

On 28th July 2013, Spicejet DASH 8 Q-400 aircraft VT-SUH was scheduled to operate flight SG-3291 (sector MAA-TCR). The aircraft was involved in an incident of tail strike while landing at TCR. The time of occurrence was 03:07 UTC. Total persons on board (POB): 54 (02 Flight Crew, 02 Cabin Crew, 48Adult, 01 Child and 01 Infant). There was no injury and no fire. The crew and passengers were able to disembark from the aircraft normally. The aircraft aft lower portion of the fuselage was significantly damaged. The airport emergency services were not mobilized.

The probable cause of the incident is owing to improper handling of the flight & thrust controls by the First Officer while carrying out an unauthorized supervised landing on a Category C airport. The early reduction of power, high pitch attitude just prior to aircraft touchdown resulted into lower aircraft speed and tail strike.

1. FACTUAL INFORMATION

1.1 History of Flight

On 28th July 2013, Spicejet DASH 8 Q-400 aircraft VT-SUH was scheduled to operate flight SG-3291 (sector MAA-TCR) with four crew members and fifty passengers on board. The PIC and First Officer had availed approximately 16:30 hrs and 18 hrs of rest respectively prior to commencement of flight. The preflight medical with BA test was carried out at Chennai and the crew were declared fit for flight duties. The aircraft took-off from Chennai at 02:06 UTC. The take-off, climb, cruise, initial descent and approach were uneventful. Throughout this flight, PIC was occupying the left hand seat and the Co-Pilot was occupying the right hand seat.

During flight the Spice Jet aircraft came in contact on VHF with Tuticorin ATC at 02:40 UTC when the aircraft was 124 NM inbound from ('TU' NDB). Latest METAR report was passed to the aircraft which was duly acknowledged by the crew. At 02:53 UTC while passing FL146 and cleared to FL60 the aircraft was released by Trivandrum area control to Tuticorin ATC. The Aircraft was further asked to report 25 miles inbound TU for further descent by Tuticorin ATC. At 02:56 UTC, the aircraft reported 25 miles inbound TU, it was cleared to 3300 ft on TCR QNH and was asked to call again when airfield in sight. At 02:59 UTC aircraft reported field in sight and requested further descent to traffic pattern altitude which was approved by the Tower. Aircraft was provided with latest wind (i.e.300 Deg/10 Knots) and was instructed to report Right Base of R/W 28.

At 03:01 UTC aircraft reported Right Base of R/W 28 and was asked to report Finals R/W 28. AT 03:03 UTC the aircraft was sighted by ATC and was cleared to land on R/W 28 with wind 300 Deg/10 Knots. At 03:07 UTC the aircraft touched down on runway 28. In cockpit "Touched Runway" and Master caution Annunciation illuminated. After landing the aircraft vacated the runway via taxiway A without backtracking. After reaching the parking stand all the passengers were disembarked normally and post flight inspection was carried out by the PIC. PIC then informed Flight Safety Department and Technician of Spice Jet about tail strike .At time 03:30 UTC Spice Jet arrival technician informed ATC, Tuticorin through telephone that strike marks were found beneath the tail of the aircraft. However flight crew did not report any abnormality after landing on runway to ATC either on RT or on telephone. Subsequently AAI official along

with Spice Jet technician carried out runway inspection and found red colored scratch marks with metal scrapes/marks on the runway with no damage to the runway surface and with no other aircraft major parts (FOD).A small portion of the "touched runway switch fairing" was found damaged. There was no abnormality reported by the passengers and the cabin crew while landing on runway 28.

The Spice Jet Technician was requested by the ATC to file a report regarding the extent of damage to the aircraft. Air Traffic Controller was informed by the technician of Spice Jet that the aircraft damage can be assessed only by the certified/qualified engineer after his arrival in the next flight. After the aircraft chocks ON, the PIC did not pull out the CVR CB, and subsequently on the advice of airline's engineering base, the aircraft technician carried out the CVR CB pull out.

1.2 Injuries to persons:

Injuries	Crew	Passengers	Other
Fatal	0	0	0
Serious	0	0	0
Minor	0	0	0
None	4	50	0

1.3 Damage to aircraft:

The aft lower portion of the fuselage of the aircraft was significantly damaged. The skin deformation and abrasion damage between X 714-X 819 and stringers 29P-29S on the lower fuselage panels P/N 85337135 and P/N 85337155.The tail strike frangible switch and doublers were damaged.

1.4 Personnel information:

1.4.1 Pilot-in-Command:

Pilot-in-Command	Line Pilot, Male, Age: 52Yrs
Licence	FATA holder valid till 31.12.2013 and ATPL(A) valid till 20.08.2017
Type endorsements/Aircraft rating	DH8Q400, EMB 135/145, SAAB 340, SA 226/227, BE20 P3-ORION, CL-215
Date of Joining Spicejet Ltd	20.09.2012
FRTO	Valid till 26.03.2018
Medical Certificate	Class I renewed on 01.02.2013
Date of last English language	Level 5 valid till 15th Dec 2016.

Proficiency	
Date of Last CRM Training	11/10/2012
Date of last Monsoon Simulator Training	29/05/2013
Date of last IR/PPC Simulator Check	17/02/2013
Date of Training for Supervised Take-off/Landing	17.02.2013
Familiarity with Route/TCR Airport flown for the last 12 months and Since Joining Company.	20 sectors flown from TCR for the last 12 months.
Total flying Experience on all types	11833:14hrs
Total Experience and on Type	2225:14 hours
For the last 24 hrs	03:30 hours
For Last 7 days	23:40 hours
For Last 30 days	92:21 hours
Total in last 90 days	187:11 hours
Rest Period Prior to duty Flight	16:30 hours

Co-Pilot:-

Co-Pilot	Line Pilot, Male, Age 37 years
Licence	CPL Holder issued on 27.12.2007 valid till 26.12.2017
Type endorsements	DHC-8Q402, B737-200,Cessna 152 A
Aircraft Rating	DHC-8Q402 endorsed on 11.03.2012
Date of Joining Spicejet	03.01.2012
Instrument Rating	DHC-8Q402 renewed on 02.03.2013 and valid till 01.03.2014
FRTO	Issued on 02.04.1998 and valid till 18.04.2017
RTR	issued on 24.03.1995 and Valid till 09.03.2041
Medical Certificate	Class I renewed on 29.11.2012 and valid until 28.11.2013.

Date of Last Line/Route Check	20.05.2013
Date of last Proficiency Check	02.03.2013
Date of last English language Proficiency	31.01.2011, level 4
Date of last Monsoon Training	05.04.2013
Date of Last CRM Training	10.01.2013
Date of last Simulator Recurrent Simulator Training	02.03.2013
Familiarity with Route/TCR Airport flown for the last 12 months	21 flights
Flying Experience	
Total all types	1461:37 hours
Total on type	413:22 hours
Total in last 90 days	154:42 hours
Total in last 30 days	56:01 hours
Total in last 7 days	10:45 hours
Total in last 24 hours	NIL
Rest Period Prior to duty	18 hours

Prior to Joining Spicejet the Co-pilot had 1048:15 Hrs experience and has flown a total of 665:50hrs on B737-200 and 382:25 hours on Cessna150, 150A, 152, 152A.The Co-pilot civil flying experience details:

Cessna150 : 20:50hrs
Cessna150A : 02:25hrs
Cessna152 : 38:50hrs
Cessna152A : 320:20hrs
B737-200 : 665:50 hrs
DHC-8Q402 : 413:22hrs

The Co-pilot has been flying as Co-Pilot on the DHC-8Q402 since 10.11.2012.

No Flight Duty Time Limitation violation was observed in respect of both cockpit crew. They were not involved in any serious incident/accident in recent past in India.

1.5 Aircraft information:

Bombardier Dash 8 Q-400 is a series of twin-engined, medium range, turboprop aircraft. Introduced by de Havilland Canada (DHC) in 1984, they are now produced by Bombardier Aerospace.

The Dash 8 was developed from the de Havilland Canada Dash 7, which featured extreme short take-off and landing (STOL) performance. With the Dash 8, DHC focused on improving cruise performance and lowering operational costs. The engine chosen was the Pratt & Whitney Canada PW100. The aircraft has been delivered in four series. The Series 100 has a maximum capacity of 39, the Series 200 has the same capacity but offers more powerful engines, the Series 300 is a stretched, 50-seat version and the Series 400 is further stretched to 78 passengers. Models delivered after 1997 have cabin noise suppression and are designated with the prefix "Q". Production of the Series 100 ceased in 2005, and the Q200 and Q300 in 2009. Bombardier is considering launching a stretched version of the Q400.

Q400

Stretched and improved 70–78 passenger version that entered service in 2000 is powered by PW150A engines rated at 5,071 shp (3,781 kW) at maximum power (4,850 shp or 3,620 kW maximum continuous rated). The maximum operating altitude is 25,000 ft (7,600 m) for the standard version, although a version with drop-down oxygen masks is offered, which increases maximum operating altitude to 27,000 ft (8,200 m). All Q400s include the ANVS (Active noise and vibration suppression) system. The Engine # 1 S/N PCE-FA0807 and Engine # 2, S/N PCE-FA0859 has logged 3283:22hrs, 3018 cycles and 3277:58hrs, 3016 cycles respectively. Last 50 hrs/ 07 days inspection was carried out on 25/07/2013. Check I was carried out on 23/07/2013.

Name of Operator	Spicejet Limited
Aircraft Type	DASH 8 Q-400
Registration Marking & S.N	VT-SUH&4389
Year of Manufacture	2011
Validity of Certificate of Airworthiness, Category &sub-division	8.5.2017, Normal & Passenger/Mail/Goods
Total Flying Hrs / Cycles since manufacture as on 28.07.2013	Airframe 3277:58 hours / 3016 cycles
The last major check/inspection carried out on the aircraft	No major check / inspection carried out
Total Flying Hrs/cycles/landing at Last major periodic inspection	Check 1 Carried out on 23/07/2013/at 3234.22Hrs/2978 Landings

All the concerned Airworthiness Directive, Service Bulletins, DGCA mandatory modifications on this aircraft and its engines have been complied with as and when due. Scrutiny of the snag register did not reveal any snag relevant to the incident.

Weight and Balance Information:

The Details of basic weight schedule were as follows:-

Aircraft Empty Weight	18141.72Kgs
Max fuel capacity(At density of .785 kg/litre)	5318Kgs
Maximum Takeoff weight	29257.00 Kgs
Empty weight CG (in)	394.81
Datum(from forward of jig point at STA.X 428)	428
Maximum Permissible number of Passengers	78
Number of Crew	2+2

Weight	Actual Weights for SG-3291	Maximum Permissible
Take Off Weight	26564 Kgs	29257 Kgs
Landing Weight	25468 Kgs	28009 Kgs
Zero fuel Weight	22184 Kgs	25855 Kgs

CG was within the prescribed limit during landing.

1.6 Meteorological information:

(1) Current weather reports (METARs) from 01:00 to 03:00 UTC/28 July 2013 indicated that fair weather prevailed during the time of incident. Visibility was well above (6000 m) prevailed from 01:00 to 02:00UTC and around the time incident no low cloud was present but only 3-4 Okta medium cloud with base 10, 000 ft (3000m) was prevailing. METARs issued are as below:

VOTK 280100Z 25006KT 6000 FEW020 SCT 100 28/23 Q1009=
VOTK 280130Z 27008KT 6000 FEW020 SCT 100 28/23 Q1010=
VOTK 280200Z 27012KT 7000 FEW020 SCT 100 29/23 Q1010=
VOTK 280230Z 27010KT 7000 SCT 100 30/23 Q1010=
VOTK 280300Z 27010KT 7000 SCT 100 30/23 Q1011=
VOTK 280330Z 27010KT 7000 SCT 100 31/23 Q1011=

(2) Terminal Aerodrome Forecast (TAF) issued at 00:00UTC for VOTK with validity 03:00 to 12:00UTC also indicated 1-2 Okta low clouds with base 2000ft and 3-4 Okta medium cloud with base 10000ft. TAF issued at 00:00 Z was:
TAF VOTK 280009 2803/2812 25010Kt 6000FEW 020 SCT 1000=

Wx at 03:00 Z

Winds 270/10, Visibility 7KM, Clouds SCT100, Temp 30/23, QNH 1011 & RWY in use 28.

1.7 Aids to navigation:

The flight crew used visual approach for the landing. There were no observations on the functioning of the PAPI or any other navigational equipment at Tuticorin Airport or onboard the aircraft. There is no evidence to indicate that aircraft experienced any navigational problem during the flight.

1.8 Communications:

There was two-way communication between the aircraft and ATC & was of good quality.

1.9 Aerodrome information:

Tuticorin Airport has a R/W orientation 28/10 with a length of 1350 meters.

Tuticorin airport has latitude 08^0 43' 20.22" N and Longitude 078^0 01' 34.20" E with an ARP elevation of 25.61meters (84 ft) above mean sea level. Airport Runway 28/10 has a Bituminous surface with dimensions 1350 x 30 meters, aerodrome elevation 25.86 meters (85 ft) and PCN 21/ F/D/Y/T. It is provided with runway strip of 75 meters width on either side of runway centerline. The runway 28 is served with Runway Edge Lights, Runway End Lights, Runway Threshold lights, Taxiway lights and PAPI. PAPI was calibrated prior to the incident on 15th July, 2013 and valid upto 14th July 2014. Simple Approach Lighting system for RWY28 & RWY10 is not available. The Airport Rescue and Fire Fighting Services was category VI (Six). At the time of incident, Tuticorin airport had a valid license.

The salient features of the Tuticorin airport safety areas are as follows:-

License Validity of Tuticorin Airport	19.06.2015
Runway Strip Length	1470 meters
Runway strip Width	150 meters.
Length of the Runway 28/10	1350 meters
Width of the Runway28/10	30 meters
Runway 28 declared distances are Take off Run Available (TORA) Take off Distance Available (TODA) Acceleration Stop Distance Available (ASDA) Landing Distance Available (LDA)	1350 meters
RESA for R/W 10/28	60X90 meters

1.10 Flight recorders(CVR/DFDR):

CVR

The aircraft is equipped with Universal Avionics Cockpit Voice Recorder P/N. 1600-00-01, S/N 313.Recording capacity is 02 hrs 02 mins 45 seconds. The Conversations are recorded on the Captain's channel, Copilot's channel, Observer's channel and an Area channel which records conversations/other sounds in the cockpit. The CVR was removed from the aircraft after the incident. A full analysis was carried out of the approach and landing phases of the flight. Salient observations made from the CVR tape transcript are given below:

Time UTC From	**Time** UTC To	**Salient CVR observations**
02:39:45	02:40:01	Flight SG3291 initial contact with Tuticorin& requesting latest METAR. ATC, TCR reported time of observation 02:30 UTC wind 270 deg. 10 Kts, visibility 7KMs cloud scattered 10000, temperature 30, dew point 23, QNH 1011, Runway in use 28.
02:59:33	02:59:40	Aircraft reported field in sight and requested descent to circuit altitude which was approved by the Tower. Aircraft was provided with latest wind (i.e. 300 Deg/10 Knots) and was instructed to report Right Base of RUNWAY 28.
03:01:24	03:01:29	PIC reported Right Base of RUNWAY 28 and he was asked by ATC to report Final of RUNWAY28.
03:03:07		Aircraft was sighted by ATC and was given clearance to land on RUNWAY28 with wind 300Deg/10 Knots.
03:03:25	03:06:54	The PIC persuaded the Co-pilot to perform the unauthorized supervised landing at Tuticorin Airport and Co-Pilot followed it as per the instruction of PIC.

From the CVR analysis it is evident that the Co-Pilot was handling the flight Controls while landing at Tuticorin Airport and the PIC was assisting him. There was no separate briefing given to the first officer by the PIC for supervised landing at Tuticorin Airport. It seems the first officer had followed

the instructions given by the PIC during the final approach and landing phase and were aiming to land and vacate the aircraft on taxiway 'A' intersection.

DFDR

The DFDR read out revealed that the Aircraft was configured for a Flap 35^0 landing at Tuticorin Airport Runway 28. There was a head wind of 10 Kts during Final Approach and Landing. At 52 Feet Radio Height, Flare was initiated (Pitch 0.53 Deg, CAS 114). At 22 Feet Radio Height, Power Levers was brought to Flight Idle (Pitch 3.16, CAS 109). Prior to touchdown, control column was pulled aggressively. Just 0.25 sec before touch down, pitch attitude was 7.38 deg. The Aircraft touched the runway with main wheels (landing G 2.22, Pitch 6.94, CAS 102 Kts). The landing speed was 14 kts less than Vref speed of 116 kts.

1.11 Wreckage and impact information:

The runway inspection revealed that aircraft aft fuselage skin strike marks on runway starting from a distance of 70.6m from the threshold lasting upto a distance of 78.2m from threshold (i.e. Total length of the scratch on the runway 28 is 7.6m).

1.12 Medical and pathological Information:

Both the cockpit crew had undergone pre-flight medical examination at Chennai Airport and found medically fit for flying. They had been declared to be 'Not under the influence of alcohol' prior to operating the flight. The FDTL/FTL regulatory requirements were met in respect of both the crewmembers.

1.13 Fire:

The aircraft and its engines did not catch fire as a result of the incident.

1.14 Survival aspects:

The incident was survivable.

1.15 Tests and research: Not applicable

1.16 Organizational and management information:

M/s. Spicejet Ltd is a low cost model airline with its head office in Gurgaon and registered office in Chennai. The airline has 58 aircraft in its fleet which includes 37 Boeing 737–800, 06 Boeing 737-900ER and 15 Dash-8 Q400. The

airline has a scheduled operator permit number S-16 issued in Pax/Cargo Category which was re-issued on 10.05.2013 valid till 16.05.2018. The initial issue of AOP was on 22-04-2005.Dash-8 Q400 aircrafts were inducted in Spicejet fleet in Sept 2011, and is used as a feeder / regional service with high connectivity. Spicejet commenced International operations in 2010. At present it operates 46 domestic & 08 international destinations with more than 350 flights daily.

1.17 Useful or effective investigation techniques: Nil

1.18 Additional Information*:* Nil

2. ANALYSIS

2.1 Serviceability and Performance of the Aircraft:

DASH 8 Q-400 Aircraft, VT-SUH was manufactured by M/s. Bombardier INC 123, Garratt BLVD, ON M3K1Y5, Canada. The aircraft had a valid Certificate of Airworthiness. It was maintained by approved Aircraft Maintenance Planning as per maintenance schedule. All relevant DGCA and manufacturer MODs for airframe and the engine were complied with as on 28.07.2013. Scrutiny of the snag register did not reveal any snag relevant to the incident. Last Check 1 carried out on 23/07/2013/at 3234.22 Hrs /2978 Landings.

Load and Trim sheet of the sector revealed that the aircraft was operated with 2541 Kg under load. During take-off & landing phases the CG of the aircraft was within the prescribed limits. The aircraft takeoff weight was 26564 Kg against Max 29257 Kg and landing weight was 25468 Kg against 28009 Kg.

Hence aircraft and its performance was not a contributory factor to this incident.

2.2 Operational Analysis

Following Operational/CRM/Human Factors and related contributory factors were deliberated in the event:

CVR/DFDR analysis:

The CVR data analysis shows evidence of first officer handling the flight controls and making an unauthorized supervised landing on Category C airport and the PIC assisting him during approach and landing phases of the flight. The DFDR data analysis clearly indicates that the aircraft flare was initiated at 52 Ft and this was followed by reduction in Thrust. Aircraft pitch attitude continued to increase and speed continued to wash off. Moreover rapid pulling of Control Column prior to touchdown resulted in a pitch attitude of 7.38 degrees. This resulted in a rapid reduction in lift and a hard landing (2.2g) on the runway with its main Wheels

and aft fuselage touching together. According to Airplane Flight Manual/Operations Manual, Pitch attitude greater than 6 Degrees nose up in the Landing Flare may cause the aft fuselage to contact the runway.

Weather Factor:

The weather report issued by Airport Meteorological Dept, Tuticorin around the time of incident(02:30/03:00 UTC) was indicated surface winds 270º /10 Kts, Visibility 7 Kms, Clouds scattered at 10000 feet, QNH 1011 Hpa, Temp 30º, QFE-1008. The prevailing weather was fine and did not contribute to the incident.

Procedures: The PIC was not approved by competent authority for instructional flying on Q400 aircraft. As per Airlines Standard Operating procedures (SOP) supervised landing is not permitted in Tuticorin airfield due to it being a Category C airport. In addition, the DGCA Civil Aviation Requirements also prohibits supervised take-off and landing on Category C airports. There was no clear briefing/discussion by the flight crew on the procedures and responsibilities of Pilot Flying & Pilot monitoring during supervised approach and landing at Tuticorin Airport. As per SOP, the Pilot monitoring shall monitor the flight instruments continuously and make callouts during the final approach and landing to alert the Pilot Flying (PF) of any excessive deviation of flight parameters. The Call out by Pilot Monitoring of the flight parameters exceedances shall be acknowledged by the Pilot Flying (PF). In this case the Pilot monitoring did not monitor the flight instruments continuously and did not give high pitch call out at any time for increased pitch attitude(above 5 deg) during critical phase of the flight just prior to the touchdown. Pilot monitoring did not call out speed deterioration from 114 kts to 102 kts. In addition to the above, the CVR data revealed that the PIC's concern was exiting of the Aircraft on the first intersection taxi exit thus saving of time on a back track.

Both Airplane Flight Manual and Operations Manual also emphasize the important point that the pitch attitude during landing flare must not exceed of 6 deg. nose up.

Sharing of workload in the flight deck: Normally during landing phase, timely and proper integration of flight instrument data along with visual clues on which the pilot-flying relies for vertical guidance into the flight can detect or prevent improper landing on the runway. In this case during approach and landing an unintentional reversal of Command roles took place in the cockpit. The CVR analysis clearly reveals that when the PIC allowed the first officer for supervised landing at Tuticorin Airport, the first officer also seemed to eager to take on the responsibility without any refusal. There was no evidence about separate briefing given by PIC to the first officer prior to approach and landing. The PIC's

instructions to reduce thrust and pulling of control column by the F/O ,just prior to touchdown during the flare led to increased pitch attitude. The increased pitch attitude was not properly monitored by both Pilots specially by the PIC.

Incident Report to ATC: The flight crew did not report any abnormality or tail strike incident immediately after landing to the ATC . The Aircraft Technician informed the ATC, Tuticorin regarding the tail strike incident after the post flight inspection by flight crew. The pilot did not carry out the deactivation of the CVR CB in order to preserve the CVR recording as is required by regulations in cases of incident/accident. Subsequently aircraft technician carried out the CVR deactivation on the advice of airline's Engineering Base.

RWY safety team:-AAI along with airline technician had carried out runway inspection and found red coloured marks with metal strike marks on the runway. There was no apparent damage to the runway surface and no other aircrafts parts, except for a small damaged portion of "touched runway Switch Fairing" .The same was reported to ATC tower by runway safety team after the completion of runway inspection. The runway inspection revealed scratches on runway starting from a distance of 70.6m from the threshold lasting up to a distance of 78.2m from threshold (i.e., the total length of the scratch on the runway is 7.6m).

Damage to aircraft: During post flight inspection of the aircraft it was found that approximately 1.65m X 0.95m scratch marks/skin/abrasion damage were observed beneath the aft portion of the fuselage between cargo compartment 2 and 3 (i.e. X714-X819 and stringer 29P to 29S). The tail strike frangible switch and doublers were damaged.

From the preceding analysis it is inferred that unauthorized landing procedure was carried out by flight crew. The improper handling of thrust and flight controls, and total disregard to SOPs including standard callouts during the final phase of landing. This resulted in high pitch attitude during flare and culminated in hard landing and tail strike on runway 28.

3. CONCLUSIONS:

3.1 Findings:

1. The Aircraft was certified and maintained in accordance with prescribed procedures.

2. The flight crew was certified and qualified to conduct the flight. They had undergone the requisite pre-flight medical examination and were certified as not being under the influence of alcohol.

3. The CG of the aircraft was within the prescribed limits.

4. All navigation and approach aids were functional and were operating normally at the time of incident.

5. The PIC had a total flying hours of 11833:14hrs of which 2225:14hrs were on type. First Officer had a total flying experience of 1461:37hrs and 413:22hrs on type.

6. There was no evidence of defects or malfunction in the aircraft which could have contributed to the incident.

7. The aircraft had valid C of A and CRS.

8. The flight crew did not comply with operator's airfield SOPs.

9. PIC was not approved by DGCA as instructorship on Q400 aircraft and also not permitted to carry out supervised landing on category C Tuticorin airport. First Officer was making approach and landing in this case and the PIC was assisting him from the left hand seat.

10. First Officer was not authorized to do supervised landing on Category C (Tuticorin) Airport. The PIC persuaded the co-pilot to perform the unauthorized landing from the right hand seat. The Co-Pilot had carried out approach and landing as per the instruction of PIC.

11. The Flight crew failed to monitor the instrument references and control the aircraft pitch attitude during the last 50 feet till touchdown, which resulted in tail strike during landing on Runway 28.

12. The pitch call out by pilot monitoring was not given when aircraft pitched above 5 degrees just prior to landing on Runway 28.

13. The abrupt reduction of thrust by flight crew below 50 feet AGL had resulted in loss of airspeed instead of maintaining the correct airspeed, (Vref + wind correction). The final approach speed had decayed from 114 kts to 102 Kts and pitch attitude of 6.94 to touchdown on runway 28.

14. Aircraft touched down with pitch up attitude of 6.94 degrees and vertical "G" of 2.22.

15. The flight crew failed to maintain the desired pitch attitude while landing on RWY 28 due to which aft lower fuselage scrapped the Runway Surface causing damage to the aircraft tail.

16. The Tail strike indication illuminated in the cockpit during landing on runway 28. The flight crew realized the tail touch only by looking at the "Touched Runway" Master Annunciation.

17. The flight crew had carried out post flight inspection and found the aircraft aft fuselage skin damage and frangible touch runway detection switch was broken. The PIC informed the Airlines flight safety department .

18. The Pilot did not report any abnormality or tail strike incident to ATC, Tuticorin after landing at Tuticorin Airport. However, the Aircraft Technician had informed the ATC, Tuticorin regarding the tail strike incident after the post flight inspection by flight crew.

19. The flight crew had failed to deactivate the CVR CB in order to preserve the CVR recording after the engines were shutdown as is required by regulations in cases of incident/accident. Subsequently on the advice of airline's Engineering base, the technician deactivated the CVR.

3.2 Probable cause of the Serious Incident:

The probable cause of the incident is owing to improper handling of the flight & thrust controls by the First Officer while carrying out an unauthorized supervised landing on a Category C airport. The early reduction of power, high pitch attitude just prior to aircraft touchdown resulted into lower aircraft speed and tail strike.

Contributing factors to the incident are:

1. Pilot's failure to scan/monitor the flight instruments and take appropriate & early action to control the aircraft pitch attitude prior to touchdown on runway.
2. Failure of the PIC to take over control from the Co-Pilot at an appropriate stage to correct the decaying speed while landing on the runway.
3. Non-adherence to SOP.

4. Safety Recommendations:

1. The airline shall re-emphasize that flight crew to strictly follow the laid down guidelines/SOP.

2. The airline shall emphasize on adequate flight crew briefings on relevant contents of the Q400 Flight Crew Operating Manual (FCOM) so as to avoid Tail Strike / Tail Scraped incidents.

(Capt. Nitin Anand)
FOI, DGCA
Member, Committee of Inquiry (VT-SUH)

(S. Durairaj)
Senior Air Safety Officer (E)
Member, Committee of Inquiry (VT-SUH)

31/3/14

(Bir Singh Rai)
Deputy Director General, AAIB
Chairman, Committee of Inquiry (VT-SUH)