

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY



Air Accident Investigation Sector

Accident

- Preliminary Report -

AAIS Case N° AIFN/0007/2019

Loss of Control on Approach during Runway Lighting Calibration Flight

Operator: Flight Calibration Services Limited

Make and Model: Diamond DA62

Nationality and Registration: The United Kingdom, G-MDME

Place of Occurrence: 3.5 nm final approach runway 30L inbound Dubai International Airport, Dubai

State of Occurrence: The United Arab Emirates

Date of Occurrence: 16 May 2019



Accident Brief

AAIS Report No.:	AIFN/0007/2019
Operator:	Flight Calibration Services Limited
Aircraft Type and Registration:	Diamond DA62, G-MDME
MSN:	62.077
Number and Type of Engines:	Two, Austro Engine GmbH E4P-C
Date and Time (UTC):	16 May 2019
Location:	3.5 nm final approach runway 30L inbound Dubai International Airport, Dubai, the United Arab Emirates
Type of Flight:	Commercial
Persons Onboard:	Four
Fatalities:	Four

Investigation Objective

This Investigation is performed pursuant to the United Arab Emirates (UAE) *Federal Act 20 of 1991*, promulgating the *Civil Aviation Law*, Chapter VII – *Aircraft Accidents*, Article 48. It is in compliance with Part VI, Chapter 3, of the UAE *Civil Aviation Regulations*, in conformity with *Annex 13 to the Convention on International Civil Aviation*, and in adherence to the *Air Accidents and Incidents Investigation Manual*.

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

This Preliminary Report is adapted from the Final Report format contained in Annex 13 to serve the purpose of this Investigation. The information contained in this Report is derived from the data collected during the initial investigation of the Accident.

The Final Report may contain amended information when new evidence becomes available during the ongoing investigation.

Investigation Process

The occurrence involved a Diamond DA62 aircraft, registration G-MDME, and was notified to the Air Accident Investigation Sector (AAIS) by phone call to the Duty Investigator Hotline Number +971 50 641 4667.

The AAIS formed an investigation team in line with the Annex 13 obligations, the UAE being the State of the Occurrence, and appointed an investigator-in-charge and members from the AAIS for the various investigation areas.



After the initial on-site Investigation phase, the occurrence was classified as an 'Accident'.

The AAIS notified the Air Accidents Investigation Branch (AAIB) of the United Kingdom, being the authority of the State of Registry, the Austrian Federal Safety Investigation Authority, being the authority of the State of Manufacture of the aircraft and the engines, the Canadian Transport Safety Board (TSB), being the authority of the State of Design, The Air Accident Investigation Committee of Thailand, being the authority of the State of the operator of the preceding aircraft, and the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile, being the authority of the State of Manufacture of the preceding aircraft.

Accredited Representatives were designated and assisted by Advisers from Diamond Aircraft Industries GmbH, Austro Engine GmbH, and Airbus. In addition, the Operator assigned an Adviser to the Accredited Representative of the AAIB.

The AAIS is leading the Investigation and will issue a Final Report when the Investigation is completed.

This Preliminary Report is publicly available at:

<http://www.gcaa.gov.ae/en/epublication/pages/investigationReport.aspx>

Notes:

- ¹ Whenever the following words are mentioned in this Report with the first letter Capitalized, it shall mean:
 - (Accident) - this investigated accident
 - (Aircraft) – the aircraft involved in this accident
 - (Commander) – the commander of the accident flight
 - (Copilot) – the copilot of the accident flight
 - (Investigation) - the investigation into this accident
 - (Operator) – Flight Calibration Services Limited
 - (Report) - this Preliminary Report
- ² Unless otherwise mentioned, all times in this Report are Local Time (UTC plus 4 hours).
- ³ Photos and figures used in the text of this Report are taken from different sources and are adjusted from the original for the sole purpose to improve clarity of the Report. Modifications to images used in this Report are limited to cropping, magnification, file compression, or enhancement of color, brightness, contrast or insertion of text boxes, arrows or lines.



Abbreviations and Definitions

AAIS	Air Accident Investigation Sector
AFM	Airplane Flight Manual
ANS	Air navigation service
ATC	Air traffic control
CAA	The Civil Aviation Authority of the United Kingdom
CFRP	Carbon fiber reinforced plastic
CSI	Total cycles since last inspection
CSN	Total cycles since new
CTR	Control zone
ECU	Engine control unit
ELT	Emergency locator transmitter
ft	feet (distance)
GCAA	General Civil Aviation Authority of the United Arab Emirates
GFRP	Glass fiber reinforced plastic
hPa	Hectopascal
ICAO	The International Civil Aviation Organization
IFR	Instrument flight rules
kt	Knots (speed)
kW	Kilowatts
MFD	Multi-function display
nm	Nautical miles
PFD	Primary flight display
PSR	Prompt safety recommendation
TAS	Traffic avoidance system
TSI	Total cycles since new
TSN	Total hours since new
UAE	The United Arab Emirates
UTC	Universal time coordinated
UK	The United Kingdom
VFR	Visual flight rules
VHF	Very high frequency



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1. Factual Information

1.1 History of the Flight

On 16 May 2019 at 1808 local time, G-MDME, a Diamond D62 aircraft, departed Dubai International Airport (OMDB) to carry out aerodrome ground lighting calibration checks as part of the OMDB southern runway refurbishment project. Onboard were two flight crewmembers, a calibration engineer and an observer. The ground lighting check required the Aircraft to fly a number of approaches to, and low passes over, runway 30L. The flights were conducted under visual flight rules (VFR).

Prior to departure, the flight crew met air traffic control and airport representatives to discuss the calibration flights. Among the items discussed it was agreed that air traffic control would communicate with the DA62 on a separate frequency.

At 1808 the Aircraft departed OMDB from runway 30R to fly its first calibration approach to runway 30L. The Aircraft flew a total of nine circuits performing different aerodrome lighting checks.

At 1929, the Aircraft entered the final to runway 30L for the tenth approach, following a Thai Airways Airbus A350-900, which was flying the approach to the parallel runway 30R. The Airbus was approximately 3.7 nautical miles (nm) ahead of the DA62.

When the DA62 leveled off after turning onto final at an altitude of approximately 1,100 feet (ft) and at an airspeed of approximately 130 knots (kt), it rolled slightly but was recovered after nine seconds. Seven seconds later, the Aircraft abruptly rolled to the left until it became inverted and it then entered a steep dive. The Aircraft impacted the ground approximately 3.5 nm from the runway 30L threshold. The impact was not visible to the runway approach camera.

Evidence noted at the Accident site indicated that the Aircraft impacted the ground at an elevation of approximately 130 ft while travelling at high speed in the direction opposite to the direction of flight, on a heading of approximately 100 degrees.

1.2 Injuries to Persons

All four persons onboard the Aircraft sustained fatal injuries as a result of the Accident.

1.3 Damage to Aircraft

The Aircraft was destroyed by impact forces and the subsequent fire.

1.4 Other Damage

There was environmental damage at the site of the Accident due to the impact, the fire, and leaking Aircraft fluids.



1.5 Personnel Information

Table 1 illustrates the Commander and Copilot information current at the date of the Accident.

Table 1. Flight crew information		
	Commander	Copilot
Age	52	26
Type of license	Commercial Pilot License (A)	Commercial Pilot License (A)
Valid until Medical expiry	9 September 2019	4 August 2019
Rating	PA31 / DA62	C172 / PA28 / PA31 / DA42 / DA62
Total flying time (hours)	3441	757
Total on this type (hours)	645	440
Total on type last 90 days (hours)	86	141
Total on type last 28 days (hours)	33	13
Total last 24 hours (hours)	0	0
Last Safety & Emergency Procedures training	to be established	to be established
Last Multi-Engine Piston check (1 year validity)	19 July 2018	20 August 2018
Last line check	to be established	to be established
Medical class	1	1
Valid to	9 September 2019	4 August 2019
Medical limitation	VNL ¹	Nil

¹ VNL: The pilot must have corrective spectacles available and must carry a spare set of spectacles.

1.6 Aircraft Information

The Diamond DA62 is designed as a 7-seat twin-engine aircraft. The fuselage is manufactured as a semi-monocoque molded construction using carbon fiber reinforced plastic (CFRP). The aircraft has a 'T' tail manufactured of glass fiber reinforced plastic (GFRP)/CFRP of semi-monocoque construction. The tricycle landing gear is retractable.

The wings, ailerons and flaps are made of GFRP/CFRP, and are principally of sandwich construction. The two CFRP manufactured main wing spars and both engine nacelles are part of the center wing. A 96-liter-capacity aluminum fuel tank consisting of three fuel chambers is installed in each of the wings. Auxiliary fuel tanks are installed in the aft section of the engine nacelles, above the wing main spars. Each auxiliary fuel tank has a fuel capacity of 70 liters. The total fuel capacity of 336.8 liters allows for a flight duration in excess of four hours.

The DA62 is fitted with a Garmin G1000 fully integrated avionics system, which comprised a flight, engine, communication, navigation, and surveillance instrumentation system. The system consists of a primary flight display (PFD), multi-function display (MFD), audio panel, air data computer, attitude and heading reference system, engine sensors and processing unit, and integrated avionics containing VHF communications, VHF navigation, and global positioning system.

The capacity of G-MDME was five occupants, including two flight crew, because of the need to allocate space to accommodate runway calibration equipment.

The design enables single-pilot operation. The DA62 was certified for daytime flights according to visual flight rules, night flights according to night visual flight rules with appropriate equipment, and flights according to instrument flight rules with appropriate equipment.

1.6.1 Aircraft data

Table 2 illustrates the general Aircraft data as of the time of the Accident.

Table 2. Aircraft data	
Manufacturer	Diamond Aircraft GmbH
Model	DA62
Manufacture Serial Number	62.077
Date of manufacture	10 November 2017
Nationality and registration	The United Kingdom, G-MDME
Name of the Owner	Flight Calibration Services Limited
Name of the Operator	Flight Calibration Services Limited

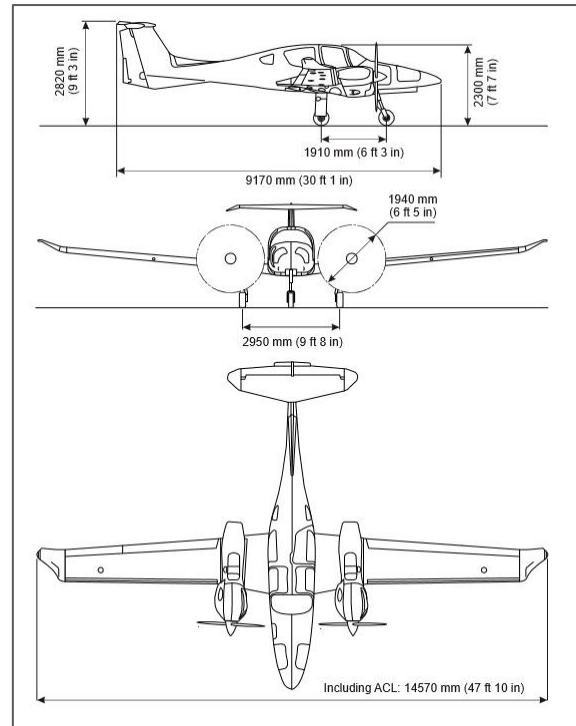


Figure 1. Diamond DA62 dimensions
[Source: Diamond Industries GmbH]



Certificate of Airworthiness		
Number:	069621/001	
Issue date:	14 December 2017	
Certificate of Registration		
Number:	G-MDME/R1	
Issue date:	21 November 2017	
Date of delivery	21 November 2017	
Total hours since new (TSN)	720	
Total cycles since new (CSN)	337	
Last major inspection and date	Not applicable	
Total hours since last 100-Hour inspection (TSI)	1:27	
Total cycles since last inspection (CSI)	1	

1.6.2 Engines

The Aircraft was fitted with two Austro Engine GmbH E4P-C engines. These are liquid-cooled inline four-cylinder four-stroke engines. Each engine produces a maximum 132 kW at 2300 RPM and a maximum continuous 126 kW.

Each engine is fitted with an electronic engine control unit (ECU) which controls manifold pressure, injected fuel quantity and propeller speed according to the desired engine power preselected with the power lever. Both power levers are situated on the center console.

A propeller governor, which is controlled by the ECU, is flanged onto the front of each engine. The propeller speeds are reduced to a ratio of 1:1.69.

The indications for monitoring engine parameters are integrated within the Garmin G1000 multi-purpose display.

1.6.2 Propellers

The 3-bladed propellers are hydraulically regulated with a constant speed feathering function. Each propeller has wooden composite blades with fiber-reinforced plastic coating and stainless steel edge cladding.

The propeller pitch control system consists of a governor valve. The pitch is set by the ECU via an electro-mechanical actuator on the governor. To change the blade pitch angle gearbox oil is pumped into the propeller hub. Increasing the oil pressure leads to a decrease of pitch and a higher RPM. Decreasing the pressure leads to higher pitch and a lower RPM.

Table 3 illustrates engine and propeller data at the time of the Accident².

² Time of the Accident includes the flight from Sharjah International Airport to Dubai International Airport (6 minutes) and 1 hour 21 minutes of the Accident flight.



Table 3. Engine and propeller data				
Engine manufacturer: Austro Engine GmbH			Propeller manufacturer: MT Propeller	
	No.1 engine	No.2 engine	No.1 propeller	No.2 propeller
Model	E4P-C	E4P-C	MTV-6-R-C-F/CF 194-80	MTV-6-R-C-F/CF 194-80
Serial number	E4P-C-00140	E4P-C-00130	170723	170722
Date installed	10 November 2017	10 November 2017	10 November 2017	10 November 2017
TSN (hours)	720	720	720	720
CSN	337	337	337	337
TSI (hours)	1:27	1:27	1:27	1:27
CSI	1	1	1	1

1.6.3 Garmin G1000 Integrated Avionics System

The G1000 Integrated Avionics System is a fully integrated flight, engine, communication, navigation and surveillance instrumentation system. The system consists of a primary flight display (PFD), multi-function display (MFD), audio panel, air data computer, attitude and heading reference system, engine sensors and processing unit, and integrated avionics containing VHF communications, VHF navigation, and global positioning system.

The primary function of the PFD is to provide attitude, heading, air data, navigation, and alerting information to the pilot. The primary function of the MFD is to provide engine information, mapping, terrain information, autopilot operation, and information for flight planning. The MFD typically displays engine data, maps, terrain, flight planning, progress information, and traffic and topography displays.

A traffic map page is configured to provide an advisory traffic avoidance system (TAS) and shows surrounding traffic data in relation to the aircraft's current position and altitude. It is the principal map page for viewing traffic information. Traffic information can also be displayed on other maps for reference on the MFD and additionally on the PFD (figure 2).

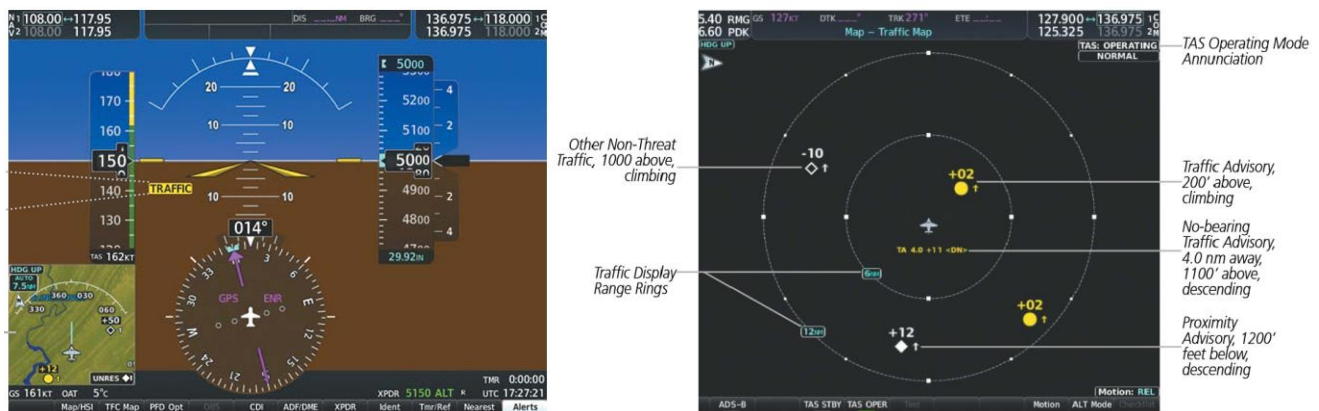


Figure 2. Traffic information maps on PFD and MFD [Source: Diamond Industries GmbH]



1.6.4 Fuel planning

The Aircraft departed Sharjah International Airport, after uplifting 126 liters of Jet-A1 fuel, with a total of 320 liters departure fuel. The refueling officer advised that, on request of the Commander, all four fuel tanks were completely filled for departure.

1.7 Meteorological Information

The prevailing meteorological conditions at the time of the Accident were fine with ceiling and visibility ok (CAVOK). The air pressure was 1005 hPa. Low level winds were recorded at 1,000 ft with a speed of 6 kt from 020 degrees, and a speed of 11 kt from 010 degrees at 1,500 ft.

The METAR for 1530 UTC at Dubai International Airport read:

METAR OMDB 161530Z 02005KT CAVOK 34/14 Q1005 NOSIG

Sunset on 16 May 2019 in Dubai was at 1857.

1.8 Aids to Navigation

Aids to navigation will be discussed in the Final Report.

1.9 Communications

Inter-pilot communications were made via the intercom system which was not recorded. All communications with air traffic control were recorded and have been made available to the investigation.

1.10 Aerodrome Information

OMDB is the primary airport in Dubai, the United Arab Emirates. It is located 4.6 km east of Dubai city and has two parallel runways, 12R/30L and 12L/30R. The runways are 4,447 meters and 4,351 meters long, respectively. The distance between the runway centerlines is approximately 380 meters.

As part of the southern runway refurbishment project, the aerodrome ground lighting for runway 12R and 30L was upgraded. The commissioning process to bring the runway back into service required aerodrome ground lighting calibration checks to verify compliance with lighting accuracy requirements.

The parallel runway 30R was operational for other aircraft for take-off and landing during the calibration flights.

1.11 Flight Recorders

The Aircraft was not fitted with a cockpit voice recorder or flight data recorder. Due to the Aircraft weight category, this was not a regulatory certification requirement.

The investigation recovered the two ECUs and the Garmin G1000 unit with the intent of recovering any data from their non-volatile memories. Additionally, a request has been made to the air services navigation provider to recover any data received from the Mode S transponder.

1.12 Wreckage and Impact Information

The Aircraft impacted the ground in a nature reserve, approximately 3.5 nm from the threshold of runway 30L. The nature reserve comprises sandy undulating terrain with scattered shrubs and trees. The majority of the trees ranged between 4 to 10 meters in height with diameters varying between 85 mm to 200 mm.

Damage to a tree was observed near the first impact site. This provided an estimate of the Aircraft attitude prior to impact. The Aircraft impacted the terrain in an upright attitude at high speed on an approximate heading of 100 degrees, with a pitch angle of 24 degrees down and in a right wing down attitude of 30 degrees.

The initial impact site, to the right and 4.2 meters beyond the damaged tree, consisted of two large double craters, each about 600 mm deep and the same widths as the engines. A smaller tree beyond the first impact site showed contact marks with the left wing. The metal wing wiring conduit was found attached to the tree. Unburnt aircraft wreckage, mainly from the underside of the fuselage and the tail, was found in and around the two craters. Evidence of initial fire spreading was evident from the right engine impact crater onwards.

The wreckage trail of burnt and unburnt Aircraft parts extended approximately 160 meters forward from the initial impact site.

The second impact was located approximately 20 meters from the initial impact point and contained the main wreckage. The Aircraft was completely destroyed by impact forces and the post impact fire. GFRP and CFRP manufactured components of the fuselage structure and the wings were completely destroyed, with only a few metal parts unaffected by the fire. The engines, landing gear, fuel tanks, the nose bay avionics rack and some unrecognizable parts were found in the main wreckage. The left center fuel tank had an impact dent near the leading edge which matched the trunk diameter of the small tree near the first impact site.

The cockpit instrument panel came to rest inverted approximately 25 meters beyond the main wreckage. Both propeller governors were found 37 meters beyond the main wreckage and the Aircraft seats were located 50 to 68 meters beyond the main wreckage.



Figure 3. The initial impact crater and the main wreckage at the second impact point



1.13 Medical and Pathological Information

Post-accident blood tests were requested to determine if any psychoactive materials could have degraded the crew's performance.

1.14 Fire

The collision with terrain at high speed resulted in the break-up of the Aircraft structure. The first evidence of fire was found where engine No. 2 first impacted the ground. Fires ignited and spread at different areas throughout the Accident site.

1.15 Survival Aspects

The Aircraft was completely destroyed by the impact forces and post-impact fires.

1.15.1 Emergency Locator Transmitter

The Aircraft was fitted with a Kannad 406 AF emergency locator transmitter (ELT), which was located in the aft fuselage below the aft baggage compartment. The ELT antenna was mounted on the upper surface of the fuselage, above the ELT. A remote ELT control panel/indicator is located on the instrument panel.

The investigation found that the ELT was damaged by the impact forces, with the antenna and electrical cables severed from the unit.

No ELT signal was received by the search and rescue center.

1.16 Tests and Research

The investigation will conduct tests and research as required.

1.17 Organizational and Management Information

1.17.1 The Operator

Flight Calibration Services Limited (FCSL) is a UK CAA approved flight inspection organization which was established in 2005 and is based in Chessington, the United Kingdom. It provides flight inspection services for airports in various regions, including the Middle East.

FCSL owns and operates six specially modified flight inspection aircraft, including one Piper Chieftain PA31 and five Diamond DA62s. All aircraft are fitted with a flight inspection system for calibration flights.

1.17.2 The Air Navigation Services Provider

The Dubai Air Navigation Services is the certified air navigation service (ANS) provider at OMDB, and provided aerodrome control services within the Dubai control zone (CTR) from the surface to 1,500 feet.

OMDB is a controlled aerodrome at which air traffic control service was provided to aerodrome traffic. The airspace classification of the Dubai CTR is Class D, where flights under instrument flight rules (IFR) and flights under visual flight rules (VFR) are permitted and all flights are provided with air traffic control service. IFR flights are separated from other IFR flights and receive traffic information in respect to VFR flights. VFR flights receive traffic information in respect to all other flights.



1.18 Additional Information

1.18.1 Radar Monitor Observations

The Investigation observed that as the DA62 flew the approach during which the Accident occurred, it followed a preceding Airbus A350-900 at a distance of 3.7 nm. The Airbus A350-900 was flying the approach to the parallel runway 30R.

Observations of previous approaches during the same calibration flight indicated that the DA62 consistently followed preceding traffic on approach to the parallel runway 30R at distances which were below the specified minimum separation, and less than the distances discussed during the pre-departure meeting.

The radar monitor recording indicated that there was an air traffic control (ATC) inconsistency in advising the DA62 of the expected occurrence of hazards caused by wake turbulence from traffic on approach to the parallel runway 30R.

Based on these observations, the Investigation believes that there is sufficient reason to issue a prompt safety recommendation to re-emphasize to pilots and air traffic controllers the importance of maintaining a minimum safe distance and issuing essential traffic information such as advising aircraft of the expected occurrence of hazards caused by wake turbulence.

1.18.2 Calibration flight meeting

Prior to the commencement of the calibration flights, the flight crew met with DANS and airport operational staff to discuss the mission. The operational parallel runway and aircraft separation were among the items discussed during this meeting.

The DA62 would apply own separation to other arriving aircraft to the parallel runway 30R while operating under VFR, which meant that ATC would not be responsible for providing wake turbulence separation.

1.18.3 Flight plan

The flight plan for the calibration flight stated that three occupants were onboard the Aircraft. Four occupants were accounted for after the Accident.

1.19 Useful or Effective Investigation Techniques

This Investigation is conducted in accordance with the Legislation and *Civil Aviation Regulations* of the United Arab Emirates, and with the AAIS approved policies and procedures, and in accordance with the Standards and Recommended Practices of *Annex 13 to the Chicago on International Civil Aviation*.

2. Ongoing Investigation Activities

The Investigation has examined the Accident site, initially examined Aircraft wreckage and CCTV footage. Witness interviews were conducted and data was collected from various sources.

The Investigation will continue and further enquiries will be made to identify the cause(s) and contributing factors to the loss of control.



3. Safety Concerns and Actions

3.1 Prompt Safety Recommendation to the General Civil Aviation Authority

Based on the potential consequences of a wake turbulence encounter due to close proximity between the DA62 and the preceding aircraft during the approach, the Investigation believes that prompt safety action is warranted to mitigate the risk.

Accordingly, the Investigation issues prompt safety recommendation PSR 01/2019, recommending that:

“The General Civil Aviation Authority issue a safety alert to all air navigation service providers in the United Arab Emirates and to all operators of light aircraft, to enhance awareness among pilots and air traffic controllers of their separation procedures, particularly under visual flight rules.”

3.2 Safety Actions Taken by DANS and Dubai Airports

DANS and Dubai Airports agreed to continue the calibration flights and necessary instrument calibration flights in a sterile airport environment and issued temporary instructions for the required days, in which ATC procedures were detailed. All commercial operation at OMDB ceased during these flights on 24th, 26th and 27th May 2019.

3.3 Safety Actions Taken by the General Civil Aviation Authority of the UAE

The General Civil Aviation Authority is in the process of publishing a Safety Decision containing mandatory requirements for ensuring that ATC procedures are developed, implemented and maintained for issuing essential traffic information, including the advice to aircraft of the expected occurrence of hazards caused by turbulent wake.

Additionally, a *Safety Decision* is being prepared to ensure standardised procedures are developed, implemented and maintained for the management of unusual or abnormal aircraft operations, including calibration flights, as it was found that regulations, standards and recommended practices and procedures did not specifically cover the management of such operations, e.g. calibration flights.

3.4 Safety Actions Taken by Flight Calibration Services Limited

As a result of the Accident, the Operator has contacted all company pilots to raise their awareness of minimum separation criteria as detailed in a Eurocontrol document titled “European Wake Turbulence Categorisation and Separation Minima on Approach and Departure”.

A training course on wake turbulence effects during take-off and landing, and a practical upset recovery training is being developed.

The Operator is in the process of reviewing the procedures and processes for calibration flights.

This Preliminary Report is issued by:

The Air Accident Investigation Sector
General Civil Aviation Authority
The United Arab Emirates
E-mail: aai@gcaa.gov.ae