AAI Case Reference: 02/2011

# AIR ACCIDENT INVESTIGATION SECTOR

**INTERIM**

## AIR ACCIDENT INVESTIGATION REPORT

# AIRCRAFT CRASH AFTER TAKEOFF

McKinnon G-21G
N221AG
Triple S Aviation
Al Ain International Airport
United Arab Emirates
27th February 2011

**General Civil Aviation Authority**
**of**
**United Arab Emirates**

***OBJECTIVE***

*This investigation is performed in accordance with the UAE Federal Act No 20/1991, promulgating the Civil Aviation Law, Chapter VII, Aircraft Accidents, Article 48, and in conformity to ICAO Annex 13 to the Chicago Convention.*

*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.*

**AIRCRAFT ACCIDENT BRIEF**

| | |
|---|---|
| **GCAA AAI Report No.:** | 02/2011 |
| **Operator/owner:** | Private, registered owner: Triple S Aviation LLC |
| **Aircraft Type and Model:** | McKinnon G-21G |
| **Registration Mark:** | N221AG, |
| **MSN:** | 1240 |
| **No. and Type of Engines:** | Two Turbo Prop, TPE331 Series |
| **Date and Time (UTC):** | 27th February 2011, 20:07 UAE LT (_+4 UTC) |
| **Location:** | Al Ain International Airport, Taxiway "F", between Taxiway "K" and "C"<br>N 24$^0$ 15' 30.941'' E 055$^0$ 36' 40.541'' |
| **Type of Flight:** | General Aviation |
| **Persons on Board:** | 4 |
| **Injuries:** | 4 Fatal |
| **Nature of Damage:** | Aircraft completely destroyed |

The accident, involving McKinnon G-21G, registration N221AG, was notified to the General Civil Aviation Authority (GCAA), on 27th February, 2011 at about 1610 UTC. An Investigation Team was dispatched and reached the accident site within one hour. The Team coordinated with all Authorities on site by initiating the accident investigation process according to the already prepared and exercised plans. The Air Accident Investigation ("AAI") of the GCAA is leading the investigation as the United Arab Emirates ("UAE") is the State of Occurrence.

Notes:

1 The word ("Aircraft") in this report implies the accident aircraft.

2 The word ("Investigation") in this report implies the Investigation on this Accident conducted by the Investigation Team headed by an Investigator-In-Charge assigned by the GCAA of the UAE and encompasses investigators from the GCAA and an accredited representative from the National Transportation Safety Board ("NTSB") of the United States of America.

3 Time mentioned in the Report is Coordinated Universal Time (UTC).

# TABLE OF CONTENTS


**FACTUAL INFORMATION**

History of the Flight 1

Injuries to Persons 2

Damage to Aircraft 2

Other Damage 2

Personnel Information 2

Aircraft Information 3

Meteorological Information 4

Flight Recorders 4

Wreckage and Impact Information 5

Fire 5

Survival Aspects 5

**INVESTIGATION PROGRESS** 6

**ONGOING INVESTIGATION ACTIVITIES** 7

**SAFETY CONCERNS AND ACTIONS** 8

**APPENDIX 1** 9

**APPENDIX 2** 10

# FACTUAL INFORMATION

*This Interim Report is published in the first anniversary of the Accident and is a continuation of the Preliminary Report published on March 31st 2011 with additional Investigation Progress Section and pertinent photos captured during hardware lab examinations.*

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

## HISTORY OF FLIGHT

On February 27th, 2011, at approximately At 12:12:20 the crew of McKinnon G-21, registration N221AG Aircraft called Al Ain International Airport tower landline advising evening departure outbound to Riyadh, Saudi Arabia.

After conversation, the aerodrome controller ("ADC") asked the Aircraft about the estimated time of departure, the crew answered that it would be at 1400, the ADC confirmed that the estimated time of departure ("ETD") will be changed to 1400 (UTC), subsequently the ADC asked if the Aircraft is going to do a test flight before the departure to the destination, the crew answered that they haven't flown the Aircraft for a while and they wanted to stay in the pattern before takeoff to the cleared route.

Accordingly the ADC offered the crew to fly in the circuit until it becomes ready to depart, the crew accepted the advised pattern and informed the ADC that they won't shutdown the engine nor they want to land thus, according to the crew advice to the ADC, the Aircraft would stay in the circuit and go straight from there to the cleared route.

At 13:53:15, the ADC called one of the crew on the landline who on his turn advised that they need one more hour waiting for fuel.

At 15:46:48, the Aircraft called the ground movement controller ("GMC") asking for IFR clearance to Riyadh, the GMC replied the Aircraft that they would not do a local circuit and would be going ahead and pick up IFR flight plan. The Aircraft asked to do one circuit in the pattern, if available, approach then accept the tower clearance to Riyadh. The GMC advised the Aircraft to expect a left closed traffic not above two thousand feet and to standby for a clearance; the Aircraft read back the instructions correctly.

At 15:50:46, the Aircraft reported engine starting then requested taxi clearance, the GMC cleared the Aircraft to the holding point of Runway ("RWY") 19 and advised QNH 1014, the GMC advised also that the Aircraft should expect a left hand closed traffic not above 2000 feet VFR, the GMC also advised the Aircraft to request for your IFR clearance with tower once airborne, the Aircraft read back the instructions correctly.

At 15:53:41, the GMC read the squawk to the Aircraft which was confirmed by the Pilot correctly. Thereafter, the Aircraft was instructed to taxi to RWY 19 holding point, and, after completion of the closed circuit, cleared to destination via ROVOS flight planned route on departure runway one nine be a right turn maintain six thousand feet, the Aircraft read back the instruction correctly.

At 16:02:38, the Aircraft called the ADC advising ready for departure RWY 19 closed circuit, the ADC instructed to hold position and to confirm one circuit, the Aircraft affirmed one circuit a low approach and then IFR to Riyadh.

At 16:03:53, the ADC instructed the Aircraft to line up and wait RWY 19.

At 16:05:37, the ADC cleared the Aircraft for takeoff and read the surface wind as 180 degrees 7 knots and to report downwind, the Aircraft read back the instructions correctly.

The Aircraft started the takeoff acceleration normally, with four persons onboard, until shortly after liftoff, and during initial climb, the Aircraft veered to left towards the ground of taxiway "F", between Taxiway Kilo and Lima where it impacted at approximately 1607 with down nose and left roll attitude. The Aircraft went for a distance of approximately 32 meters until came to a complete stop.

The Aircraft was destroyed by the impact and subsequent fire. All occupants were fatally injured.

## INJURIES TO PERSONS

| Injuries | Flight Crew | Cabin Crew | Passengers | Other | Total |
|---|---|---|---|---|---|
| Fatal | 2 | - | 2 | - | 4 |
| Serious | - | - | - | - | - |
| Minor | - | - | - | - | - |
| None | - | - | - | - | - |
| **Total** | **2** | **-** | **2** | **-** | **4** |

## DAMAGE TO AIRCRAFT

The aircraft was destroyed due to significant impact forces and subsequent fire.

## OTHER DAMAGE

None

## PERSONNEL INFORMATION

Table 1 below illustrates the operational qualifications and experience of the pilot in command at the time of the occurrence.

| Table 1- Pilot in command qualifications and experience | |
|---|---|
| **Gender** | Male |
| **Date of Birth** | 24th February 1983 |
| **Licence Category and Rating** | CPL: AIRPLANE MULTIENGINE SEA<br>AIRPLANE SINGLE ENGINE LAND |

| | |
|---|---|
| | AIRPLANE SINGLE ENGINE SEA<br>ATPL: AIRPLANE MULTIENGINE LAND |
| **Class & date of last medical** | Pending, 6th October 2009 |

## AIRCRAFT INFORMATION

### General Information

Table 2 below illustrates updated general information of the Aircraft after the records review.

**Table 2- General information of the Aircraft.**

| | | |
|---|---|---|
| **Manufacturer** | | McKinnon [1] |
| **Model** | | G-21G |
| **MSN** | | 1240 |
| **Year of manufacture** | | 1944 |
| **Registration** | | N221AG |
| **TSN** | | 9912 hours |
| **CSN** | | Unknown |
| **Certificate of Airworthiness** | | |
| | Issuing Authority | The Federal Aviation Administration ("FAA") of the United States of America |
| | Issue date | 17th May, 1996 |
| | Valid till | No expiry date |
| **Certificate of Registration** | | |
| | Issuing Authority | The Federal Aviation Administration of the United States of America |
| | Issue date | 17th December, 2009 |

[1] The manufacture name contained in the Preliminary Report published on 31st March 2011 is amended in this Report since the review of Aircraft records revealed that the G-21G model is a conversion of the basic Grumman model G21 and G21A, under Type Certificate No. 654. Later on the G-21G became under McKinnon Type Certificate No. 4A24.

The latest Type Certificate holder of this model is "Atlantic Coast Seaplanes LLC", the Type Certificate Holder Record shows also that the A.G. McKinnon transferred 4A24 to Viking Air Limited on June 6, 1984, Viking Air Limited transferred 4A24 to Aero Planes, Inc on September 4, 1998, TC 4A24 was reissued to Aero Planes, LLC on May 5, 2000. Aero Planes, LLC transferred 4A24 to Atlantic Coast Seaplanes LLC on September 27, 2007, accordingly TC 4A24 was reissued to Atlantic Coast Seaplanes LLC on March 7, 2008.

| | | |
|---|---|---|
| | Expiry Date | 30th June, 2013 |
| **Last inspection** | | 10th June, 2010 |
| **Empty weight** | | 7980.64 pounds |
| **E.W. C. G in % MAC** | | Arm 16.92 inches, Moment 135003.99 pounds-inches |
| **Last Weight and Balance** | | 28th May, 2010 |
| **Engines** | | Two Turbo Prop Garrett AiResearch Manufacturing Company of Arizona [2] TPE-331-2UA-203D |
| S/N | Engine No. 1 | 97002 73HRS SMOH |
| | Engine No. 2 | 97001 73HRS SMOH |
| **Propellers** | | Two Hartzell constant speed 3-blades propellers HC-B3TN-5E |
| S/N | Propeller No. 1 | BUA 7076 73 HRS SMOH |
| | Propeller No. 2 | BUA 7078 73 HRS SMOH |

The installation of the two TPE-331-2UA-203D was according to Supplemental Type Certificate ("STC") No. SA2809WE issued by the FAA for McKinnon Enterprises on 7th November 1975, accordingly a new issue of Aeroplane Flight Manual ("AFM") was approved by the FAA.

**Aircraft Records**

(a) Reviewing the Aircraft records did not reveal in significant deficiencies that might have contributed to the Accident.

(b) The extra fuel tank installation history is under investigation.

(c) Two modifications were performed on the Aircraft during the last year before the Accident:

1. Installation of Garmin G600 primary flight display and multifunction flight display according to STC No. SA02153LA issued by the FAA for Garmin AT Inc. on 25th July 2008.
2. Installation of electroluminescent glow strip supplemental instrument panel lighting.

Both modifications were approved by FAA Form 337.

## METEOROLOGICAL INFORMATION

The ongoing Investigation did not reveal significant weather at the time of the Accident.

## FLIGHT RECORDERS

According to the FAA Regulations of the United States, the Aircraft was not required to be equipped with flight recorders.

[2] Lately became Honeywell Engines

## WRECKAGE AND IMPACT INFORMATION

The main wreckage was almost one unit; the wings, flight controls, engines mainframe were damaged but stayed at their original place. The two propellers and the left hand tyre were found at various locations but close to the main wreckage. The cockpit was the most severely damaged zone where the windows scattered and the seats out of place.

The cargo door as well as the passengers' door disintegrated and departed the aircraft. Most of passengers' seats also departed their fixtures and scattered.

The post impact fire consumed the majority the Aircraft left side structure, whereas the right side exhibited less damage and burnt metals.

The nose of the Aircraft was heading about 060°

Green smears and narrow scars were observed at the yellow edge of the asphalt paved TWY ("F") with lose green head rivets which could indicate that the smears were drawn and scars were engraved by the Aircraft nose belli green skin.

Another impact scar was observed at a lateral distance of approximately 8.4 meters from the green smear mark. The distances were matching with the aircraft wing dimensions with both floats-up configuration[3] which could introduce a clue that the scar was engraved by the left wing float.

Three propeller slash marks were observed at the left side of the green smears whereas two were to the right side, the pitch distances of the right and left slash marks were almost similar with an average of 0.5 meters.

Neither scars nor smears were noticed along a distance of approximately 26 meters from the last impact mark, engraved by the right propellers, to the Aircraft final settlement.

All the wreckage was removed and preserved in special containers located at the quarantine area accessible only to the Investigation Team.

## FIRE

There was no evidence of inflight fire. The Aircraft destroyed due to impact and subsequent fire.

## SURVIVAL ASPECTS

This accident was non-survivable.

[3] Wing span 50.94 feet (15.53 meters, half the span is 7.77 meters)

## INVESTIGATION PROGRESS

1. Both engines were shipped to the engine's manufacturer for teardown and lab examination. [4]

In addition to the examination performed on the various major hardware, the examination showed the following observations concerning the compressor and turbine sections of both engines:

Engine No. 1

(a) The compressor section:

- The first stage compressor impeller shroud showed heavy rubs at exducer and knee with heavier indications at the bottom.
- The first stage compressor impeller showed that all blades at the inducer and exducer were bent in direction of rotation. There was also rotational scoring at the rear curvic outer diameter and back face at hub. (Appendix 1, Figure 1).The first stage compressor diffuser showed rubs corresponding to impeller back face.
- The second stage compressor housing showed 360 degrees uniform heavy rub from inducer to exducer.
- The second stage compressor impeller showed rub on the entire length of the blade. . (Appendix 1, Figure 2).

(b) The turbine section:

- The first stage turbine stator and rotor were intact and showed metal spray and material deposit on shroud over 90 degrees. There was also rubs at the aft inner diameter of the rotor platform.
- The second stage turbine stator and rotor showed metal spay on suction sides. The stator showed rubs on forward inner platform and heavy rubs in honeycomb seal offset to aft side. The rotor showed rub on aft side of rotor platform and blade tips.
- The third stage turbine stator showed heavy rubs on the inner diameter honeycomb seal.
- The third stage turbine rotor showed metal spay on the suction side and rub on the aft side of rotor at platform and at aft edge of blade tips. (Appendix 1, Figure 3).

Engine No. 2:

(a) The compressor section:

- The first stage compressor impeller shroud was intact with rubbing marks at the first stage compressor impeller shroud locations 4-8 o'clock from inducer to exducer, extending 11 o'clock exducer.

[4] Reference- Honeywell Teardown Notes, Report No. DCA11WA032, dated 4th October 2011.
The examination was attended by NTSB investigator and FAA Inspector. Photos appended to this Report were examples to show some observable marks on the rotating and stationary engine hardware, those photos are some of numerous photos taken during the engines' teardown.

- The first stage compressor impeller intact, undamaged with marks of rub from knee to exducer.
- The second stage compressor housing was intact with shroud rubs of 360 degrees at the exducer and local rub at 3 o'clock at inducer.
- The second stage compressor impeller was intact with marks of blade rubs in knee to exducer. (Appendix 1, Figure 4).

(b) The turbine section:

- The first stage turbine stator, shroud and rotor were intact and showed metal spray leading edges and suction sides.
- The second stage turbine stator, rotor showed metal sprays on the leading edge and suction sides.
- The third stage turbine stator and rotor were intact metal sprays on the suction side trailing edges.

The rub marks and the bending of the impeller blades to the direction of rotation gave clues that both engines were rotating pre-impact but with unknown engines' power settings.

2. The following recovered indicators were shipped to the NTSB labs for teardown examination[5]:

- Attitude
- Air Speed
- Turn Indicator
- Oil Pressure of engine No. 1 and 2
- Fuel pressure of engine No. 1 and 2.
- Fuel computer
- EGT Limit
- Exhaust temperature of engine No. 1 and 2
- Torque of engine No. 1 and 2
- RPM of engine No. 1 and 2
- One unidentified indicator

Except the engine No. 1 Torque Indicator, all indicators were either hidden by heavy soot or could not depict any witness mark.

The engine No. 1 Torque Indicator depicted a witness mark near the 25 psi marker.(Appendix 2, Figure 5).

## ONGOING INVESTIGATION ACTIVITIES

- Propellers' examination is under process; the examination will be performed at the propellers' manufacturer labs. The examination will be a trial to find out, if possible, the blades' pitch angle through exploring any witness marks on the propellers' hardware.

[5] Reference- NTSB Material Laboratory Factual Report No. 11-127, dated 16th December 2011

- The AFM, AMM [6], then engine's charts will be used to determine the propellers' rotational speed and engine power settings.

## SAFETY CONCERNS AND ACTIONS

None issued yet.

**Air Accident Investigation Sector**

**The General Civil Aviation Authority**

**United Arab Emirates**

[6] Aircraft Maintenance Manual

## APPENDIX 1


**Figure 1-** Rub on the entire length of the engine No. 1 first stage compressor impeller


**Figure 2-** Bent blades and scores on engine No. 1 second stage compressor impeller


**Figure 3-** Rub marks at engine No. 1 third stage turbine rotor platform

**Figure 4-** Marks of blade rubs in engine No. 2 first stage compressor impeller

## APPENDIX 2


**Figure 5-** The torque indicator of engine No. 1 depicted a witness mark near the 25 psi marker.