AV.15103/005/2011-AS/2011

REPORT
OF
COMMITTEE OF INQUIRY

ACCIDENT TO AIRBUS A320 AIRCRAFT A9C-AG OF
M/S GULF AIR AT COCHIN INTERNATIONAL AIRPORT
ON 29TH AUGUST 2011

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REPORT ON ACCIDENT TO M/S GULF AIR A-320-214 AIRCRAFT, REGN:A9C-AG, FLIGHT GFA 270 (BAHRAIN-COCHIN) AT COCHIN ON 29TH AUGUST 2011

SYNOPSIS

On 29th August 2011, Gulf Air Flight No. 270 experienced a Runway Excursion whilst landing at Cochin Airport (VOCI/COK), at 22:24 UTC GF-270 was a scheduled passenger flight operating the Bahrain-Cochin Sector with a total of 143 personnel plus 1 infant (including 2 Cockpit and 4 Cabin Crew). During landing the Aircraft touched down towards the right edge of Runway 27 and went on the soft shoulder. The aircraft covered a distance of 1235 mtrs. from the threshold before coming to a halt. All passengers were evacuated safely and there were no injuries. Fire did not occur.

1. Factual information:

1.1 History of the Flight

On 29th August, 2011 M/s Gulf Air A-320-214 aircraft, Regn: A9C-AG operated scheduled passenger flight GFA 270 sector BAH-COK experienced a runway excursion while landing on RWY 27 with a Nose Landing Gear(NLG) collapse at about 22:25 UTC in CIA,Cochin,India.

1.2 Injuries to persons

Injuries	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	Nil	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil	Nil
Minor	Nil	Nil	07	Nil	07

1.3 Damages to the aircraft

1.3.1 Major Damages:

a) NLG found sheared and collapsed
b) Steering Actuator jammed into the fuselage skin
c) NLG doors broken and damaged
d) Skin damage and buckling observed up to VHF antenna
e) LH VHF antenna found broken
f) Slush and mud ingestion observed in the avionic compartment ventilation inlet.
g) Visual detailed inspection of the lower forward fuselage could not be done as the aircraft was resting on this part of the fuselage

1.3.2 Main Landing Gear:

a) LH MLG fixed door found cracked at the bottom edge by approximately 3".
b) Few brake hydraulic lines and electrical lines were found damaged.
c) A small dent observed on lower edge of the LH MLG door.
d) Scratches observed on RH MLG door
e) MLG doors found open

1.3.3 Bottom Fuselage:

a) Belly fairing near the forward portable water drain panel found damaged approximately 2 ½' x ¾'.
b) Slush and mud ingestion observed between belly fairing and fuselage.
c) Slush and mud ingestion observed into the air-conditioning panel inlets.

1.3.4 Wings

a) Both landing light seal beams found broken.
b) Slush and mud ingestion observed all along the wings

1.3.5 Wheel well

Slush and mud ingestion observed inside the wheel well and hence detailed visual inspection could not be carried out.

1.3.6 Engines

a) RH & LH engine nose cowl torn, buckled and crushed at the bottom.
b) Few of the RH engine blades found shingled.
c) Slush and mud ingestion observed into both engines.

1.4 Other Damages

The aircraft had reportedly hit 4 – 5 RWY lights and damaged them.

1.5 Personnel Information

1.5.1 Pilot-in-Command

Licence No:	BAH- P1240
Nationality:	Bahrani
Date of Birth:	21st February 1976
Ratings:	Multiengine Land P1: A320 P2:A330, A340

Flying Experience:

Total: 7000 hours
PIC (on type): 1200 hours
Last Date of Recurrent
Training : 07th July 2011
Medical Certificate : Class-I, 23rd September 2010

1.5.2 Co- Pilot

Licence No: BAH- P1842
Nationality: Bahrani
Date of Birth: 26th January 1974
Ratings: Multiengine Land
P2: A320
Flying Experience:
Total: 3000 hours
Last Date of Recurrent
Training : 15th March 2010
Medical Certificate: Class-I, 21st October 2010

1.6 Aircraft Information

A-320 MSN4188 was delivered on the 8th February 2010.

Operator	GFA				
A/C Model	320-214	MSN	4188	A/C Registration	A9C-AG
Flight Hours	4758	Flight Cycles	2301		
Engine Model	CFM56-5B4/3				

1.7 Meteorological Information

Time(UTC)	Wind	Visibility	Weather	Clouds	Temp	QNH	Trend
21:30	290/05kts	3000M	MOD DZ	SCT1000ft BKN8000ft	26	1008	No sig
2200	290/05kts	3000M	HZ/RERA	SCT1000ft BKN8000ft	26	1008	No sig
2215	-	2000M	MOD RA	SCT800ft SCT1500ft OVC8000ft	-	-	-
2230	040/10kts	4000M	MOD DZ	SCT800ft SCT1500ft OVC8000ft	26	1007	Tempo Vis 2000M in RA

1.8 Aids to Navigation

a. DVOR I - CIA VOR
b DVOR II - CIBVOR
c. Localiser R27
d. Glidepath R27
e. Outermarker R27
f. NDB

1.9 Communication

VHF Communication fecilities

Surface Movement control	121.75 MHz
Tower	118.8
Approach	119.75
Distress	121.5
DAVIS	126.2

1.10 Aerodrome Information

1.10.1 GENERAL INFORMATION

VOCI
Cochin International Airport

Location	:	045^{o} , 28 kms from Ernakulam South Railway Station
Geographical co-ordinates	:	10^{0} 09'14" North 076^{0} 24' 25" East (WGS-84)
ARP Elevation	:	9.22 m (30 ft) Magnetic variation 1^{o} W
Runway threshold elevation	:	Runway 09 – 28 ft Runway 27 – 30 ft
Aerodrome reference temperature	:	29.6^{o} C
Aerodrome beacon	:	15 white and 15 green flashes per minute

1.10.2 AERODROME DIMENSIONS AND RELATED INFORMATION

a) RUNWAY

Rwy Desig. No.	True Bearing	Lngth (m)	Width (m)	THR co-ordinates	Surface type	Slope %	OFZ	PCN
09	088	3400	45	$10^0$09'01.96" N $76^0$23'06.00" E	Asphalt Concrete	0.155 from 09	No obstacles	60/F/B/W/T
27	268	3400	45	$10^0$09'06.05" N $76^0$24'57.66"E	Asphalt concrete	0.063 from 27	No obstacles	60/F/B/W/T

b) STRIP, RESA, STOPWAY

		Length (m)	Width (m)	Surface Type
Runway Strip		3580	300	Grass / Graded
RESA	**09**	90	300	Grass / Graded
	27	90	300	Grass / Graded
Stopway	**09**	NIL		
	27	NIL		

c) TAXIWAY

Taxiways	Width	Surface Type	PCN	Edge lights
	23 m with 10.5 m shoulder on each side	Asphalt Concrete	60/F/B/W/T	Provided
B				Do
C				Do
D				Do
E				Do
C 1				Do
C 2				Do
C 5				Do
C 3*			60 F/B/W/U	Do
C 4				Do
H				Do

* - Shoulder and fillets as per Annex -14 standards for Rapid Exit Taxiways

d) APRON

One Apron of size 1040m X 125m with PCN value of 65/R/B/W/T is provided for all aircraft, International, Domestic and Cargo. The Aircraft mix possible on the apron is as follows.

STAND NO.	Type of aircraft based on maximum wingspan that can be accommodated
1A, 1,2,3	Upto B-747
4,5	Upto A-300
6	Upto B-737-800
7	Upto A 320
8	ATR-72, EMB-170
9	Upto B-737-800
9A	Upto DO-228
10,11,12,13,14,15	Upto B-737-800

e) CLEARWAY : Not Provided

f) VISUAL AIDS :

Runway	**09**	Simple Approach lights, PAPI, Threshold lights HIRL, End lights HIRL
	27	Cat-1 Approach lights, PAPI, Threshold Lights HIRL, End lights HIRL
Taxiway		Edge lights Blue MIRL
Apron		Blue edge lights MIRL, Apron Flood lights
Runway markings		Threshold, Aiming point, Centre line, Touch Down Zone, Runway Edge
Taxiway markings		Taxiway Edge, Center Line, Runway Holding position, Intermediate Holding position, DVOR checkpoint
Other visual signs		Mandatory Sign Runway 09 & 27 with ILS Category, Information Sign Taxiway A, B, E, H, C, C1, C2, C3, C4, C5 & D, Isolation Parking Bay, Aerodrome Reference Point
Apron Markings		Stand guideline markings, Aircraft Stand markings, Apron Safety lines, Apron boundary, Vehicle lane markings, Fuel hydrant marking, Aerobridge Movement Area, Equipment Staging Area, Obstruction marking on structures
Docking Guidance system		Laser based Visual Docking Guidance System for Aircraft Stands 1 to 5
Standby Power for lighting		Powered through UPS system ensuring zero-changeover. Standby power supply with changeover time within Cat-1 requirement of 15 seconds.

g) VOR CHECK POINT: Taxi Holding position (C2)

VOR 113.5 087° 1.2 NM

h) Standard Taxi route: Entering runway via Rapid Exit Taxiway C3 not allowed.

i) Geographical co-ordinates of each threshold:

Threshold 09	10^0 09'01.96" N	76^0 23'06.00" E
Threshold 27	$10^0$09'06.05" N	$76^0$24'57.66" E

j) Geographical co-ordinates of appropriate taxiway Centre line: Not provided

k) Geographical co-ordinates and top elevation of significant obstacles in approach and take off areas.

Runway 27 - Clear to 1:50 (2%) from Runway strip edge

Runway 09 - Clear to 1:40 (2.5 %) from Runway strip edge

l) Pavement Surface Type and Bearing Strength

RWY 09/27	Asphalt concrete	60/F/B/W/T
Taxiway	Asphalt concrete	60/F/B/W/T and 60/F/B/W/U*
Apron	Concrete	65/R/B/W/T and 60/F/B/W/U**

* Refer section 3.2 c

** Refer section 3.2 k

m) Pre-flight Altimeter check location: On apron, on each aircraft parking stands Elevation 26.09 ft AMSL (Ref. Section 3.2k)

n) RUNWAY DECLARED DISTANCES

RWY	TORA	TODA	ASDA	LDA
09	3400m	3400m	3400m	3400m
27	3400m	3400m	3400m	3400m

o) Airport Rescue and Fire Fighting Services Category:

Maintained at Category - 9

1.11 Flight Recorders

DFDR analysis provided by BAE is appended along with report as Annexure- A.

1.12 Wreckage and Impact Information

Nil

1.13 Medical and Pathological Information

1.13.1 To detect for the consumption of alcohol, post incident Breath analyzer Test was conducted on both cockpit crew and same was found to be negative.

1.13.2 Medical treatment was given to 07 pax at M.I room by CIAL doctor immediately after the occurrence.

1.13.3 One passenger was admitted in Hospital as he had right angle fracture, fracture to 6 ribs, and stitches in left elbow. He was hospitalized till 11-09-11 and later discharged and was advised to take rest till 28-09-11.

1.14 Fire

No fire was reported

1.15 Survival Aspects

All POB-143 + 1 infant were evacuated through escape slides of L1,L2,R1,R2 doors and both RH over wing window exits. They were further assisted by CIA rescue team and later taken to airport terminal building safely.

1.16 Tests and Research

Nil

1.17 Orgainisation and Management Information

Nil

1.18 Additional Information

Nil

1.19 Useful and effective Investigation Techniques

Nil

2. ANALYSIS

At 1000' AAL (22:22:32) both APs and FDs were engaged in LOC (track) and G/S (track). A/c was in full landing configuration. Drift angle was 4° (A/c heading 266°).
APs were disconnected at approx. 670 feet on RA (22:23:02) FDs were kept engaged in G/S and LOC. At 500 ft. (22:23:18) the A/c was on G/S and LOC.
From 200 ft. AAL the a/c started banking to the right (max 4°) and the LOC deviation increased from 10 micro Amperes at touch down. The Drift Angle reduced progressively to reach almost zero at touch down. The a/c at this stage was side slipping to the right with application of cross controls. The consequent result was that the a/c was now deviating from the R/W Axis (Centre Line). At 22:24:03 the a/c had touched down on both Main Landing Gears with no lateral drift but with a deviation of 2° 17' wrt the R/W Axis, and 21m (30 micro Amperes) from the Centre Line. From the tyre marks on the R/w it was established that the left main gear wheels touched the R/W at 12.8 m from Centre Line at 459 m from threshold of R/W 27. (Ref. Appendix B) with the A/c of the track by 8.75 m, the right wheel has touched down at approx. 21.5 m, which is 1.5 m from the R/W edge and within 3" has run over R/W Light R220. In 7" from touch down the right wheels have entered the soft R/W shoulders. The Left wheels have left the R/w at a distance of 570 mtrs. from the threshold. PIC had applied corrective Left rudder, however it had not been effective due to A/c being on the soft shoulders and diminishing CAS. Auto brakes did not operate as the deceleration was 0.26 g in 4 seconds. Auto brake target deceleration is 0.17 g. The a/c rolled on the soft shoulders till it stopped 1235 m from the R/w threshold and 660 m from the touch down.

3. CONCLUSIONS

3.1. FINDINGS

From the flight analysis the following aspects emerge:-

a) Aircraft was on stabilised ILS approach at 1000' AGL with both APs and FDs engaged in LOC track (Lateral mode) and G/S track (vertical mode). APs were disengaged at 670' AAL.
b) Passing 200' AGL the aircraft was banking to the right and the drift angle of 4° left progressively started reducing. A side slip condition to the right was initiated which led to a deviation from the R/W axis (Centre line). Initially the deviation was 10 micro Ampere and increased to 30 micro Ampere (equal to 21m from Centre Line) at touch down. The a/c

right wheel touched 25 m from Runway centre line on the hard shoulder with a deviation of 2°17' from R/W axis.

c) The A/c went off the R/W pavement onto the soft shoulders and came to a halt at 1235m from the R/W threshold (The A/c had landed 469 M away from threshold).

d) The PIC who was at the controls was not able to appreciate the induced deviation below 200' AAL and continued to maintain a right bank (2°-4°). According to the PIC, on short finals there was an increase of downpour reducing visibility considerably. Visibility reducing to 2000 mtr. In rain, was the met report communicated to Pilots from Air Traffic Control. This was well within the Pilot limitation.

e) Till touch down PM (Pilot Monitoring) kept calling "Continue, Localizer Nice, Profile Nice and Continue." After touch down he kept repeating "Maintain Centre Line."

f) The PIC at no stage considered a "go around" action or "diversion." The PM call after touch down of "maintain centre line" was too little too late and not forceful. Obviously, the PIC was not aware of the relative position of the Centre Line. The call could have stated that the Centre Line was well to the left.

g) There was no fire. 07 passengers had minor injuries.

h) R/W Safety Services were provided promptly and in proper time.

i) R/W Centre Line lights are under installation and would be operational by Dec.2011 as per CIAL.

j) R/W friction measurement checks are being done regularly and the values reported are within limits. Rubber deposits have been cleared around touch down areas.

k) Consulting Process with stake holders has been efficiently functioning. Regular meetings of various committees have been held and Minutes forwarded to DGCA.

l) There was no indication of aqua planning.

3.2 CAUSE

The Runway Excursion was caused due to an error of judgment of the PIC during which was due to loss of situational awareness during reduced visibility conditions.

4.0 SAFETY RECOMMENDATIONS

4.1 Monsoon Conditions Training recommended by DGCA vide CAR, Section 8, Series C, Part-I dated 17-08-2011 may also be communicated to international Operators operating in India.

4.2 RVR (Drishti) eqpt. has not been functioning regularly. The equipment is manufactured by NAL. IMD may ensure that NAL is able to ensure serviceability for effective performance. This is applicable to all airfields where such equipment is installed.

4.3 Gulf Air may address the issue of CRM. Appropriate and focused interjection by PM whilst PIC was deviating from R/W axis during short finals, may have averted the incident.

4.4 Applying cross control and side slipping inadvertently on short finals, resulting in deviation from R/W Axis is a dangerous occurrence. Skill levels with reference to this aspect need attention.

4.5 Correct utilisation of FD to avoid large deviation of LOC, should be advocated.

4.6 After such incident when preliminary investigation is completed and there is no indication of maintenance or technical failure, it must be ensured by DGCA that the aircraft be released at the earliest. Apart from financial loss to the operator, high tech. equipment (Computers, Avionics etc.) exposed to weather for long durations, could cause irreparable damage.

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GLOSSARY OF ABBREVATIONS USED IN THIS REPORT

BAH	:	Bahrain
BAE	:	Bureau d'Enquetes et d' Analyses
BKN	:	Becoming
CIA	:	Cochin International Airport
CAS	:	Computer Airspeed
COK	:	Cochin
DFDR	:	Digital Flight Data Recorder
GFA	:	Gulf Air
HZ	:	Haze
Kts.	:	Knots
L	:	Left
LH	:	Left Hand
M	:	Meter
MLG	:	Main Landing Gear
M.I.Room	:	Medical Inspection Room
MSN	:	Manufacturer Serial Number
MOD	:	Moderate
NLG	:	Nose Landing Gear
OVC	:	Overcast
PIC	:	Pilot in Command
POB	:	Persons on Board
PM	:	Pilot Monitoring
R	:	Right
RA	:	Rain
RH	:	Right Hand
RWY	:	Runway
SCT	:	Scattered
UTC	:	Universal Co-ordinated Time
VIS	:	Visibility