



# 2019 HELICOPTER FEATURE

FLIGHT TEST

REPORT: GEORGE TONKING

IMAGES: MARK MANSFIELD



# THE ROBINSON R44

SOUTH AFRICA'S UNIQUE  
CRIME-FIGHTING R44.

Dawn Patrol - The surveillance R44 in action crime-fighting over Johannesburg's suburbs.



Ready go - Bidvest Protea Coin's, ZS-RGP is based, mission ready, at The Ultimate Heliport in Waterfall Midrand.



Ever since its humble beginning the helicopter has inspired and intrigued many; young and old. It has however been an expensive and exclusive contraption in which only a very small percentage of even the aviation fraternity could afford to fly.

**W**ITH many moving parts requiring complex, compact engineering, the helicopter's development was always going to be costly, let alone the unit production costs and maintenance.

These were issues close to Frank Robinson's heart when he had joined Cessna in the early 1950s as a young flight test engineer on Cessna's Skyhook helicopter project. He was putting his nose in wherever he could to glean technological wizardry. Frank had a dream of building a light piston powered helicopter that would bring hovering within reach of the average American.

Frank Robinson befriended Charles Seibel, who had stayed on at Cessna after the purchase of the Seibel Helicopter Company. Helicopters were new to Cessna, but not to Siebel. Turns out that the resultant Cessna CH1 Skyhook lived up to its promises, claiming the FAI Helicopter World Altitude Record in 1957 of 29,777 feet. At the time, it overtook the Sud Est Alouette II as the highest flying chopper,

and to this day its record stands undefeated as a piston powered helicopter.

Cessna had done valiantly, but the Skyhook project became too expensive for a firm that had no proven track record in the rotor wing arena. Frank was taking notes and moved on to Kaman, then Bell and lastly Hughes Helicopters. With a string of successes in the engineering and design departments, he was well known for his exploits into anti-torque or tail rotor design. But as those around him worked their 9 to 5, he just couldn't put his dream down.

Eventually, Frank quit Hughes to start building his own low cost helicopter – the two-seat Robinson R22. Built in Frank's garage, it was a humble beginning. The first flight was in 1975 in Frank's hands. Surprisingly for many, it lifted off and all worked as expected. FAA certification followed in 1979 in the capable hands of Joseph John "Tym" Tymczyszyn, a veteran test pilot who, two decades earlier, had been part of the certification team of the Boeing 707.

In 1990 the natural progression from the R22 followed: the R44, which is basically a larger R22 with two extra seats and a larger Lycoming O-540 engine. 'Built light to fly right', we always say. The design brief was exactly the same as for the R22; keep it efficient and cost effective. The materials and construction are largely conventional steel skinned and welded chromoly space frame with bonded aluminium honeycomb main rotor blades. Nothing new, just old school, slide rule computed fabrication.

Robinson revolutionised the light helicopter industry by standardizing the main component time to overhaul and life span to 2,000 flight hours or 12 years, whichever comes first. With many millions of fleet hours covered without failure, this figure was increased to 2200 flight hours or 12 years in 2012 with the endorsement of engine manufacturer Lycoming. This business philosophy means more predictable maintenance schedules for the owner and it has proven to be the cheapest way to operate and maintain a new helicopter. It is

around 60% less costly than its competitors. To date Robinson has produced over 12,000 helicopters, making it the biggest producer of helicopters in history as well as the biggest single aircraft producer of the 21st century.

Who would have thought? Actually, I think Frank did.

Some will ask why all piston Robinsons are not turbo or super charged?

At the heart of the design philosophy of the R22 and R44 is efficiency for performance, and the longevity of engine life for safety. The power plant chosen for the R44 Raven II was the trusted, naturally aspirated de-rated 300 hp Lycoming 540 unit popular in many fixed wing aircraft. This engine is able to produce around 400 hp in a turbocharged fixed wing application, but at the cost of fuel consumption and lifespan.

Robinson de-rates the engine from its static 295 horse power to 205 hp for continuous use and a five minute 245 hp take off limit. This is accomplished by the pilot referencing a manifold pressure limit table accessible above his seat area. By limiting the engine according to the manifold pressure for a given density altitude, the engine output, or torque, can be restricted by the pilot's collective control. The limitation being factored against density altitude increases the helicopter's high altitude performance. If flown within these operational limits, it allows for some power margin in reserve, which is a big help for hot and high Highveld conditions.

#### **FLYING THE ROBINSON R44**

There really is no trickery to flying the Robinson R44. It is an honest simple ship.

The walk around pre-flight is easily performed, from the pilot station on the right, clockwise around the aircraft.

First stop is the rotor head inspection. The first thing you notice is that you need to use a combination of the rear seat and horizontal fire wall under the Aux fuel tank to climb your way up the tall rotor mast. A great design; the spinning blades are very far away from bystanders and passengers.

The next inspection is the main gearbox driveshaft flex couplings and drive belts as you work your way to the tail. Its monocoque

design allows for the Dural skin to be the only structure managing the tail loads, so it is light and strong. It's one of the few components that last 4400 hours before overhaul.

Going past the skinned tail feathers, you make your way to the tail rotor assembly. Interestingly, the aluminium teetering tail rotor spins in the opposite direction to the R22's. The reason being that this allows the

advancing tail rotor blade to push up into the main rotor's down-wash, increasing its effectiveness. – Clever stuff.

After an engine oil level check on the port side, the preflight is complete, ready for start. Seat belts on, controls checked full and free. Master on, key onto both, fuel cutoff to full rich and a further turn clockwise for a short prime. Everything is close at hand. The



priming is done by the auxiliary electric fuel pump. Good to know as Robinson added a second fuel pump to back up the engine's mechanical diaphragm type fuel pump on the fuel injected Raven II.

The electric fuel pump self-test happens automatically when the clutch switch is engaged on the ground. If the engine dies then you know that the mechanical fuel pump is likely at fault.

Fuel mixture is returned to full lean and the engine cranked via the starter button on the end of the collective. Once the engine fires then mixture set to full rich.

Run up is done at 70% engine RPM with a Mag check, followed by the RPM horn check at 97% and lastly throttle chop to check the sprag clutch operation. The performance tables above the pilot's seat are then referenced to establish takeoff and continuous power settings in accordance with the all-important manifold pressure gauge.



The FLIR system requires a skilled operator.



Prominent in the centre console is the FM Tactical communication system.



Engine oil and cylinder head temperature are noted in the green arc. Hatches closed and we're ready for take-off.

The R44 uses an electronic servo engine governor to maintain constant main rotor RPM, limiting the normal pilot work load by controlling the throttle twist grip during normal flight. The governor actuates after 80 % engine RPM and can be deactivated via a switch on the end of the collective lever.

All ground manoeuvres are done in a five foot hover. Once transitioning into wind, rotation speed is 40 knots. Nose position is then adjusted for a 60 knot climb attitude, all typical helicopter numbers. Due to the great power to weight ratio, the R44 has an impressive 1000-fpm-plus climb in most conditions.

The R44 behaves predictably in autorotative decent. Normal speed is 65-70 kts with the high inertia type rotors storing plenty of energy to absorb engine-off landings with relative ease. Descent speed is at 60 knots following the typical height velocity vertical corridor to ensure a safe outcome if the donkey dies.

Performance wise, the R44 will skip along happily at over 100 kts with a 2.8 hour fuel endurance making it a popular choice for

businessmen relying on the convenience of vertical lift. The useful payload of the R44 is compromised by a centre of gravity forward limit: typically two average adults (80 kg each) in the front seats and two smaller people in the rear seats. Fuel quantity can be limited to compensate for cabin loading weights, with baggage space limited to the four under-seat box areas.

#### **ROBINSON R44 ZS-RGP**

Bidvest Protea Coin acquired ZS-RGP virtually new from a private owner in the UK in 2010. It is a standard R44 Raven II which we equipped as a Telstar platform with a number of modifications to use it in the security environment.

The aircraft is equipped with a FLIR Systems U8500 XRT forward-looking infrared sensor ball. This is a Nitrogen cooled type sensor that runs at -197 degrees Celsius, which actively presents the operator with an environment picture with contrasts of temperature variation. The system uses a 6-mode tracker on the isolated gyro stabilised ball, reducing the operator work load and thus enabling him to concentrate on other mission requirements.

Imaging is monitored on an

Aerocomputers NVG capable screen with multiple inputs for picture-in-picture style mapping. Targeting is taken care of with an invisible laser target designator on the ball that runs on the same plane as the imager, allowing the operator to light the target for night vision goggle operators covertly.

A full communications suite, including a NAT TAC COM control head, allows the crew to communicate through VHF, UHF and GSM encrypted radios to keep all operators in the loop. Downlinking of the imager is done through a microwave downlink system providing imaging to vehicles and VR goggles equipped ground teams. This is complemented by a 3G low-latency feed to keep our Headquarters War Room up to date on field operations.

The aircraft is limited to pilot and FLIR operator in the Restricted Category due to the modifications. The entire process of modification approval took five years, making this the only R44 with a side mounted FLIR Systems U8500 in the world.

ZS-RGP is based, mission ready, at The Ultimate Heliport in Waterfall Midrand. Due to the system complexity only a handful of specially trained pilots operate the aircraft. A fuel bowser and motor home support the

# ROBINSON R44 RAVEN II

## SPECIFICATION:

**CREW:** 1 pilot plus 3 pax

**PAYLOAD:** 748 lb (340 kg)

**LENGTH:** 38 ft 3 in (11.65 m)

**ROTOR DIAMETER:** 33 ft (10.1 m)

**HEIGHT:** 10 ft 9 in (3.3 m)

**EMPTY:** 1450 lb (658 kg)

**LOADED WEIGHT:** 2500 lb (1134 kg)

**FUEL CAPACITY:** 175 litres usable

**POWERPLANT:** 1 Lycoming IO-540-AE1A5 fuel injected, 295 bhp.

## PERFORMANCE

**MAXIMUM SPEED:** 130 knots (240 km/h)

**CRUISE SPEED:** 110 knots (200 km/h)

**RANGE:** 300 nautical miles (560 km)

**FUEL CONSUMPTION:** 15 US gallons (57 litres) per hour

**SERVICE CEILING:** 14,000 ft (4,300 m)

helicopter, allowing it to be dispatched within hours to any environment where it may be needed.

## CONCLUSION

Frank Robinson was right. He doggedly followed his dream while acquiring all the tools he needed along the way. There remains no easy way to success, but he pushed the hard yards to produce an oxymoron; a cheap helicopter, yet one that performs well.

Thankfully he never compromised on safety. Robinson has a well-earned reputation of changing designs and training to meet the demands of regulators around the world, making Robinson Helicopters leaders for pilots and owners safety.

If the mainstream light helicopter manufacturers had listened to Frank and empowered his ideas, they wouldn't be battling against him now.

I owe my career to the humble R44. Its qualities have allowed me to fly more hours at a lower cost and to come home safely after every sortie. ✈️



Photo by Troy Holloway, Courtesy Helbiz, Australia

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**H**ENLEY Air based at Rand airport, Germiston has become Africa's first aviation training organisation to operate a Bell 222 FNPT II flight simulator.

After two years of planning and preparation, Henley Air now offers a fully functional Bell 222 SCAA approved FNPT II helicopter simulator approved for both the Bell 222B (retractable undercarriage version) and the Bell 222UT (utility version; has skids), for advanced twin-engine helicopter training, CPL, ATP, IF, and multi-crew co-operation (MCC) training and recurrence training.

According to Dr. Andre Coetzee, CEO Henley Air, the Bell 222 simulator was the perfect investment as Henley Air is one of the largest operators of Bell 222 helicopters in the world. "We are now in a position to train our flight crews more cost effectively and are now in a position to offer third-party training on our simulator", commented Dr. Coetzee.

Henley Air operates 10 Bell 222's of which two are permanently configured to fly for the Netcare emergency medical services (EMS) and are on standby 24 hours a day. The Bell 222, a twin-engine helicopter allows for night operations and night operations are further enhanced with the crew wearing Night Vision Goggles (NVG), one of only two such operators in South Africa.

Henley Air has established itself over the last 23 years as one of Africa's leading helicopter charter and flight training companies in the aviation industry.

What started out in 1995 as a dream has today grown into a major operation at Rand Airport, Johannesburg. The early years saw Henley Air using one Bell JetRanger, today it provides their clients with a variety of single and multi-engine aircraft to meet their diverse requirements.

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B222 Simulator.

(MCC), Night Vision Imaging Systems (NVIS), single/multi-engine type ratings.

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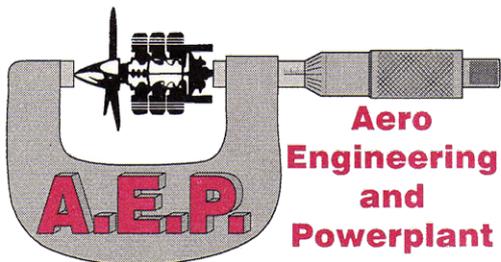
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W10-2015/04

Following a management buyout in August 2001, Placo Engine Division became known as APCO Engine Division. Spear headed by Tony Rodrigues and Henk Joubert this engine shop has spread its wings.

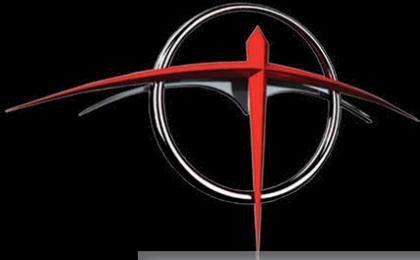
APCO has full in-house capacity to do all the required work on Lycoming and Continental engines.

APCO has an NDT facility, machine shop, component division, hose shop, Aluminium welding and Cadmium plating capability, engine division and engine bench testing facilities.

On request, various mods or STCs can be carried out. NTC engine balancing and porting and corrosion protective applications are available, ranging from polyurethane base paints to the more durable external ceramic coatings. APCO is also an Engine and Component Certified Centre as well as an approved MT Governor Service Station.

All personnel are qualified and have had the appropriate training either locally, or at the factory. APCO prides itself in giving the best customer service, workmanship and value as far as reciprocating engines are concerned. This with their turn key service and written warranties makes them an obvious first choice when engine overhauls, repairs, mods etc are to be carried out.

Contact APCO on Tel: +27 12 543 0775 / 543 0181,  
or Email: [tonyrodrigues@mweb.co.za](mailto:tonyrodrigues@mweb.co.za) / [henkjoubert@mweb.co.za](mailto:henkjoubert@mweb.co.za)



# DART AERONAUTICAL

Pieter Viljoen +27 83 652 4421 pieterviljoen@mweb.co.za

Jaco Kelly +27 84 498 4916 jacokelly@mweb.co.za

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# CENTURY AVIONICS

## - EXCELLENCE IN AVIONICS

***SA FLYER EXTENDS AN APOLOGY TO CENTURY AVIONICS, LAST MONTH A FEW GREMLINS CREPT INTO OUR SYSTEM AND WE PLACED AN OUTDATED COMPANY PROFILE ON CENTURY AVIONICS.***

**CENTURY AVIONICS** is celebrating 41 years in business this year and is located at Lanseria International Airport. We specialise in general aviation avionics for fixed- and rotary-wing aircraft together with handheld units and headsets.

Century Avionics will be exhibiting at several events this year including Nampo, Aero SA, Presidents Trophy Air Race and the regular airshows. We are excited to announce that Nampo for the first time will have a Pilot Refreshment Area on the Nampo Airfield for all pilots and their clients flying with them sponsored by Century Avionics, Bose and Garmin.

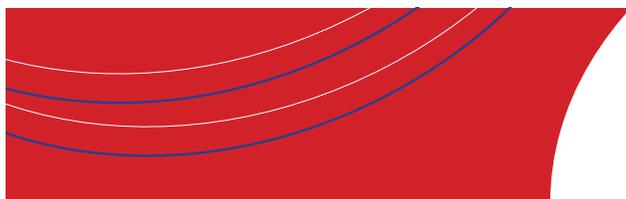
We offer a wide range of general aviation avionic solutions, including cockpit upgrades. We excel in Avionics Sales/Marketing, Installations, Repairs/Maintenance, Support and Certification, making us a one-stop avionic shop. We are also an in- and out of warranty service centre for Bose, David Clark and Lightspeed headsets.

We are approved dealers for a host of avionics manufacturers (Garmin, Honeywell, Avidyne, McMurdo ELT, Genesys Aerosystems and many others) and constantly aim to offer our valued customers the widest range of products and capabilities. Longstanding customers attest to our professional commitment, and fast and friendly service.

Our AMO and Design Organisation is approved in South Africa, Botswana, Kenya, Namibia, Malawi and Zimbabwe. Century NAVCOM, our Design Organisation, along with our qualified and experienced Certification Department, will assist with Avionics STC Application/Development and/or Modification Approvals.

Please contact us for all your avionic requirements.

Tel: +27 11 701 3244 | E-mail: [sales@centuryavionics.co.za](mailto:sales@centuryavionics.co.za) | Website: [www.centuryavionics.co.za](http://www.centuryavionics.co.za)



### **Dart Aircraft Electrical**

**Tel: +27 11 827 0371      Aeronautical House**  
**Fax: +27 86 764 1737      Site 86 , Rand Airport**  
**Mobile: +27 82 559 8762      Germiston , 1419**  
**Email: [dartairstelectrical@gmail.com](mailto:dartairstelectrical@gmail.com)**

Vat:  
Tax: 9265208190  
Reg:2014/223431/07

Building on the success of Dart Aeronautical and M&D Aircraft Electrical, Dart Aircraft Electrical opened its doors in January 2015.

Dart Aircraft Electrical (DAE) took over from M&D and has acquired all M&Ds test and bench equipment, thereby maintaining M&Ds capabilities.

DAE has also retained the services of M&Ds Matthew Joubert, and is therefore well-equipped to cater to all aircraft electrical requirements.

Matthew has over 17 years' experience and brings a high degree of professionalism to the aircraft electrics trade. He specialises in fuel pumps, magnetos, alternators and starters.

Sharing the premises with Dart Aeronautical, DAE is located on the ground floor of Aeronautical House at Rand Airport.

DAE is able to sell, overhaul, service and repair the following:

- Starters
- Alternators
- Fuel Pumps
- Magnetos
- Strobe Boxes
- Aircraft electrical wiring installation and repairs
- Electronic components

