

GROUND HANDLING WHEELS NOT REMOVED

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GENERAL INFORMATION

Identification number:	2010060
Classification:	Accident
Date, time ¹ of occurrence:	14 August 2010, approximately 12.30 hours
Location of occurrence:	Stroe
Aircraft registration:	D-HNOC
Aircraft model:	Robinson R44
Type of aircraft:	Helicopter
Type of flight:	Positioning
Phase of operation:	Landing
Damage to aircraft:	Severely damaged
Cockpit crew:	One
Number of Passengers:	None
Injuries:	None
Other damage:	None
Lighting conditions:	Daylight

SUMMARY

During a positioning flight, both ground handling wheels were left attached to the helicopter. While hover taxiing before landing, the left ground handling wheel fell from the aircraft. The right ground handling wheel, however, was still attached to the right skid with its lifting handle pointing downwards. When the lifting handle hit the ground, the helicopter pivoted over to the left, the tail hit the ground and the tail, including the tail rotor, broke off. The helicopter became uncontrollable and came to a standstill lying on its side. The pilot suffered no injuries. The helicopter was damaged beyond repair.

This report is published in the Dutch and English languages. In the event of conflict in interpretation, the Dutch text will be deemed binding.

¹ All times given in this report are local unless stated otherwise.

FACTUAL INFORMATION

The flight

On 14 August 2010, a Robinson R44 helicopter, registration D-HNOC, was scheduled for Air Transport category flights to various locations. The first flight of the day was from its home base Kootwijkerbroek to Stroe to pick up passengers. Approximately one hour before departure the pilot arrived in Kootwijkerbroek to prepare for the flight. He put the helicopter on its wheels, pulled it out of the hangar and performed a pre-flight inspection. The Robinson R44 helicopter is equipped with two landing skids (left and right) as undercarriage. To move the helicopter on the ground a removable ground handling wheel with a lifting handle is fitted to each skid (see figure 1). The lifting handles are approximately one metre long. After fitting the ground handling wheels, the skids can be raised by the lifting handles and the helicopter moved on its wheels. Part of the daily or pre-flight checks in the aircraft flight manual is to verify that the ground handling wheels are removed before departure.



Figure 1: ground handling wheel with lifting handle mounted on left skid

The pilot was the only occupant on the five minute flight from Kootwijkerbroek to Stroe and he was familiar with the landing location. During the flight, both ground handling wheels remained attached to the skids with their lifting handles hanging downwards (see figure 2). Before landing, the pilot hover-taxed to the landing spot. During taxiing, both lifting handles momentarily touched the ground, causing the left ground handling wheel and its handle to fall from the helicopter (see figures 3 & 4). As it descended for landing, and approximately thirty metres away from the waiting passengers, the right lifting handle hit the ground. The helicopter pivoted around the handle until the left skid touched the ground (see figure 5). Then the sequence of events occurred rapidly. The helicopter turned ninety degrees left around the top axis before the tail struck the ground (see figure 6). The tail and the tail rotor broke off, the helicopter pitched forwards and rolled to the left where it came to rest on its side (see figure 7). During the accident the left fuel tank was damaged, resulting in a fuel leak (see figure 8). The helicopter was severely damaged. The pilot suffered no injuries.



Figure 2: both lifting handles attached



Figure 3: both lifting handles touch the ground



Figure 4: left lifting handle detached



Figure 5: helicopter pivots on right lifting handle



Figure 6: tail strike



Figure 7: D-HNOC after the accident

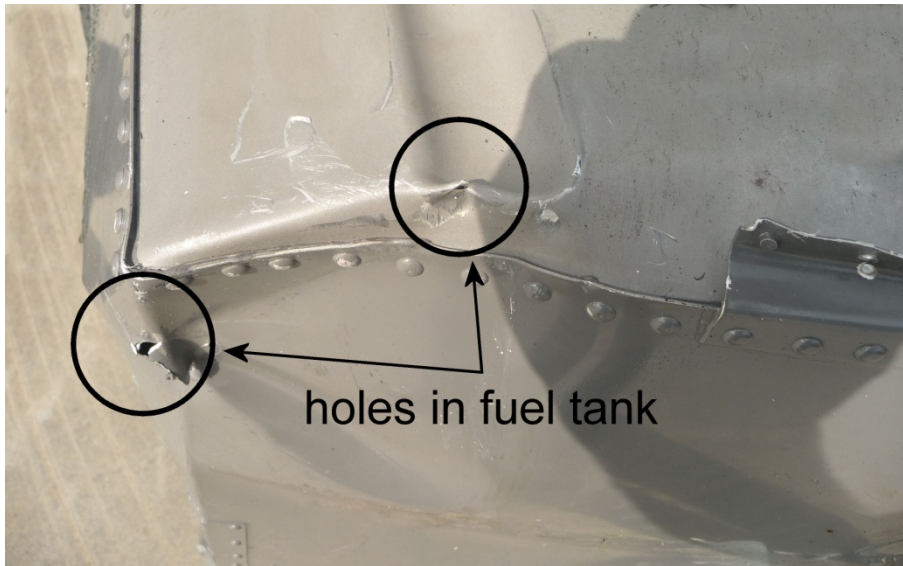


Figure 8: holes in left fuel tank

The crew

The pilot possessed a valid Commercial Pilot Licence (CPL(H)) to operate the flight.

Number of hours total	Approximately 300
Number of hours on type	Approximately 150
On type last three months	Approximately 50

Table 1: flying experience pilot

The weather

At the time of the accident, VMC (Visual Meteorological Conditions) prevailed. Visibility was more than 10 kilometres and there was no precipitation. The wind direction was variable and the wind speed 3 knots.

INVESTIGATION AND ANALYSIS

The accident was recorded on video by one of the bystanders. These video recordings were used for the investigation.

Pre-flight inspection

The pilot's initial plan was to depart with the passengers from his home base but during the pre-flight inspection he received a telephone call asking him to pick up the passengers at a heli spot in Stroe. The pilot stated that he was not in a hurry and the time schedule was not tight. However, the telephone call interrupted his pre-flight inspection and the change of plans did, in fact, make his schedule more critical.

According to the flight manual, part of the daily or preflight checks is to verify that the ground handling wheels are removed before departure. On the *Robinson R44 II Operating Limitations and Pilot's Checklist* (see Appendix A) provided by the manufacturer and used by the pilot, there is no reference to the ground handling wheels or a preflight check in general. However, according to the manufacturer, this checklist is used by the pilot for Start-up/Shut-down procedures only and is not intended to remind the pilot of any other actions. The pilot could not recall why he did not remove the ground handling wheels.

Flight and landing

The flight from Kootwijkerbroek to Stroe was uneventful. While descending for landing, the right lifting handle hit the ground causing the helicopter to pivot until the left skid touched the ground. Because of this sudden and unexpected pivoting movement, the pilot was unable to retain control of the helicopter. Although fuel was spilled during the impact, there was no fire because it did not come into contact with hot engine parts or any other ignition source.

Safety actions

According to the helicopter manufacturer it was not the first time ground handling wheels were not removed before flight. To prevent further accidents the helicopter manufacturer has released Service Letter SL-41 (see Appendix B) on 7 September 2011. Production of the old type R44 ground handling wheels has been discontinued and an improved version, as used on the latest model (R66), has replaced them. In this version the ground handling wheels slide into a bracket from the inside and the handle is angled across the skid so that it cannot rotate downwards if left connected. The existing wheels can be modified.

D-HNOC was equipped with a single-walled aluminum fuel tank. This tank has proved to be vulnerable to post-accident fuel leaks and fires in other R44 accidents. To improve the R44 fuel system's resistance to a post-accident fuel leak and possible fire, the helicopter manufacturer issued R44 Service Bulletin SB-78 (see Appendix C) on 20 December 2010. This bulletin requires R44 and R44 II helicopters with single-walled aluminum fuel tanks to be retrofitted with bladder-type tanks. With this modification the tank consists of a metal outer tank and a rubber inner tank which makes it double-walled and less vulnerable to fuel leaks and fire in the event of disruption of the outer tank. The SB states that compliance should be *"as soon as practical but no later than 31 December 2014."*

CONCLUSIONS

The ground handling wheels of the helicopter were not removed before departure. The helicopter crashed because one of the ground handling wheel handles touched the ground shortly before touchdown. The helicopter manufacturer has announced that an improved type of wheels will be fitted to new helicopters and a modification has been developed for existing helicopters. These changes will ensure that the ground handling wheels stay connected to the helicopter if the wheels are not removed before departure.

A single-walled fuel tank provides little protection against fuel leaks in the event of an accident. A leaking fuel tank after an accident is a fire risk.

APPENDIX A: R44 II OPERATING LIMITATIONS AND PILOT'S CHECKLIST

R44 II OPERATING LIMITATIONS AND PILOT'S CHECKLIST

NEVER EXCEED SPEED - KIAS

2200 LB TOGW & BELOW

PRESS ALT-FT	OAT - °C							
	-30	-20	-10	0	10	20	30	40
SL								
2000	130							
4000								
6000			126	122	117	113	108	103
8000	126	122	117	112	107	101	96	91
10000	117	112	106	101	95	90	85	
12000	107	101	95	89				
14000	95	89	NO FLIGHT					

OVER 2200 LB TOGW, SUBTRACT 10 KIAS
FOR AUTOROTATION, SUBTRACT 30 KIAS

NOTE: REDUCE POWER ON Vne 10 KIAS WITH FIXED FLOATS

LIMIT MANIFOLD PRESSURE - IN. HG

MAXIMUM CONTINUOUS POWER

PRESS ALT-FT	OAT - °C							
	-30	-20	-10	0	10	20	30	40
SL	21.5	21.8	22.1	22.4	22.6	22.9	23.1	23.3
2000	20.9	21.2	21.5	21.8	22.1	22.3	22.5	22.8
4000	20.4	20.7	21.0	21.3	21.5	21.8	22.0	22.2
6000	19.9	20.2	20.5	20.8	21.0	21.3	21.5	21.7
8000	19.5	19.8	20.1	20.3	20.6	20.8	21.0	21.3
10000	19.1	19.4	19.6	19.9				
12000	FULL THROTTLE							

FOR MAX TAKEOFF POWER (5 MIN), ADD 2.8 IN. HG

**MANIFOLD PRESSURE LIMIT
5 MINUTE TAKEOFF RATING**

FOR MCP
SUBTRACT
2.8 INCHES MAP

AIRSPEEDS FOR SAFE OPERATION

Takeoff & Climbs	60 KIAS
Maximum Range	100 KIAS
Autorotation	70 KIAS

MT599-2 JUN 02

BEFORE STARTING ENGINE

- | | |
|----------------------------|-------------------------------|
| Seat belts | <u>Fastened</u> |
| Fuel shut-off valve | <u>On</u> |
| Cyclic/collective friction | <u>Off</u> |
| Cyclic collective, pedals | <u>Full travel free</u> |
| Throttle | <u>Full travel free</u> |
| Collective | <u>Full down, friction on</u> |
| Cyclic neutral | <u>Friction on</u> |
| Pedals | <u>Neutral</u> |
| Landing light | <u>Off</u> |
| HYD & governor switches | <u>On</u> |
| Circuit breakers | <u>In</u> |
| Clutch | <u>Disengaged</u> |
| Altimeter | <u>Set</u> |
| Rotor brake | <u>Disengaged</u> |

STARTING ENGINE AND RUN-UP

- | | |
|-----------------------------|----------------------------|
| Throttle | <u>Closed</u> |
| Master switch | <u>On</u> |
| Area | <u>Clear</u> |
| Strobe light | <u>On</u> |
| Mixture | <u>Rich</u> |
| Ignition switch | <u>Prime, then Both</u> |
| Mixture | <u>Pull off</u> |
| Starter | <u>Engage</u> |
| Mixture | <u>Move full rich</u> |
| Mixture guard | <u>Installed</u> |
| Starter-On light | <u>Out</u> |
| Set engine RPM | <u>50 to 60 %</u> |
| Clutch switch | <u>Engaged</u> |
| Blades turning | <u>Less than 5 seconds</u> |
| Alternator switch | <u>On</u> |
| Oil pressure in 30 sec | <u>25 PSI minimum</u> |
| Avionics, headsets | <u>On</u> |
| Wait for clutch light | <u>Out</u> |
| Warm-up RPM | <u>60 to 70%</u> |
| Engine gages | <u>Green</u> |
| Mag drop at 75% RPM | <u>7% max in 2 sec</u> |
| Sprag clutch check | <u>Needles split</u> |
| Doors | <u>Closed and latched</u> |
| Limit MAP chart | <u>Check</u> |
| Cyclic/collective friction | <u>Off</u> |
| Hydraulic system | <u>Check</u> |
| Governor On | <u>RPM 101 - 102%</u> |
| Warning lights | <u>Out</u> |
| Lift collective, reduce RPM | <u>Horn/light at 97%</u> |
| Area | <u>Clear</u> |

SHUT DOWN

- | | |
|---------------------------|---|
| Coil down, RPM 60-70% | <u>Friction on</u> |
| Cyclic and pedals neutral | <u>Friction on</u> |
| CHT drop | <u>Throttle closed</u> |
| Clutch switch | <u>Disengage</u> |
| Wait 30 seconds | <u>Mixture off</u> |
| Wait 30 seconds | <u>Apply rotor brake</u> |
| Clutch light off | <u>Ignition & master switch off</u> |

MINUTES - 104 KT (120 MPH) Average Ground Speed - Sectional Chart Only (WAC x 2, TAC + 2)

APPENDIX B: R44 SERVICE LETTER SL-41

**ROBINSON
HELICOPTER COMPANY**

2901 Airport Drive, Torrance, California 90505

Phone (310) 539-0508 Fax (310) 539-5198

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R44 SERVICE LETTER SL-41

DATE: 07 September 2011

TO: R44 and R44 II owners, operators, and maintenance personnel

SUBJECT: Ground Handling Wheels and Wheel Supports

BACKGROUND: C063-1 ground handling wheels are no longer available from the factory. Wheel supports on production helicopters are oriented for C063-5 (LH) and C063-6 (RH) ground handling wheels, installed inboard of landing gear skid tubes. New wheels may be used on earlier R44 helicopters when the wheel supports are rotated 180°. Earlier wheels may be modified for inboard installation.

COMPLIANCE PROCEDURE:

A. To rotate ground handling wheel supports 180°:

1. Refer to R44 Illustrated Parts Catalog (IPC) Figure 3-1. Remove hardware securing C719-1 support to landing gear skid tube and remove support. Thoroughly clean and visually inspect support, and skid tube at support attachment.
2. Refer to Figure 1. Orient support with tall plate inboard and install original hardware, but with bolt heads inboard for tire clearance. Special torque nuts to 70 in.-lb and torque stripe per R44 Maintenance Manual (MM) Figure 2-1. Repeat steps for opposite support.

B. To modify earlier ground handling wheels:

1. Order KI-210 kit from RHC Customer Service.
2. Refer to IPC Figure 3-7. Remove cotter pin and nut securing C717 shaft assembly to wheel. Pull shaft assembly, with attached C718 lever assembly, from wheel.
3. Remove hardware securing lever to shaft.
4. Refer to Figure 2. Install hardware securing C717-7 plate to lever and shaft. Special torque nuts to 70 in.-lb and torque stripe per MM Figure 2-1.
5. As required, pack wheel cavity and bearings with new A257-5 grease. Insert shaft assembly in wheel and install nut. Special torque nut to 30 in.-lb, then loosen nut to nearest castellation, and install cotter pin. Repeat steps for opposite wheel.

(OVER)

Approximate Cost:

Parts: None required, to rotate ground handling wheel supports 180°.

\$90.30 for KI-210, to modify earlier ground handling wheels. KI-210 includes C717-7 plates, MS24665-285 cotter pins, NAS6603-4 bolts, NAS6603-12 bolts, NAS620-10L washers, NAS1149F0332P washers, NAS1149F0363P washers, and MS21042L3 nuts.

Labor: 1.0 man-hour.

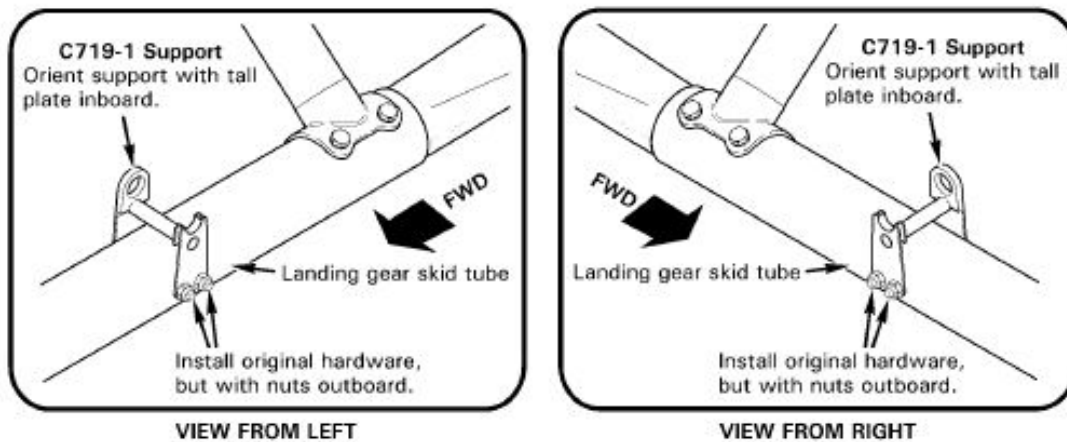


FIGURE 1

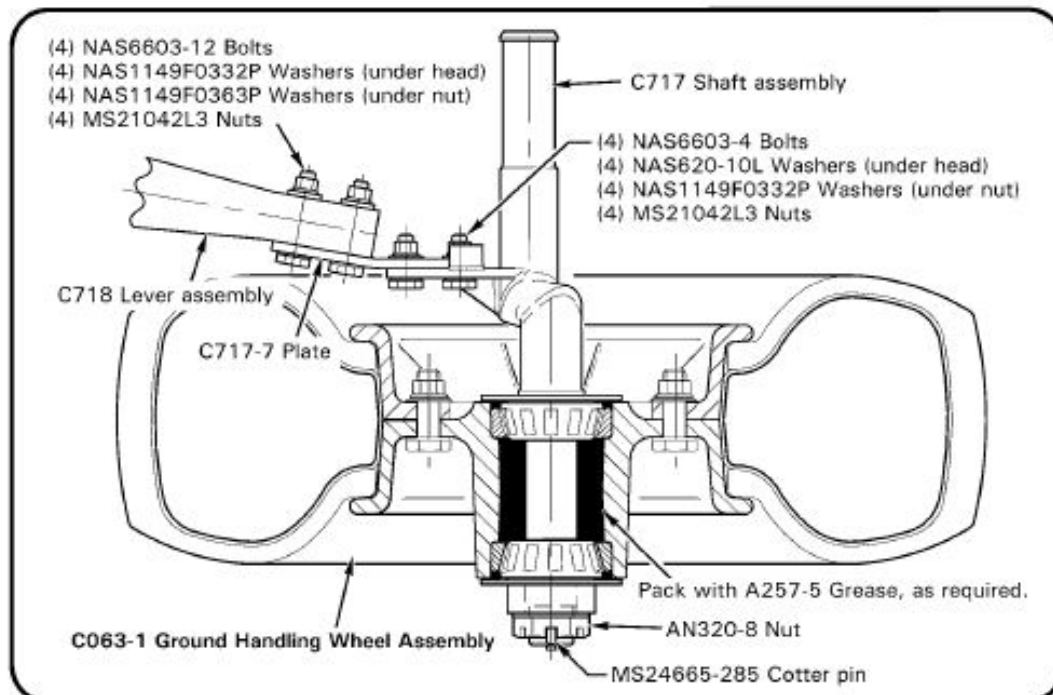


FIGURE 2

APPENDIX C: R44 SERVICE BULLETIN SB-78

**ROBINSON
HELICOPTER COMPANY**

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Page 1 of 1

R44 SERVICE BULLETIN SB-78

DATE: 20 December 2010

TO: R44 and R44 II owners, operators, and maintenance personnel

SUBJECT: Bladder Fuel Tank Retrofit

ROTORCRAFT AFFECTED: R44 helicopters S/N 0001 thru 2064, and R44 II helicopters S/N 10001 thru 12890, unless previously accomplished.

TIME OF COMPLIANCE: As soon as practical, but no later than 31 December 2014.

BACKGROUND: This bulletin requires R44 helicopters with all-aluminum fuel tanks to be retrofitted with bladder-type tanks. In addition to a factory retrofit program, a field kit is now available. To improve the R44 fuel system's resistance to a post-accident fuel leak, this retrofit must be performed as soon as possible.

COMPLIANCE PROCEDURE:

Order one KI-196-1 kit for R44, or one KI-196-2 kit for R44 II, from RHC Customer Service and install per kit instructions. Kit includes main and auxiliary bladder tanks, installation hardware, hoses, and instructions. Kit instructions also available online at www.robinsonheli.com/servelib.htm.

Alternately, return helicopter to RHC for factory retrofit (ref. R44 SL-36).

Note: Retrofit requires substantial sheet-metal work. Paint refinishing for aesthetics may be desired.

Approximate Cost:

Parts: \$6800 for KI-196-1 or -2 kit, if ordered by 31 December 2011. Reference helicopter model and serial number. Fuel tanks are supplied painted white.

Labor: Approximately 40 man-hours (paint refinishing not included).

Note: Normal Service Center discounts do not apply. (Refer to RHC memo dated 28 May 1997.)

THE DESIGN ENGINEERING ASPECTS OF THIS BULLETIN HAVE BEEN SHOWN TO COMPLY WITH APPLICABLE FEDERAL AVIATION REGULATIONS AND ARE FAA APPROVED.