FINAL REPORT OF SERIOUS INCIDENT TO AIRLINE ALLIED SERVICES LTD CRJ-700 AIRCRAFT VT-RJE AT CHAKERI AIRFIELD, KANPUR ON 20/07/2011

1. Aircraft
   - Type : CRJ-700
   - Nationality : INDIAN
   - Registration : VT - RJE
2. Owner/ Operator : Alliance Air Ltd.
3. Pilot – in –Command : ATPL holder on type
   Extent of injuries : Nil
4. First Officer : CPL Holder qualified on type
   Extent of injuries : Nil
5. Place of Incident : Chakeri Airfield, Kanpur
6. Date & Time of Incident : 20th July 2011 0652UTC(Approx.)
7. Last point of Departure : Delhi
8. Point of intended landing : Kanpur
9. Type of operation : Schedule Operation
10. Crew on Board : 4
    Extent of injuries : Nil
11. Passengers on Board : 55
    Extent of injuries : Nil
12. Phase of operation : Landing
13. Type of incident : Runway Excursion

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY:

On 20/07/2011 M/s Airlines Allied Services Ltd. CRJ-700, VT-RJE, aircraft was operating a scheduled flight from Delhi to Kanpur. There were 55 passengers and 4 crew members on board the aircraft. The aircraft took off from Delhi at around 05:15 UTC.

While inbound to Chakeri, the Commander contacted ATC at around 06:00 UTC and requested latest weather. ATC reported weather as cloudy, overcast, rain with thunder showers and runway surface wet, visibility 2000 meters. At around 06:20 UTC the ATC reported visibility as 800 meters and as a result Commander had to execute 6 to 7 holding patterns and waited for visibility to improve. After holding for about 20 minutes the ATC reported similar weather with visibility improving to 1200 meters. Once the visibility had improved to 1200 meters the aircraft was cleared for VOR-ILS approach, landing runway 27. The VOR-ILS procedures were executed and the aircraft was configured for landing. By Decision Altitude the runway was visible and the approach was continued. While landing the aircraft floated on the runway and made a delayed touchdown past the center marker. After landing, full reverse and ground spoilers were deployed by the crew. However the aircraft kept on rolling and overshot the overrun area and entered into the soft ground area. After the aircraft went off the runway the port side wing had hit the localizer antenna and punctured a hole on the leading edge. After the aircraft came to complete halt the commander informed ATC that they have gone off the runway and required assistance. The passengers were deplaned normally from the aircraft and no emergency was declared. There was no fire. There were no injuries to any of the occupants on the aircraft.

1. FACTUAL INFORMATION.

1.1 History of the flight

On 20/07/2011 M/s Airlines Allied Services ltd. CRJ-700, VT-RJE, aircraft was operating a scheduled flight from Delhi to Kanpur under the command of ATPL license holder endorsed on type with duly qualified First Officer on type. There were 55 passengers and 4 crew members on board the aircraft.

Previous to the incident flight, the aircraft VT-RJE had operated an early morning flight at around 00:30 UTC Delhi-Ranchi-Delhi with the same Commander and landed at Delhi at around 04:00 UTC. There was no snag reported by the Commander on the completion of the flight. Subsequently the aircraft was scheduled for CD-9801, Delhi-Kanpur on 20/7/2011 at around 05:00 UTC. The weather at Delhi was fine, visibility 5 kilometers with clear skies. The aircraft took off for Kanpur at around 05:15 UTC. While inbound to Chekeri, VT-RJE first contacted ATC at around 06:00 UTC and reported ETA as 06:22 UTC, the ATC gave the complete METAR as cloudy, overcast, Rain with thunder showers and runway surface wet, winds variable 04 knots, visibility 2000 meters and confirmed operating minima from Commander. At around 06:15 UTC the visibility dropped to 1500 meters in rain and the same was reported to the aircraft. At 06:20 UTC the visibility dropped to 800 meters and the same was reported to the Commander. At 06:30 ATC again informed the Commander that visibility reported was 800 meters in rain and at that time was raining over airfield. At 06:36 UTC ATC again requested Commander to report endurance. The Commander reported that they could hold for next 20 minutes and thereafter, if required they will divert to Lucknow. At 06:40 UTC the ATC informed the Commander that weather was similar, but visibility had improved to 1200 meters. Thereafter the Commander initiated setting course for overhead for runway 27 ILS approach. ATC cleared for VOR-ILS R/W 27 and informed runway surface condition as "water patched on runway". As per the Commander statement, the VOR-ILS procedure was executed, as per Standard Operating Procedure. On Out bound ILS locking was checked. The aircraft was configured for full flap 45 degrees landing. The LOC/GS was intercepted, on profile. Aircraft was on profile at check heights of 1000', 500', 100'

above minima. The Commander mentioned that, the aircraft was on profile on ILS and all standard callouts were made by the co-pilot. At 500 ft on ILS winds were 5 knots abeam from the left. The ATC had reported Surface winds 5 knots variable.

Both the cockpit crew stated that they saw the runway at decision altitude and continued for landing. The Commander further stated that at approximately 43 feet he retarded throttles levers and round-off for landing was initiated, however the aircraft continued to float and he had to deliberately put down the aircraft and after a few seconds a normal positive landing was made. The first officer had stated that the aircraft made a delayed touchdown past the ATC tower which was near the middle marker. The Commander further stated that the aircraft was kept fully under control along the centre line. Just prior to the exit the aircraft veered right of center line and exited the runway at around 44 knots. After the aircraft went off the runway the port side wing had hit the localizer antenna and punctured a 3 inch hole on the leading edge. After rolling for about 200 feet in the soft ground the aircraft came to final halt position. ATC was informed and requested for assistance. The Engines were switched off normally, since there was no abnormal condition or EICAS warnings/messages. No evacuation was declared and normal deplaning of the passengers was carried out. Post flight procedures/ checks were carried out. There was no fire. There was no injury to any of the occupants on the aircraft.

Figure: Nose Landing Gear completely bogged down in the soft ground.

Figure: Both Main Landing Gears Bogged down in soft ground area

1.2 Injuries to persons.

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
MINOR/ None	Nil	Nil	----

1.3 Damage to aircraft.

- A 3 inch hole on the leading edge of the port wing. Other than this there was no other damage on the aircraft.

Figure: Damage on the leading edge of the port wing

1.4 Other damage: The localizer antenna located at the runway end was broken by the aircraft port side wing.

Figure: Damaged Localizer Antenna

1.5 Personnel information:

1.5.1 Pilot – in – Command:

AGE	: 53 years
Licence	: ATPL holder
Date of Issue	: 13/06/1995
Valid up to	: 22/05/2012
Category	: Aeroplane
Class	: Multi Engine Land
Endorsements as PIC	: CRJ-700 & CRJ-200
	Open rating for all types of airplanes having AUW not exceeding up to 5700 Kgs.
Date of Med. Exam.	: 27/06/2011
Med. Exam valid upto	: 26/12/2011
FRTO Licence No.	: 5367
Date of issue	: 22/11/1994
Valid up to	: 27/08/2012
Total flying experience	: 9670 hours approx
Experience on type	: 3690 hours approx

Experience as PIC on type : 2980 hours approx
Last flown on type : 20/07/2011

Total flying experience during last 180 days : 441:00 hours approx
Total flying experience during last 90 days : 247:33 hours approx
Total flying experience during last 30 days : 45:33 hours
Total flying experience during last 07 Days : 22:30 hours
Total flying experience during last 24 Hours : NIL

1.5.2 Co-Pilot:

AGE : 21 years
Licence : CPL holder
Date of Issue : 10/09/2008
Valid up to : 09/09/2013
Category : Aeroplane
Class : Single Engine Land
Endorsements as PIC : NIL
Date of Med. Exam. : 02/05/2011
Med. Exam valid upto : 01/05/2012
FRTO Licence No. : 11981
Date of issue : 10/09/2008
Valid up to : 09/09/2013
Total flying experience : 480.37 hours
Experience on type : 259.52 hours
Experience as PIC on type : NIL
Last flown on type : 20/07/2011

Total flying experience during last 180 days : 138.12 hours
Total flying experience during last 90 days : 84.14 hours
Total flying experience during last 30 days : 50:12 hours
Total flying experience during last 07 Days : 07:00 hours
Total flying experience during last 24 Hours : NIL

1.6 Aircraft information:

CRJ 700 is a twin engine aircraft fitted with General Electric CF 34-8C5B1 Engine and is manufactured by Bombardier Aerospace, Canada. The aircraft is certified in transport category, for day and night operation under VFR & IFR. The maximum operating altitude is 41,000 feet (12,500 m) and maximum takeoff weight is 33995kgs. Aircraft length is 32.51 meters, wingspan is 23.24 meters and height of this aircraft is 7.57 meters. The Aircraft is approved in the "Transport" category under FAR 29 amendment 16 category B & category A.

Construction:

The structure of the aircraft CRJ 700 is based on Modern Technology and makes wide use of new materials.

The primary structure includes fuselage which is an All Metal, 2024 T3 ALCLAD Aluminium Semi-Monocoque structure that has forward, mid and rear fuselage sections riveted together. The fuselage's has a cylindrical cross section for most of its length. The fuselage main structure consists of components such as Bulkheads, Fuselage frames, Longerons, Stringers and Skin panels. The main wing is an All Metal Airfoil machined Aluminium Alloy with integral Stringer.

The tail structure includes horizontal stabilizer made of aluminium alloy which is a single piece, variable incidence, sweptback structure that turns on two support fittings at the top of the vertical stabilizer. The vertical stabilizer, made of aluminium alloy is a fully cantilevered, swept back structure which attaches the horizontal stabilizer and rudder.

Bombardier CRJ 700 aircraft VT-RJE (MSN. 10029) had been manufactured on 11 Nov. 2001. The aircraft is presently leased to M/s Alliance Air Ltd and maintained by them. The aircraft was registered with DGCA under the ownership of

M/s Alliance Air Ltd on 06.08.2008. The aircraft is registered under category 'A' and the Certificate of Registration No.3769.

The Certificate of Airworthiness Number 4078 under "normal category" sub-division passenger was issued by DGCA on 23.07.2008 and specified minimum operating crew as two. The maximum authorized all up weight is 33995 kgs. At the time of incident the Certificate of Airworthiness was current and was valid upto 11th Nov 2011. The Aircraft was holding a valid Aero Mobile Licence No. A-024/006-RLO (NR) at the time of incident. This Aircraft was operated under Scheduled Operator's Permit No. S-8 which was valid up to 30.04.2013.As on 20th July 2011 the aircraft had logged 15966:09 Airframe Hours.

The Bombardier CRJ 700 Aircraft and its Engines are being maintained as per the maintenance program consisting of calendar period based maintenance and flying Hours/ Cycles based maintenance as per maintenance program approved by Regional Airworthiness office, New Delhi.

Accordingly, the last major inspection '6A' was check carried out at 1200Hrs/02 year at 15889:49 airframe Hrs on 08.07.2011. Subsequently all lower inspections, after last flight inspection and pre flight checks were carried out as and when due before the incident.

The aircraft was last weighed on 01.07.2008 at New Delhi and the weight schedule was prepared and duly approved by the office of Director of Airworthiness, DGCA, New Delhi. As per the approved weight schedule the Empty weight of the aircraft is 19555kgs. Maximum fuel capacity is 8888kgs. Maximum permissible load with 2 pilots, 2 cabin crew, with full fuel and Oil (without passenger) is 29106 Kgs. Empty weight CG is 20.41 meter aft of datum. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing was due on 01.07.2013. Prior to the incident flight the weight and balance of the aircraft was well within the operating limits.

All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine have been complied with as & when due.

Turn Around Inspections are carried out as per approved Turn Around Inspection schedules and all the higher inspection includes checks/inspection as per the manufacturer's guidelines as specified in "PRE" (Maintenance Program) and are approved by the Quality Manager.

The last fuel microbiological test was done on 14.01.2011 at Air India, E-QA & TS division; OIL & Fuel test laboratories, A320 hanger, New Delhi. DGCA approved facility and the colony count was within acceptable limits.

The Bombardier CRJ 700 aircraft is fitted with two high tail mounted Turbofan CF 34-8C5B1 engines manufactured by General Electric, France. The left Engine S/N 965260 had logged 14710:05 Engine Hrs and 9901 cycles respectively and the right Engine S/N 965265 had logged 15764:02 Hrs with 10604 cycles. There was no defect report on the engine on the previous flight.

The status of all Airworthiness Directives as issued by DGCA through mandatory modifications for Aircraft were found to be satisfactory. Prior to the incident flight there was no pending/repetitive defect entered on the Commander Defect Report/Technical Logbook of the aircraft. The certificate of Flight Release was valid prior to the incident flight.

1.7 Meteorological information:

The following is the Met report on the date of incident between 1030 hrs to 1300 hrs

Time (UTC)	Wind Dir	Vis	Weather	Trend	Supp Info
05:00	VRB	6000	MOC	TEMPO RAIN	
05:30	230	5000	MIST RAIN	TEMPO 3000M TSRA	TCU NW 25 KM
05:40	50	2000	MIST LIGHT RAIN CONTINUOUS	TEMPO TSRA	TCU NW 25 KM
06:00	110	2000	MIST LIGHT RAIN CONTINUOUS	TEMPO TSRA	TCU SW 15 KM
06:15	140	1500	MIST LIGHT RAIN CONTINUOUS	TEMPO TSRA	TCU OH
06:20	90	800	HEAVY RAIN CONTINUOUS	TEMPO TSRA	TCU OH
06:30	110	800	HEAVY THUNDER SHOWER	NOSIG	CB OH
06:40	100	1200	THUNDER SHOWER	TEMPO 0800 M	CB OH
06:57	50	1200	THUNDER SHOWER		CB OH
07:00	50	1200	THUNDER SHOWER	TEMPO 0800 M	CB OH
07:15	90	1500	THUNDER SHOWER	NOSIG	CB OH
07:30	110	3000	THUNDER SHOWER	TEMPO 1500 M	CB OH

1.8 Aids to navigation:

There is single runway available at Chakeri, Kanpur which has the orientation 09/27. The ILS is available when the approach is made for runway 27. For runway 09 VOR/DME approach is available. PAPI is available for both sides of the runway. NDB is also available at Chakeri, for approach and landing. Two way VHF communication is available at the airport. The ATC is controlled and manned by Air Force.

1.9 Communications: There was always two ways communication between the ATC and the aircraft.

1.10 Aerodrome information:

Chakeri, Kanpur airfield is a Defence airfield. The operations and ATC are controlled by Indian Air Force. However, the Civil Apron is controlled by Airports Authority of India. It has single runway 09/27 which is 9000 ft long and has runway markers 1 to 9 at 1000 ft interval on the left side. The ATC is located on right side of runway 27 approximately opposite to 5 to 6 markers. The field elevation is about 419 feet. Since it is an Air Force airfield it has arrestor barriers and a soft ground area on either side of the runway to stop the aircraft in case of an overrun. The airfield is equipped to provide VOR/DME approach on either side of the runway. Runway 27 is equipped for making ILS approach and landing. The PAPI is also available for the runway 09/27.

1.11 Flight recorders: The Cockpit Voice Recorder (CVR) and the Digital Flight Data Recorder (DFDR) was downloaded and the following information was available from them

CVR:

1. While approaching into Kanpur the Commander of the aircraft requested the weather updates from ATC Kanpur.
2. Initially the weather reported by ATC was rain with thunder showers and visibility 2000 meters. Later the ATC informed that the visibility had reduced to 800 meters.
3. The Commander informed the ATC that the existing visibility was below his landing minima and he will follow the hold pattern.
4. The Commander also discussed with the First Officer that they had the holding fuel of 24 minutes failing which they had to divert.
5. The ATC informed the Commander that the prevailing weather was the same however the visibility had improved to 1200 meters.
6. Once the visibility had improved to 1200 meters the Commander requested for descent and landing clearance.
7. Subsequently the ATC vectored the aircraft and cleared for ILS approach and landing for runway 27.

8. During final approach at around 1000 feet the runway was not visible, however at decision altitude both the crew announced runway field visible.
9. ATC cleared the aircraft for landing on runway 27 with water patches on the runway, winds variable 05 knots.
10. The Commander called out to First Officer to give height call outs.
11. After touch down the first officer called out speed brakes deployed.
12. The Commander called out to First Officer to apply brakes from his side with full pressure.
13. The Commander informs ATC that the aircraft had gone off the runway and required assistance.
14. Commander told the cabin crew for the deplaning of the passengers.

DFDR:

Tabulated DFDR parameters from 49 ft till Touch Down

REL TIME	RADIO HEIGHT (ft)	GROUND SPEED	AIRSPEED (CAS)	MAGNETIC HEADING (L)	LEFT ENG FAN SPEED (N1)	RIGHT ENG FAN SPEED (N1)	PITCH ATTITUDE
17:37:02	62	147	135.50	- 94.68	62.69	64.88	2.02
17:37:03					66.38	66.38	1.58
17:37:04	49	146	135.25	- 96.66	66.56	68.50	2.29
17:37:05					72.50	72.88	3.16
17:37:06	44	146	135	- 96.21	71.94	71.81	3.43
17:37:07					71.94	72	2.46
17:37:08	44	148	136.50	- 97.65	71.88	69.56	2.20
17:37:09					66.31	65.13	2.64
17:37:10	43	147	135.50	- 97.56	62.56	58.25	3.16
17:37:11					51.50	47.25	3.60
17:37:12	43	145	132.50	- 97.56	43.13	38.75	3.60
17:37:13					36.50	33.69	3.69
17:37:14	42	144	129.25	- 95.22	31.75	30.19	3.52
17:37:15					29.19	30.13	3.87
17:37:16	34	138	124	- 93.51	32.44	36	3.25
17:37:17					41.38	46.44	4.04
17:37:18	22	137	123.25	- 94.41	53.19	47	3.87
17:37:19					50.94	48.63	4.31
17:37:20	9	135	122.50	- 93.15	63	52.88	4.83
17:37:21					63.19	51.06	4.66
17:37:22	0	135	122.25	- 94.68	55.31	43.88	4.75

1. At relative time 17:37:04 aircraft on a normal glide path is at about 49 feet radio height. The speed at this point is about 135 knots and the ground speed is 146 knots.

2. The tail wind component just prior to landing was about 11 knots whereas the aircraft limitations for tail wind and landing into wet conditions are restricted to 10 knots as per the flight manual.

3. From relative time 17:37:04 to 17:37:14 the aircraft floated on the runway for about 10 seconds between 49 to 42 feet. All along this time the tail wind component is around 11 to 12 knots.

4. At relative time 17:37:23 the aircraft makes a touchdown. The reverse thrust is deployed to maximum 70% N1 on both engines.

5. Speed brakes are deployed normally.

6. There is an appreciable shift of the magnetic heading of about 8 degrees to the left of the centreline and is considered to be the point at which the aircraft leaves the concrete surface. At this point the aircraft speed is about 44 knots.
7. As per DFDR the aircraft rolls on the paved surface for about 28 seconds and then veers off to the right of centre line and exit the paved surface at 44 knots.
8. It further rolls for another seven seconds before it comes to final stop.
9. Positive deceleration is recorded during the landing roll.
10. As per DFDR analysis from touch down to the end of paved surface the aircraft rolled for about 4235 feets in 28 seconds and it further rolls for about 201 feet in 07 seconds before it comes to complete halt.

1.12 Wreckage and impact information.

There was no major damage to the aircraft however while exiting the runway the port side wing had hit the localizer antenna which punctured a hole of approximately 3 inches on the port side leading edge. Other than this there was no damage to the aircraft.

1.13 Medical and pathological Information:

Both the Commanders had undergone preflight medical check prior to the flight and was found satisfactory. After the incident post flight medical check was also carried out at the Air Force facility and was found satisfactory.

1.14 Fire:

There was no fire after the incident.

1.15 Survival aspects:

The incident was survivable.

1.16 Tests and research: NIL

1.17 Organizational and management information:

Airlines Allied Services Ltd. is a fully owned subsidiary of Air India Ltd. which has a separate Air Operators Permit. Presently Airlines Allied Services Ltd. has a fleet of 11 operational aircrafts, 04 CRJ-700 and 07 ATR-42 aircrafts. The B737-200 aircraft in the fleet are grounded from operation. It basically caters for the feeder's routes for Air India.

1.18 Additional information:

1.18.1 At the time of landing the weight of the aircraft was 27 ton. As per Quick Reference Hand Book for CRJ-700 Under wet/ contaminated runway landing data for landing weight 27 Ton the runway required to stop the aircraft is around 5000 ft. As per the Flight Crew Operating Manual of CRJ 700 the maximum tail wind component for this aircraft for landing is restricted to 10 knots. The total runway

length available at Chekari, Kanpur is 9000 ft. As per the statement of the ATC controller and the first officer the aircraft landed after the middle marker which is around 4500 ft from runway end. And the remaining runway was not enough to stop the aircraft on the runway under the prevailing rainy conditions. The aircraft exited the runway at around 44 knots and entered into soft ground and thereafter rolled for another 201 ft before it came to final halt.

Figure: Aircraft rolled over into the soft ground area

1.18.2 The total flying experience of the Commander is around 9670 hrs. He was made the check pilot by the company on 16/04/2010. He has around 110 hrs of instructional flying on CRJ 700 aircraft and around 1737 hours as total instructional hours. Prior to this incident he was not involved in any of the incident/violations.

1.19 Useful or effective investigation techniques: NIL

2. ANALYSIS

2.1 Serviceability of the aircraft:

CRJ 700 aircraft VT-RJE MSN.10029 was manufactured by M/s Bombardier Aerospace, Canada in 2001. The aircraft is registered under the ownership of M/s Alliance Air, the Certificate of registration No. 3769, under category' A' was issued on 06.08.2008. On the day of incident the aircraft VT-RJE had logged 15966:09 airframe hours.

The aircraft was holding a valid Certificate of Airworthiness Number 4078 issued under normal category sub-division passenger by DGCA and was valid up till 11th November 2011.The aircraft is holding Aeromobile License No. A-024/006-RLO (NR) and was valid on the day of incident. This aircraft was operated under Non-Scheduled Operator's Permit No. S-8 and which was valid till 30.04.2013. Prior to flight the Aircraft was holding a valid Certificate of Flight Release.

The aircraft was last weighed on 01.07.2008 at New Delhi and the next weighing was due on 01.07.2013. There was no major modification carried out on the aircraft affecting weight & balance. The aircraft and Engines were being maintained under continuous maintenance as per maintenance program consisting of calendar period based maintenance and flying Hours/ Cycles based maintenance as per maintenance program approved by Regional Airworthiness office, New Delhi.The last major inspection 1200 Hrs/02 year inspection was carried out at 15889:49 airframe hours/10691cycles on 08.07.2011. Subsequently all lower inspections/schedules, till the last flight prior to incident was carried out as per the maintenance programme.

All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine were found complied with. Turn Around Inspections were carried out as per approved schedules and all the higher inspections including checks/inspection as per the manufacturer's guidelines as specified in "PRE" (Maintenance Program) were complied with and same were found approved by the Quality Manager.

The last fuel microbiological test was done on 14.01.2011 at Air India, E-QA & TS division; OIL & Fuel test laboratories, A320 hanger, New Delhi. DGCA approved facility and the colony count was within acceptable limits.

2.1.1 Examination of the aircraft at the site revealed that it was confined around its final rest position and there was no in-flight disintegration of any part of the aircraft. After the aircraft exited the runway the portside wing hit the localizer antenna and punctured a hole on the leading edge of the wing and both the main landing gears and the nose gear had bogged down in the soft ground. Other than this there was no other visible damage on the aircraft. After the aircraft was retrieved from the soft ground, the brakes and wheels of both the landing gears were removed and send to the wheel and brake shop for investigation and were found to be satisfactory. The nose landing gear was also inspected and found satisfactory. DFDR analysis was carried out and it was observed that after touchdown both the thrust reversers deployed normally to maximum and the speed brakes also deployed normally for decelerating the aircraft. The parameter for pedal braking is not recorded in DFDR. However prior to the incident flight the aircraft had operated an early morning flight Delhi-Ranchi-Delhi and no snag was reported on the aircraft.

In view of the above, it is inferred that the serviceability of the aircraft is not a factor to the incident.

2.2 Weather:

The weather at Delhi was fine with visibility 5 kilometers with clear skies. The aircraft took off for Kanpur at around 05:15 UTC. While inbound to Chakeri, VT-RJE first contacted ATC at around 06:00 UTC and reported ETA as 06:22 UTC, the ATC gave the complete METAR as cloudy, overcast, Rain with thunder showers and runway surface wet, winds variable 04 knots, visibility 2000 meters and confirmed operating minima from Commander. The Commander informed ATC that his landing minima was 1200 meters. At around 06:15 UTC the visibility dropped to

1500 meters in rain and the same was reported to the aircraft. At 06:20 UTC the visibility dropped to 800 meters and the same was reported to the Commander. At 06:30 UTC ATC again informed the Commander that visibility reported was 800 meters in rain. At 06:36 UTC ATC again requested Commander to report endurance. The Commander reported that they could hold for next 20 minutes and thereafter, if required they will divert to Lucknow. At 06:40 the MET reported visibility as 1200 meters in rain with similar weather. Thereafter the Commander initiated setting course for overhead for runway 27 ILS approach. ATC cleared the aircraft for VOR-ILS R/W 27 and informed runway surface condition as "water patched on runway". At 500 ft on ILS winds were 5 knots abeam from the left however the ATC had reported Surface winds 5 knots variable. Both the cockpit crew stated that they both saw the runway at decision altitude and hence continued for landing. This was also confirmed by the CVR.

As per the DFDR analysis it was observed that at around 43 feet with a Vref of 128 knots the throttles were retarded and the aircraft was flared for landing. At that point the aircraft speed was around 135 knots and the ground speed was 146 knots which implies that at the time of landing the tail wind component was around 11 knots.

From the foregoing, it is inferred that weather is a contributory factor to the incident since the Commander continued for landing in marginal visibility conditions in rain with water patched on the runway, accompanied with a tail wind component of 11 knots which resulted into late touchdown on the runway and eventually resulted into the incident.

2.3 Pilot handling of the aircraft:

Previous to the incident flight, the aircraft VT-RJE had operated an early morning flight at around 00:30 UTC Delhi-Ranchi-Delhi with the same Commander and landed at Delhi at around 04:00 UTC. There was no snag reported by the Commander on the completion of the flight. Subsequently the aircraft was scheduled for CD-9801, Delhi-Kanpur on 20/7/2011at around 05:00 UTC. The

weather at Delhi was fine, visibility 5 kilometers with clear skies. The aircraft took off for Kanpur at around 05:15 UTC. While inbound to Chekeri, VT-RJE contacted ATC and requested current weather. ATC reported weather as Rain with thunder showers and runway surface wet, winds variable 05 knots, visibility 1200 meters. However, before the aircraft reached overhead the visibility dropped to 800 meters and same was reported to the Commander. After holding for about 20 minutes the visibility improved to 1200 meters and subsequently ATC cleared the aircraft for VOR-ILS runway 27 and informed runway surface condition as "water patched on runway". As per the Commander statement, the VOR-ILS procedure was executed, as per Standard Operating Procedure. On Out bound ILS locking was checked. The aircraft was configured for full flap 45 degrees landing. The LOC/GS was intercepted, on profile. Aircraft was on profile at check heights of 1000', 500', 100' above minima. The Commander mentioned that, the aircraft was on profile on ILS and all standard callouts were made by the co-pilot. At 500 ft on ILS winds were 05 knots abeam from the left. The ATC had reported Surface winds 05 knots variable.

Both the cockpit crew saw the runway by decision altitude and continued for landing. The Commander at approximately 43 ft AGL retarded throttle levers and initiated for landing, however the aircraft continued to float and he had to deliberately put down the aircraft and after a few seconds a normal positive landing was made past the middle marker. After landing maximum thrust reversers and speed brakes were deployed to stop the aircraft. The Commander realizing that the aircraft was not decelerating fast and runway end was nearing he applied full pedal brakes to stop the aircraft, however the aircraft kept on rolling and exited the runway at around 44 knots of speed. As per DFDR analysis after landing positive declaration was recorded. The same was verified by the DFDR.

The Commander kept the aircraft under control along the centre line, however just prior to exiting the runway, the aircraft went to the right of the center line and exited the runway into the soft ground area and stopped. ATC was informed and requested for assistance. The Engines were switched off normally, since there was

no abnormal condition or EICAS Warnings/messages. No evacuation was declared and normal deplaning of the passengers was carried out. Post flight procedures/ checks were carried out by the cockpit crew.

As per the statement of the ATC controller he had observed that the aircraft had touched down after the middle marker and he had anticipated that the aircraft may not be able to stop safely on the left over landing distance available to him. He had infact alerted the safety services for any exigencies. Soon after, the Commander transmitted rolled over the arrester net and nose wheel collapsed, the safety services were activated and they reached the site in time and initiated rescue operation.

From the above it is inferred that during landing the aircraft floated for long and made delayed touchdown past the middle marker as a result the remaining runway was not enough to stop the aircraft on the runway surface since the remaining runway was less than the minimum required under wet runway conditions. The aircraft over ran the runway and entered into soft ground and resulted into an incident. Hence handling of the aircraft by Commander is a contributory factor to the incident.

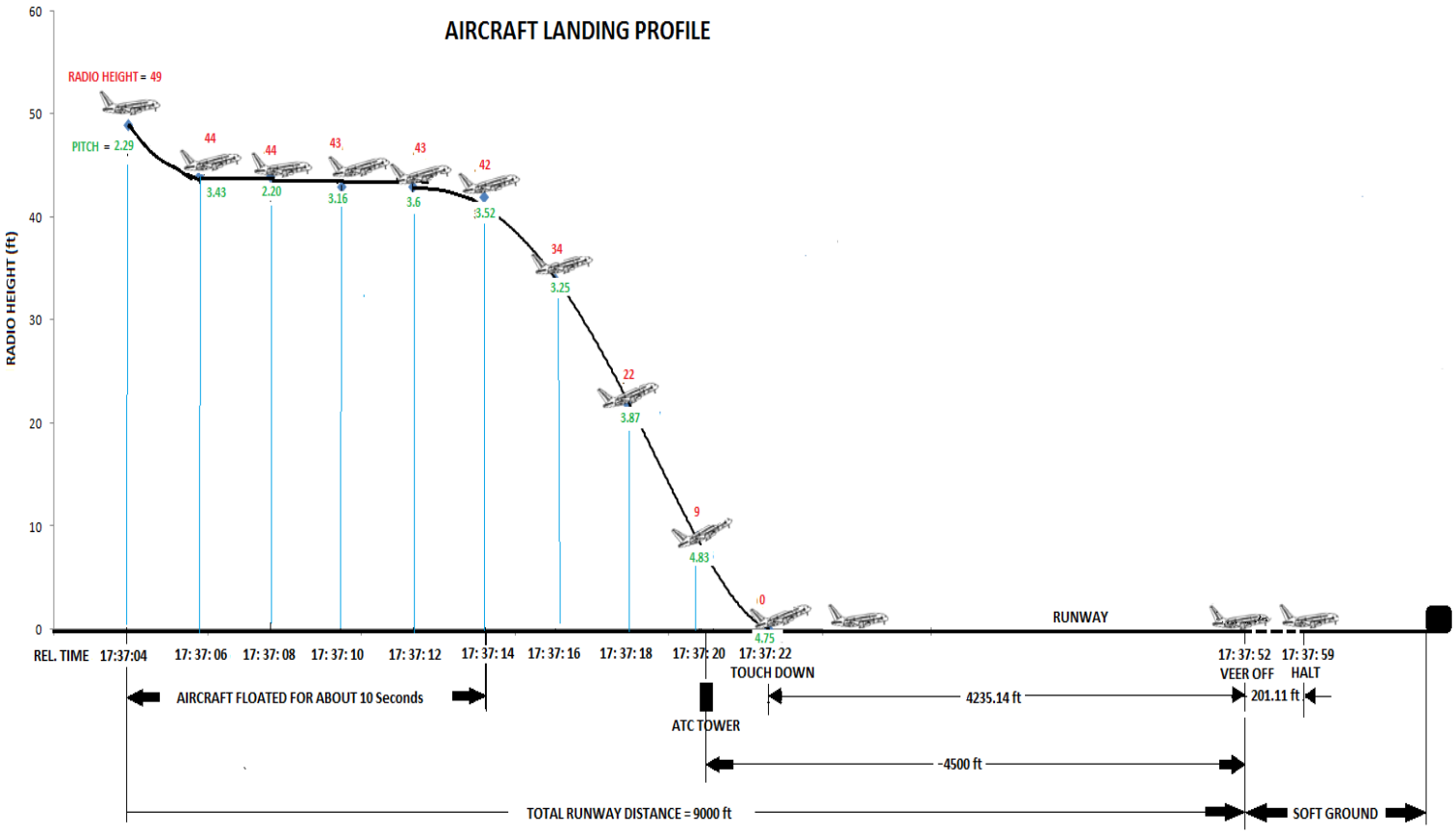
2.4 Circumstances leading to the Incident :

Airlines Allied Services Ltd. CRJ-700 aircraft, VT-RJE was operating a flight CD-9801, Delhi-Kanpur on 20/7/2011 at around 05:00 UTC. The weather at Delhi was fine, visibility 5 kilometers with clear skies. The aircraft took off for Kanpur at around 05:15 UTC.

At around 06:40 UTC ATC informed that the visibility has improved to 1200 feet in rain and cleared the aircraft for landing for VOR-ILS runway 27 and informed runway surface condition as "water patched on runway". As per the Commander

statement, the VOR-ILS procedure was executed, and the aircraft was configured for full flap 45 degrees landing.

As per the DFDR analysis it was observed that at around 43 feet with a Vref of 128 knots the throttles were retarded and the aircraft was flared for landing. At that point the aircraft speed was around 135 knots and the ground speed was 146 knots which implies that at the time of landing the tail wind component was around 11 knots. The winds reported by the tower at the time of landing was 05 knots variable. As per the Flight Crew Operating Manual of CRJ 700 the maximum tail wind component for this aircraft for landing is restricted to 10 knots. Once the power levers were retarded the aircraft floated for about 10 seconds before the Commander landed the aircraft. Thereafter the aircraft rolled on the paved surface for about 28 seconds and then Veered off to the right of center line and exited the runway at around 44 knots and then rolled for another seven seconds before it came to final stop. Speed brakes and thrust reversers were deployed normally and Positive deceleration is recorded by DFDR during the landing roll.



The landing weight of the aircraft was 27 ton. As per the Quick Reference Handbook of CRJ-700 aircraft for wet/contaminated runway, the actual landing distance required with full flaps is around 5000 feet. The total runway length available at Chakeri, Kanpur is 9000 ft. As per the statement of the ATC controller and the first officer the aircraft landed past the middle marker which is around 4500 ft from runway end, the remaining runway was not enough to stop the aircraft on the runway under the prevailing rainy conditions, as a result the aircraft exited the runway and entered into soft ground.

3 CONCLUSIONS:

3.1Findings:

a) The Certificate of Airworthiness and the Certificate of Registration of the aircraft was valid on the date of incident.

b) The certificate of flight release was valid on the day of incident.

c) Both the pilots were appropriately qualified to operate the flight.

d) All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine were found complied with.

e) Prior to the incident flight the same Commander had operated an early morning flight Delhi-Ranchi-Delhi and there was no snag reported on the aircraft by the Commander.

f) At 0640 UTC ATC informed VT-RJE that visibility improved to 1200 meters in rain and subsequently cleared the aircraft for VOR-ILS runway 27 and informed runway surface condition as "water patches on runway".

g) The VOR-ILS procedure was executed, as per Standard Operating Procedure by the operating crew.

h) At decision altitude both the cockpit crew sited the runway and continued the landing.

i) At around 43 feet with a Vref of 128 knots the throttles were retarded and the aircraft was flared for landing. At that point the aircraft speed was around 135 knots and the ground speed was 146 knots which implies that at the time of landing the tail wind component was around 11 knots. The winds reported by the tower at the time of landing was 05 knots variable. The aircraft floated on the runway for about 10 seconds before touchdown.

j) As per the statement of the First Officer and ATC Controller the aircraft landed past the middle marker.

k) The landing weight of the aircraft was 27 ton. As per the Quick Reference Handbook of CRJ-700 aircraft for wet/contaminated runway, the actual landing distance required with full flaps is around 5000 feet

l) The total runway length available at Chekari, Kanpur is 9000 ft. since the aircraft landed past the middle marker which is around 4500 ft from runway

end. The remaining runway was not enough to stop the aircraft on the runway.

m) After landing the speed brakes deployed normally and maximum reverse thrust was applied by the Commander. Positive deceleration was recorded in DFDR.

n) The aircraft rolled for 28 seconds on the paved surface and then exited the runway at around 44 knots and then rolled for another 07 seconds on the soft ground before it came to final halt.

o) There was no injury to any of the occupants on board the aircraft.

p) Weather was a contributory factor to the incident.

3.2 Probable cause of the Incident:

The commander while landing in marginal visibility condition in rain on a wet runway with water patches floated on runway after the threshold and made a delayed touchdown.

Aircraft experiencing tail wind higher than the aircraft limitation during landing is a contributory factor to the incident.

4 **SAFETY RECOMMENDATIONS**:

1. Airlines to lay down less Cross Wind/Tail-wind limits than the manufacturers in their Operation Manual.
2. During performance refresher more emphasis should be laid in landing distances under wet/contaminated runway.
3. All incident/accident to be discussed/reviewed during refreshers/CRM course.
4. Go Around policy to be revised and amended in their Training/Operations Manual as 'Non-Punitive' policy.
5. During PPC/IR checks, simulator check & refresher to include for heavy rain adverse weather, tail/cross wind exercise, training manual to ensure inclusion of this policy.
6. Hqrs may take appropriate action against the operating crew as deemed fit.

Place: New Delhi
Date: 18.10.2011

(A. X. Joseph)
Senior Air Safety Officer (E)
Inquiry officer to VT-RJE