AIRCRAFT ACCIDENT REPORT

IAC/2014/08/18/F

Accident Investigation Bureau

Report on the Serious Incident involving International Aviation College (IAC) Diamond DA42 Aircraft with registration 5N-BNH, on Runway 23 of Ilorin International Airport, which occurred on 18th August, 2014

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 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.

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.

Readers are advised that Accident Investigation Bureau investigates for the sole purpose of enhancing aviation safety. Consequently, Accident Investigation Bureau reports are confined to matters of safety significance and should not be used for any other purpose.

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

Recommendations in this report are addressed to the Regulatory Authority of the State (NCAA). It is for this authority to ensure enforcement.

Printed in Nigeria for the Accident Investigation Bureau (AIB)

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

A & C	Airframe & Engines (A type of Aircraft Maintenance Engineers' Licence)
AIB	Accident Investigation Bureau
AFM	Airplane Flight Manual
AMM	Aircraft Maintenance Manual
AMO	Approved Maintenance Organisation
ATC	Air Traffic Controller
ATO	Approved Training Organisation
CPL	Commercial Pilot Licence
CRM	Crew Resource Management
FAAN	Federal Airport Authority of Nigeria
FIR	Flight Information Region
IAC	International Aviation College, Ilorin
ICAO	International Civil Aviation Authority
ILS	Instrument Landing System
IPM	Inspection Procedure Manual
KIAS	Knot Indicated Airspeed
MLG	Main Landing Gear
MPM	Maintenance Procedure Manual

MSB	Mandatory Service Bulletin
NAF	Nigerian Air Force
NAMA	Nigeria Airspace Management Agency
NCAA	Nigerian Civil Aviation Authority
Nig.CARs	Nigerian Civil Aviation Regulations
NDB	Non Directional Beacon
NIMET	Nigerian Meteorological Agency
NM	Nautical Miles
NOTAM	Notice to Air Men
PIC	Pilot-in-Command
PF	Pilot Flying
PM	Pilot Monitoring
P/N	Part Number
QNH	Altimeter Setting That Causes Altimeter To Indicate Altitude Above Sea Level
RWY	Runway
SOP	Standard Operating Procedure
TDZ	Touch Down Zone
TSN	Time Since New
TSO	Time Since Overhaul

UTC	Universal Time Coordinated
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
W/S	Windsock
WX	Weather

Aircraft Accident Report No:	IAC/2014/08/18/F
Registered Owner and Operator:	International Aviation College (IAC), Ilorin
Aircraft Type and Model:	Diamond DA42
Manufacturer:	Diamond Aircraft Industry, Austria
Date of Manufacture:	2006
Serial No.:	42.010
Registration Number:	5N-BNH
Location:	Runway 23 of Ilorin International Airport
Date and Time:	18th August, 2014 at about 1610hrs. (*All times in this report are local time, equivalent to UTC + 1) unless otherwise stated*

SYNOPSIS

Accident Investigation Bureau (AIB) was notified by International Aviation College (IAC), Ilorin at about 1730hrs on 18th of August 2014, of a serious incident involving a Diamond DA42 aircraft with registration number 5N-BNH owned and operated by the College, which occurred on Runway 23 at Ilorin International Airport. Investigators were dispatched to the crash site the following day. All relevant stakeholders were also notified.

On 18th August, 2014 at 1220hrs, the aircraft 5N–BNH took off from Runway 23 of Ilorin International Airport for a training flight with fuel endurance of four hours. There were two persons on board; a Flight Instructor and a Student Pilot. At the training area, the Flight Instructor requested the Student Pilot to perform some manoeuvres; which involved stall simulation in landing configuration. After landing gear extension, the Flight Instructor noticed that the right main gear did not extend. He then took control of the aircraft and performed the emergency gear extension procedure in accordance with the Airplane Flight Manual (AFM); the right main gear still did not extend.

At 1430hrs, the crew informed the Control Tower about the situation and subsequently, the airport safety and emergency services/procedures were activated and put on standby.

At 1535hrs, the Tower in liaison with the owners of the aircraft decided to approve the belly-landing of the aircraft on a foamed runway in accordance with the manufacturer's specifications.

At 1610hrs, the aircraft 5N-BNH belly-landed at the Touch Down Zone (TDZ) on the centre line of Runway 23 after it had been airborne for three hours and fifty minutes.

The aircraft was substantially damaged and there was no fire outbreak. Also, no injuries were sustained by the crew.

The investigation identified the following causal and contributory factors:

Causal Factor

The failure to adhere to the main wheel installation procedure as contained in the AMM, Section 32-40-00, bordering on:

a. Minimum clearance check between the MLG tire and the lower wing shell/wheel bay cut-out.

b. Test of correct operation of the landing gear retraction and extension system.

Contributory Factor

Inadequate oversight by the Quality Assurance department.

Four Safety Recommendations were made.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On the 18th of August 2014 at about 1220hrs, a Diamond DA42 aircraft with registration number 5N-BNH, owned and operated by the International Aviation College, Ilorin took off from Runway 23 of Ilorin International Airport for a training flight with fuel endurance of four hours. There were two persons on board; a Flight Instructor and a Student Pilot. At the training area, the Flight Instructor requested the Student Pilot to perform stall simulation in landing configuration. After landing gear extension, the Flight Instructor noticed that the right main gear did not extend. According to the Flight Instructor, he observed two green gear indication lights for the nose and the left main landing gear but the right main landing gear indication light was OFF while the red unsafe light was ON.

The Flight Instructor, in his report said; he took control of the aircraft and performed some in-flight tests to ascertain whether the gear was not extended or it was a case of dead bulb/false indication and then carried out manual gear extension in accordance with the AFM, but the right main gear did not extend.

According to the ATC audio recordings, at 1315hrs the Flight Instructor said, *"Yes, I request Tower to do a fly-by by the Tower 'cos it appears that I do not have three greens. I request to do a fly-by by the Tower, a low pass by the runway for you to help me confirm the situation of my landing gear."*

At 1318hrs, the Tower observed that no landing gear was down and advised the crew accordingly. The crew requested to proceed to the training area for some manoeuvres and was approved. The crew returned to the training area and repeated the gear extension and retraction procedure.

At 1346hrs, the Tower called the crew to request for the situation and got a response that they had two greens ON while the third one was *"not yet ON"*. However, the crew continued in their attempts to see if it will come ON.

At 1417hrs, when the Tower called the crew, the situation was reported to be the same even as they informed the Tower of their intention to burn more fuel before coming to land, as the aircraft was not equipped with fuel jettisoning system. At this point, the crew decided to proceed to the airfield for belly-landing.

At 1430hrs, after several verifications of the situation of the aircraft and crew by the ATC, the airport safety and emergency services/procedures were activated and put on STANDBY. The two Area Control Centres in Lagos and Kano were also notified in line with Kano Flight Information Region (FIR) procedures.

At 1535hrs, the Tower in liaison with the operator approved the belly-landing of the aircraft on a foamed runway in accordance with the Airplane Flight Manual (AFM) Section 3.6.3.

At 1550hrs, foaming operation of "Touch Down Zone" (TDZ) of Runway 23 was carried out using two Rescue Fire Fighting Vehicles.

At 1610hrs, the aircraft belly-landed at the TDZ of Runway 23 and skidded for 131m before coming to a final stop. There was no fire outbreak.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/None	2	Nil	Nil

1.3 Damage to Aircraft

The aircraft was substantially damaged.

1.4 Other Damage

Nil.

1.5 Personnel Information

1.5.1 The Flight Instructor

Nationality:	Nigerian
Age:	27 years
Gender:	Male
Licence No.:	CPL 6077
Licence Validity:	24th March 2018
Aircraft Ratings:	Single & Multiple engine Type(s) Part 1: DA40 & DA42 Type(s) Part 2: Instructor's Ratings: Single and multi-engine aircraft types with MTWA of 5700kg or less and valid for types specified in part 1.
Instructor's Rating validity:	28th November, 2014
Instrument Rating validity:	21st June, 2015
Proficiency Check:	20th March, 2014
Medical Validity:	4th August, 2015

Total Flying Experience:	1273hrs
On Type:	229hrs
Last 90 days:	190hrs
Last 28 days:	67hrs
Last 24 hrs:	8.8hrs

1.5.2 The Student Pilot

Nationality:	Nigerian
Age:	27 years
Gender:	Male
Licence No.:	PPL 6105
Aircraft Ratings:	Single Engine
Proficiency Check:	Not Applicable
Medical Validity:	16th May, 2016
Total Flying Experience:	179.9hrs
On Type:	40hrs
Last 90 days:	27.2hrs
Last 28 days:	8.6hrs
Last 24 hours:	3.8hrs

1.5.3 Certifying Engineer 1

Nationality:	Nigerian
Age:	40 years

Gender:	Male
Licence No.:	AMEL 2775
Licence Validity:	19th June, 2015
Ratings:	**Category A**
	Tampico TB-9 landplanes
	Diamond DA40 series
	Diamond DA42 series
	Category C
	Lycoming 0-320-D2A engines
	2.0 Centurion engines

This Engineer performed the wheel change after the last flight on 25th July, 2014.

1.5.4 Certifying Engineer 2

Nationality:	Senegalese
Gender:	Male
Age:	33 years
Licence No.:	AMEL 2984
Licence Validity:	20th May, 2015
Ratings:	**Category A**
	Dash 8-300 landplanes
	B737-600/700/800
	Diamond DA42 series airplane

Diamond DA40 aeroplane

Category C

PW 123 engines

TAE 125-02-99 engine

B737-600/700/800 CFM 56-7B

Dash 8-300 (PW 123)

Category X

Avionics on Diamond DA40/42

(TAE 125-02-99) Dash 8

This Engineer released the aircraft to service on the day of occurrence.

1.6 Aircraft Information

Type:	Diamond DA42
Year of Manufacture:	2006
Serial No.:	42.010
Nationality:	Nigerian
Registration number:	5N-BNH
Total Airframe Time:	1436:42hrs
Cycles/Landings:	Not Available
Certificate of Insurance:	27th February, 2015
Certificate of Airworthiness:	13th June, 2015

Certificate of Registration: Issued 16th May, 2011

1.6.1 Mandatory Service Bulletins (MSBs)

A Mandatory Service Bulletin (MSB) is a document issued by the aircraft manufacturers to operators to enhance safety.

Four Mandatory Service Bulletins related to the landing gear were issued by the manufacturer as follows:

MSB 42-062/1 was issued on 13th November, 2008. The effectivity was within a period of 100 flight hours and within every 200 flight hours thereafter, but not later than 31st December, 2009.

MSB 42-088/3 was issued on 5th July, 2010. The Date of Effectivity was 5th July, 2010 and the time of compliance was within the next 20 flight hours from that date and thereafter at each scheduled 100 hours maintenance inspection until replacement with P/N D64-3217-23-0X or not later than 31st December 2011.

MSB 42-091 was issued on 28th June, 2011. It was performed on 8th July, 2011. The effectivity was within a period of 100 flight hours but not later than one calendar year.

MSB 42-095 was issued on 11th November, 2011. It was performed on 5th December, 2011. The effectivity was within a period of 200 flight hours but not later than 31st December, 2012.

See Appendices C, D, E and F.

1.6.2 Engines

Type:	Piston	
Manufacturer:	Thielert AG (TAE 125-02-99)	
	No. 1	**No. 2**
Serial No.:	02-02-02557	02-02-02558
TSN:	386.6hrs	389.9hrs

There was no log book entry of the right main landing gear wheel change carried out after the last flight of 25th July, 2014.

On 12th August, 2009 while under British registration (G-OCCV) and operated by the former owner, Cabair, the right hand main landing gear actuator was adjusted and found satisfactory, as extracted from the Cabair Rectification Worksheet Airframe (File/W/0 Ref:40095/00) dated 18th August, 2009, Item No. 9.

The aircraft came under Nigerian registration on the 16th May, 2011 and had been maintained in accordance with the approved Diamond Manufacturer's Airplane Maintenance Manual.

The Noise Certificate issued by NCAA identifies the engine type installed on the aircraft as a Turboprop whereas the original engine log book from the manufacturer indicates that it is a piston engine. This discrepancy was also observed in the Noise Certificates issued for other aircraft in the college's fleet.

Type of fuel used is Jet A1.

1.7 Meteorological Information

The following weather information was obtained from Ilorin MET office at Ilorin International Airport and was available to the crew.

Time	**:**	**1200 UTC**
Wind	:	220/10KT
Visibility	:	15km
Weather	:	Nil
Cloud	:	BKN 300m
Temperature	:	26°C
Dew Point	:	22°C
QNH	:	1016

Time	**:**	**1500 UTC**
Wind	:	240/06KT
Visibility	:	15km
Weather	:	Nil
Cloud	:	BKN 300m
Temperature	:	28°C
Dew Point	:	22°C
QNH	:	1013

1.8 Aids to Navigation

The conditions of the navigation aids as obtained from Ilorin control tower the day of the incident were as follows:

VHF 119.6MHZ & 121.7MHz	:	'S[1]'
VOR 'ILR' 112.3 MHz	:	'S'
ILS 'IL' 109.9 MHz	:	'US[2]'
DME & BINOCULARS	:	'US'
ALDIS & ALARM	:	'S'
PHONES & CLOCKS	:	'S'
W/V INDICATORS	:	'S'
W/S	:	'S'
WX COMPUTER	:	'S'
RWY	:	'S'

1.9 Communications

There was two-way communication between the crew and the Control Tower.

According to the audio recordings of the communication between the crew and the ATC:

[1] S: Servicable

[2] US: Unservicable

At 1215 UTC, the Flight Instructor said, *"Yes, I request Tower to do a fly-by by the Tower 'cos it appears that I do not have three greens. I request do a fly-by by the Tower, a low pass by the runway for you to help me confirm the situation of my landing gear....Did you confirm my landing gear?"*

At 1220 UTC, the controller replied, *"Landing gears are not out."*

1.10 Aerodrome Information

The Ilorin International Airport with ICAO location indicator DNIL has a runway designation of 05/23.

The runway surface is coated with asphalt and of the dimension 3100m x 60m. The Aerodrome Reference Point is 08°26'24"N 004°29'38"E with an elevation of 334m.

1.11 Flight Recorders

The aircraft was not fitted with flight recorders neither was it required by law.

1.12 Wreckage and Impact Information

Following the non-extension of the right main landing gear, the touchdown zone of Runway 23 was foamed by the Airport Rescue and Fire Fighters in preparation for the belly-landing of the aircraft. 5N-BNH initially contacted Runway 23 at about 479m from the threshold, and skidded for 131m before coming to a final stop.

All the propeller blades on both engines were damaged, the left and right engine exhaust pipes were abraded, the left and right side steps were damaged, the left and

right engine nacelles were scratched and there were a few faint propeller strike marks on the runway but there was no fire outbreak.

Figure 1: Photograph showing the aircraft at its final resting point on Runway 23 after belly-landing

1.13 Medical and Pathological Information

There was no medical, pathological or toxicological examination conducted on the crew.

1.14 Fire

There was no fire outbreak.

1.15 Survival Aspect

The aircraft belly-landed on Runway 23 of the Ilorin International Airport following the non-extension of the right main landing gear. The ATC was fully aware of the emergency situation of the aircraft and had notified the Airport Rescue and Fire Fighting Services which in turn foamed the Touch Down Zone of Runway 23 prior to the aircraft's arrival and belly-landing. The aircraft belly-landed on the foamed portion of the runway and there was no fire outbreak.

There was also a liveable volume for the crew who disembarked the aircraft unaided and without injuries.

1.16 Test and Research

On the 19th of August 2014, a retraction and extension test was carried out in the college's maintenance facility by the maintenance personnel in accordance with Section 32-30-00 "Landing Gear Extension and Retraction Test (Normal Extension)" of the approved Airplane Maintenance Manual (AMM), to ascertain the functionality of the aircraft's landing gear, and a report was produced to this effect.

Extract from the report on the Retraction and Extension Test

When the Landing gear lever was put in UP position, the three landing gears started retracting, the three green lights went OFF and the unsafe light came ON. After the landing gear had completely retracted and locked, the unsafe light went OFF.

When the landing gear lever was put down, the Nose Landing Gear and Left Main Landing Gears extended but the Right Main Landing Gear did not. The left and nose landing gears fully extended and locked down, with their green lights ON, the unsafe light was still ON but the right hand main landing gear was still stuck UP.

After thorough inspection, it was discovered that the Right Main Landing Gear Tire was pressing against the wall of the Tire compartment. We therefore had to deflate the tire a little bit to allow the gear extend.

See Figures 2 and 3.

A minimum clearance of 4mm (0.16in.) between the MLG tyre and the lower wing shell/wheel bay cut-out is required for normal operations of the landing gear system, as contained in AMM Section 32-10.

Figure 2: Photograph showing extension and retraction test being conducted at IAC Hangar Facility

Figure 3: Photograph showing the right main landing gear tyre stuck in the wheel well during extension and retraction test

1.17 Organizational and Management Information

1.17.1 The Operator (IAC)

The International Aviation College concept began in 2006 with the express purpose of offering aviation training to meet the serious shortages of aviation personnel on a global level but more especially in Nigeria and the West African sub-region.

It is established to train different professionals for the rapidly expanding Nigerian and international aviation industry including pilots (fixed and rotary wing), cabin crew, air traffic controllers and engineers.

The College is located in Ilorin, a city geographically good for flying because of its all year round good flying weather and flat topography.

International Aviation College is a collegiate system with several schools within the system. Each school addresses a specific area of specialty within the profession. Four departments and schools are envisaged. These are:

DEPARTMENT

- *The Rectorate*
- *The Registry dept*
- *The Bursary dept*
- *The Training dept*

SCHOOL

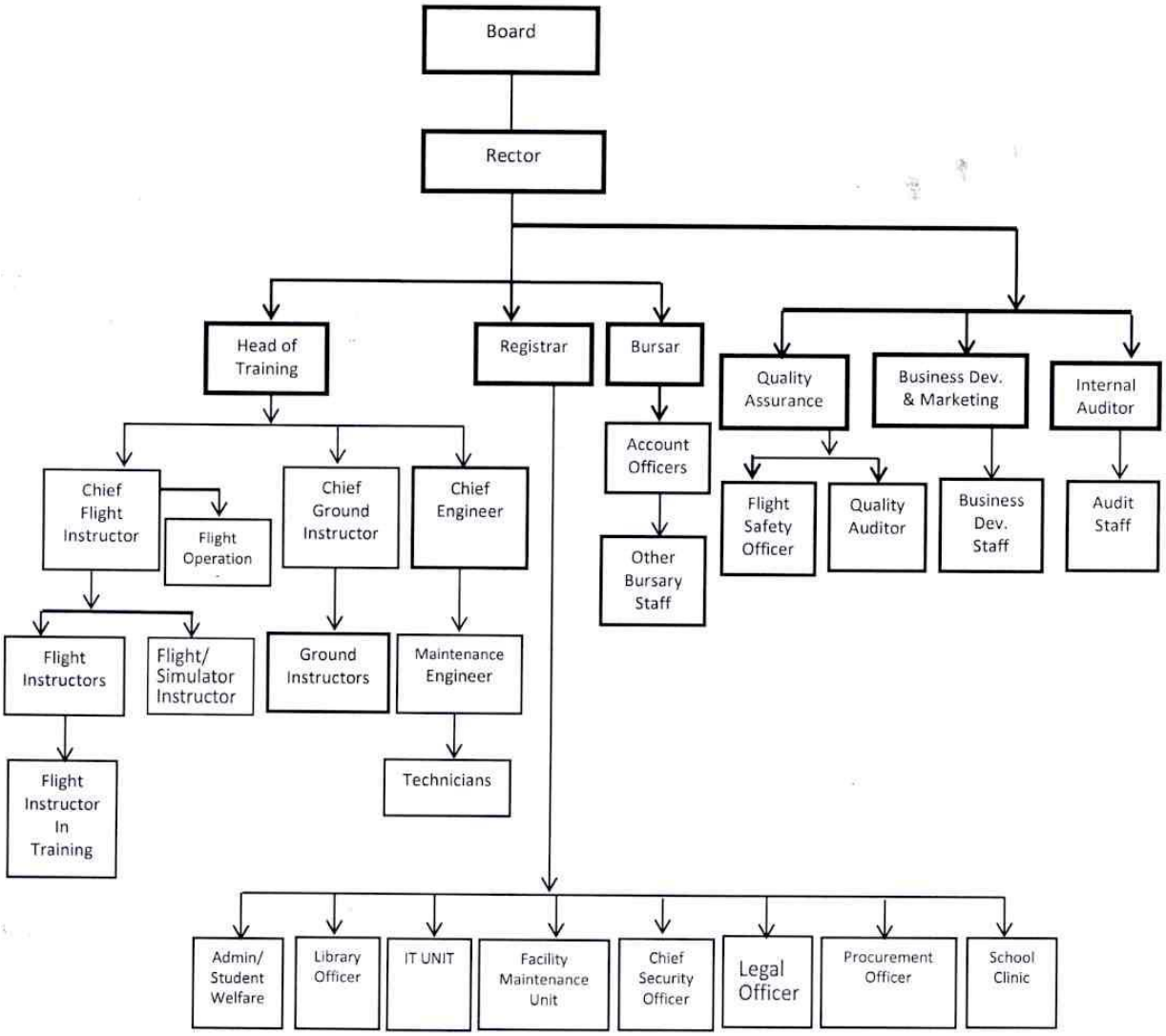
- *Flight School*
- *Aircraft Engineering School*
- *ATC School and*
- *Support Services School*

The Training department is the department responsible for the Training of students in the college academic department.

The Aircraft Engineering department is solely responsible for the maintenance and services of the College Aircraft.

The IAC has an Approved Training Organization (ATO) certificate valid from 5th March, 2013 to 4th March, 2015.

5.12 GENERAL ORGANISATION STRUCTURE



The investigation observed that the Quality System is not technically positioned in the College to adequately ensure effective oversight of the Maintenance Department.

1.17.1.1 Extracts from IAC Quality Manual

1.3 Quality Manager

The Quality Manager will monitor compliance with, and the adequacy of, procedures required to ensure safe operational practices and airworthy airplanes, as required by Nig.CAR Part-2.6.2 and requirements of Part 3. He is one of the nominated Post holders and he will have access to all parts of the IAC's ATO, Director of Training and Accountable Manager, and where necessary, any contractors and sub-contractor's organization.

The Quality Manager will verify, by monitoring activity in the fields of flight Training, maintenance, crew training and ground Training, that the standards required by the Authority are being carried out under the supervision of the relevant nominated Post holder.

The Quality Manager must be acceptable to the Nigeria Civil Aviation Authority.

2.5 Maintenance

The INSPECTION PROCEDURE MANUAL (IPM) describes the provision of aircraft engineering and maintenance by a maintenance organisation (IAC Aircraft ONLY). The IAC MPM describes how this is monitored by the Chief Maintenance Engineer as in Part 2.6.3. Quality Assurance of maintenance will involve periodic auditing of the contractor or sub-contractor and, where appropriate, their Quality Assurance Program and the Maintenance Management function.

1.17.1.2 Airplane Flight Manual

The following procedures as contained in the Airplane Flight Manual are required when there is an abnormal operation of the landing gear system.

Extracts from the Airplane Flight Manual

3.6 LANDING GEAR SYSTEM FAILURES

3.6.1 LANDING GEAR UNSAFE WARNING

NOTE

The landing gear unsafe warning light illuminates if the landing gear is neither in the final up or down & locked position. Illumination of this light is therefore normal during transit.

If the light remains on for longer than 20 seconds during landing gear retraction / extension:

1. Airspeed . . . . . .check below V_{LOR} 156 KIAS

2. Gear selector . . . . . re-cycle if continued illumination occurs

If the landing gear cannot be extended to the down & locked position or red light does not extinguish:

- Continue with 3.6.2 - MANUAL EXTENSION OF THE LANDING GEAR.

3.6.2 MANUAL EXTENSION OF THE LANDING GEAR

NOTE

In case of a failure of the electrical pump, which is driving the landing gear actuators, the landing gear can be extended manually at speeds up to 156 KIAS. The manual extension of the landing gear may take up to 20 seconds.

The following checks shall be completed before extending the landing gear manually:

1. Gear indicator lights . . . . . test / push test button

2. ELECT. MASTER . . . . . check ON

3. Bus voltage . . . . . check in normal range

4. Circuit breaker . . . . . check in / reset if necessary

Manual landing gear extension procedure:

5. Gear selector . . . . . select DOWN

6. Manual gear extension handle . . . . . pull out

NOTE

The landing gear should now extend by gravity and relief of hydraulic pressure from the system. If one or more landing gear indicator lights do not indicate the gear down & locked after completion of the manual extension procedure steps 1- 6 reduce airspeed below 110 KIAS and apply moderate yawing and pitching to bring the landing gear into the locked position.

7. Gear indicator lights . . . . . check 3 green lights

NOTE

If the landing gear is correctly extended and locked, as indicated by the 3 green lights, the red light is illuminated additionally if the GEAR circuit breaker is pulled.

If the landing gear cannot be extended to the down & locked position continue according to 3.6.3 - LANDING WITH GEAR UP.

3.6.3 LANDING WITH GEAR UP

NOTE

This procedure applies if the landing gear is completely retracted.

1. Approach . . . .with power at normal approach airspeeds and flap settings

2. POWER lever . . . . . IDLE / just before touchdown

If the time / situation allows, the following steps can help to reduce the risk of fire:

3. ENGINE MASTER . . . . . both OFF

4. FUEL SELECTOR . . . . . both OFF

5. ELECT. MASTER . . . . . OFF

Touchdown:

6. Touchdown . . . . . Contact surface with minimum airspeed

7. On ground . . . . . Maintain directional control with rudder as long as possible so as to avoid collision with obstacles

1.17.1.3 Description of the Landing Gear system

The following is an extract from the Airplane Maintenance Manual, Section 32-30.

2. Description

Figure 1 shows the main components of the landing gear. The landing gear absorbs landing loads and let[s] you move the airplane on the ground. The landing gear also provides steering control and braking when the airplane is on the ground.

The DA 42 has a tricycle landing gear. The landing gear can retract. The left main gear leg attaches to the wing center section on the left side of the fuselage. The right main landing gear attaches the wing center section on the right side of the fuselage. The nose gear leg attaches to the fuselage front bulkhead. All three legs have CFRP doors that seal the landing gear bays when the landing gear is retracted in flight.

Each main leg is a tubular steel strut. A trailing arm attaches to the bottom of the strut and an axle for the wheel assembly attaches to the trailing arm. A damper behind the tubular strut also attaches to the trailing arm and absorbs the landing loads. The landing gear hydraulic system holds the main gear legs in the retracted position. When the main gear legs are extended the legs geometrically lock and a latch holds the legs in the locked position during rebound loads.

Each main gear leg has a single main-wheel and a hydraulic disk-brake. Toe pedals on the rudder pedals operate the disk-brakes.

The nose gear leg attaches to the fuselage front bulkhead. A steel strut with an integral telescopic damper absorbs the landing loads. The nose gear leg carries a single nose-wheel. The pilot uses the rudder control pedals to steer the nose-wheel. Two steering stops attached to the gear leg limit the rotary motion of the nose landing gear.

The landing gear hydraulic system holds the nose leg in the retracted position. When the nose leg is extended the leg geometrically locks and a latch holds the leg in the locked position during rebound loads.

The landing gear has an electrically powered hydraulic supply and control system. The hydraulic supply and control system is mounted on a bracket located in the rear fuselage, near the rear baggage compartment. Refer to Chapter 29, Section 32-30 for more data about the hydraulic system.

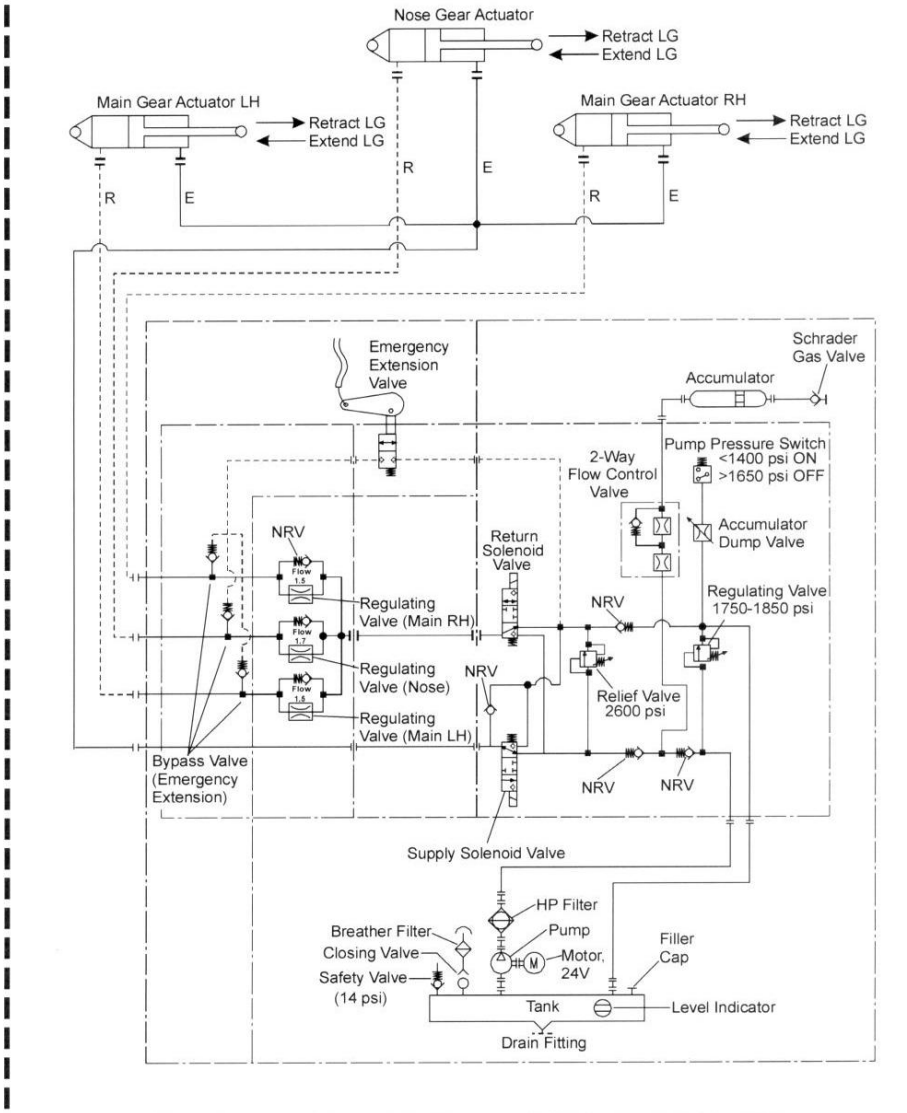


Figure 6: Hydraulic Schematic Diagram - Normal Extension Operation

Figure 4: Hydraulic schematic diagram

1.17.1.4 Landing Gear position indication

Each landing gear has a related green indicator. The green indicators will light if all the landing gear legs are down and locked when the gear selector is set to DOWN. The green indicators will not light if all the landing gear legs are fully up when the gear selector is set to UP. During the movement of the legs during extension or retraction the red UNSAFE indicator will light and the green indicators will be off.

The red indicator will stay lit if one, or more, of the landing gear legs has not fully retracted when the selector has been set to UP. The red indicator will stay lit if one, or more, of the landing gear legs has not fully locked down when the selector has been set to DOWN. The related leg green indicator will also not be lit.

Push the TEST switch to make sure that the red and green indicators are serviceable and to test the landing gear audible warning horn.

1.17.1.5 Diamond DA42 Airplane Maintenance Manual

See Appendix C for the recommended procedure on the installation of a main wheel.

1.17.2 The Nigerian Civil Aviation Authority (NCAA)

The Nigerian Civil Aviation Authority (NCAA) is the apex regulatory body, overseeing the activities of all airlines and their pilots, engineers and cabin staff, airports, airstrips and heliports, navigation aids, all service providers including the airport authority and the air traffic service provider, aviation training institutions etc, as well as economic regulations of the industry.

1.17.2.1 Extracts from the Nigeria Civil Aviation Regulations (Nig.CARs)

The investigation revealed that log book entries were sometimes ambiguously recorded with alterations. This is not in accordance with the Nigerian Civil Aviation Regulations. Also, the requirements for training aircraft used in an Approved Training Organization are outlined in the regulations.

The following are the relevant sections of the Nig.CARs:

> ***FALSIFICATION, REPRODUCTION, OR ALTERATION OF APPLICATIONS, LICENCES, CERTIFICATES, LOGBOOKS, REPORTS, OR RECORDS (Nig.CARs 1.2.1.5)***
>
> *(a) No person may make or cause to be made concerning any licence, certificate, rating, qualification, or authorisation, application for or duplicate thereof, issued under these Regulations:*
>
> > *(1) Any fraudulent or intentionally false statement;*
> >
> > *(2) Any fraudulent or intentionally false entry in any logbook, record, or report that these Regulations require, or used to show compliance with any requirement of these Regulations;*
> >
> > *(3) Any reproduction for fraudulent purpose; or*
> >
> > *(4) Any alteration.*
>
> ***TRAINING AIRCRAFT (Nig.CARs 3.3.4.2)***
>
> *(a) An applicant for, or holder of, an ATO certificate must ensure that each aircraft used for flight instruction and solo flights meets the following requirements:*

(2) The aircraft must be maintained and inspected in accordance with Part 8: 8.3 of this Regulation and an approved maintenance program.

AIRCRAFT MAINTENANCE AND INSPECTION REQUIREMENTS (Nig.CARs 8.3)

8.3.1.1 APPLICABILITY

(a) This Subpart prescribes the rules governing the maintenance and inspection of Nigerian registered civil aircraft operating within or outside Nigeria.

8.3.1.8 REQUIRED MAINTENANCE

(a) Each owner or operator of an aircraft shall—

(4) Ensure that maintenance personnel make appropriate entries in the aircraft maintenance records indicating the aircraft has been approved for return to service.

1.18 Additional Information

Nil.

1.19 Useful or Effective Investigation Techniques

Nil.

2.0 ANALYSIS

2.1 Conduct of the flight

On the 18th of August 2014 at about 1220hrs, the aircraft took off from Runway 23 of Ilorin International Airport on a training flight with fuel endurance of four hours. There were two persons on board; a Flight Instructor and a Student Pilot. The purpose of the flight was to prepare the Student Pilot for CPL check.

The Student Pilot was flying and the training flight was uneventful. During a "stall simulation in landing configuration" exercise, the Flight Instructor observed that the right main landing gear was not extended. This was confirmed by the landing gear position indication lights on the instrument panel; the nose and left position indication green lights were illuminated, the right green indication light did not illuminate but the red unsafe indication light illuminated.

The investigation revealed that the procedures for handling such a situation, as required in Sections 3.6.1 (Landing Gear Unsafe Warning) and 3.6.2 (Manual Extension of the Landing gear) of the Airplane Flight Manual (AFM) were carried out. After these actions, the right main landing gear still did not extend.

At this point, the options available to the crew were:

1. To land with the right main landing gear in the UP position or,
2. To belly-land with all gears up.

The crew decided on the second option. This option requires for the manual gear extension handle to be returned to the normal position. The procedure to do this is a maintenance procedure covered only in the AMM but not in the AFM. The crew went on to return the manual gear extension handle to NORMAL and retracted the gear. They had normal indications with gears up; all gears OFF and UNSAFE (red) OFF. They

wanted a confirmation so they came overhead for a visual check by the CT. The CT affirmed that the landing gear were in the retracted position.

The crew after a wide consultation with the ATC, Ground Maintenance Personnel and the School Authority, resolved to belly-land the aircraft in accordance with section 3.6.3 of the AFM.

The belly-landing was successfully executed at 1610hrs after the aircraft had been airborne for about 3hrs and 50mins.

2.2 Maintenance

The International Aviation College, Ilorin is an Approved Training Organization. The ATO approval is in accordance with Part 3 of NCARs 2009. It had a valid certificate as at the time of the occurrence.

The College adopts the manufacturer's maintenance manual as its maintenance program for its fleet of three DA40 and two DA42 aircraft. The Maintenance Program/Inspection Procedure Manual was duly approved by the NCAA. The Inspection Procedure Manual (IPM) authorises the maintenance department to carry out maintenance activities on the aircraft.

The Quality department is not involved in the preparation of job or task cards. The Quality Manager only monitors scheduled inspections by checking the weekly and monthly status of aircraft prepared by the Technical Record officer who is a staff of the maintenance department. He also monitors unscheduled maintenance through the Technical Log book. The Quality department is not technically positioned in the College to adequately ensure effective oversight of the maintenance department.

2.2.1 Maintenance Practice

The Nigerian Civil Aviation Regulations (Nig.CARs 1.2.1.5) on Falsification, Reproduction, or Alteration of Applications, Licences, Certificates, Logbooks, Reports, or Records prohibits amongst others; any alteration in the listed documents. The investigation revealed that Log book entries were sometimes ambiguously recorded with alterations, which is not in accordance with the referenced section. For example, on the 10th of June 2014, a licenced maintenance engineer made an entry in the Tech Log with cancellations. A similar trend was observed in the Master Technical document file.

Nig.CARs 8.3.1.8 (a)(4) mandates each owner or operator of an aircraft to ensure that maintenance personnel make appropriate entries in the aircraft maintenance records indicating the aircraft has been approved for return to service. However, AIB, in the course of this investigation, found out that the right main landing gear tyre was changed after the last flight on 25th July, 2014 but this was neither documented in the Technical Log book nor the Aircraft Log book. The wheel change was also not accompanied by a retraction and extension check as required in section 32-30 of the AMM.

The minimum clearance check between the MLG tyre and the lower wing shell/wheel bay cut-out was not performed as well, in accordance with section 32-10. According to the referenced section of the AMM, a minimum clearance of 4mm (0.16in.) between the MLG tyre and the lower wing shell/wheel bay cut-out is required for normal operation of the landing gear system.

This training flight was the first after the tyre change.

2.3 Main wheel change procedure

As a result of the worn out tyre on right MLG, there was a need for a tyre change in accordance with AMM 32-40-00.

The investigation discovered that proper maintenance procedure with regards to the tyre change was not adhered to.

However, the following Detail Steps/Work Items were not carried out:

- *If a tire/wheel change is performed check minimum clearance between MLG tire and the lower wing shell/wheel bay cut-out.*
- *Carry out a test of the correct operation of the landing gear retraction and extension system.*

The incident would have been prevented if the above steps had been carried out in accordance with section 32-10 and 32-30 of the AMM respectively, when the right main wheel was changed.

3.0 CONCLUSIONS

3.1 Findings

3.1.1 The flight was a training flight aimed at preparing the student pilot for CPL check.

3.1.2 The training flight was the first after the right main wheel change.

3.1.3 The flight instructor was duly licenced and qualified to conduct the flight.

3.1.4 The right main landing gear did not extend during the training exercise involving stall simulation in landing configuration.

3.1.5 The crew notified the Control Tower about the technical challenges they were having at 1315hrs.

3.1.6 The airport safety and emergency services/procedures was activated and put on STANDBY at 1430hrs.

3.1.7 FAAN fire personnel completed the foaming of the Touch Down Zone of runway 23 prior to aircraft belly landing at 1610hrs.

3.1.8 There was no medical, pathological or toxicological examination conducted on the crew.

3.1.9 The Noise Certificate issued by NCAA identifies the engine type installed on the aircraft as a Turboprop whereas the original engine log book from the manufacturer indicates that it is a piston engine. This discrepancy was also observed in the Noise Certificates issued for other aircraft in the college's fleet.

3.1.10 The aircraft came under Nigerian registration on the 16th of May, 2011.

3.1.11 Diamond Aircraft Industries issued four Mandatory Service Bulletins related to the Landing gear, as follows:

- MSB 42-062/1 – Complied.
- MSB 42-088/3 – Complied.
- MSB 42-091 – Complied.
- MSB 42-095 – Complied.

3.1.12 MSB 42-088/3 was not complied within the stipulated period.

3.1.13 Log book entries were sometimes ambiguously recorded with alterations.

3.1.14 The wheel change before the occurrence was not accompanied by a retraction and extension check as required in the AMM.

3.2 Causal Factor

The failure to adhere to the main wheel installation procedure as contained in the AMM, Section 32-40-00, bordering on:

a. Minimum clearance check between the MLG tire and the lower wing shell/wheel bay cut-out.
b. Test of correct operation of the landing gear retraction and extension system.

3.3 Contributory Factor

Inadequate oversight by the Quality Assurance department.

4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendations 2017-015

NCAA should intensify its safety oversight responsibilities on the operator to ensure that it adheres strictly to procedures in the AMM and that maintenance records are properly kept.

4.2 Safety Recommendations 2017-016

IAC should restructure its Quality System to provide adequate safety oversight on the maintenance department thereby enhancing airworthy aircraft and safe operations.

4.3 Safety Recommendations 2017-017

IAC should ensure that medical, pathological or toxicological examinations are conducted immediately after an occurrence.

4.4 Safety Recommendations 2017-018

Diamond Aircraft Industries should incorporate the following procedures in the AFM:

1. Landing with partial gear.
2. Resetting emergency extension lever after manual extension.

SAFETY ACTION

NCAA agrees with the Conclusion in Section 3.1.9 and is presently amending the subject Noise Certificates to reflect the type of engine installed.

APPENDICES

Appendix A: Main landing gear

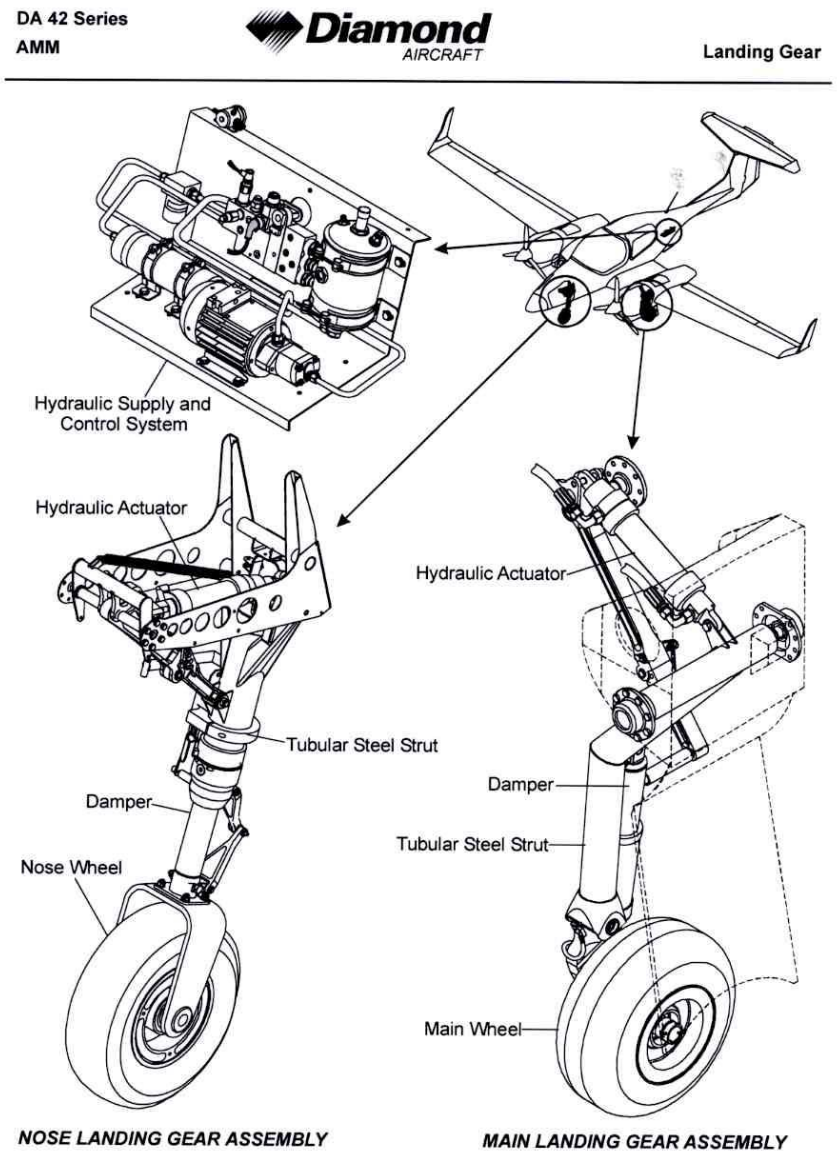


Figure 1: Landing Gear - Main Components

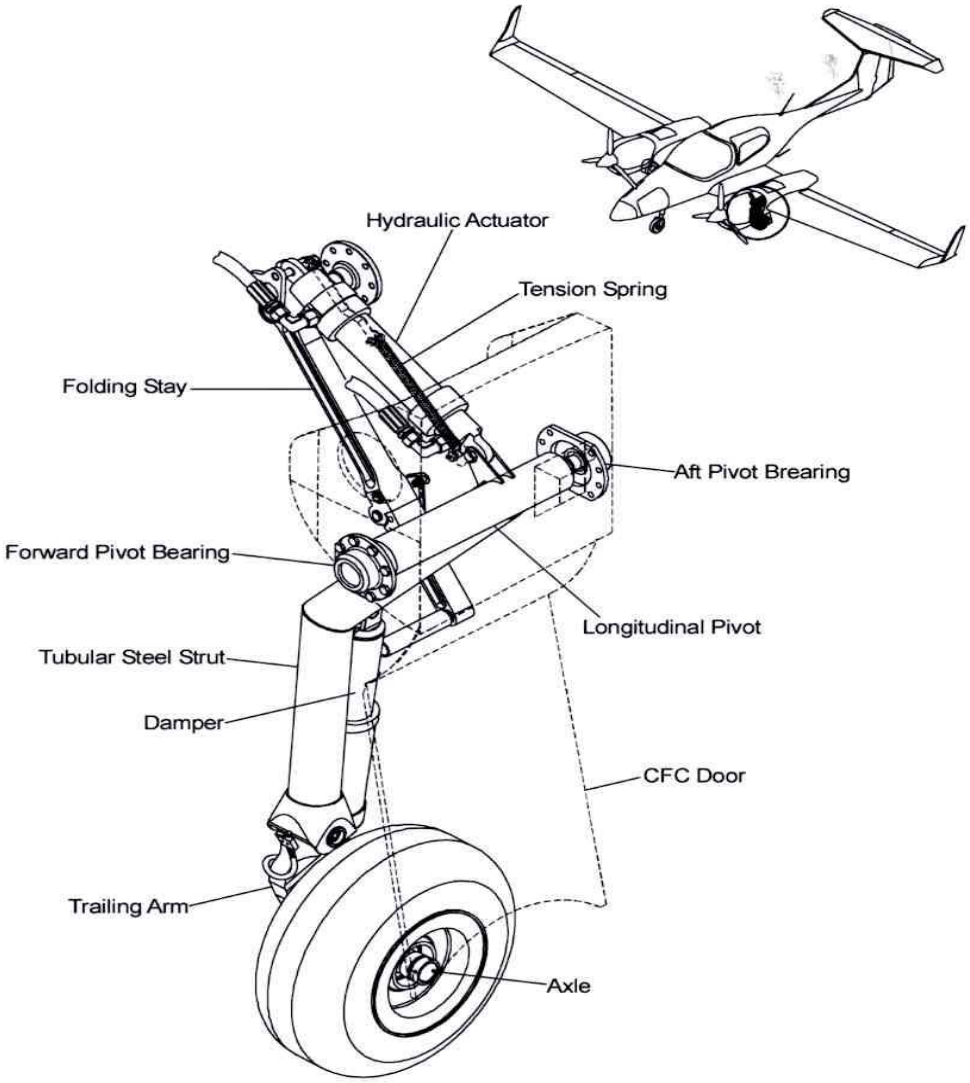


Figure 1: Main Landing Gear

Appendix B: Main Wheel change procedure (AMM, Section 32-40)

Section 32-40 - Wheels and Brakes

1. General

The DA 42 has 2 main wheels and 1 nose wheel. All wheels have split hubs and tires with inner tubes.

The main wheels are standard Cleveland components.

The main wheels have brake disks and a Cleveland brake caliper. Toe-brake pedals operate hydraulic cylinders. Hydraulic pipes and hoses connect the cylinders to the brake calipers. A parking valve locks the brakes ON.

Each main wheel has an independent brake system. The left pedal of each rudder pedal assembly operates the left wheel brake and the right rudder pedal operates the right wheel brake.

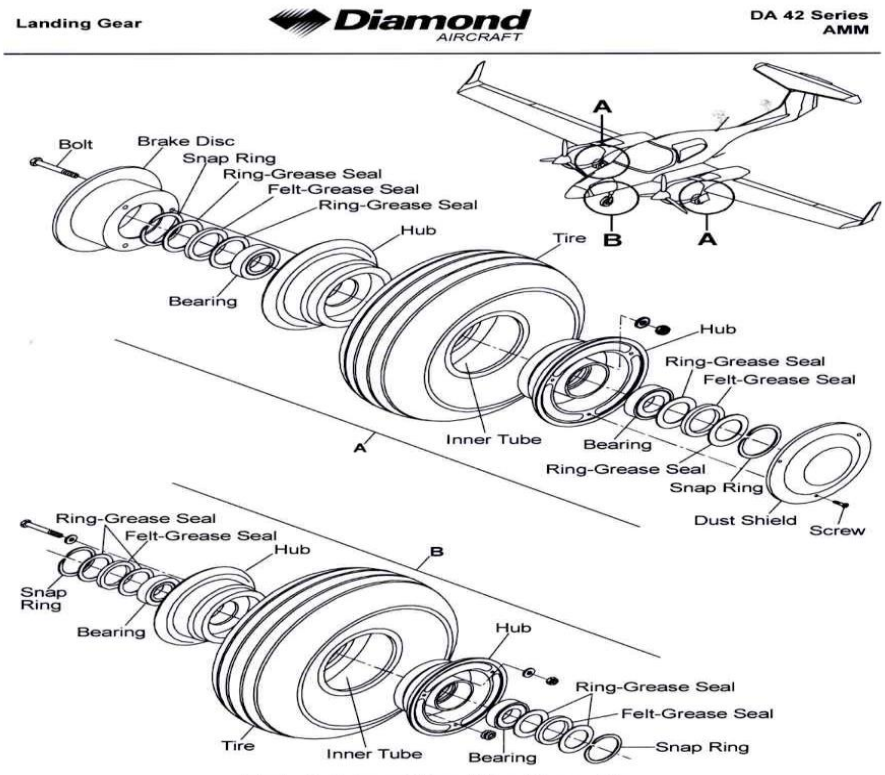


Figure 1: Main and Nose Wheel Assemblies

2. Description - Main Wheels

Figure 1 shows the main and nose wheel assemblies. The main wheel hub has 2 halves. Each half of the hub is made from light alloy. Three bolts with nuts and washers hold the 2 halves of the hub together. The bolts also hold a brake disk to the wheel.

Each half of the hub has a roller bearing assembly. Each bearing has 2 grease seals and a felt seal.

Snap rings hold each bearing assembly in position.

Each main wheel has a Goodyear 15 x 6.0 - 6, 6 PR, TT, 160 mph, FS II tire with a Goodyear 6.00 - 6 / 15 x 6.00 - 6 (G15 / 6.00 - 6), valve type TR-20 inner tube. Two red slip marks - one on the tire and the other on the wheel - are aligned.

3. Description - Nose Wheel

Figure 1 shows the main and nose wheel assemblies. The nose wheel has a split hub. Each half of the hub is made from light alloy. Three internal hexagon headed bolts hold the two halves of the hub together. Each hub half has a sealed bearing.

The nose wheel has a Goodyear 5.00 - 5, 10 PR, TT, 120 mph, FS II and a Goodyear 5.00 - 5 /15 x 6.00 - 5 / 380x150-5 inner tube, valve type TR-67.

C. Install a Main Wheel

	Detail Steps/Work Items	Key Items/References
(1)	Install the wheel: – Make sure that the axle is clean. – Move the wheel into position on the axle. – Install the castle nut. Tighten the castle nut finger tight and align the cotter pin hole in the axle with a castellation in the nut. – Install the cotter pin.	
(2)	Make sure that the wheel turns freely and with no noise.	
(3)	Move the caliper into position at the wheel. Make sure that the mounting spigots engage with the locating bushes.	Make sure that the pressure plate is correctly located within the caliper.
(4)	Install the back-plates: – Move the back-plates into position at the caliper. – Install the 4 bolts and washers that attach the back-plates to the caliper, finger tight. – Make sure that the wheel brake disk can rotate freely between the caliper pressure plate and the back-plates. – Tighten the bolts that attach the back-plates to the caliper.	Torque according to Cleveland/Parker Maintenance Manual, latest revision or placard on caliper.
(5)	Install dust shield.	

CAUTION: MAKE SURE THAT THE AREA AROUND THE AIRPLANE IS CLEAR. IF THE LANDING GEAR HITS AN OBJECT THE LANDING GEAR CAN BE DAMAGED.

CAUTION: MAKE SURE THAT THE LANDING GEAR IS LOCKED DOWN BEFORE YOU LOWER THE AIRPLANE WITH THE JACKS.

	Detail Steps/Work Items	Key Items/References
(6)	Reset the GEAR circuit-breaker and make sure that the landing gear selector is set to DOWN.	
(7)	If a tire/wheel change is performed check minimum clearance between MLG tire and the lower wing shell / wheel bay cut-out.	Refer to Section 32-10 - Adjustment of the MLG wheel in retracted position.
(8)	Carry out a test of the correct operation of the landing gear retraction and extension system.	Refer to Section 32-30.
(9)	Move the wing and fuselage trestles clear of the airplane.	
(10)	Lower the airplane with the jacks.	Make sure that the area around the airplane is clear.

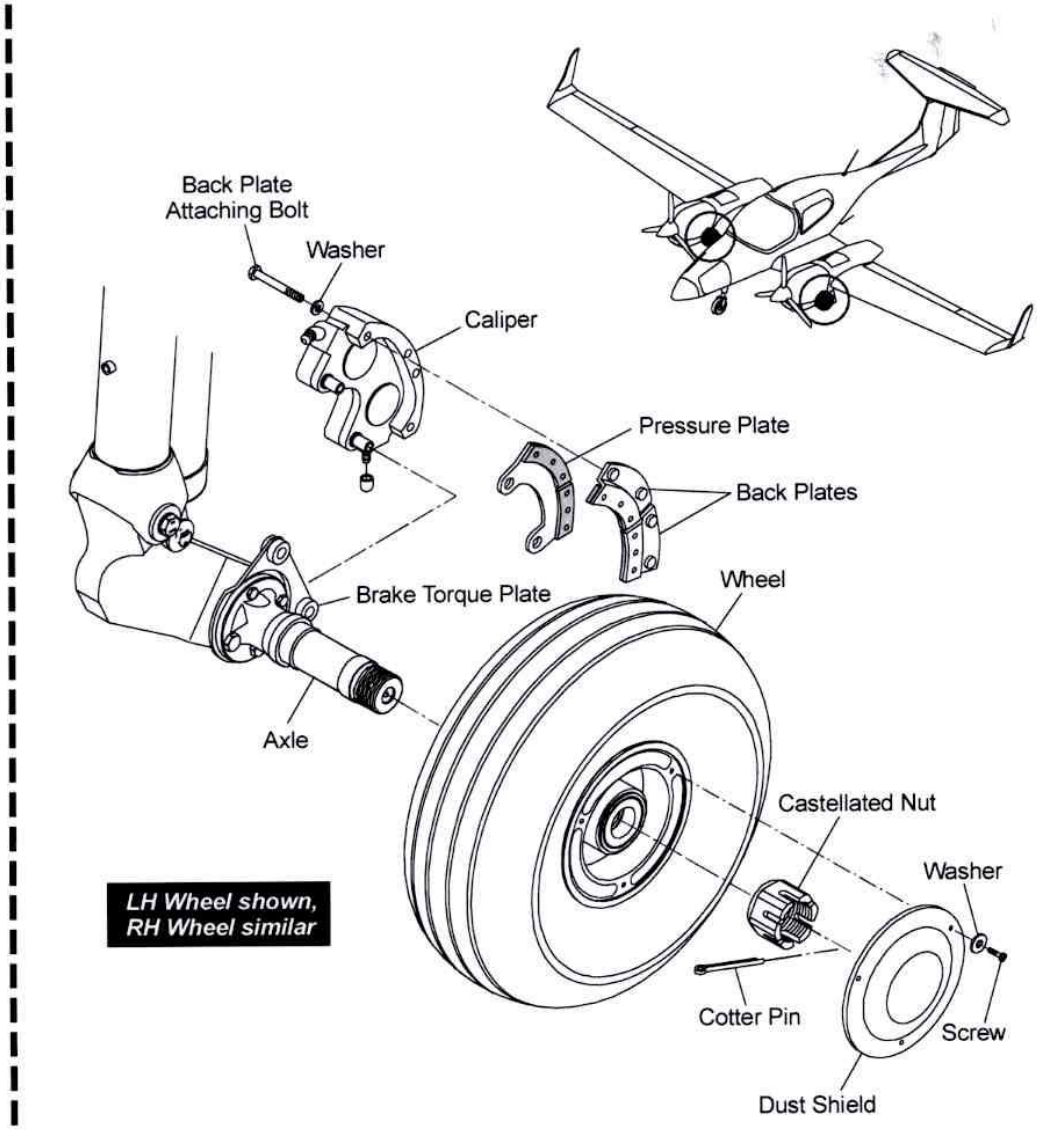


Figure 4: Remove/Install a Main Wheel

D. Remove/Install a Joint on Main Landing Gear Leg

(1) Equipment

Item	Quantity	Part Number
Airplane jacks.	3	Commercial.
Wing trestle.	2	Commercial.
Rear fuselage trestle.	1	Commercial.

(2) Remove a Joint on Main Landing Gear Leg

	Detail Steps/Work Items	Key Items/References
	WARNING: TAKE PRECAUTIONS BY SECURING THE AREA AROUND THE AIRPLANE BEFORE YOU PERFORM MAINTENANCE ON THE LANDING GEAR. THE LANDING GEAR RETRACTION SYSTEM CAN CAUSE SERIOUS INJURY TO PERSONS IF OPERATED ACCIDENTALLY.	
(1)	Raise the airplane on jacks and move the wing and rear fuselage trestles into position to support the airplane.	Refer to Section 07-10.
(2)	Pull the GEAR circuit breaker.	Right side of instrument panel.
(3)	Support the tire and remove the nut, washer, lower bolt and bushing from the joint.	Refer to Figure 2. If MÄM 42-452 or MSB 42-088/2 is installed refer to Figure 3. If OÄM 42-195 is installed refer to Figure 4.
(4)	Move the damper and the joint clear of the trailing arm.	
(5)	Remove the nut, washer and the upper bolt from the joint. If MÄM 42-452 or MSB 42-088/2 is installed remove the nut, washer, spacer and the upper bolt from the joint.	Refer to Figure 2. If MÄM 42-452 or MSB 42-088/2 is installed refer to Figure 3. If OÄM 42-195 is installed refer to Figure 4.
(6)	Move the joint clear of the MLG damper.	

	Detail Steps/Work Items	Key Items/References
(7)	Measure the joint.	Refer to Figure 7.
(8)	Make a note of ordering numbers of the LH and RH joint sizes: – D60-3217-23-51 Joint: x = 59 mm, z = 32 mm – D60-3217-23-52 Joint oversize 1: x = 61 mm, z = 34 mm – D60-3217-23-53 Joint oversize 2: x = 63 mm, z = 36 mm – D60-3217-23-54 Joint oversize 3: x = 65 mm, z = 38 mm If MÄM 42-452 or MSB 42-088/2 is installed: – D64-3217-23-00 Joint: x = 62 mm, z = 32 mm – D64-3217-23-01 Joint oversize 1: x = 64 mm, z = 34 mm – D64-3217-23-02 Joint oversize 2: x = 66 mm, z = 36 mm – D64-3217-23-03 Joint oversize 3: x = 68 mm, z = 38 mm	
	Note: Different part numbers may be used on LH and RH MLG of the airplane.	

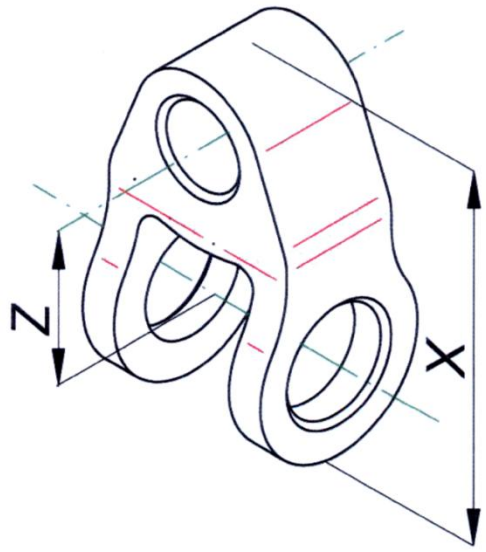


Figure 7: Main Landing Gear Joint Measurement

(3) Install a Joint on Main Landing Gear Leg

	Detail Steps/Work Items	Key Items/References
(1)	Use a joint according to your measurement.	As noted in Sub-Paragraph (2).
	Note: You must use the correct joint / joint oversize.	
(2)	Examine the bushing for wear, if a D60-3217-23-5X joint is reused.	Use new bushing if worn.
(3)	Install joint on damper: – Move joint on damper – Verify smooth and easy movement – Install the bolt, washer and self locking nut. If MÄM 42-452 or MSB 42-088/2 is installed: – Install the bolt, washer, spacer and self locking nut.	 Use new self-locking nut. Use new self-locking nut.
(4)	Connect joint to main landing gear trailing arm: – Move trailing arm into position – Install bushing, bolt, washer and self locking nut.	 Use new self locking nut.
(5)	Adjust the wheel in retracted position and check MLG door pre-load.	Refer to Paragraph 12.

Appendix C: MSB 42-0621/1

Diamond AIRCRAFT

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt

MANDATORY SERVICE BULLETIN

NO. MSB-42-062/1

Supersedes MSB-42-062

I TECHNICAL DETAILS

I.1 Category

Mandatory

I.2 Airplanes affected

Type:	DA 42, DA 42 M
Serial Numbers:	42.004 up to and incl. 42.429 42.AC001 up to and incl. 42.AC152 42.M001 up to and incl. 42.M039

I.3 Time of Compliance

Action 1: within the next 100 flight hours and within every 200 flight hours thereafter until Action 2 is carried out

Action 2: not later than 31-Dec-2009

I.4 Subject

Replacement of the Landing Gear - Down Lock Pin

ATA-Code: 32

I.5 Reason

It has been reported, that on a few airplanes circlips of the Landing Gear Down Lock Pins fell off because of corrosion of the clips. To correct this situation, this Bulletin addresses the replacement of the Down Lock Pin circlips of the Landing Gear and subsequently the replacement of these pins with a modified design as the terminating action for repetitive replacement of the circlips.

I.6 Concurrent Documents

None

I.7 Approval

The technical information or instructions contained in this document relate to the Design Change Advisory No. MÄM 42-275, which has been approved under the authority of DOA No. EASA.21J.052.

The technical content of this document has been approved under the authority of DOA No. EASA.21J.052.

I.8 Accomplishment / Instructions

WI-MSB-42-062, latest effective issue must be complied with.

I.9 Mass (Weight) and CG

Negligible

II PLANNING INFORMATION

II.1 Material & Availability

The Work Instruction WI-MSB-42-062 is attached to this Service Bulletin.
Appropriate necessary materials are available through Diamond Aircraft Industries.

II.2 Special Tools

None

II.3 Credit

Action 1: None.

Action 2: Material as mentioned in WI-MSB-42-062 and 1 hour of labor.

II.4 Labor effort:

Action 2: Approx. 1 hour additional during scheduled maintenance

II.5 Reference Documents

DA 42 Series Airplane Maintenance Manual Doc. No. 7.02.01, latest effective issue
WI-MSB-42-062, latest effective issue.

III REMARKS

1. All measures must be carried out by a certified aircraft service station or a certified maintenance aircraft mechanic.

2. Accomplishment of the measures must be confirmed in the log book.

3. In case of any doubt, contact Diamond Aircraft Industries.

4. If material and labor hours are subject to be credited through Diamond Aircraft Industries, the SB must be carried out by an authorized Diamond Service Center and the Warranty Application must be sent not later than 30 days after completion of work.

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt

WORK INSTRUCTION

WI-MSB 42-062

„Replacement of the Landing Gear - Down Lock Pins“

I GENERAL INFORMATION

I.1 Subject:

MSB-42-062 / Action 1:
Replacement of the Circlips of the Landing Gear Down Lock Pins every 200 hours.

MSB-42-062 / Action 2:
Replacement of the Locking Pins as terminating action (Modified design without circlips).

I.2 Reference Documents:

Diamond Aircraft DA 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, latest effective issue.

I.3 Remarks:

a) All measures must be carried out by a certified aircraft service station or a certified aircraft maintenance mechanic.

b) All works, particularly those that are not especially described in this work instruction, must be carried out in accordance with the referenced maintenance manual.

c) Accomplishment of the measures must be confirmed in the log book.

d) In case of doubt, contact Diamond Aircraft Industries.

II DRAWINGS, SPECIAL TOOLS & MATERIALS

II.1 Drawings

None.

II.2 Special Tools

None.

II.3 Material

MSB-42-062 / Action 1

Replacement of the NLG- and MLG- Down Lock Bolt circlips every 200 hours.

Qty	Description	Part Number
6	Circlip	DIN 471-08-verzinkt
3	Self locking nut	DIN 985-M6-A2

MSB-42-062 / Action 2

Replacement of the Locking Pins as terminating action. (Modified design without circlips)

Qty	Description	Part Number
1	NLG Locking Bolt	D60-3233-00-35
1	NLG Locking Bolt- Nut Assy.	D60-3233-70-00
2	MLG Locking Bolt	D60-3237-11-37
2	MLG Locking Bolt-Nut Assy.	D60-3237-70-00
3	Self locking nut	DIN 985-M6-A2
a/r	Corrosion inhibitive sealant	P/S 870 Class A-2

III INSTRUCTIONS

GENERAL:

Torque all screws without special torque acc. to the values given in the AMM, Section 20.

Action 1:

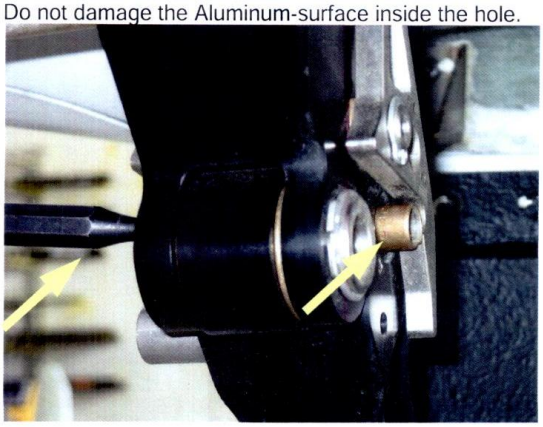
Replacement of the Circlips (Repetitive action every 200 hours)

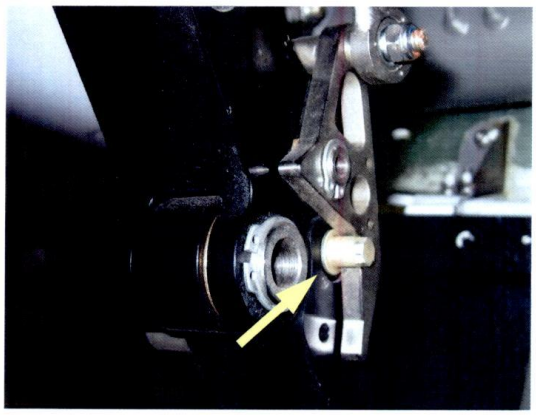
Warning:	**Do not begin any disassembly without consulting the DA 42 Series Airplane Maintenance Manual, latest effective issue.**
Warning:	**Take precautions by securing the area around the airplane before you perform maintenance on the landing gear retraction system. The landing gear retraction system can cause serious injury to persons if operated accidentally.**
Warning:	**The folding stay and Landing Gear Legs are spring loaded. Due to the high forces involved the elements can cause serious injury to persons.**
1	Pull the GEAR circuit-breaker.
2	Pull the PITOT and STALL WRN circuit breakers.
3	Raise the airplane on jacks and move the wing and rear fuselage trestles into position to support the airplane.
4	Release the hydraulic pressure from the hydraulic system: • Fold the rear passenger seat-backs forward. Refer to AMM Section 25-10. • Remove the rear baggage compartment lower access panel. Refer to AMM Section 25-60. • Operate the accumulator dump-valve at the hydraulic and control assembly. • Install the rear baggage compartment lower access panel. Refer to AMM Section 25-60.
5	Remove the screw which connects the Hook Rod and the Hook Assembly and turn back the Hook Assembly. Discard the self locking nut.
6	Replace the two circlips which hold the bolt in position. **CAUTION:** Do not overstress the circlip during the installation!
7	Turn the Hook Assembly into position and reinstall the screw connecting the Hook Assembly with the Hook Rod. Install the new self locking M6 - nut.
8	Clean working area and check for foreign objects.
9	Carry out step 5 – 8 on the Nose Landing Gear and the Main Landing Gear Assemblies.

11	Perform an operational check of the landing gear indication system.
12	Lower the airplane with the jacks. Refer to AMM Section 07-10. **CAUTION:** Make sure that the area around the airplane is clear of equipment.
13	Push the PITOT and STALL WRN circuit breakers.
14	Make appropriate entries in aircraft documents.

Action 2:

Replacement of the Locking Pins as terminating action. (Modified design without circlips)

Warning:	**Do not begin any disassembly without consulting the DA 42 Series Airplane Maintenance Manual, latest effective issue.**
Warning:	**Take precautions by securing the area around the airplane before you perform maintenance on the landing gear retraction system. The landing gear retraction system can cause serious injury to persons if operated accidentally.**
Warning:	**The folding stay and Landing Gear Legs are spring loaded. Due to the high forces involved the elements can cause serious injury to persons.**
15	Carry out Step 1 – 5 of this Work Instruction.
16	Remove the circlips and the bolts from the landing gear assemblies.
17	Carefully remove the two bushings which are pressed into the Brace Assemblies of the Nose and Main Landing Gear. **CAUTION:** Do not damage the Aluminum-surface inside the hole. 

18	Install P/N D60-3237-11-37 and P/N D60-3237-70-00 on the Main Landing Gear Assemblies. (see picture) Prior to installation, apply P/S 870 Class A-2 sealant on Locking Bolts by dipping. Refer also to the sealant manufacturer's instructions. Remove excessive sealant and clean surrounding surfaces. Torque Locking Bolt assemblies with 16+/-2 Nm (11.8 ± 1.5 ft.lbf.). **NOTE:** New parts are self locking, no additional securing required. 
19	Install P/N D60-3233-00-35 and P/N D60-3233-70-00 on the Nose Landing Gear Assembly. Prior to installation, apply P/S 870 Class A-2 sealant on Locking Bolts by dipping. Refer also to the sealant manufacturer's instructions. Remove excessive sealant and clean surrounding surfaces. Torque Locking Bolt assembly with 16+/-2 Nm (11.8 ± 1.5 ft.lbf.). **NOTE:** New parts are self locking, no additional securing required.
20	Carry out steps 5, 7, 8 and 10 – 14 of this Work Instruction.

Appendix D: MSB 42-091

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

MANDATORY SERVICE BULLETIN

MSB 42-091

I TECHNICAL DETAILS

I.1 Category

Mandatory.

I.2 Airplanes affected

Type: DA 42, DA 42 M,

Serial numbers: 42.005 through 42.416, 42.427;
42.AC001 through 42.AC151;
42.M001 through 42.M026;

I.3 Date of Effectivity

28-Jun-2011

I.4 Time of Compliance

Within the next 100 flight hours, but not later 12 months from the date of effectivity.

Recurring inspection every 200 flight hours until replacement with an improved design.

I.5 Subject

Main Landing Gear Bearing Housing

ATA-Code: 32-17

I.6 Reason

During standard maintenance on aircraft operated mainly in coastal areas several Main Landing Gear Bearing Housing have been found with cracks initiating from corrosion on the surface between the attachment bolts and the housing. This service bulletin is issued to draw the attention to that area and prescribes an inspection of the Main Landing Gear Bearing Housing. If there are cracks in the housings, the housings must be replaced by an improved design.

I.7 Concurrent Documents

None.

I.8 Approval

The technical information or instructions contained in this document relate to the Design Change Advisory No. MÄM 42-498, which has been approved under the authority of EASA Design Organization Approval No. 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 42-091, latest effective issue.

I.10 Mass (Weight) and CG

Not affected.

II PLANNING INFORMATION

II.1 Material and Availability

See WI-MSB 42-092 latest effective issue.
Materials are available from Diamond Aircraft Industries.

II.2 Special Tools

None.

II.3 Labor Effort

Approx. 1 hours for inspection (both sides).
Approx. 12 hours for replacement (both sides)

II.4 Credit

For all airplanes within warranty period for replacement:
12 labor hour and Material acc. to WI-MSB 42-091

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

II.5 Reference Documents

Diamond Aircraft 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, latest effective issue.

III REMARKS

1. All works must be done by a certified aircraft service station or a certified aircraft maintenance mechanic.
2. All works, particular those that are not especially described in this Service Bulletin, must done in accordance with the referenced Maintenance Manual.
3. Completion of all works must be confirmed 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 completion of work.
5. In case of doubt contact Diamond Aircraft Industries GmbH.

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

EXECUTION REPORT TO SERVICE BULLETIN MSB 42-091

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 _____

_____
Date, Name, Sign

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

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

WORK INSTRUCTION

WI-MSB 42-091

Inspection of MLG bearing housing

I GENERAL INFORMATION

I.1 Subject

This Work Instruction describes the inspection and if required, replacement with an improved design of the MLG (main landing gear) bearing housing.

I.2 Reference Documents

Diamond Aircraft DA 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, 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 for replacement

Puller	VR D60-3217-11-00
Installation tool	VR D60-3217-12-00

II.3 Material for replacement

Quantity	Part No.	Description	Item
16	LN 9037 M8x32	Screw	1
50	LN 9025-0815K	Washer	2
2	D60-3217-51-00_1	MLG bearing housing front assy	3
4	D60-3217-11-01_01	Washer sheet	4
32	LN 9348-M8	Self-locking-nut	5
14	LN 9037-M8x30	Screw	6
2	LN 9037-M8x50	Screw	6
2	D60-3217-61-00_1	MLG bearing housing rear assy	7
a.r.*	D60-3217-11-07	GFK spacer	(8)
16	DIN 9021-M8-ZP	Washer	9
1	CA1000-CART or JC 11 (Celloseel QH)	Chromate free j. Compounf 130ml Cart (PRC De Soto) or Chromate compound (PRC De Soto)	

a.r. *) If a adjustment of the axial clearance on the MLG bearing housing is necessary.

Materials are available from Diamond Aircraft Industries.

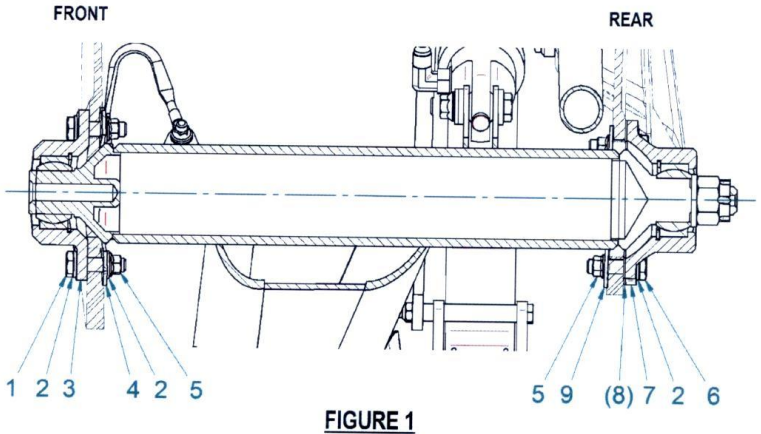


FIGURE 1

Diamond Aircraft Industries GmbH
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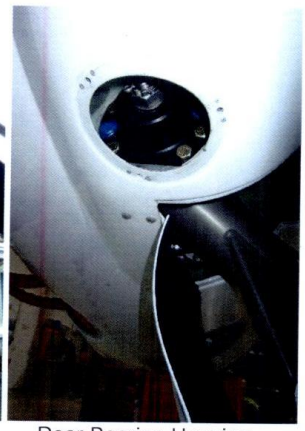
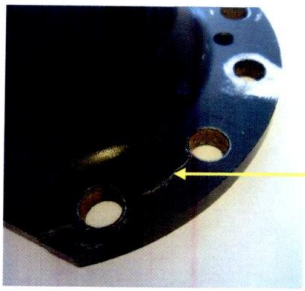
Austria

III INSTRUCTIONS

III.1 Inspection of MLG bearing housing

1)	Raise the airplane on jacks and move the wing and rear fuselage trestles into position to support the airplane. Refer to AMM section 7-10. Pull the GEAR, GEAR WRN / ELEV. LIMIT and STALL WRN circuit-breakers. **WARNING: Make sure that the GEAR, GEAR WRN ELEV LIM, and STALL WRN circuit breakers are pulled before you perform maintenance on the landing gear. The landing gear retraction system can cause serious injury to personnel if operated by accident.**
2)	Remove Fuel Filter Cap RH and LH. Refer to AMM section 52-40.
3)	Remove Maintenance Cap 2 LH and RH. Refer to AMM section 52-40.
4)	Examine all four bearing housings for cracks between the attachment bolts.  Front Bearing Housing  Rear Bearing Housing  CRACK

5)	If cracks are found, replace the MLG bearing housing in accordance with Section III.2. If no cracks are found proceed with step 6.
6)	Install Maintenance Cap 2 LH and RH. Refer to AMM section 52-40.
7)	Install Fuel Filter Cap RH and LH. Refer to AMM section 52-40.
8)	If Replacement per section III.2 was carried out, perform operation test of the landing gear. Refer to AMM section 32-30.
9)	Lower the airplane and remove the wing and rear fuselage trestles.
10)	Set the GEAR, GEAR WRN / ELEV. LIMIT and STALL WRN circuit-breaker.
11)	Clean working areas, check for foreign objects.
12)	Check all altered, replaced, repaired parts for proper function.
13)	Test all systems in working area for function.
14)	Make all necessary entries in the airplane logs.

III.2 Replacement of all four MLG bearing housing

1)	Bleed the hydraulic system: • Retract the landing gear to bleed the system. • Operate the emergency extension of the landing gear (Repeat this step one or two times).
2)	Remove Fuel Filter Element. Refer to AMM section 28-20. **CAUTION:** Seal fuel system to prevent dust or foreign objects intruding the fuel system.
3)	Remove the flexible heat pipe from the clamp to gain more space to reach the front bearing housing.
4)	Disconnect the main gear doors from the main gear leg.
5)	Disconnect the MLG Folding Stay Assembly in acc. with AMM section 32-10 paragraph 9. B.
6)	Remove the front bearing housing: • Remove the 8 bolts, nuts and washers which hold the bearing housing onto the fuselage. • Use the bearing housing puller VR-D60-3217-11-00 to get the bearing housing off the longitudinal pivot. **Note: Support the main gear leg and make sure not to scratch the surface.**

7)	Install the front bearing housing P/N: D60-3217-51-00_1. • Remove surface protection at the bonding connection of the bearing housing. • Use the installation tool VR D60-3217-12-00 to install the bearing on the longitudinal pivot. Apply a thin film of corrosion protection CA1000-CART or JC 11 on the pivot. • Apply a thin film of corrosion protection CA1000-CART or JC 11 on the attachment bolts. • Install the 8 bolts, washers and nuts acc. to figure1. • Fastening torque 26 Nm – 32 Nm. • Seal the bonding connection with appropriate coating, e.g. Nycote 7-11.
9)	Remove the rear bearing housing: • Remove the cotter-pin form the castle nut. • Remove the castel nut. • Remove the 7 bolts, nuts and washers which hold the bearing housing onto the fuselage. • Remove the bolt, 3 washers, 2 spacer, the spacer sleeve and the nut from the bearing housing. • Use the bearing housing puller VR-D60-3217-11-00 to get the bearing housing off the longitudinal pivot. **Note: Support the main gear leg and make sure not to scratch the surface.**
10)	Install the rear bearing housing P/N: D60-3217-61-00_1. • Remove surface protection at the bonding connection of the bearing housing. • Use the installation tool VR D60-3217-12-00 to install the bearing on the longitudinal pivot. Apply a thin film of corrosion protection CA1000-CART on the pivot. • Apply a thin film of corrosion protection CA1000-CART on the attachment bolts. • Install the 7 bolts, nuts and washers which hold the bearing housing onto the fuselage acc. to figure 1. • Install the bolt, 3 washers, 2 spacers, the spacer sleeve and the nut to the bearing housing. Fastening torque 26 Nm – 32 Nm. • Check the axial clearance of the gear leg. • Required axial clearance: max 0,2mm, if necessary install a GFK spacer. • Install the castle nut and adjust axial clearance by tightening the castle nut. • Tighten by hand the castle nut. • Check the axial clearance again. • Install the cotter-pin form the castle nut. • Seal the bonding connection with appropriate coating, e.g. Nycote 7-11.
11)	Connect the MLG Folding Stay Assembly in acc. with AMM Chapter 32-10 Section 10
12)	Connect the main gear doors to the main gear leg.
13)	Reinstall the flexible heat pipe.
14)	Install Fuel Filter Element. Refer to AMM section 28-20.
15)	Proceed with Section III.1, Item 6.

Appendix E: MSB 42-095

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

MANDATORY SERVICE BULLETIN
MSB 42-095
MSB 42NG-026

I TECHNICAL DETAILS

I.1 Category

Mandatory.

I.2 Airplanes affected

Type: DA 42, DA 42 M, DA 42 NG, DA 42 M-NG

Serial numbers: 42.004 through 42.321, 42.324 through 42.347,
42.349, 42.351, 42.353 through 42.357,
42.359 through 42.386, 42.388, 42.389, 42.391,
42.394, 42.396, 42.399, 42.405 through 42.409,
42.412 through 42.416, 42.427,
42.AC001 through 42.AC152,
42.M001 through 42.M011, 42.M015 through 42.M019,
42.M021, 42.M022,
42.N001 through 42.N011, 42.N013, 42.N018, 42.N019,
42.N023 through 42.N028,
42MN001 through 42.MN008
provided that damper D60-3277-10-00_01 has NOT been installed on both MLG legs

I.3 Date of effectivity

11-Nov-2011

I.4 Time of Compliance

Within 200 flight hours, but not later than 31-Dec-2012.

I.5 Subject

Replacement of MLG damper nut.

ATA-Code: 32-10

I.6 Reason

In one case the nut in the MLG damper has loosened itself during operation. This might lead to the MLG leg getting jammed in the gear bay. This Service Bulletin describes the work necessary to secure the nut in the MLG damper.

Note: Diamond Aircraft Industries recommends doing RSB 42-089 / RSB 42NG-017. The measures prescribed by this service bulletin are included in RSB 42-089 / RSB 42NG-017.

I.7 Concurrent Documents

None.

I.8 Approval

The technical information or instructions contained in this document relate to the Design Change Advisory No. MÄM 42-434, 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

If RSB 42-089 / RSB 42NG-017 has been done on both MLG dampers:

Record MSB 42-095 / MSB 42NG-026 as performed.

Note: Doing RSB 42-089 / RSB 42NG-017 on both MLG dampers is included in Work Instruction "Conversion to DA 42 NG / M-NG" Rev. 7 and later.

If RSB 42-089 / RSB 42NG-017 has **not** been done on both MLG dampers:

Comply with WI-MSB 42-095 / MSB 42NG-026, latest effective issue.

Note: WI-MSB 42-095 / MSB 42NG-026 is attached to this document.

Note: Diamond Aircraft Industries recommends to do RSB 42-089 / RSB 42NG-017 on both MLG dampers. The measures prescribed by this service bulletin are included in RSB 42-089 / RSB 42NG-017.

I.10 Mass (Weight) and CG

The change in mass and CG is negligible.

II PLANNING INFORMATION

II.1 Material and Availability

See WI-MSB 42-095 / MSB 42NG-026, latest effective issue.

Materials including drawings are available from Diamond Aircraft Industries.

II.2 Special Tools

None.

II.3 Labour Effort

Approx. 2 hours.

II.4 Credit

For all AC within warranty period:

2 man hours of work.

Material according to WI-MSB 42-095 / MSB 42NG-026, latest effective issue.

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

II.5 Reference Documents

Diamond Aircraft DA 42 Series Airplane Maintenance Manual, Doc. No. 7.01.01, latest effective issue.

Diamond Aircraft DA 42 NG Airplane Maintenance Manual, Doc. No. 7.01.15, 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.

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

EXECUTION REPORT TO SERVICE BULLETIN MSB 42-095 MSB 42NG-026

AIRPLANE DATA

Airplane Serial Number: _____

Airplane Registration: _____

Airplane Operator: _____

Hours of operation of airplane: _____

No. of landings: _____

Hours of operation-engine: LH _____

RH _____

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

_____
Date, Name, Sign

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

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt

WORK INSTRUCTION

WI-MSB 42-095 / WI-MSB 42NG-026

I GENERAL INFORMATION

I.1 Subject

Replacement of nut in MLG damper

I.2 Reference Documents

DA 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, latest effective issue.

DA 42 NG Airplane Maintenance Manual, Doc. No. 7.02.15, latest effective issue.

I.3 Remarks

a) All work must be done by a certified aircraft service station or a certified aircraft maintenance mechanic.

b) All work, in particular that which is not especially described in this work instruction, must be done in accordance with the referenced maintenance manual.

c) For conversion factors between SI and US/Imperial units refer to AMM Chapter 02.

d) It is recommended to print this Work Instruction in color.

e) In case of doubt, contact Diamond Aircraft Industries GmbH.

II DRAWINGS, SPECIAL TOOLS & MATERIALS

II.1 Drawings

D60-3277-10-00_01

II.2 Special Tools

Spacer X00-W027-00-00.02 Rev."-"

II.3 Material

Quantity	Part No.	Description
2	ORAR00227-N7083	O-Ring
2	MS 28775-010	O-Ring
2	LN 9348-08	Hexagon nut
2	LN 9348-06	Hexagon nut
100ml	1U-9891 or equivalent	Additiv 1U-9891 Caterpillar Inc.

Materials including special tools are available from Diamond Aircraft Industries.

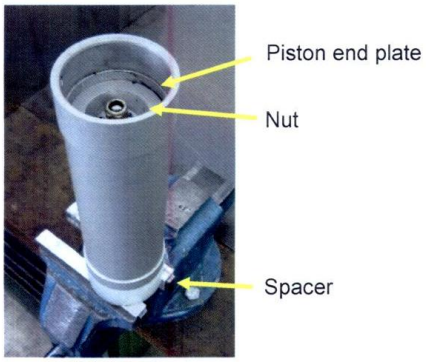
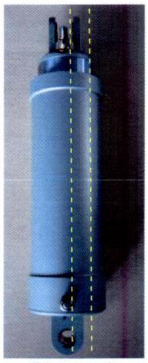
II.4 Consumables

Quantity	Part No.	Description
Approx. 2 l	3627020L	Aero Shell Fluid 41
a. r.	Royoco 81MS	Grease Royoco 81MS
a. r.	135376	Loctite 262

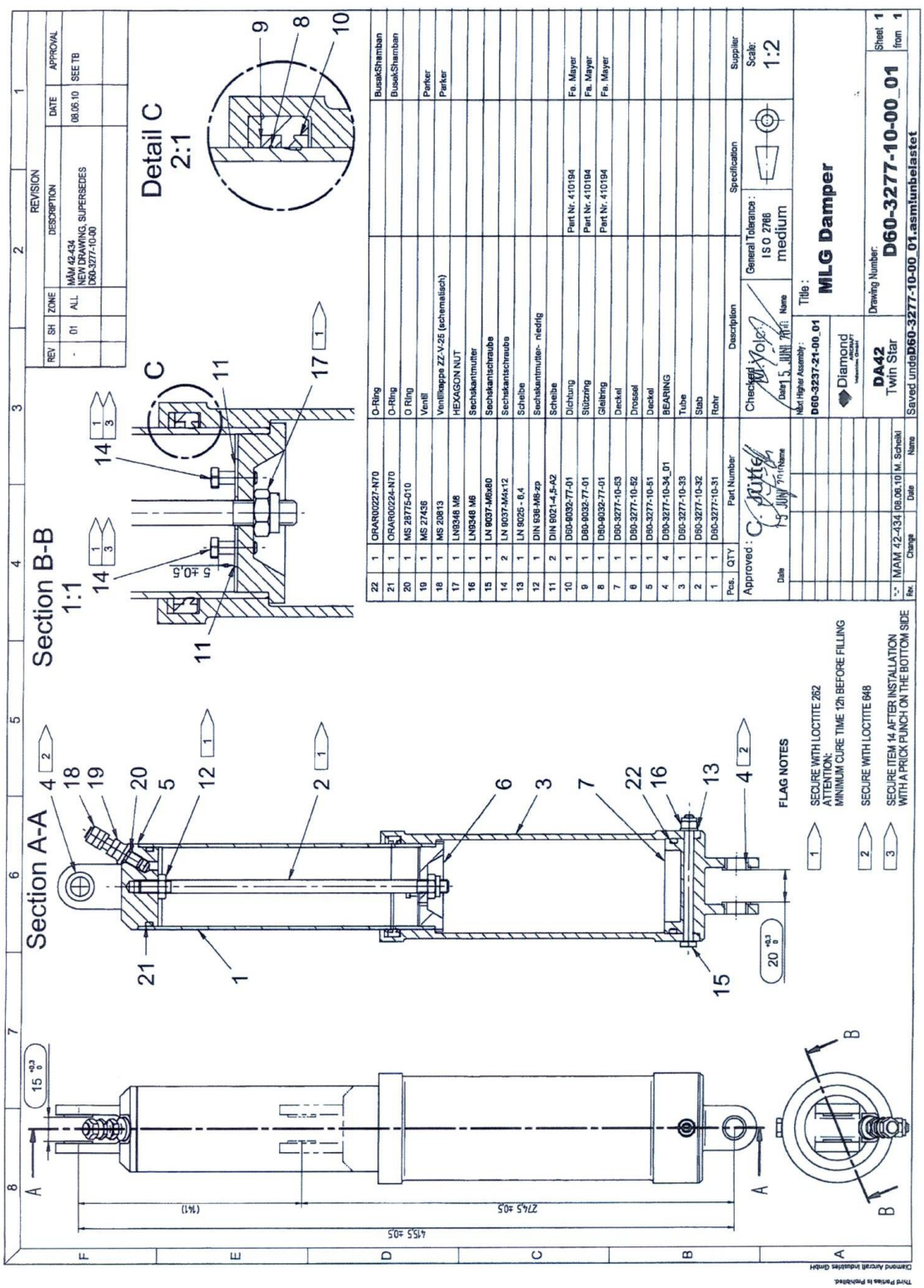
Consumables may be procured locally or from Diamond Aircraft Industries

III INSTRUCTIONS

1	Make sure AMM-TR-MÄM-42-368 and AMM-TR-MÄM-42-447 are incorporated into the AMM.
2	Remove the LH Main Landing Gear Damper acc. to AMM section 32-10.
3	Release nitrogen and oil from the damper. **WARNING: Do not spill Fluid 41 on your skin or on your clothes. Fluid 41 is harmful and can cause skin disease and damage to clothes.** **WARNING: Always wear safety glasses. The damper is gas loaded.** ☐ Install the adapter with drain hose onto the charging valve of the damper and release the pressure into the suitable container acc. to picture 1. ☐ Wait until the nitrogen is fully released. ☐ Push in the damper to minimum position to drain the oil.  Picture 1
4	Remove the charging valve from damper and install spacer.
5	Remove the bottom cap: ☐ Remove the bolt holding the bottom cap. ☐ Pull the bottom cap from the damper assembly. **WARNING: Do not spill Fluid 41 on your skin or on your clothes. Fluid 41 is harmful and can cause skin disease and damage to clothes.** Note: Catch the residual oil into a suitable container. ☐ Clean the cap with acetone. ☐ Replace the O-Ring from the cap by new O-Ring ORAR00227-N7083 and apply a coat of Additive 1U-9891 on the new O-Ring. **Caution: Do not use steel tools when removing the O-Ring. Do not scratch the surfaces of the groove.**

6	Remove the nut on the piston end plate.
7	Install nut LN 9348-08 on the piston end plate. Secure the connection with Loctite 262 i.a.w. drawing D60-3277-10-00_01.  Picture 2
8	Allow Loctite to cure before filling (Minimum cure time 12 hours).
9	Install the bottom cap with the bolt, washer and nut.
10	Remove the spacer from piston tube.
11	Install the charging valve with a new O-Ring MS 28775-010.
12	Adjust the direction of the piston tube to the cylinder tube acc. to picture 3. Note: The charging valve must be aligned with the nut from the bolt holding the bottom cap.  Picture 3
13	Fill and charge the Damper acc. to AMM Section 32-10.
14	Install the Damper to the MLG acc. to AMM Section 32-10.

15	Mark damper with "modified i.a.w. MSB 42-095 / MSB 42NG-026" using a fine permanent marker. Cover the marking with commercial clear coat. Note Mask around the marking before you apply the clear coat. Note Choose an inconspicuous location for the marking on the damper (e.g. on the side facing towards the MLG doors).
16	Perform steps 2 through 15 on the RH MLG damper.
17	Clean working area and check for foreign objects.
18	Do a landing gear extension and retraction test and check clearance between MLG wheel and wheel bay i.a.w. AMM Section 32-10.
19	Apply anti-corrosion coating on damper connections i.a.w. AMM Section 12-30.
20	Perform functional check of altered, repaired and new parts.
21	Test all systems in working area for function.
22	Make necessary entries into aircraft logs.


Section A-A
Section B-B
1:1
Detail C
2:1
REVISION
DESCRIPTION
DATE
APPROVAL
MAM 42-434
NEW DRAWING, SUPERSEDES D60-3277-10-00
08.06.10
SEE TB
FLAG NOTES
SECURE WITH LOCTITE 262
ATTENTION:
MINIMUM CURE TIME 12h BEFORE FILLING
SECURE WITH LOCTITE 648
SECURE ITEM 14 AFTER INSTALLATION
WITH A PRICK PUNCH ON THE BOTTOM SIDE
Approved :
Checked :
Title :
MLG Damper
Drawing Number:
D60-3277-10-00_01
DA42
Twin Star
Diamond
General Tolerance :
ISO 2768
medium
Scale:
1:2
Sheet 1
from 1
Saved under D60-3277-10-00_01.asm
unbelastet
Busak+Shamban
Parker
Fa. Mayer
Supplier
Specification
Description
Part Number
Pcs.
QTY
O-Ring
HEXAGON NUT
Sechskantmutter
Sechskantschraube
Scheibe
Sechskantmutter- niedrig
Dichtung
Stützring
Gleitring
Deckel
Drossel
BEARING
Tube
Stab
Rohr
Ventil
Ventilkappe ZZ-V-26 (sechsmalisch)
Diamond Aircraft Industries GmbH

Appendix F: MSB 42-088/3

Diamond AIRCRAFT

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt

DAI MSB 42-088/2
Page 1 of 5
08-Mar-2011

MANDATORY SERVICE BULLETIN

NO. MSB 42-088/3

SUPERSEDES MSB 42-088/2

I TECHNICAL DETAILS

I.1 Category

Mandatory.

I.2 Airplanes affected

Type: DA 42, DA 42 M

Serial Numbers: 42.004 through 42.321, 42.324 through 42.347, 42.349, 42.351, 42.353 through 42.357, 42.359 through 42.386, 42.388, 42.389, 42.391, 42.394, 42.396, 42.399 through 42.401, 42.405 through 42.409, 42.412 through 42.416, 42.427
42.AC001 through 42.AC152
42.M001 through 42.M011, 42.M015 through 42.M019, 42.M021, 42.M022

I.3 Date of Effectivity

5-Jul-2010

I.4 Time of Compliance

Within the next 20 flight hours from the date of effectivity and thereafter at each scheduled 100 hours maintenance inspection thereafter until replacement with P/N D64-3217-23-0x.
Replacement with P/N D64-3217-23-0x not later than 31-Dec-2011.

I.5 Subject

This Service Bulletin prescribes the inspection of the joints that connect the MLG (main landing gear) damper with the MLG trailing arm for cracks.

ATA-Code: 32-10

I.6 Reason

Depending on environmental, operating and runway conditions the MLG joint P/N D60-3217-23-5x (4 different lengths available) made of aluminium is susceptible to cracking. These cracks have been detected during standard maintenance, but if such cracks remain undetected, this may lead to failure of the joint and subsequent damage or malfunction of the MLG. To avoid such undetected cracks, this Service Bulletin prescribes special recurring inspection of the MLG joint.

The MLG joint D60-3217-23-5x has been replaced by an improved design. Replacement of the MLG joint with the new design P/N D64-3217-23-0x (4 different lengths available) made of steel is described in this Service Bulletin. If MLG joint D64-3217-23-0x (4 different lengths available) is installed, no recurring inspection is necessary.

I.7 Concurrent Documents

None.

I.8 Approval

The technical information or instructions contained in this document relate to the Design Change Advisory No. MÄM 42-452/d, which has been approved by EASA.

The technical content of this document has been approved under the authority of DOA No. EASA.21J.052.

I.9 Accomplishment/Instructions

Comply with Work Instruction WI-MSB 42-088, latest effective issue.

I.10 Mass (Weight) and CG

Mass and Center of Gravity are not affected.

II PLANNING INFORMATION

II.1 Material & Availability

Materials are available from Diamond Aircraft Industries.

II.2 Special Tools

None.

II.3 Labour Effort

- 0,5 labour hour for inspection only
- 1 labour hour for inspection & replacement.

II.4 Credit

- No credit for inspection only.
- For all aircraft within warranty period 1 labour hour and Material acc. to WI-MSB 42-088 Rev. 1 or later are credited through Diamond Aircraft Industries GmbH, provided that the execution report with the requested information and the replaced parts were sent to DAI for the attention of Warranty Department.

II.5 Reference Documents

DA 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, latest effective issue.

III REMARKS

1. All measures must be carried out by a certified aircraft service station or a certified aircraft maintenance mechanic.
2. All works, particular those that are not especially described in this Service Bulletin, must be carried out in accordance with the referenced Maintenance Manual.
3. Accomplishment of the measures must be confirmed in the log book.
4. If material and/or labour 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 and the defective parts must be sent to DAI to the attention of Warranty Department not later than 30 days after the end of time of compliance.
5. In case of doubt contact Diamond Aircraft Industries GmbH.

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt

EXECUTION REPORT TO

SERVICE BULLETIN MSB 42-088/3

AIRPLANE DATA

Airplane Serial Number: _____

Airplane Registration: _____

Airplane Operator: _____

Hours of operation of airplane: _____

No. of landings: _____

Hours of operation-engine LH: _____

RH: _____

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

Cracked MLG joints were replaced

O – no, time since installation of MLG joint LH _____ and RH _____

O – yes, on LH MLG at _____ hours time since installation of MLG joint
on RH MLG at _____ hours time since installation of MLG joint

_____

Date, Name, Sign

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

Diamond Aircraft Industries GmbH
N. A. Otto-Straße 5
A-2700 Wiener Neustadt
Austria

WORK INSTRUCTION

WI-MSB 42-088

Inspection of MLG joint

I GENERAL INFORMATION

I.1 Subject

This Work Instruction describes the inspection of the joints that connect the MLG (main landing gear) damper with the MLG trailing arm for cracks.

I.2 Reference Documents

Diamond Aircraft DA 42 Series Airplane Maintenance Manual, Doc. No. 7.02.01, 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

D60-3217-21-00_02 / D60-3217-22-00_02

II.2 Special Tools

None.

II.3 Material for replacement of MLG joints

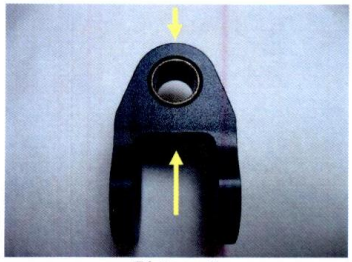
Quantity	Part No.	Description
2	D60-3217-25-00	Adapter bushing assy
2	D64-3217-21-62	Bushing
2	D64-3217-21-67	Bushing
a.r. *)	D64-3217-23-00	MLG cross joint assy Replacement part for D60-3217-23-51
a.r. *)	D64-3217-23-01	MLG cross joint assy oversize1 Replacement part for D60-3217-23-52
a.r. *)	D64-3217-23-02	MLG cross joint assy oversize2 Replacement part for D60-3217-23-53
a.r. *)	D64-3217-23-03	MLG cross joint assy oversize3 Replacement part for D60-3217-23-54
8	LN 9025-0815K	Washer M8
4	LN 9037-M8x50	Hexagon screw
4	LN 9338 M8	Hexagon nut
a.r	63830	Loctite 638

a.r. *) Check which MLG joints are installed i.a.w. AMM Section 32-10. Different part numbers may be used on LH and RH MLG of the airplane.

Materials are available from Diamond Aircraft Industries.

III INSTRUCTIONS

III.1 Inspection of MLG Joint

1	Insert AMM-TR-MÄM-42-447/a & AMM-TR-MÄM-42-452 and AMM-TR-MÄM-42-368 into the AMM or use an AMM revision into which these AMM-TRs have been incorporated.
2	Remove the joint P/N D60-3217-23-5x (4 different lengths available) that connects the LH MLG damper and the LH MLG trailing arm. The joint is indicated in the picture. Refer to AMM, section 32-10.  Picture 1
3	Clean the MLG joint.
4	Examine the MLG joint for cracks. **CAUTION: Look especially in the areas indicated by the arrows.**  Picture 2
5	If cracks are found, replace the MLG joint i.a.w. Section III.2. Otherwise reinstall MLG Joint.

6	Check adjustment of wheel in retracted position. Refer to AMM, section 32-10.
7	Repeat items 2 – 6 on the RH MLG.
8	Carry out a landing gear emergency extension system test. Refer to AMM, section 32-30.
9	Carry out a landing gear extension and retraction test. Refer to AMM, section 32-30.
10	Clean working areas, check for foreign objects.
11	Check all altered, replaced, repaired parts for proper function.
12	Test all systems in working area for function.
13	Make all necessary entries in the airplane logs.

III.2 Replacement of MLG Joint

1	Pull the GEAR and PITOT HEAT circuit-breakers. **WARNING: Make sure that the GEAR and PITOT HEAD circuit breakers are pulled before you perform maintenance on the landing gear. The landing gear retraction system can cause serious injury to personnel if operated by accident.**
2	Raise the airplane on jacks and move the wing and rear fuselage trestles into position to support the airplane. Refer to AMM Section 07-10.
3	Remove the Main Landing Gear cross joint acc. to AMM section 32-10. **Caution: Do not damage the weight on wheel switch.**
4	Measure the joint acc. to AMM Section 32-10, and ensure the replacement part has the same size.
5	Remove the coated bushings carefully from the trailing arm and clean the bearing carrier with fresh acetone.

Picture 3

6	Install the adapter bushing assy. - Apply a thin coat of Loctite 638 on trailing arm bearing carrier and on the adapter bushing assy. - Insert the adapter bushing assy flush into the trailing arm. - Remove the excessive Loctite from the trailing arm. - Allow Loctite to cure. Adapter Bushing assy  Picture 4
7	Install the new joint on the MLG leg acc. to AMM Section 32-10. Use fasteners i.a.w. drawings D60-3217-21-00_02 / D60-3217-22-00_02.
8	Apply anti-corrosion coating on damper connections acc. to AMM section 12-30.