RADIOMETRIX

Rocket Science and Low Power Radio
with Traxa Rocketry

Case Study, February 2005

Traxa Rocketry designs and manufactures radio tracking devices for small commercial and hobby rockets, using Radiometrix TX2 RF modules for tracking them after they return to earth.

Traxa Rocketry, a company that designs and manufactures radio tracking devices for small commercial and hobby rockets, has made full use of Radiometrix's TX2 radio frequency (RF) modules for tracking them after they return to earth.
Today, a surprisingly large number of ground to air rockets are being fired off - not just around the world and for warlike purposes - but in the UK and for entirely peaceful reasons.

Rocketry has come of age as a hobby.
But it's not just hobby rockets, which may go as high as 3000 or even 9000m, that are booming; there are many small commercial rockets too - such as those for weather research. Such rockets are comparatively small, simple and cheap compared with military versions, let alone highly sophisticated space rockets. Even so, they work on identical principles using liquid or predominantly solid fuels as propellant.

Where they do differ is in their control systems.
Small rockets, especially hobby rockets, have to be cheap by definition - "cheap" here means perhaps GBP 2000 to GBP 3000 each. Such a price, especially when combined with their small size, means that such rockets have little or no room for sophisticated control systems, and that any such systems must also be low-cost items. In practise, this means that small rockets are typically guided for the first 60/70m of a high-altitude flight by control wires trailing out behind.
After that, the flight is at the mercy of winds and many other factors.
All this means that, on return to earth using a parachute, often way out of sight, significant numbers get lost. They fall into fields (some full of crops, which makes rockets almost impossible to find), behind hedges, in gardens, on rooftops and so on. At two to three grand a time, rocket owners simply cannot afford losses of this sort.

This is where specialist rocketry beacon expert Traxa Rocketry comes in - the company manufactures and supplies miniature low-cost and highly effective rocket location beacons, audible "lost in the crops" bleepers, and more, and it uses Radiometrix low power radio devices to do it.

Traxa's rocket location beacons provide, says the company, an "affordable solution to aid the tracking and recovery of high altitude flights".
The company's RLB device transmits a Morse identifier on 433.92MHz - a UK licence exempt frequency.

The Traxa RLB enables rocket builders and owners to track their rocket, be it higher than the cloud base, or just simply too high to see.
Customers' own Morse messages up to 50 characters can programmed in, at a small extra charge.

Although Traxa does not guarantee successful recovery, its RLB device, in conjunction with a suitable receiver and Yagi antenna (a Japanese beam antenna), will help to alleviate the fear of losing prised rockets and, at around GBP 30, it is a small price to pay.

Traxa MD Paul Shackleton says that Radiometrix RF transmitters are used because they are "compact, reliable, comparatively low-cost items that do an excellent job in transmitting the data - be it Morse or (in some cases) digital messages back to the searcher".

Each of Traxa's RLB and RLBx rocket location beacons uses a Radiometrix TX2-433-40-5V radio frequency (RF) module. This operates on the 433.92MHz frequency with a transmitted power of 10mW. The range, in free space, is around 8000-9000m, as determined by verified ground tests, although this is subject to receiver, antenna and atmospheric conditions. The rocket location beacon's dimensions are: for the RLB, 22.5 x 38 x 15mm, and for the RLBx, 20.5 x 38 x 15mm, with a mere 9g weight (excluding antenna).

The power requirement is small - 7 to 16V (35V on request) at13mA.
The supplied antenna is a flexible quarter-wave copper plated steel device.
In a range test on a Traxa rocket location beacon, using the base RX location of Cranfield Airport, Bedfordshire, the furthest verified TX location was Steppingley near Flitwick, Bedfordshire. *This represented a maximum range of 10km.* The verification method used an audible relay to transmit the tracker signal to the driver of a recovery vehicle.

Traxa is also branching out by developing a new wireless rocket control system to be called the Rocket Launch Controller. This will provide a far more sophisticated control system than the traditional method of trailing wires. The Rocket Launch Controller, which can also be used as a tracker, is an onboard four-channel two-way device using both transmitter and receiver. Paul Shackleton has chosen Radiometrix's TX3/RX3 transmitter receiver pair for the task.

The Rocket Launch Controller - now under test - comprises the TX3/RX3 and a microcontroller with Morse identifier (or digital tone to allow "listening in"). The versatile Rocket Launch Controller has been designed to be used as either a ground-based controller (using the TX3/RX3 pair), or - alternatively - it can be mounted inside the rocket to provide a range of control and recovery facilities. In this application, only the RX3 receiver is necessary.

As Radiometrix's TX3/RX3 modules have a 1mW output compared with the RX2's 10mW output, a larger antenna is required. Radiometrix's TX2 and RX2 datalink modules are ideal for OEMs, as well as hobby rocketeers. They comprise a miniature PCB-mounting UHF radio transmitter and receiver pair, operating on the 433.92MHz European frequency.

The TX2 transmitter is a two-stage SAW controlled module, and the RX2 (not used by Traxa) is a double conversion FM superhet module with a SAW front-end filter. They provide a high-speed datalink at up to 160Kbit/s over significant ranges over open ground. The modules are also ideal for a wide range of other one-to-one and multinode wireless link applications in battery-powered/handheld equipment. The FM modulated Radiometrix TX2/RX2 transmitter receiver pair, CE-certified by an independent notified body, provides verification to comply with Radio standard ETSI EN300 220-3 and with EMC standard ETSI EN301 489-3 by UKAS accredited Test Laboratory.

Radiometrix's TX3/RX3 miniature UHF radio transmitter and receiver modules have been designed for PCB mounting and are suitable for many applications - apart from rocketry - including wireless industrial data exchange and monitoring systems. There are two versions: for the European market (868-870MHz band); and for the North American market (902-928MHz band). Both ensure EMC compliance by minimising spurious radiation and susceptibility. Because of their small size and low power requirements, these modules are perfect for use in portable, battery-powered applications.

The TX3 transmitter uses a frequency modulated crystal-locked PLL, FM modulated at up to 50Kbit/s. Operation is from 2.2 to 10V at 10mA. An inbuilt regulator improves stability and supply noise rejection and an enable facility is provided. The RX3 single conversion FM superhet receiver features a SAW front-end filter and operation is from 2.7 to 10V at 9.5mA.This also has the built-in regulator and an enable facility.

About Radiometrix

Established in 1985 and headquartered in London, Radiometrix continues to be recognised as the leading global developer of narrow and wideband radio communication modules. Our diverse product range is suitable for a wide variety of licensed and licence-exempt ISM/SRD wireless applications, and is available worldwide through our global sales and distribution network.

For more information on the company, please visit our website:
www.radiometrix.com

Contact Radiometrix
Editorial queries can be sent to press@radiometrix.com
Sales queries can be directed to the sales department: sales@radiometrix.com

Radiometrix Ltd,
Hartcran House,
231 Kenton Lane,
Harrow,
Middlesex,
HA3 8RP,
UK.
Tel: +44 (0) 208-909-9595
Fax: +44 (0) 208-909-2233