AAI Case Reference: 02/2012

AIR ACCIDENT INVESTIGATION SECTOR

PRELIMINARY

SERIOUS INCIDENT INVESTIGATION REPORT

Runway Misalignment

Airbus 330-243

A6-EYE

Abu Dhabi International Airport

30th January, 2012

General Civil Aviation Authority
of
United Arab Emirates

Air Accident Investigation Department
General Civil Aviation Authority
United Arab Emirates

SERIOUS INCIDENT

NAME OF THE OPERATOR	:	Etihad Airways
MANUFACTURER	:	Airbus Industries
AIRCRAFT MODEL	:	A330-243
NATIONALITY	:	UAE
REGISTRATION	:	A6-EYE
STATE OF OCCURANCE	:	UAE
LOCATION	:	Abu Dhabi airport runway 31L
DATE & TIME	:	30th January 2012, 03:46:26 Local Time

Notes:

1. All times in the report are Local Time (Local time in UAE was UTC + 4h)
2. The word "Aircraft" in this report implies the aircraft involved in the serious incident
3. The word "Team" in this report implies the Investigation Team

This serious incident investigation is performed in accordance with UAE Federal Act No. 20 (1991), Promulgating the Civil Aviation Law, Chapter VII, Aircraft Accidents, Article 48, and in conformity to Annex 13 to the Chicago Convention on International Civil Aviation.

The sole objective of this investigation is to prevent aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The information contained in this preliminary report is derived from the factual information gathered during the ongoing investigation of the occurrence. Later interim reports or the final report may contain altered information in the case that new evidence appears during the ongoing investigation that requires changes to the information depicted in this report.

Any specific safety issues identified during the course of the investigation will be advised to all parties through the GCAA Safety Recommendations (SR) procedure.

Contents

Synopsis

The GCAA AAI was informed of the serious incident via the Duty Investigator “hotline” and initiated the investigation of the incident on 30th January 2012, the day of the incident.

In accordance with the recommendations of ICAO Annex 13, The State of the Manufacturer (BEA) was notified and assigned an Accredited Representative to the investigation. The UAE GCAA will lead the investigation and issue the final report.

The flight crew on an A330-200 with a scheduled service Abu Dhabi to Dublin, after being given clearance for line up on the active runway at Abu Dhabi Airport, 31L, misaligned the aircraft on the left edge lights of the runway instead of the center line. During the attempted take off roll, the aircraft impacted and damaged eleven left edge lights at which time the crew had rejected the take off. The aircraft came to a stop just before taxiway E14 after travelling approximately 775 m.

Due to the nose wheel low tire pressure warning, the aircraft was towed from runway 31L back to the passenger terminal where the passengers and crew disembarked and full inspection of the aircraft was performed.

No injuries to flight crew, passengers and ground staff were reported as a result of the incident. A total of 13 crew and 216 passengers were on board this flight.

1.0 Factual Information

1.1 History of the Flight

The crew reported for duty at the airport and after the initial briefing they proceeded to the aircraft where they continued the preparation of the flight for departure. Approximately at 02:00 local time, due to Low Visibility Operations, the crew was informed, by ATC for delay on departure due to prevailing fog.

Following an uneventful start of the engines and taxi, the aircraft reached the holding point of runway 31L, which is the southern runway (see photo 1), during which time the crew was informed of the limited visibility but acceptable for the Operator's take off operating minimums. Following a brief communication of the crew with the Air Traffic Control Tower regarding the stop bar, the lights (indicating the runway ahead) were extinguished to allow the aircraft to proceed into the active runway. The crew taxied the aircraft towards the active runway following the yellow line leading towards runway 31L (see photo 2).

Photo 1

Holding point 31L

Photo 2

Yellow line leading to the runway

This yellow line is normally illuminated by 30 green lights and it was measured to be approximately 222 meters long, leading the aircraft to the centre line of the runway from the red stop bar.

The crew members involved in the event stated, after the occurrence, that shortly after passing the stop bar they could not see the green leading taxi centerline lights located on the yellow line.

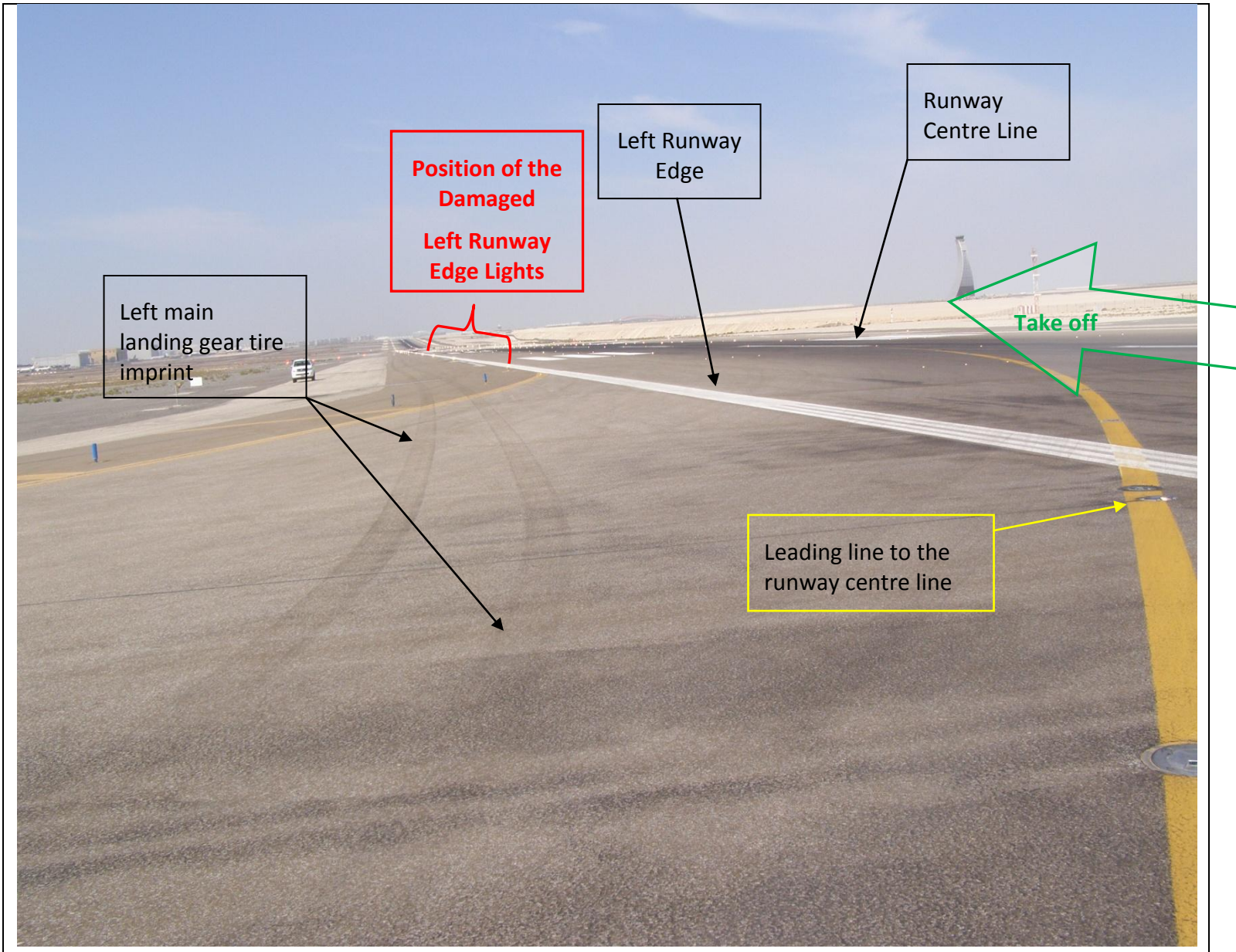


Photo 3 A

Runway 31L

Photo 3B – Aircraft Line-up Position

Then the occurrence aircraft after travelling for approximately 157 meters on this yellow leading line, turned left away from the yellow line and the nose gear was positioned, to be over the left runway edge white line, instead of the runway centre line (see photos 3A and 3B).

Shorty after, the take off run was initiated, with the aircraft's nose gear continued being over the left runway edge, passing over 11 runway edge lights, which were destroyed, while the left main landing gear was approximately 4.9 meters left of the runway edge.

The crew stated that during the takeoff roll the interval of travelling over the lights to be unfamiliar and the intensity of the thumps to be more intense.

Due to this the take-off was rejected, with the maximum indicated airspeed reached 83 knots, as per the flight recorder data (see Appendix 1). After stopping for approximately 2 minutes, the pilots taxied the aircraft back to the runway centerline in order to vacate the runway. While taxiing on the centerline, the crew received the ECAM message, "TIRE LO PR" as the left hand nose wheel had punctured due to the impact with the runway edge lights. The pilots then stopped the aircraft on the centerline, from where they requested towing assistance back to the terminal building.

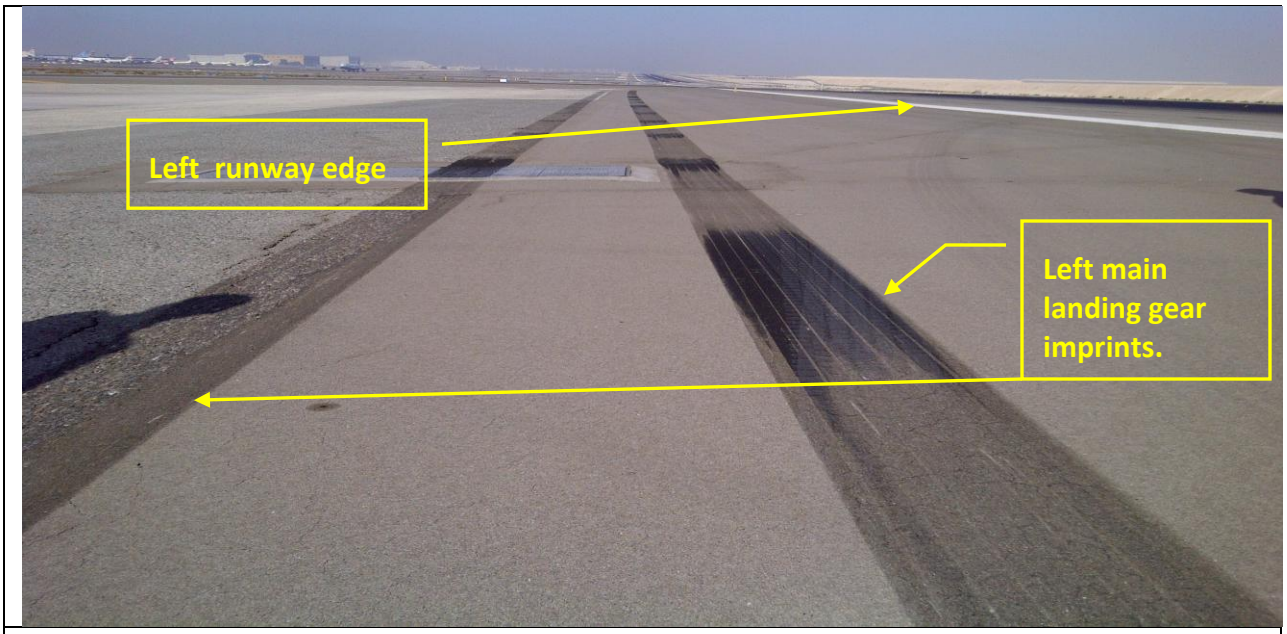


Photo 4

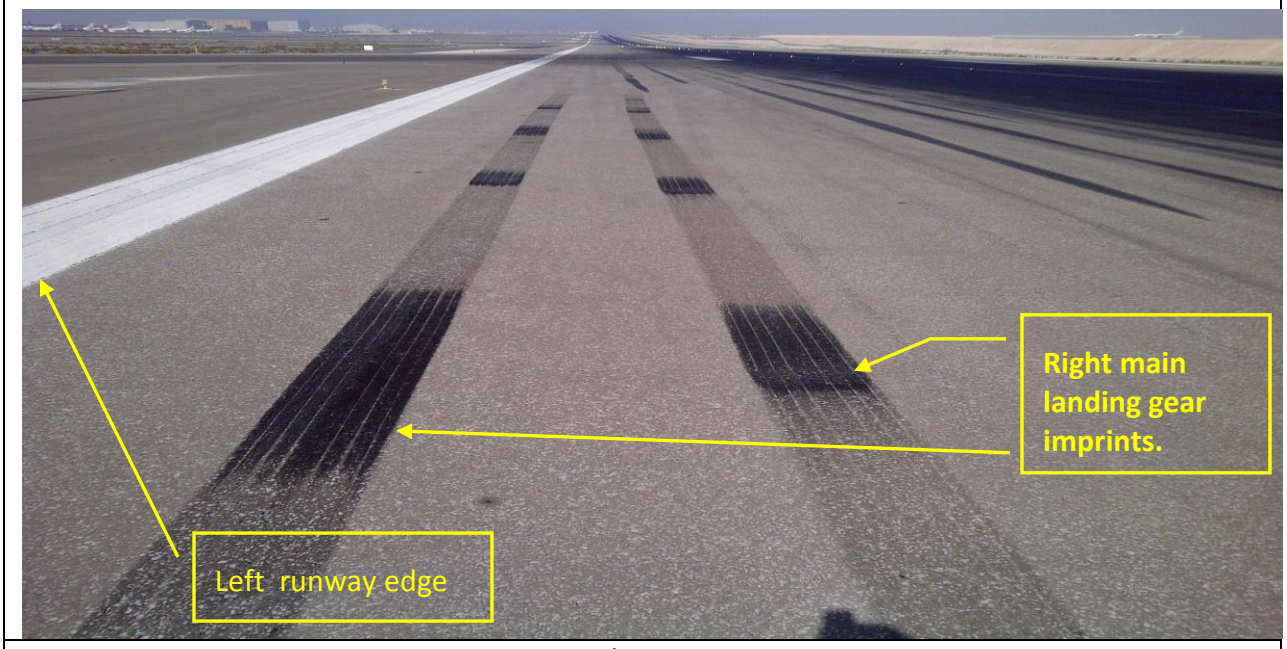


Photo 5

1.2 Injuries to Persons

Injuries	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	**0**	0	0	0	0
None	2	11	216	0	229
Total	**2**	**11**	**216**	**0**	**229**

1.3 Damage to Aircraft

During the event, the left hand nose wheel was punctured and replaced. Seven main wheels were found with glass pieces embedded in the wheels and required replacement. The right hand nose wheel was also replaced due to the load placed on it.

1.4 Other Damage

Eleven runway Edge lights were damaged and replaced.

1.5 Personnel Information

Gender	Male	Male
Date of birth	27-Mar-74	11-Apr-65
Foreign licence number	I-ATPL-A-016476 (Italy)	AL05181 (Jamaica)
Foreign licence validity	9-Dec-09	31-Mar-10
UAE licence number	14522	32358
UAE licence validity	30-May-19	8-Mar-18
UAE licence category and rating	ATPL-A; M/E LAND, A330, A340	ATPL-A; M/E LAND, A320(P2), A330(P2)
Class and date of last medical	Class - One; 23/02/2011	Class - One; 23/01/2012
Flying experience		
Total all types	9663 hr 51	6173 hr 29
Total Command on all types	3495 hr 58	2828 (S/E & M/E aircraft)

Total on type	4408 hr 36	399 hr 18
Total last 30 days	87 hr 51	47 hr 37
Total last 24 hours	0	0
All classroom training and checking	OPC due: May 2012; Line Check due: April 2012	OPC due: June 2012; Line Check due: August 2012
Last Line and proficiency check	OPC: 05/11/2011; Line Check: 25/04/2011	OPC: 17/12/2011; Line Check: 13/08/2011
English language proficiency	Level 5, reassess on 07-Apr-14	Level 6, reassess on N/A

1.6 Aircraft Information

The A330 is a subsonic, medium to long range, civil transport aircraft, with two high bypass turbofan engines, mounted under the wings (see figure 1).

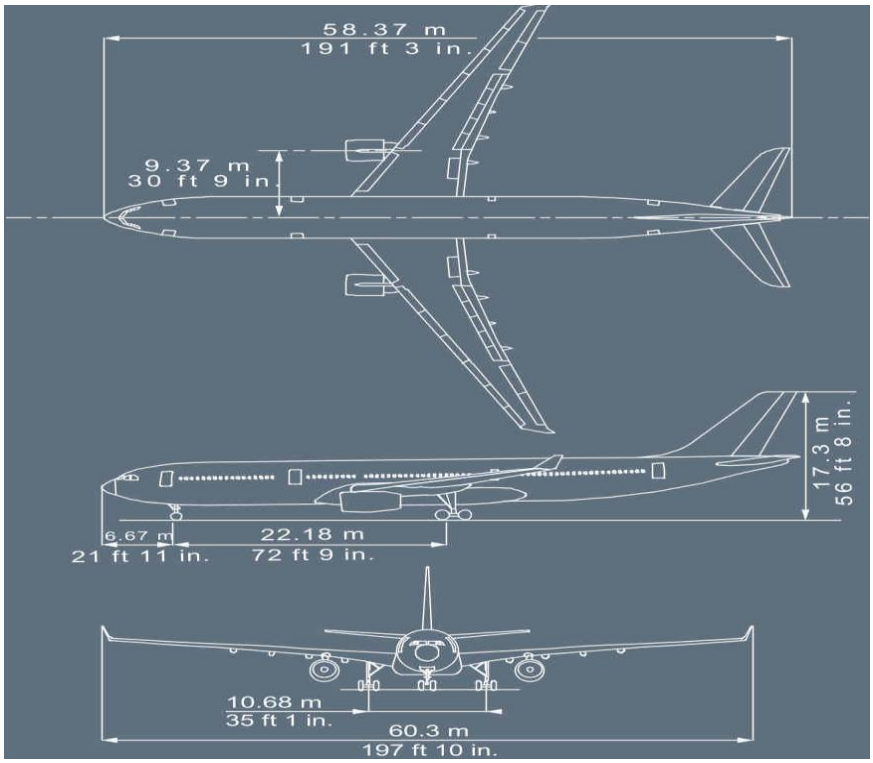


Figure 1

MSN	688
C OF A- DATE OF ISSUE	30/09/2005 (1st Issue)
C OF R- DATE OF ISSUE	30/09/2005 (1st Issue)

1.7 Meteorological Information

METAR OMAA 292200Z 35002KT 0100 R13R/0300N R31L/0150N
R13L/0225V0550D R31R/0800U FG FEW008 15/14 Q1016 A3002 NOSIG

SPECI OMAA 292239Z 11004KT 0100 R13R/0175N R31L/0125N R13L/0375U
R31R/P2000U FG BKN001 13/13 Q1016 A3003 NOSIG

METAR OMAA 292300Z 13003KT 090V180 0100 R13R/0175V0350N R31L/0150N
R13L/0275VP2000U R31R/0450D FG BKN001 13/13 Q1016 A3002 NOSIG

METAR OMAA 300000Z 12004KT 0150 R13R/0175N R31L/0200N R13L/0200N

R31R/0200N FG BKN001 13/13 Q1016 A3002 NOSIG

1.8 Aids to navigation

To be determined.

1.9 Communications

To be determined.

1.10 Aerodrome Information

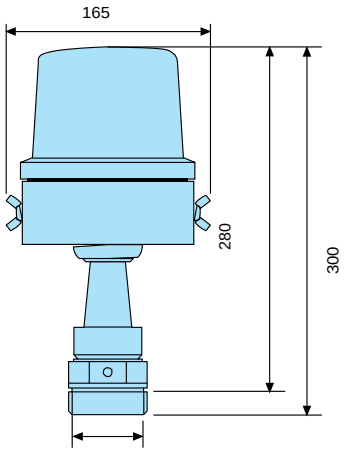
Abu Dhabi International aerodrome has two runways with the following information:

Slope of RWY-SWY			SWY dimensions (M)	CWY dimensions (M)	Strip dimensions (M)
13R	-0.2% (first 1310 M) -0.7% (next 690 M) 0% (next 900 M) +0.8% (next 1200M)		55 x 45	420 x 45	4335 x 300
31L	-0.8% (first 1200 M) 0% (next 900 M) +0.7% (next 690 M) +0.2% (next 1310M)		60 x 45	380 x 45	4335 x 300
13L	+0.1%	0%	130 x 60	NIL	4480 x 300
31R	-0.1%	0.2%	130 x 60	NIL	4480 x 300

In addition the declared distances are :

RWY Designator	TORA (M)	TODA (M)	ASDA (M)	LDA (M)	Remarks
13R	4100	4520	4155	4100	NIL
31L	4100	4480	4160	4100	NIL
13L	4100	4100	4230	4100	NIL
31R	4100	4100	4230	4100	NIL

Runway 31L has an ICAO CAT II/III precision approach lighting system 900 M CL strobe and Flashing RTIL. The Runway centre line lighting is bi - directional with 15 meters spacing, Colour coded with first 3200 M white, next 600 M ALTN white / red, last 300 M red LIH. The runway edge lighting is bi - directional with LIL omni - directional component white LIH. The Runway Edge lights are High Intensity Bidirectional Elevated Lights (see photos 6 & 7)

	
Photo 6 Runway edge light	Photo 7 Runway edge light outline dimensions

1.11 Flight Recorders

The aircraft was equipped with flight recorders as follows:

- a cockpit voice recorder (CVR), L3-Comm FA2100,
  Part number: 2100-1020-02
  Serial Number: 000317872
- a flight data recorder (FDR) L3-Comm FA2100
  Part number: 2100-4043-02
  Serial Number: 000446135

As per ICAO Annex 13, the flight recorders were removed from the aircraft and brought to the General Civil Aviation Authority Air Accident Investigation Laboratory on the same day in order to download the data for the investigation purpose. Both recorders' contained valuable data which was successfully downloaded.

1.12 Wreckage and impact information

There were no reported pertinent material failures and component malfunctions, prior to or during the occurrence.

1.13 Medical and Pathological Information

To be determined.

1.14 Fire

There was no evidence of fire in flight or after the occurrence.

1.15 Survival aspects

For the purpose of this occurrence there was no search and rescue activity involved. Additionally there was no evacuation performed and both pilots exited the aircraft by their own means.

1.16 Tests and research

No special tests and research performed.

1.17 Organizational and management information

1.17.1 The Operator

The Operator was set up by Royal (Amiri) Decree in July 2003, commenced commercial operations in November 2003, is licensed by the General Civil Aviation Authority of the UAE and currently (as of February 2012), has a fleet of 63 Airbus and Boeing aircraft operated just over 1,000 flights per week, serving an international network of 84 destinations in 52 countries.

Furthermore the Operator performed an initial investigation (awaiting information regarding the serviceability and proper usage of the aerodrome lighting system) with recommendations in the areas of : flight operations during Low visibility Procedures, the documentation supporting the flight operation in Low Visibility Operations and training.

1.18 Additional Information

1.18.1 Annexes to the Convention on International Civil Aviation

Annex 2 — *Rules of the Air*, Chapter 3:

> "3.2.2.7.3 An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off."

Annex 14 — *Aerodromes,* Volume I — *Aerodrome Design and Operations*, Chapter 5:

> "5.3.19.9 Selectively switchable stop bars shall be installed in conjunction with at least three taxiway centre line lights (extending for a distance of at least 90 m from the stop bar) in the direction that it is intended for an aircraft to proceed from the stop bar."

> "5.3.19.13 *Note 1.— A stop bar is switched on to indicate that traffic stop and switched off to indicate that* traffic *proceed."*

ICAO Manual on the Prevention of Runway Incursions (Doc 9870).

> 7.14.7 Stop bars
>
> Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.
>
> *Note.— Stop bars are located across taxiways at the point where it is desired that traffic stop, and consist of lights, showing red, spaced across the taxiway.*"

ICAO Aerodrome Design Manual (Doc 9157), Part 4.

> 10.5.8 The system is so designed that the length of taxiway centre line lighting available to the pilot is always such that the speed at which the aircraft can be taxied is not dependent on the extent of the route that is in view.
>
> 10.5.9 At taxiway intersections, only one route is illuminated at any time.
>
> 10.5.10 Once the surveillance system has detected that an aircraft has passed through a block, the lighting behind that aircraft is switched off in accordance with the relevant system protocol.
>
> 10.5.11 To provide guidance and control by selective switching of stop bars and taxiway centre line lights, the following design features should be incorporated in the system:

a) a taxiway route should be terminated by a stop bar;
b) control circuits should be so arranged that when a stop bar is illuminated, the appropriate section of taxiway centre line lights beyond it is extinguished and deactivated;
c) the system should be so designed that a display of the taxiway layout and lighting system should be provided on a control panel capable of indicating the sections of centre line lights and stop bars which are activated;
d) if necessary, a control should be provided, permitting air traffic controllers to override the system at their discretion and to deactivate a route which crosses an operational runway;
e) system faults or incorrect operation of the system should be indicated by a visual monitor on the control panel.

10.5.12 It is to be anticipated that new SMGC systems will employ increased levels of automation in accordance with the "ICAO Operational Requirements for A-SMGCS".

1.18.2 Other Occurrences

1.18.2.1 From the UAE GCAA accident investigation data base

The following is extracted from the official UAE GCAA Report[1]:

"On May 9th, 2011, at approximately 1535 UTC, a Bombardier Aerospace CL600-2B19, registration A6-BNH, was cleared for pushback out of Bay E36 in Dubai International Airport for a flight from Dubai, United Arab Emirates to Dammam, Saudi Arabia with two flight and one cabin crewmembers…

…After entering the runway, the Aircraft kept rolling until stopped before the runway threshold where it was mistakenly lined up with the right runway edge line instead of lining up with the runway centerline….

…At 15:41:01, the thrust levers were advanced and the Aircraft started to accelerate. Seven seconds later, two bumping sounds were heard in seven seconds apart. The second sound was acknowledged by the two pilots.

[1] More information on this event may be found in the GCAA web site :
http://www.gcaa.gov.ae/en/ePublication/admin/iradmin/Lists/Incidents%20Investigation%20Reports/Attachments/20/2011-Final%20Report%20Bombardier%20Aerospace%20CL600-2B19%20-%20A6-BNH%20-%20Report%2005%202011.pdf

The Aircraft continued the acceleration, at 15:41:23 the captain called-out “80 kts” which was checked and affirmed by the co-pilot.

At approximately 15:41:26, 90 kts, the right wing of the Aircraft collided with the runway nearest PAPI2 light unit when the captain immediately called for “stop”. Shortly thereafter, the aircraft engines thrust levers were retarded and the Aircraft started to decelerate.”

(See Appendix 2 for the list of findings, probable cause and recommendations issued)

1.18.2.2 From The Transportation Safety Board of Canada

The following is extracted from the official Transport Safety Board (Canada) Report:

Summary

"An Airbus A319-114 (registration C-FYKR, serial number 0693) operating as Air Canada Flight 596, with 84 passengers and 5 crew members on board, was on a scheduled flight from Las Vegas, Nevada, United States, to Montréal, Quebec. The aircraft was cleared to depart Runway 25R and the crew commenced a rolling take-off at 0015 Pacific standard time. Shortly thereafter, both members of the flight crew realized that the aircraft was rolling on the asphalt runway shoulder instead of on the runway centreline. At approximately 65 knots indicated airspeed, the pilot flying applied left rudder to realign the aircraft with the runway centreline and completed the take-off. The flight continued to Montréal where an uneventful landing was carried out. During the flight to Montréal, the crew advised company dispatch of the departure occurrence. Dispatch advised the Las Vegas tower that the aircraft may have damaged some runway edge lights during the take-off roll. Three runway edge lights were found damaged. The only damage noted on the aircraft was a cut on the left-hand nose-wheel tire. There were no injuries."

Finding as to Causes and Contributing Factors

"The pilot flying likely relied on peripheral vision to taxi the aircraft because of the requirement to maintain separation with the aircraft departing ahead. This, combined with the aerodrome markings, resulted in the misalignment of the aircraft and the initiation of the take-off from the asphalt runway shoulder instead of the runway centreline."

Findings as to Risk

"A rolling take-off reduces the crew's time for conducting a thorough outside visual check and verifying runway alignment before initiating the take-off roll.

Taxiways B1 and A2 centrelines curve onto the runway edge line. At night, this could result in pilots aligning their aircraft with the runway side stripe marking instead of with the runway centreline.

This occurrence was reported to company dispatch and air traffic services two hours after the event. During that time, debris left by the broken lights could have posed a hazard for other aircraft using Runway 25R."

Other Finding

"The other three similar events that happened on Runway 25R at the Las Vegas McCarran International Airport (KLAS) were not reported. Failure to declare such events deprives investigators of important data that could help to identify the contributing factors that lead to this type of event."

Safety Action Taken

"The Las Vegas airport authority made modifications to the taxiway markings following the occurrence. At Taxiway B1, the radius of the taxiway centreline was extended past the runway edge line and now meets with the runway centreline in the displaced threshold arrow area. At Taxiway A2, the radius of the taxiway centreline that curves to the runway edge line was erased, and the taxiway centreline now extends to the threshold markings."

The following is an extract from the Transportation Safety Board Aviation Safety Information System (ASIS) Data printout of the Aviation Occurrence A09F0158:

"A09F0158: THE CHALLENGER 601-3A, CANADIAN REGISTRATION C-GFCB, WAS DEPARTING FROM MUMBAI FOR DELHI, INDIA. DURING THE TAKE-OFF ON RUNWAY 27, THE AIRCRAFT STRUCK RIGHT-SIDE RUNWAY-EDGE LIGHTS. THE CREW REJECTED THE TAKE-OFF AT ABOUT 80 KNOTS. THE TWO TIRES ON THE RIGHT LANDING GEAR DEFLATED AND THERE WAS A SMALL PUNCTURE HOLE IN THE RIGHT FLAP. THERE WAS SOME MINOR DAMAGE TO THE NOSE WHEEL AND THE RIGHT MAIN LANDING GEAR DOOR REQUIRED REPLACEMENT. THE RIGHT-SIDE

WEIGHT-ON-WHEEL (WOW) HARNESS WAS ALSO SEVERED. THERE WERE NO INJURIES TO THE 2 CREW AND 6 PASSENGERS ON BOARD THE AIRCRAFT.

WEATHER - THE REPORTED WEATHER AT VABB AT 20:10 LOCAL WAS AS FOLLOWS: TEMPERATURE: + 29° C, DEW POINT: + 21° C, VISIBILITY - 2.6 KMS OBSCURED BY SMOKE, AND WIND - 360° TRUE AT 13 KM/HOUR. IT WAS DARK AT THE TIME OF THE OCCURRENCE.

RUNWAY CHARACTERISTICS - RUNWAY 27 HAS A TAKE-OFF DISTANCE AVAILABLE OF 3445 METRES AND IS 45 METRES WIDE. HOWEVER, ITS THRESHOLD IS DISPLACED 482 METRES LIMITING ITS LANDING DISTANCE AVAILABLE TO 2,963 METRES. THE AREA AT THE BEGINNING OF THE TAKE-OFF RUN ON RUNWAY 27 IS WIDER THAN THE 45 METRE RUNWAY WIDTH. RUNWAY 27 HAS CATEGORY II APPROACH LIGHTING, GREEN THRESHOLD LIGHTING, A PRECISION APPROACH PATH INDICATOR LIGHTING SYSTEM LOCATED ON THE SOUTH SIDE OF THE RUNWAY (3.3 DEGREES), TOUCHDOWN ZONE LIGHTS, WHITE RUNWAY CENTRE LINE LIGHTS, WHITE RUNWAY EDGE LIGHTS AND RED RUNWAY END LIGHTS.

THE TAKE-OFF WAS COMMENCED WITH THE AIRCRAFT LINED UP WITH THE RIGHT SIDE OF THE RUNWAY DURING THE EXISTING LOW-VISIBILITY CONDITIONS. WHEN THE AIRCRAFT TRAVELLED DOWN THE RUNWAY, IT STRUCK THE RIGHT-SIDE TAXI LIGHTS WITH THE NOSE WHEEL. THE TAKE-OFF WAS REJECTED, AND WHILE THE AIRCRAFT WAS MOVED TOWARD THE CENTRE OF THE RUNWAY, THE RIGHT MAIN GEAR WAS DAMAGED AS MORE LIGHTS WERE STRUCK.
FOLLOWING A DETAILED SMS INVESTIGATION, THE OPERATOR INTRODUCED CHECKLIST SAFETY ACTION TO MITIGATE THE POSSIBILITY THAT THEIR CREWS WOULD LINE UP WITH THE EDGE OF RUNWAYS. THE OPERATOR ALSO ENSURED THAT ITS PILOTS WHO OPERATE INTERNATIONALLY HAVE INTERNATIONAL FLIGHT OPERATIONS TRAINING AT A SUITABLE INTERVAL TO ENSURE THAT THEY ARE AWARE OF THE FREQUENT DIFFERENCES IN AIRPORT ENVIRONMENTS AND OPERATIONAL CHALLENGES ASSOCIATED WITH INTERNATIONAL FLIGHT OPERATIONS."

1.18.3 Research of factors influencing misaligned take-off occurrences at night

On 3 July 2009, the Australian Transport Safety Bureau (ATSB) was notified that a SAAB Aircraft Company 340B (SAAB), registered VH-ZLW, had commenced its take-off roll along the runway 25 left edge lights at Sydney Kingsford Smith Airport, New South Wales. This was one of three occurrences over the previous 2 years that involved aircraft commencing takeoff on the runway edge lighting.

In addition, within the previous 2 years the ATSB investigated two other occurrences involving pilot misidentification of runway alignment cues or lack of those cues during takeoff. All five

Australian misaligned take-off and landing occurrences involved aircraft with weights greater than 5,700kg and three of the six occurrences involved scheduled regular passenger transport (RPT) operations. The remaining two occurrences involved charter operations.

This research investigation examined each of these occurrences and relevant international occurrences to identify the common factors associated with misaligned take-off and landing occurrences.

After reviewing the Australian and international occurrences, eight common factors were identified that increased the risk of a misaligned take-off or landing occurrence. The factors included: distraction or divided attention of the flight crew; confusing runway layout; displaced threshold or intersection departure; poor visibility or weather; air traffic control clearance/s issued during runway entry; no runway centreline lighting; flight crew fatigue; and recessed runway edge lighting

1.19 Useful or effective investigation techniques

To be determined.

2.0 ANALYSIS

To be determined.

3.0 CONCLUSIONS

To be determined.

3.1 Findings

To be determined.

3.2 Causes

To be determined.

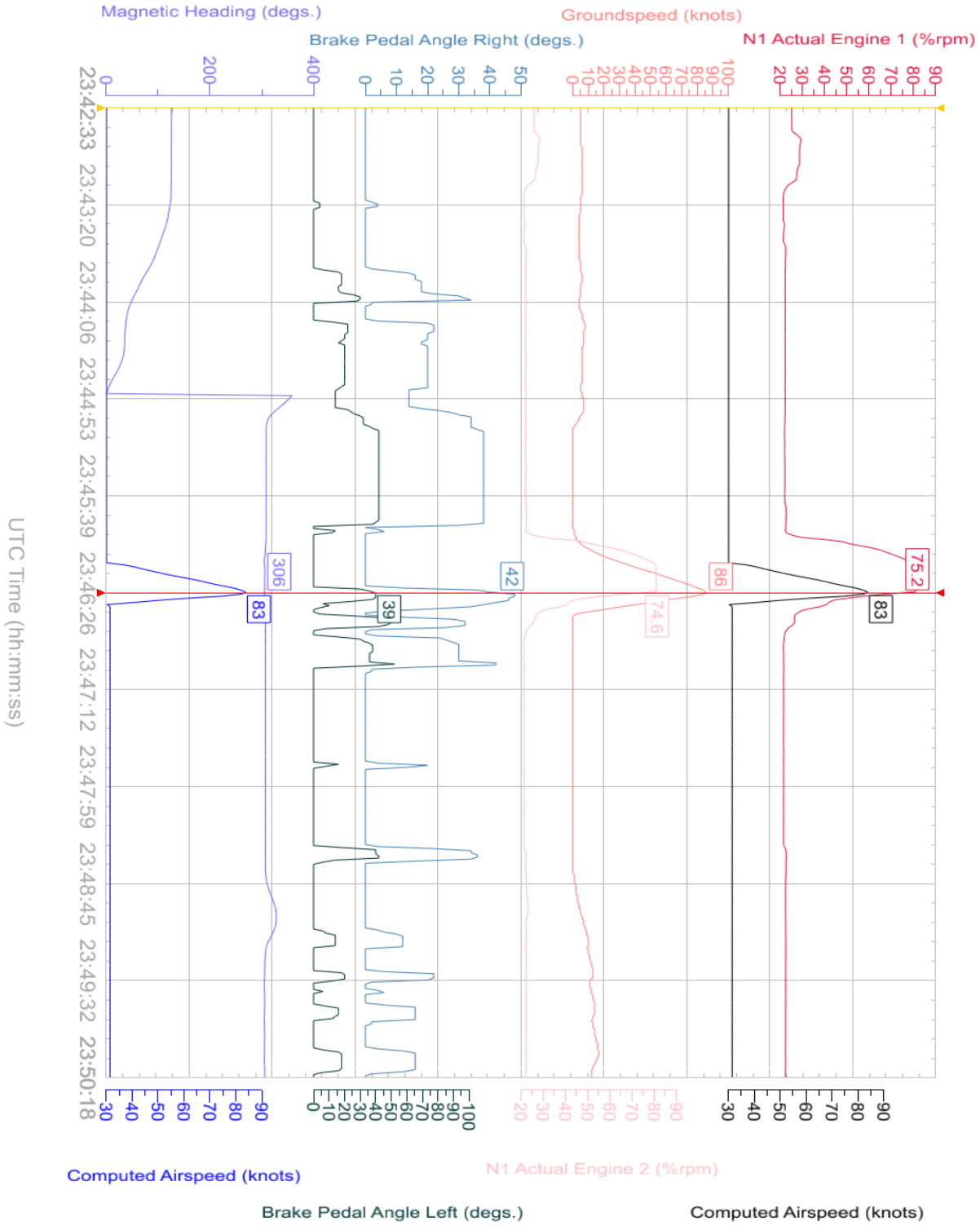
4.0 SAFETY RECOMMENDATIONS

To be determined.

5.0 Ongoing Investigation

To date the investigation process has identified several opportunities of improvement, which the Team will pursuit accordingly.

APPENDIX 1


Magnetic Heading (degs.)
Groundspeed (knots)
Brake Pedal Angle Right (degs.)
N1 Actual Engine 1 (%rpm)
UTC Time (hh:mm:ss)
23:42:33
23:43:20
23:44:06
23:44:53
23:45:39
23:46:26
23:47:12
23:47:59
23:48:45
23:49:32
23:50:18
306
83
42
39
86
74.6
75.2
83
Computed Airspeed (knots)
N1 Actual Engine 2 (%rpm)
Brake Pedal Angle Left (degs.)
Computed Airspeed (knots)

APPENDIX 2

The following is extracted from the official UAE GCAA Report of the event associated with the take of the a Bombardier Aerospace CL600-2B19 on the 9th May 2011

"3.1 FINDINGS

(a) The crewmembers were possessing pilot crew licenses issued by the GCAA in accordance with the UAE Civil Aviation Regulations, Part II, Chapter 2.

(b) The Aircraft was properly certificated and maintained.

(c) The transfer of control between the captain and co-pilot happened two times: one from the captain to the co-pilot at the beginning of the takeoff roll, and the other from the co-pilot to the captain after the "stop" call-out. In both cases, the transfer of control was not conforming with the Operations' Manual, Part B, in that:

1. the terms used in the first transfer were not consistent with those in the Manual; and
2. the second transfer was not explicit.

(d) The Operation's Manual does not include a check item of the meaning "check the aircraft position in relation to the runway centre line".

(d) The taxiway and runway marking lines and lights were in compliance with the Civil Aviation Regulations, Part IX and in conformance with the Standard Practices of Annex 14 to the Chicago Convention.

(e) The intensity of the runway and taxiway lightings had no influence on the cockpit runway visibility.

(f) The test aircraft was seen on the monitor of the Airport Surface Movement Radar in reference to the runway centreline.

(g) Neither the Civil Aviation Regulations nor the ATC Local Air Traffic Service Instructions manual mandates the tower controller to use the SMR is such conditions. The Standard Practices set forth in ICAO Annex 14 and ICAO Doc. 4444 do not require the use of the SMR as a primary reference to monitor the movement of aircraft on the maneuvering area.

(h) The instructions of the tower controller were clear, well read and listened to by the crew.

3.2 PROBABLE CAUSE

The Air Accident Investigation Department determines that the probable cause of the Serious Incident was the impact with the runway nearest PAPI light after incorrect line-up with the runway edge line instead of centerline. The incorrect line-up was due to the crew confusion between the runway center and edge lights.

Contributing factor to the Serious Incident was that neither of the two pilots realised the misalignment situation due to that their situational awareness was overwhelmed by activities not enabling them to have adequate peripheral vision outside the cockpit.

3.3 SAFETY CONCERNS

Floodlights affect on waiting crew at RWY 30L holding positions might have a positive relation with the waiting time period.

4.1 Safety Recommendations related to Findings, Probable Cause and Contributing Factors

The Air Accident Investigation Department recommends that:

The Operator should-

SR 12/2011

Enhance his procedure to ensure that situational awareness of the pilots is more coherent with the actual case; pilots' lookout should be more relying on peripheral vision with minimised distraction by other cockpit activities that could be done at different times and situations.

SR 13/2011

Enhance his policy and procedure to assure proper transfer of controls between the captain and co-pilot.

The Air Traffic Control Management should-

SR 14/2011

Forward advisory material to tower controllers highlighting the availability the SMR as an augmentation tool for the surveillance of aircraft and vehicles on the manoeuvring areas, particularly when the method of direct visual surveillance may be insufficient to ensure correct positioning or safe operation of aircraft or vehicles and based on the controller's situation's risk assessment.

4.2. Safety recommendation related to Safety Concerns

The Air Accident Investigation Department recommends that:

Dubai Airports Company-

SR 15/2011

Conducts a safety risk assessment on the influence of the floodlights on the crew sight ability"