



AIRCRAFT ACCIDENT REPORT

IAC/2013/11/25/F

Accident Investigation Bureau

**Report on the Accident involving a Diamond DA40D
Aircraft operated by International Aviation College
(IAC) Ilorin with Nationality and Registration Marks
5N-BRD which occurred at Ilorin International Airport,
Ilorin, Kwara State, Nigeria
On 25th November, 2013**



This report was produced by the Accident Investigation Bureau (AIB), Murtala Muhammed Airport, Ikeja, Lagos.

The report is based upon the investigation carried out by the Accident Investigation Bureau, in accordance with Annex 13 to the Convention on International Civil Aviation, Nigerian Civil Aviation Act 2006, and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2016.

In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of aircraft accident/serious incident investigations to apportion blame or liability.

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Accident Investigation Bureau believes that safety information is of great value if it is passed on for the use of others. Hence, readers are encouraged to copy or reprint for further distribution, acknowledging the Accident Investigation Bureau as the source.

Safety Recommendations in this report are addressed to the Regulatory Authority of the State (NCAA). This authority ensures enforcement.

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TABLE OF CONTENTS

TABLE OF CONTENTS	i
TABLE OF FIGURES	iii
GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT	v
SYNOPSIS	1
1.0 FACTUAL INFORMATION.....	3
1.1 History of the Flight	3
1.2 Injuries to Persons.....	4
1.3 Damage to Aircraft	4
1.4 Other Damage.....	5
1.5 Personnel Information.....	5
1.5.1 Safety Pilot	5
1.5.2 Student Pilot.....	6
1.5.3 Check Airman	6
1.5.4 Engineer.....	6
1.6 Aircraft Information	7
1.6.1 General Information	7
1.6.2 Power Plant	7
1.6.3 Propeller.....	8
1.6.4 Engine Description	8
1.6.5 Air Intakes DA40 Series AMM 71-00-00	8
1.6.7 Aircraft Maintenance	10

1.6.8	Mandatory Service Bulletin (MSB).....	10
1.6.9	Airworthiness Directive (AD)	12
1.7	Meteorological Information.....	14
1.8	Aids to Navigation.....	15
1.9	Communications	15
1.10	Aerodrome Information.....	16
1.11	Flight Recorders	16
1.12	Wreckage and Impact Information.....	16
1.13	Medical and Pathological Information.....	18
1.14	Fire.....	18
1.15	Survival Aspects	18
1.16	Test and Research	19
1.17	Organizational and Management Information	19
1.17.1	International Aviation College (IAC)	19
1.18	Additional Information	20
1.18.1	Extract from DA40-D-AFM sub-section 3.4	20
1.18.2	Examination of the FADEC	22
2.0	ANALYSIS	23
2.1	General	23
2.2	Conduct of the Flight	23
2.3	Engine Failure	24
2.4	Pre-flight Inspection/Maintenance.....	24
2.5	Compliance with EASA AD 2012-0024	25



3.0	CONCLUSIONS	26
3.1	Findings	26
3.2	Causal Factor	26
4.0	SAFETY RECOMMENDATIONS	28
	Appendix A: MSB D4-088.....	29
	Appendix B: WI MSB D4-075	34
	Appendix C: MSB D4-075/1	39
	Appendix D: EASA AD No.: 2012-0024	43
	Appendix E: FADEC Data Evaluation Report.....	45
	Appendix F: DA40 AMM (Servicing) (B) Fuel Contamination Test procedure	46
	Appendix G: Witness Statement of the Check Airman (NCAA Flight Operator Inspector)	47
	SUMMARY OF COMMENTS TO DRAFT FINAL REPORT	49

TABLE OF FIGURES

Figure 1: The suitable quality Turbocharger hose (MSB D4-088)	11
Figure 2: Other quality (NOT suitable according to MSB D4-088)	12
Figure 3: Delaminated turbocharger hose found installed on 5N-BRD	13
Figure 4: The turbocharger hose found installed on 5N-BRD.....	13
Figure 5: Final resting position of the 5N-BRD.....	17



Figure 6: A damaged left wing	17
Figure 7: Propeller blade bent rearward.....	18



GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

AD	Airworthiness Directive
AFQRJOS	Aviation Fuel Quality Requirements for Jointly Operated Systems
AGL	Above Ground Level
ATPL (A)	Air Transport Pilot License (Aeroplane)
CA	Check Airman
CB	Circuit Breaker
CPL (A)	Commercial Pilot License (Aeroplane)
CT	Control Tower
EASA	European Aviation Safety Agency
ECU	Engine Control Unit
FI	Flight Instructor
IAC	International Aviation College
ILS	Instrument Landing System
MSB	Mandatory Service Bulletin
MSL	Mean Sea Level
NAF	Nigerian Air Force
NCAA	Nigerian Civil Aviation Authority
PPL	Private Pilot License



RWY	Runway
SfP	Safety Pilot
SPL (A)	Student Pilot (Aeroplane)
UTC	Coordinated Universal Time



Aircraft Accident Report No.:	IAC/2013/11/25/F
Registered Owner and Operator:	International Aviation College, Ilorin
Aircraft Type and Model:	Diamond DA40D
Manufacturer:	Diamond Aircraft, Austria
Year of Manufacture:	2006
Registration Marks:	5N-BRD
Serial No.:	D4.242
Location:	Ilorin International Airport 08 ⁰ 26'24"N, 004 ⁰ 29'38"E
Date and Time:	25 th November, 2013 at 11:35 h

(All times in this report are local time, equivalent to UTC+1, unless otherwise stated)

SYNOPSIS

Accident Investigation Bureau (AIB) was notified of the accident by the International Aviation College (IAC) on 25th November, 2013. Investigators were dispatched the following day and commenced investigation into the circumstances surrounding the occurrence.

At 11:34 h, 5N-BRD on a Private Pilot License (PPL) Check Ride, departed runway 05, Ilorin International airport and commenced initial climb. During after-take off checks (i.e. landing light off, flaps up and climb power was set), at about 1,600 ft above mean sea



level (AMSL) in climb, the load percentage decreased to 65%, engine RPM dropped drastically and subsequently the engine failed.

The Safety Pilot (SfP) took over control of the aircraft, verified that the throttle was at full power position, tried restarting the engine but the engine failed to restart. He commenced air return to the airfield and declared emergency, trimmed the aircraft to glide at a speed of 75 kt.

The aircraft force-landed short of runway 23 to the right and came to a stop, 596 m from the threshold. All the three occupants evacuated unhurt.

The accident occurred in daylight.

Causal Factor

Loss of engine power during initial climb caused by insufficient air supply into the inlet manifold due to constriction of the inner layer of the flexible hose connecting the alternate air valve to the turbocharger air inlet.

Contributory Factor

Poor maintenance practice as regards non-compliance with EASA AD No.: 2012-0024 for the replacement of the Turbocharger hose.

Four Safety Recommendations were made.



1.0 FACTUAL INFORMATION

1.1 History of the Flight

On 25th November 2013, a Diamond DA40D aircraft, registered 5N-BRD belonging to the International Aviation College (IAC), Ilorin, was scheduled for a Private Pilot License (PPL) Check Ride. The aircraft took off from Ilorin International Airport runway 05 on a Visual Flight Rules (VFR) flight plan with four hours endurance. Onboard the aircraft were the Student Pilot (SP), Safety Pilot (SfP) and Check Airman (CA). The SfP reported that 5N-BRD was scheduled for three Private Pilot License check rides.

External and internal pre-flight inspections were completed for the second check ride, and the pilot requested engine start at 11:22 h which was approved at 11:24 h.

After the start-up, an Engine Control Unit (ECU) test was carried out by the SP. All engine indications and operations were normal. The SP was the Pilot Flying (PF).

At 11:28 h, 5N-BRD requested for taxi clearance and was cleared to taxi holding point Runway (RWY) 05.

At 11:32 h, 5N-BRD requested for take-off on RWY 05. The aircraft was cleared and directed to turn right to training area Three Bravo (3B).

At 11:34 h, 5N-BRD got airborne, and the Student Pilot (SP) reported that, during the after-take off checks (i.e. landing light off, flaps up and climb power was set), climbing through 1,600 ft above mean sea level (AMSL), the load percentage decreased to 65%, and engine RPM dropped drastically. Subsequently the engine failed.

At this point, the SfP took over control of the aircraft, verified that the throttle was at full power position, tried restarting the engine but the engine failed to restart. He then called out "engine failure". According to the CA, the SfP trimmed the aircraft to establish 75 kt glide speed, commenced air return to the airfield and declared



emergency. The Tower (TWR) acknowledged “May Day” and cleared the aircraft for emergency landing.

The SfP maintained a speed of 75 Kt, wings level and aimed towards RWY23. The aircraft force-landed short of runway 23 to the right and came to a stop about 596 m from the threshold. The CA commanded “evacuate” and all the occupants evacuated unhurt. The crash alarm activated and Aerodrome Rescue and Fire Fighting Services (ARFFS) were notified.

The Rescue Team arrived the scene and found all the three occupants unhurt. The three occupants were taken to the College Clinic. The SP was subsequently moved to a designated Hospital for further check-up and attention.

The accident occurred in daylight.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Total in the Aircraft	Others
Fatal	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil
Minor	Nil	Nil	Nil	N/A
None	3	Nil	3	N/A
TOTAL	3	Nil	3	Nil

1.3 Damage to Aircraft

The aircraft was substantially damaged.



1.4 Other Damage

Nil.

1.5 Personnel Information

1.5.1 Safety Pilot

Nationality:	Nigerian
Age:	26 years
Gender:	Male
License Type:	CPL (A)
License Validity:	24 th March, 2018
Medical Validity:	5 th August, 2014
Ratings:	C172, Piper Arrow PA 28R, DA40, DA42, Decathlon (8KCAB)
Total Flight Time:	718.9 h
Hours on type:	177.7 h
Last 90 days:	Not Available
Last 28 days:	Not Available
Last 7 days:	Not Available
Last 24 hours:	Not Available

The SfP holds a Federal Aviation Administration (FAA) license on single engine and multi-engine airplanes which was validated by NCAA on 16th July, 2013. The SfP's progress report entries indicated that he had done standardization flight on DA40 on the 25th of September, 2013.



1.5.2 Student Pilot

Nationality:	Nigerian
Age:	27 years
Gender:	Male
License Type:	SPL (A)
License Validity:	20 th June, 2018
Medical Validity:	10 th May, 2015
Total Flight Time:	58.2 h
Hours on type:	58.2 h

1.5.3 Check Airman

Nationality:	Nigerian
Age:	61 years
Gender:	Male
License Type:	ATPL (A)
Ratings:	C150, C172, PA23, PA34, F28, A310, B737, B707, L1011, DC-10, TB-9, TB-20, TBM 850
Total Flight Time:	23,880 h
The check Airman Authorization:	Q400, CRJ900, B737-Classic, B737-NG, A330-200, Diamond D40 and D42

1.5.4 Engineer

Nationality:	Nigerian
Age:	41 years
Gender:	Male



License Type:	AMEL
License Validity:	14 th Feb, 2014
Ratings:	C172, DA40D, DA42, Lycoming 0-320- E2D engines, 2.0 Centurion Engines

1.6 Aircraft Information

1.6.1 General Information

Manufacturer:	Diamond Aircraft Austria
Model:	DA40D
Serial Number:	D4.242
Year of Manufacture:	2006
Nationality and Registration Marks:	5N-BRD
Name of Operator:	International Aviation College (IAC)
Certificate of Airworthiness:	9 th September, 2014
Certificate of Insurance:	28 th February, 2014
Airframe Time:	1,894.26 h as at 7 th November, 2013

1.6.2 Power Plant

Engine Type:	TAE 125-02-99
Manufacturer:	Thielert, Germany
Serial No.:	02-02-03150
Year of Manufacture:	2006
Total Time since New:	329.51 h



1.6.3 Propeller

Manufacturer:	MT-Propeller Entwicklug GMBH
Serial No:	02234
Number of blades:	3
Type:	Variable Pitch
TSO/TSN:	260:31 h

1.6.4 Engine Description

Extract from DA40 Series AMM 71-00-00

The Centurion is a liquid-cooled 4 cylinder in-line four-stroke diesel engine with Double Overhead Camshaft (DOHC). The valves are activated by cam follower. The direct diesel-injection engine operates based on the common-rail techniques and turbo charging. The engine is controlled by a FADEC system. The propeller is driven through an integrated gearbox ($i=1.69$) with a clutch. The engine is equipped with an electric starter and alternator.

1.6.5 Air Intakes DA40 Series AMM 71-00-00

The bottom cowling has these air intakes:

- *The intake on the front left face of the bottom cowling supplies cooling air for the engine.*
- *The intake on the front right face of the bottom cowling has three outlets:*
 - *A small outlet which supplies additional cool air to the engine.*
 - *An outlet which supplies cooling air through integral ducting to the oil cooler.*



- *An outlet which connects to a flexible hose which supplies cooling air to the cabin heat system, to the battery and to the alternator.*
- *Engine air intake. This intake is located in the lower center of the cowling and supplies air to the engine air filter.*

DA 40 series AMM chapter 81 TURBINES

Description:

The air intake system has an air filter located on the right of the engine compartment, just forward of the firewall. The filter attaches to the bottom of an alternate valve air. The alternate valve air also has an inlet direct from engine compartment. A flap in the valve can select either filtered or warm, unfiltered air. The outlet from the alternate air valve connects to the Turbocharger. The Turbocharger compresses the air. This makes the air hot. The outlet from the Turbocharger connects to an intercooler. The intercooler is located on the right of the engine. It attaches to the engine mounting frame. The outlet from the intercooler connects to the engine inlet manifold. A manifold pressure sensor and a manifold temperature sensor attach to the outlet pipe of the intercooler (TAE 125-01 engine) or the intake air box (TAE 125-02-99 engine, MAM 40-256 carried out)

1.6.6 Aircraft History

5N-BRD, DA40D was manufactured by Diamond aircraft industry, Austria in 2006. It was first acquired by CabAir UK, registered as G-OCCO and maintained by Apollo Aviation. In June 2013 the aircraft was sold to IAC, Ilorin and inspected by the college/NCAA inspectors before it was ferried into Nigeria. The aircraft was registered as 5N-BRD in September, 2013 and all relevant documents were issued.



1.6.7 Aircraft Maintenance

The aircraft was maintained by IAC as an Approved Training Organization. The following are the maintenance checks carried out:

- a) 200 h (annual) inspection carried out and signed at 1619 h on 11th September, 2013.
- b) 100 h inspection carried out and signed at 1717 h on 6th October, 2013.
- c) 200 h inspection carried out and signed at 1830 h on 7th November, 2013.

1.6.8 Mandatory Service Bulletin (MSB)

A Mandatory service bulletin is a document issued by the aircraft manufacturers to operators to enhance safety.

Three mandatory service bulletins related to the Turbocharger hose were issued by the manufacturer as follows:

- 1. MSB D4-088** - (30th January, 2012): *For the inspection of turbocharger hose, and if required be replaced with another hose part No: DAI P/N SG2M-64-920mm and standardization of the installation per MSB D4-075/1. The time of compliance is presented with two actions:*
 - i) Within 20 flight hours, but not later than 1st April, 2012, identification of turbocharger hose and replacement of NOT suitable quality before further flight*
 - ii) If MSB D4-075 (initial issue) has not been carried out yet, within 100 flight hours but not later than 31st July, 2012, carryout MSB D4-075/1 or later issue.*

This MSB states its reason as: *There are different qualities of SCEET 10 flexible ducting available, where it appears that specific qualities are not suitable for the application as a turbocharger hose on a DA 40D. In some cases, the inner layer of the 2-layer ducting separated and caused a reduction of cross section of the air intake of the turbocharger and a subsequent engine power loss. See appendix A*

2. WI-MSB D4-075 (30th January, 2012): Replacement of air intake hose from Turbocharger and installation with a P-CLAMPS. See appendix B

3. MSB D4-075/1:(30th January, 2012) Air Induction System; and supersedes **MSB D4-075** the reason for **MSB D4-075/1** is, in-service experience has shown that the hose between the alternate air valve and the turbocharger is sensitive against chafing if not correctly installed. To provide additional measures against that chafing of the air induction tube on the engine mount the flexible air intake tube is now fixed in a more defined position. This service bulletin describes the retrofit installation on aircraft already in service. **See Appendix C.**



Figure 1: The suitable quality Turbocharger hose (MSB D4-088)

2 strings (one close to each side of the wire) and a maximum bonding area between each winding.



Figure 2: Other quality (NOT suitable according to MSB D4-088)

1.6.9 Airworthiness Directive (AD)

Airworthiness Directive: Continuing Airworthiness information that applies to the following products: Aircraft, aircraft engines, propellers and appliances. An airworthiness directive is mandatory if issued by the State of Design.

European Aviation Safety Agency (EASA) had issued an Airworthiness Directive (**AD No.: 2012-0024:** Power plant –Turbocharger –Inspection/replacement.) dated 3rd February, 2012 mandating compliance with MSB D4-088, WI-MSB D4-075 and MSB D4-075/1. **See Appendix D**

The records available to the Bureau indicated that the MSB D4-088 and MSBD4-075/1 were complied with on 28th November, 2012 and 5th January, 2011 respectively and also AD 2012-0024 (Power Plant-Turbocharger Hose-Inspection/Replacement) was complied with on 28th November, 2012 by Apollo Aviation Limited in the United Kingdom before IAC purchased the aircraft.

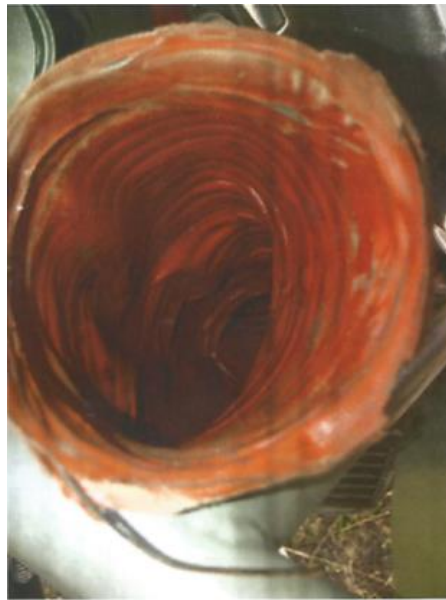


Figure 3: Delaminated turbocharger hose found installed on 5N-BRD



Figure 4: The turbocharger hose found installed on 5N-BRD



1.6.10 Fuel

Type of Fuel Used: Jet A1

The CA who was a Flight Operations Inspector from the Nigerian Civil Aviation Authority (NCAA), reported noticing a telltale sign of a leak underneath the aircraft on the morning of 25th November 2013. Upon enquiry, it was confirmed to him by the student that he had drained fuel from the aircraft tanks during the fuel-drain check due to a lot of sediments in the tank. The student said he had drained the fuel until it was clear of the sediments.

1.7 Meteorological Information

At 0900 UTC

Wind: 190/09 kt
Visibility: 15 km
Cloud: SCT 330 m
Weather: Nil
QNH: 1012 hPa
Temp/Dew: 29/22 °C

At 1000 UTC

Wind: 230/10 kt
Visibility: 15 km
Cloud: SCT 360 m
Weather: Nil
QNH: 1012
Temp/Dew: 30 °C



At	1100 UTC
Wind:	230/05 kt
Visibility:	15 km
Cloud:	SCT 360 m
Weather:	Nil
QNH:	1011 hPa
Temp/Dew:	31/21 °C

1.8 Aids to Navigation

The condition of Navigational aid on the day of occurrence at Ilorin International airport are as follows:

VHF 119.6 MHz /121.7 MHz	Serviceable
VOR 'ILR' 112.3 MHz	Serviceable
DME	Unserviceable
ILS 'IIL' 109.9 MHz	Testing
Phones	Serviceable
W/V indicators	Serviceable
W/S 1&2	Serviceable
Aldis Lamp and Alarm	Serviceable
RWY	Serviceable

1.9 Communications

There was effective communication between the aircraft and the Tower throughout the duration of the flight.



1.10 Aerodrome Information

Ilorin International Airport (DNIL) has Aerodrome Reference Point 08°26'24" N, 004°29'38" E and an elevation of 343 m (1,126 ft). The aerodrome has a runway orientation of 05/23. The length and width of the runway are 3,100/60 m respectively, with an asphalt/concrete surface and a blast pad of 120 m at both ends. The local training area is Northwest of Ilorin between radials 270° and 320° within 30 Nautical miles.

1.11 Flight Recorders

The aircraft was not fitted with Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR), neither recorder was required by current Regulations.

TAE-125 engine is equipped with a Full Authority Digital Engine Control unit (FADEC) that keeps some engine parameters in memory.

1.12 Wreckage and Impact Information

The accident occurred within the airfield's vicinity about 596 m to runway 23 threshold. When the aircraft was turning to land, the left wing impacted shrubs and got damaged. The right wing was intact. One of the propeller blades bent rearward at the tip. The distance between the approach light and the final resting point of the aircraft was 40 m.

Examination of the wreckage area and vicinity revealed no evidence of pre-impact or post-impact fire.



Figure 5: Final resting position of the 5N-BRD



Figure 6: A damaged left wing



Figure 7: Propeller blade bent rearward

1.13 Medical and Pathological Information

Nil.

1.14 Fire

There was no pre or post-crash fire.

1.15 Survival Aspects

The crew declared emergency after the engine failure and immediately Tower alerted all the airport emergency services. The accident occurred within the airport vicinity and the ARFFS arrived the crash site shortly after. All the occupants evacuated the aircraft unhurt.



The accident was survivable due to low speed impact that allowed livable volume of space for the occupants as the aircraft fuselage remained intact. The seats, seat belt harnesses and attachments were all intact.

1.16 Test and Research

The engine oil sample and fuel samples from the two tanks were taken to a laboratory in Lagos for analysis. The outcome of the analysis indicated that the products conformed to the Aviation Fuel Quality Requirement for Jointly Operated Systems (AFQRJOS) issue 27 Check List.

1.17 Organizational and Management Information

1.17.1 International Aviation College (IAC)

IAC is an Approved Training Organization (ATO) with Certificate No.: ATO/AA/004 valid till 4th March, 2015. The approval was granted to provide training for different professionals in the aviation industry including Pilot (fixed and rotary wing), Cabin Crew, Air Traffic Controllers and Engineers.

IAC adopts manufacturer's maintenance manual as the maintenance program for its fleet of DA40 and DA42 aircraft. The Maintenance program/inspection procedure manual was duly approved by the NCAA.



1.18 Additional Information

1.18.1 Extract from DA40-D-AFM sub-section 3.4

3.4 GLIDING

1. Flaps.....UP

2. Airspeed for best glide angle (Flaps UP):

73 KIAS (1150 kg, 2535 lb)

68 KIAS (1000 kg, 2205 lb)

60 KIAS (850 kg, 1874 lb)

Note

The glide ratio is 8.9; i.e., for every 1000 ft (305 meters) of altitude loss the maximum horizontal distance traveled in still air is 1.46 NM (2.71 km). During this time the propeller will continue to windmill.

(Page 3-24 15 Jun 2013 Rev. 2 Doc. No. 6.01.02-E)

Extract from DA40-D-AFM sub-Section 3.5

3.5 EMERGENCY LANDINGS

3.5.1 EMERGENCY LANDING WITH ENGINE OFF

1. Select a suitable landing area. If no level landing area is available, a landing on an upward slope should be attempted.

2. Consider the wind.



3. Approach: If possible, fly a short-cut rectangular circuit. On the downwind leg of the circuit the landing area should be inspected for obstacles from a suitable height. The degree of offset at each part of the circuit will allow the wind speed and direction to be assessed.

4. Airspeed for best glide angle (Flaps UP):

73 KIAS (1150 kg, 2535 lb)

68 KIAS (1000 kg, 2205 lb)

60 KIAS (850 kg, 1874 lb)

5. ATC.....advise, if time allows

6. Fuel tank selector.....OFF

When it is certain that the landing field will be reached:

7. Flaps.....LDG

8. Safety harnesses.....Tighten

CAUTION

If sufficient time remains, the risk of fire in the event of a collision with obstacles can be reduced as follows:

Ignition switchOFF

Master switch/Battery/Alternator switch.....OFF

9. Touchdown.....with the lowest possible airspeed



1.18.2 Examination of the FADEC

The FADEC (Full Authority Digital Engine Control) unit was recovered in a good condition. The FADEC is a unit that, among other functions, translates the pilot's control of power and other engine parameters into mechanical changes to engine values. The FADEC unit also has a memory function that stores certain information. The following are some parameters that can be recorded from its memory unit:

The engine RPM, the engine power, Air pressure, Coolant temperature, air temperature, Oil temperature, Oil pressure, fuel pressure, Oil temperature in the gearbox and electrical voltage to the FADEC.

The data were downloaded successfully by IAC and was sent to the engine manufacturer's laboratory in Hamburg. There was no complaint to indicate any abnormalities with the memory function of the FADEC evaluated. **See Appendix E.**

The evaluation of the data suggested that the root cause of the drop in power is located in the low pressure side of the air intake system; this includes the air filter, alternate air door, and the hose from the alternate air door to the compressor (Turbocharger inlet). The result further shows that Manifold air pressure should be around 2,000 mbar, but during this flight phase manifold air pressure dropped first to down to 1,300 mbar and then down to 574 mbar which is well below the ambient air pressure which had been around 970 mbar.

FADEC Data

Several photos received do confirm the assumption. The hose between the alternate air door and the Turbocharger inlet shows evidences of a delamination of the inner layer from outer. Most likely the inner layer collapsed and restricted or even blocked the air intake flow significantly. Consequently, this resulted in a severe power drop.



2.0 ANALYSIS

2.1 General

The aircraft was scheduled for a PPL check ride with a check airman (CA), safety pilot (Sfp) and a student pilot on board. The investigation revealed that the engine failed while the aircraft was climbing after take-off. This prompted the Safety Pilot to take control of the aircraft. He decided to return to the airfield, but force landed short of the runway. The three occupants exited the aircraft unhurt.

Records available to the Bureau indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident. The safety pilot and check airman were qualified and certified to conduct the flight.

2.2 Conduct of the Flight

During After Take-off Checks, the load power decreased to 65% as against the recommended 90%, the RPM dropped drastically and continued to drop until the engine failed.

At this point, the SfP took over control of the aircraft. Attempted engine restart failed. Thereafter, the SfP declared "May Day" and returned to the airfield.

According to the Diamond D40 AFM sub-section 3.4 (GLIDING), the recommended gliding speed is 73 kt. The speed of the aircraft at the point of engine failure was 75 kt.



However, considering the height at which the engine failed, the weight of the aircraft and the 180° turn to return to land, the aircraft was unlikely to have made it to the runway.

2.3 Engine Failure

The engine failed at about 1,600 ft AMSL.

The post-crash examination of the data downloaded from FADEC, indicated that the engine failure might be due to the restriction of air flow into the engine combustion chamber. The result further explained that Manifold Air Pressure (MAP) should be around 2000 mbar, however during that flight phase MAP dropped initially to 1300 mbar and then down to 574 mbar which was way below the ambient air pressure that had been around 970 mbar.

Also, the post-crash examination found that the inner layer of the Turbocharger Air Intake Hose had delaminated from the outer layer and collapsed, restricting air flow into the engine manifold.

2.4 Pre-flight Inspection/Maintenance

The drained fuel reported by the CA had been drained in accordance with the DA40 AMM chapter 12-10-00 page 4 (SERVICING), (B) Fuel Contamination Test Procedure.

See Appendix F.

The drained fuel should have been stored in a clean approved transparent bottle container for further examination by the maintenance and quality department to determine what type of contaminant was seen. It is a standard practice in maintenance



procedure to keep samples of drained fuel for a certain period of time for the purpose of monitoring fuel contamination, before appropriately disposing it against environmental pollution.

2.5 Compliance with EASA AD 2012-0024

In accordance with the TASK WORKSHEET (APOLLO FORM 5C Issue 1), the EASA AD 2012-0024 (Power Plant-Turbocharger Hose-Inspection/Replacement) was complied with on 26th November, 2012 by Apollo Aviation Limited in the United Kingdom before IAC purchased the aircraft.

However, during the post-crash examination by the Bureau, it was found that the Turbocharger Inlet hose installed on the aircraft was not of the suitable quality as specified by the AD. **See Appendix A & Appendix D** and Figures 1 and 2.

In view of the above, the investigation revealed that the engine failure caused by the lack of adequate airflow through the delaminated Turbocharger Inlet Hose into the manifold resulted from the installation of an inappropriate hose. See Figures 1, 3 and 4.



3.0 CONCLUSIONS

3.1 Findings

1. The flight was a PPL Certification flight.
2. The aircraft was first acquired by CabAir in UK, registered as G-OCCO and maintained by Apollo Aviation.
3. Diamond Aircraft Industry issued MSB D4-088, MSBD4-075/1 dated 30th January, 2012 on Inspection and Replacement of Turbocharger Hose.
4. European Aviation Safety Agency (EASA) issued an AD No. 2012-0024 dated 3rd February 2012 on Power Plant-Turbocharger Hose-Inspection/Replacement.
5. The aircraft came under Nigeria registration in June 2013 and was registered as 5N-BRD.
6. The aircraft had a valid Certificate of Airworthiness at the time of the accident.
7. The Turbocharger Inlet hose found installed on the aircraft was the "NOT suitable" one as specified in EASA AD No.: 2012-0024.

3.2 Causal Factor

Loss of engine power during initial climb caused by insufficient air supply into the inlet manifold due to constriction of the inner layer of the flexible hose connecting the alternate air valve to the turbocharger air inlet.



3.3 Contributory Factor

Poor maintenance practice as regards non-compliance with EASA AD No.: 2012-0024 for the replacement of the Turbocharger hose.



4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendation 2019-003

IAC should ensure strict compliance with implementation of applicable Airworthiness Directives.

4.2 Safety Recommendation 2019-004

IAC should ensure disposal of drained fuel is in conformity with environmental protection requirements.

4.3 Safety Recommendation 2019-005

IAC should ensure flight crew report to technical department of any contamination found in fuel drained more than three times during pre-flight inspection in accordance with the DA40 AMM chapter 12-10-00 page 4 (SERVICING), (B) Fuel Contamination Test Procedure.

4.4 Safety Recommendation 2019-006

NCAA should ensure that IAC complies with recommendations 4.1, 4.2, and 4.3, viz,

- a) applicable Airworthiness Directives.
- b) DA40 AMM chapter 12-10-00 page 4 (SERVICING), (B) Fuel Contamination Test Procedure.

APPENDICES

Appendix A: MSB D4-088



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N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

DAI MSB D4-088
Page 1 of 5
30-Jan-2012

MANDATORY SERVICE BULLETIN MSB D4-088

I TECHNICAL DETAILS

I.1 Category

Mandatory

I.2 Airplanes affected

Type: DA 40 D

Serial numbers: all airplanes equipped with TAE 125-02-99 engine

I.3 Date of effectivity

30-Jan-2012

I.4 Time of Compliance

Action 1: Within 20 flight hours, but not later than 01-Apr-2012, identification of turbocharger hose and replacement of NOT suitable quality before further flight.

Action 2: If MSB D4-075 (initial issue) has not been carried out yet, within 100 flight hours but not later than 31-Jul-2012, carry out MSB D4-075/1 or later issue.

I.5 Subject

Inspection of Turbocharger Hose

ATA-Code: 71-60

I.6 Reason

There are different qualities of SCEET 10 flexible ducting available, where it appears that specific qualities are not suitable for the application as a turbocharger hose on the DA 40 D. In some cases, the inner layer of the 2-layer ducting separated and caused a reduction of cross-section of the air intake of the turbocharger and a subsequent engine power loss.

This service bulletin prescribes the identification of the quality of the turbocharger hose (SCEET 10 ducting) installed and if required, replacement with a hose DAI P/N SG2M-64-920mm and standardization of the installation per MSB D4-075/1 or later issue.

I.7 Concurrent Documents

None



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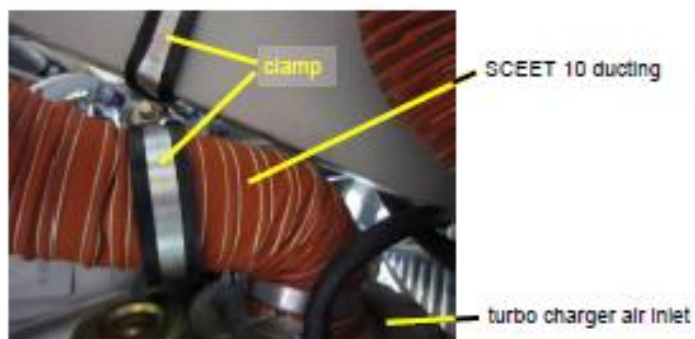
DAI MSB D4-088
Page 2 of 5
30-Jan-2012

I.8 Approval

The technical content of this document has been approved under the authority of DOA ref. EASA.21J.052.

I.9 Accomplishments / Instructions

- Action 1: Identification of the turbocharger hose:
- Remove cowling according to AMM Section 71-11.



- Identify quality of turbocharger hose (SCEET 10 ducting), that connects the air alternate valve with the turbocharger air inlet.

Criteria:

- Suitable Quality: 2 strings (one close to each side of the wire) and a maximum of bonding area between each winding





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DAI MSB D4-088
Page 3 of 5
30-Jan-2012

- Other Quality available (NOT suitable):



- Measures:

- If a NOT suitable quality is identified, replace turbocharger hose with DAI P/N SG2M-64-920mm according to WI-MSB D4-075 Revision 1 or later issue.

- Action 2:

- If clamp P/N D4D-7166-00-91 has not been installed yet (see picture above), carry out MSB D4-075/1 or later issue.

I.10 Mass (Weight) and CG

No change

II PLANNING INFORMATION

II.1 Material and Availability

None

II.2 Special Tools

None

II.3 Labour Effort

Approx. 0.5 hours

II.4 Credit

None



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DAI MSB D4-088
Page 4 of 5
30-Jan-2012

II.5 Reference Documents

Diamond Aircraft DA 40 Series Airplane Maintenance Manual, Doc. No. 6.02.01, latest effective issue.

III REMARKS

1. All work must be done by a certified aircraft service station or a certified aircraft maintenance mechanic.
2. All work, particular those that are not especially described in this Service Bulletin, must be done in accordance with the referenced Maintenance Manual.
3. Completion of all work must be recorded in the log book.
4. If material and/or labor hours are subject to be credited through Diamond Aircraft Industries, the Service Bulletin must be carried out by an authorized Diamond Service Center and the Warranty Application Incl. Work Report must be sent not later than 30 days after the end of time of compliance.
5. In case of doubt contact Diamond Aircraft Industries GmbH.



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DAI MSB D4-088
Page 5 of 5
30-Jan-2012

EXECUTION REPORT TO SERVICE BULLETIN MSB D4-088

AIRPLANE DATA

Airplane Serial Number: _____
Airplane Registration: _____
Airplane Operator: _____
Hours of operation of airplane: _____
No. of landings: _____
Hours of operation-engine: _____
Typical operation of airplane: private, club, training, other _____

MSB D4-075 was carried out on date _____

SCEET ducting replacement was required ☐ yes
☐ no

Date, Name, Sign

Please fax the completed form to Fax No. +43-2622-26700-1369 or e-mail to
airworthiness@diamond-air.at

Appendix B: WI MSB D4-075



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GmbH
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Austria

WI-MSB D4-075
Revision 1
Page 1 of 5
30-Jan-2012

WORK INSTRUCTION WI-MSB D4-075 „Turbocharger Hose with Clamps“

I GENERAL INFORMATION

I.1 Subject

Replacement of Air Intake Hose from Turbocharger and installation with P-clamps.

I.2 Reference Documents

Diamond Aircraft DA 40 Series Airplane Maintenance Manual, Doc. No. 6.02.01, latest effective issue.

I.3 Remarks

- a) The work must be carried out by a certified aircraft service station or a certified aircraft maintenance mechanic.
- b) All works, particular those that are not especially described in this work instruction, must be carried out in accordance with the referenced maintenance manual.
- c) In case of doubt, contact Diamond Aircraft Industries GmbH.

II DRAWINGS, SPECIAL TOOLS & MATERIALS

II.1 Drawings

None.

II.2 Special Tools

None.



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WI-MSB D4-075
Revision 1
Page 2 of 5
30-Jan-2012

II.3 Material

Quantity	Part Number	Description
1	RSGU1-65-20W1	Clamp
1	D4D-7166-00-91	Clamp 25x88
1	DIN 985 M8 A2	Nut
1	DIN 125A-M8-A2	Washer
1	DIN 933 M8x30-8.8-YZP	Screw
1	SG2M-64-920mm	Matzen & Timm ducting inner diameter: 63,5 mm

Material including drawings is available from Diamond Aircraft Industries.

Caution: For air ducting only the air hose specified in the material list may be installed. Similar hoses from other manufacturers are not suitable for this application and must not be used.

III INSTRUCTIONS

1.	Make sure that the engine is secured: Set ELECTRIC MASTER switch to OFF. Set the ENGINE MASTER switch to OFF. Set the power lever to 0%.
2.	Remove cowlings according to AMM, Section 71-10.
3.	Remove exhaust muffler from engine mount.
4.	Remove heating hose from heating valve.
5.	Loosen fuel filter box mounting clamps.
6.	Remove air intake hose from alternate air valve and turbocharger.



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WI-MSB D4-075
Revision 1
Page 3 of 5
30-Jan-2012

7. Install the new turbocharger hose (ducting P/N SG2M-64-920mm) on the turbocharger and alternate air valve.

Note: Do not remove the spiral wire from the ends of the new ducting (P/N SG2M-64-920mm). Attach hose and spiral wire with the hose clamps to the alternate air valve and the turbocharger.





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WI-MSB D4-075
Revision 1
Page 4 of 5
30-Jan-2012

8. Make sure that the fuel return line- and turbocharger hose routing is according to the following pictures. Torque worm-drive clamps with 5,5 Nm (4 ft lb).



9. Install Clamp D4D-7166-00-91 and RSGU1-65 with bolt nut and washer according to the following picture.



Flight Direction



Center of engine mount


Bottom view

Position of clamp 140 mm (6 in) from centre of engine mount cut out.



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WI-MSB D4-075
Revision 1
Page 5 of 5
30-Jan-2012

10.	<p>Check clearance between turbocharger hose and engine mount. Minimum clearance is 5 mm (0,2 in). Re-position clamps if necessary.</p>  <p>Bottom view</p>
11.	The turbocharger hose must not chafe at the engine mount during engine operation. Check for positive clearance by pushing and pulling sideways on propeller blade root.
12.	Install fuel filter box and torque clamps with 6 NM (4,43 ft lb).
13.	Install heating hose on heating valve.
14.	Install exhaust muffler on engine mount.
15.	Check free engine movement by pushing and pulling sideways on propeller blade root.
16.	Apply TORQUE-SEAL Anti Sabotage Inspector's Laquer (or equivalent) to the hose clamps.
17.	Clean working area and check for foreign objects.
18.	Perform functional check of all new, altered or repaired parts.
19.	Test all systems in working area for function.
20.	Install cowlings according to AMM Section 71-10.
21.	Make necessary entries in the aircraft log book.



Appendix C: MSB D4-075/1



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DAI MSB D4-075/1
Page 4 of 4
30-Jan-2012

EXECUTION REPORT TO SERVICE BULLETIN MSB 40-075/1

AIRPLANE DATA

Airplane Serial Number: _____

Airplane Registration: _____

Airplane Operator: _____

Hours of operation of airplane: _____

No. of landings: _____

Hours of operation-engine _____

Typical operation of airplane: private, club, training, other _____



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DAI MSB D4-075/1
Page 1 of 4
30-Jan-2012

MANDATORY SERVICE BULLETIN

MSB D4-075/1

SUPERSEDES MSB D4-075

I TECHNICAL DETAILS

I.1 Category

Mandatory.

I.2 Airplanes affected

Type: DA 40 D
Serial Numbers: D4.254, D4.279, D4.280, D4.282 through D4.287,
D4.296 through D4.353, D4.355 through D4.371,
D4.373 through D4.378, D4.381, D4.382, D4.399,
40.DS001 through 40.DS027.
All airplanes with TAE 125-02 engine retrofitted via OSB D4-061

I.3 Date of effectivity

14-Jun-2010

I.4 Time of Compliance

Within 100 flight hours, but not later than 31-Jul-2012 and inspection every 100 flight hours thereafter.

I.5 Subject

Air induction system.
ATA-Code: 71-60

I.6 Reason

In-Service experience has shown that the hose between the alternate air valve and the turbo charger is sensitive against chafing if not correctly installed. To provide additional measures against that chafing of the air induction tube on the engine mount the flexible air intake tube



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DAI MSB D4-075/1
Page 2 of 4
30-Jan-2012

is now fixed in a more defined position. This Service Bulletin describes the retrofit installation on aircraft already in service.

I.7 Concurrent Documents

None.

I.8 Approval

The technical information or instructions contained in this document relate to the Design Change Advisory No. MAM 40-408, which has been approved under the authority of EASA Design Organization Approval ref. EASA.21J.052.

The technical content of this document has been approved under the authority of DOA ref. EASA.21J.052.

I.9 Accomplishments / Instructions

Comply with WI-MSB D4-075 Revision 1 or higher, always latest effective issue.

Note: WI-MSB D4-075 is attached to this document.

I.10 Mass (Weight) and CG

Negligible.

II PLANNING INFORMATION

II.1 Material and Availability

See WI-MSB D4-075, latest effective issue.

II.2 Special Tools

None.

II.3 Labour Effort

Approx. 1 hour.

II.4 Credit

For installation of Clamps: 1 hour of labour and material as listed in WI-MSB D4-075 for all aircraft within warranty period.



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DAI MSB D4-075/1
Page 3 of 4
30-Jan-2012


II.5 Reference Documents

Diamond Aircraft 40 Series Airplane Maintenance Manual, Doc. No. 6.02.01, latest effective issue.

III REMARKS

- a) The work must be carried out by a certified aircraft service station or a certified aircraft maintenance mechanic.
- b) All works, particular those that are not especially described in this work instruction, must be carried out in accordance with the referenced maintenance manual.
- c) If material and/or labor hours are subject to be credited through Diamond Aircraft Industries, the Service Bulletin must be carried out by an authorized Diamond Service Center and the Warranty Application incl. Work Report must be sent not later than 30 days after the end of time of compliance.
- d) In case of doubt, contact Diamond Aircraft Industries GmbH.

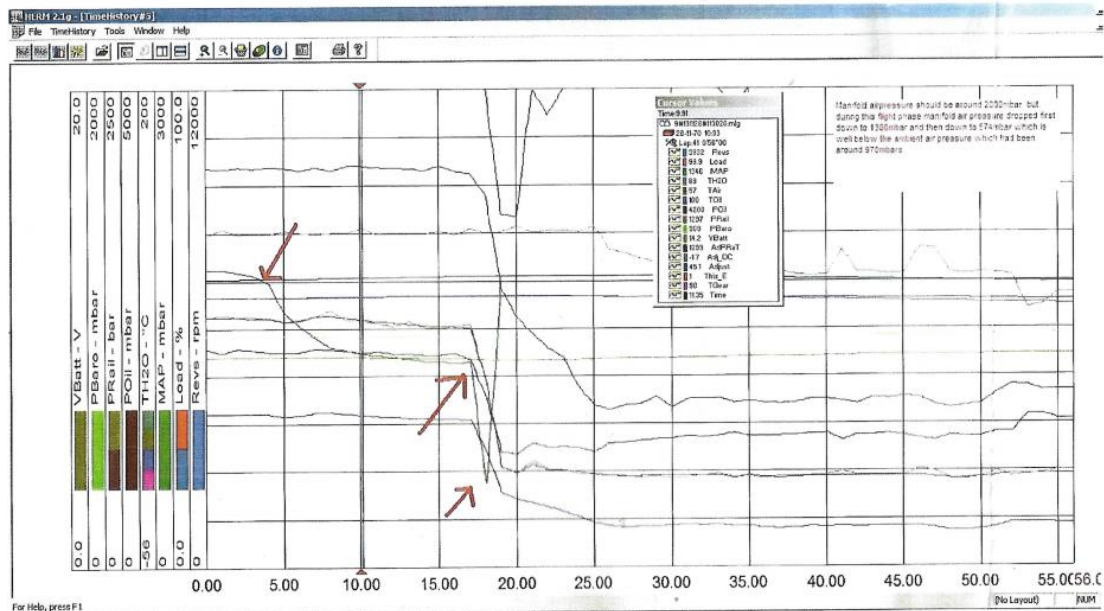
Appendix D: EASA AD No.: 2012-0024

EASA		AIRWORTHINESS DIRECTIVE	
		AD No.: 2012-0024	
		Date: 03 February 2012	
<p>Note: This Airworthiness Directive (AD) is issued by EASA, acting in accordance with Regulation (EC) No 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation.</p>			
<p>This AD is issued in accordance with EC 1702/2003, Part 21A.3B. In accordance with EC 2042/2003 Annex I, Part M.A.301, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified by the Agency [EC 2042/2003 Annex I, Part M.A.303] or agreed with the Authority of the State of Registry [EC 216/2008, Article 14(4) exemption].</p>			
Type Approval Holder's Name : Diamond Aircraft Industries GmbH		Type/Model designation(s) : DA 40 D aeroplanes	
TCDS Number : EASA.A.022			
Foreign AD : Not applicable			
Supersedure : None			
ATA 71		Power Plant – Turbocharger Hose – Inspection/Replacement	
Manufacturer(s):		Diamond Aircraft Industries GmbH (Austria), Shandong Bin Ao Aircraft Industries Company, Ltd (China)	
Applicability:		DA 40 D aeroplanes, all serial numbers, if equipped with a Thielert TAE 125-02-99 engine.	
Reason:		<p>Occurrences have been reported of engine turbocharger hose inner layer separation on Diamond DA 40 D aeroplanes.</p> <p>The technical investigation concluded that different qualities of flexible turbocharger hose, which connects the air alternate valve with the turbocharger air inlet, were used on the affected aeroplanes. Inappropriate quality of some flexible hoses caused the inner layer of the 2-layer ducting to separate, thereby reducing the cross-section of the air intake of the turbocharger.</p> <p>This condition, if not detected and corrected, could lead to engine power loss or in-flight shut-down, possibly resulting in a forced landing and consequent damage to the aeroplane and/or injury to the occupants.</p> <p>Prompted by these findings, Diamond Aircraft Industries (DAI) have developed procedures for identification and replacement of unsuitable turbocharger hoses and installation of the proper hose attachment on the engine mount.</p> <p>For the reasons described above, this AD requires a one-time inspection of the turbocharger hose and, depending on findings, replacement with a serviceable part, and modification of the hose attachment with a P-clamp.</p>	
Effective Date:		10 February 2012	

EASA AD No : 2012-0024

<p>Required Action(s) and Compliance Time(s):</p>	<p>Required as indicated, unless accomplished previously:</p> <ol style="list-style-type: none"> (1) Within 20 flight hours (FH) or 2 months, whichever occurs first after the effective date of this AD, inspect the flexible hose that connects the air alternate valve with the turbocharger air inlet (hereafter called turbocharger hose) in accordance with the instructions of DIA Mandatory Service Bulletin (MSB) MSB D4-088. (2) If, during the inspection as required by paragraph (1) of this AD, an unsuitable turbocharger hose, not meeting the criteria as specified in DAI MSB D4-088, is found to be installed, before next flight, replace the turbocharger hose with a DAI Part Number (P/N) SG2M-64-920mm hose and modify the hose attachment with a P-clamp in accordance with the instructions of MSB D4-075/1 and associated Working Instruction (WI) WI-MSB D4-075 revision 1. (3) Within 100 FH or 6 months, whichever occurs first after the effective date of this AD, unless already accomplished as required by paragraph (2) of this AD, replace the turbocharger hose with a DAI P/N SG2M-64-920mm hose and modify the hose attachment with a P-clamp in accordance with the instructions of MSB D4-075/1 and associated WI-MSB D4-075 revision 1. (4) Modification of an aeroplane, before the effective date of this AD, in accordance with the instructions of MSB D4-075 and WI-MSB D4-075 at initial issue, constitutes an acceptable method of compliance with the requirements of paragraph (3) of this AD. (5) From the effective date of this AD, do not install any turbocharger hose on an aeroplane, except a hose with DAI P/N SG2M-64-920mm.
<p>Ref. Publications:</p>	<p>Diamond Aircraft Industries GmbH Mandatory Service Bulletins: MSB D4-088 dated 30 January 2012 MSB D4-075/1 dated 30 January 2012 with WI MSB D4-075 revision 1 The use of later approved revisions of these documents is acceptable for compliance with the requirements of this AD.</p>
<p>Remarks :</p>	<ol style="list-style-type: none"> 1. If requested and appropriately substantiated, EASA can approve Alternative Methods of Compliance for this AD. 2. The required actions and the risk allowance have granted the issuance of a Final AD with Request for Comments, postponing the public consultation process after publication. 3. Enquiries regarding this AD should be referred to the Safety Information Section, Executive Directorate, EASA; E-mail: ADs@easa.europa.eu. 4. For any question concerning the technical content of the requirements in this AD, please contact: Diamond Aircraft Industries GmbH, Austria. Telephone +43 2622 26700, Facsimile +43 2622 26780, E-mail office@diamond-air.at.

Appendix E: FADEC Data Evaluation Report



Appendix F: DA40 AMM (Servicing) (B) Fuel Contamination Test procedure

Servicing



DA 40 Series
AMM

3. Fuel Contamination Test

Do this test each day you operate the airplane. Test fuel from both the wing tanks.

A. Equipment

Item	Quantity	Part Number
Sampling container.	1	Commercial.

B. Fuel Contamination Test Procedure

	Detail Steps/Work Items	Key Items/References
(1)	Put the sampling container under the drain valve in one wing.	
(2)	Open the drain valve.	
(3)	When the container is half full, close the drain valve.	
(4)	Wait for 1 minute.	
(5)	Examine the fuel: <ul style="list-style-type: none"> – It must be pale-blue or green (AVGAS). – It must be clear (JET A1 or Diesel Fuel). – Look specially for small drops of water at the bottom of the sampling container. – Look for small particles of solid material. 	If you find any contamination of the fuel you must do the test again. If you still find contamination after three tests, you must drain the tank. Flush the tank and fill it with clean fuel.
(6)	Repeat steps (1) to (5) for the drain valve in the other wing.	
(7)	Repeat steps (1) to (5) for the drain valve at the gascolator.	Below the front fuselage.



Appendix G: Witness Statement of the Check Airman (NCAA Flight Operator Inspector)

ACCIDENT REPORT OF DIAMOND AIRCRAFT (D40) 5N-BRD

Name: _____
Position: Flight Operations Inspector/ Check Airman
Organization: Nigerian Civil Aviation Authority
Mission: Check Airman for Initial Private Pilot, Multi-Engine and Instrument Rating
Location: International Aviation College.

I arrived at the College on Wednesday, 20th November 2013 and went straight to brief the students and the instructors on the conduct of the check rides. The following is the chronological order of events after the briefing:

1. The first check ride was on Wednesday, 20th November 2013 starting at with the first student on the D40 with registration number 5N-BRM. When the student complained of poor rudder control from his side during the 2nd Touch and Go, the check was abandoned for maintenance action; that was it for that day.
2. On Thursday, 21st November 2013 starting at 1115 local time, I was presented with a candidate for the Multi-Engine/Instrument rating on the multi-engine D42 with reg. no. 5N-BNI. The flight went well with no safety issue or incident.
3. On Friday, November 22nd 2013 starting at 0743 local time, I continued with the PPL check ride of the student that had rudder problems on Wednesday, but on another D40 with reg. no. 5N-BRC there were no incident.
4. On Friday, 22nd November 2013 starting at 11:10 LT, I had two more PPL check rides with other two students on D40 with reg. no 5N-BRD with no incident.
5. On Saturday, 23rd November 2013 starting at 10:45 local time, I did three PPL check rides on D40 with reg. no. 5N-BRD for three additional students; it all went well as far as safety was concerned with no incident.
6. On Sunday, 24th November 2013 starting 10:25 local time, I conducted other three PPL check rides for other three students, with no incident.
7. On Monday, 25th November 2013 starting at 09:20 local time, I noticed a telltale of a leak under the aircraft D40 (reg. 5N-BRD) and inquired. The student stated that there were a lot of sediments in the tanks during fuel-drain check. He continued to drain until it was clear.
 - After Engine Start, the Engine indication on the G1000 was unserviceable. My suggestion to the crew was to check the circuit breaker; the instructor said they would need to shutdown and restart. That was done and the engine indications were restored; there were no further incident. However, at the tail end of the check ride, I decided to ask for final landing when it became obvious that we needed to pave way for a Nigerian Air Force Alpha jet from Kainji that came to practice ILS letdown in Ilorin. No incident.
8. After 25 minutes delay to allow the departure of the Alpha Jet from Ilorin Airspace, the last check ride commenced at 11:24 LT. Preflight and Before-Takeoff was routinely accomplished. From my position as always I heard that the ECU checked OK, amongst other checks.
9. We were cleared takeoff on Runway 05 with a tailwind component. I noted to discuss later that it was not discussed, but it was safe for takeoff. I saw the engine check on brakes at 60% torque; thereafter, it registered at 100% torque, but decreased to 99% torque as the aircraft accelerated. We got airborne at 65Kt and commenced initial climb. Shortly, the tower called to give airborne time of 1032Z (11:32LT). I wrote that down on my scratchpad.
10. Climbing through 1650 feet above mean sea level, I noticed the student actions of retracting the takeoff flaps and setting the thrust to climb power, which should be 90% torque. However, as I looked at the engine instrument I saw 67% torque.
11. The situation prompted my enquiry, "Why are you throttling back?"
12. The student and the Safety Pilot/Instructor said in unison that the engine was no longer responding to throttle movements.



13. I asked the instructor to take over, but he said he already had control. Fuel lever he said was on my query and he declared "Mayday", while trying to restart the engine.
14. I then suggested that he should go back towards the airport as the best option because ahead was a built up area.
15. I asked him to trim for 73kts (Drift Down Speed); he maintained about 75kts and kept saying just keep the speed and wings level.
16. He aimed towards the approach lighting system of Runway 23 at Ilorin. I kept reminding them to keep calm that the impact is survivable if we keep the aircraft flying at a good speed and no banking.
17. The impact on the ground probably broke our momentum and prevented us from flying headlong to the approach lighting system masts.
18. Immediately after we came to a stop, I shouted "Evacuate" since nothing came from the people in front.
19. We evacuated quickly and stood away from the wreckage. Shortly afterwards, rescue team arrived.
20. We decide to walk the whole way back to the airport and declined to be ferried in the cars.

FINDINGS:

- A. There were varying procedures introduced that I had to correct; such as takeoff procedure of letting the aircraft fly itself into the air. I rejected that and said that the aircraft must be rotated the recommended rotation speed of 59kts for the D40.
- B. On every check flight I briefed and cautioned that in the event of an engine failure, the safe thing was to fly the drift down speed religiously. That perhaps saved us when we actually lost the engine on that day.
- C. I found out that the target for touchdown on landings had been moved well into the runway; I said it must be for their type aircraft on the numbers i.e. the "Piano". That was demonstrated and it was done successfully by the students.
- D. Addressing safety concerns raised by student or instructor need not be punitive; I advised that it should be welcomed.
- E. The system lacks proper Safety Management System, SMS, this should be implemented immediately.

I thank you for this opportunity to aid in finding the cause of the accident.

NCAA
Tel:

Email:
Address:



SUMMARY OF COMMENTS TO DRAFT FINAL REPORT

The draft final report was submitted for comments to the Nigerian Civil Aviation Authority, International Aviation College Ilorin, Civil Aviation Safety Investigation Authority, Austria and the Federal Bureau of Aircraft Accident Investigation, Germany.

This is in compliance with sub-section 6.3 of Annex 13 to the ICAO Convention.

Nigerian Civil Aviation Authority agreed with the safety recommendations and proposed additional safety recommendations.

International Aviation College, Ilorin remarked about the fuel found underneath the aircraft and its contamination as presented in the draft final report.

Federal Bureau of Aircraft Accident Investigation Germany clarified technical details of the FADEC download and made editorial suggestions.

Accident Investigation Bureau (AIB) Nigeria made necessary amendments to the final report based on the submitted comments.

