

## TROPOSCATTER BOUNCES BACK

De troposcatter is ruim 20 jaar geleden bij de Nederlandse strijdkrachten uit beeld geraakt. De ontwikkelingen hebben echter niet stil gestaan en inmiddels zijn troposcattersystemen operationeel beschikbaar in diverse soorten en maten. Is de troposcatter anno 2010 een *military owned and controlled* alternatief voor milsatcom? Oordeel zelf.

Touted as a forgotten technology that was never fully exploited by the military, Troposcatter is back and being used to meet near term needs, linking distributed forces in Afghanistan and elsewhere, without recourse to expensive and scarce transponder time using satellites.

### TROPOSCATTER

Troposcatter or 'Tropo' is a non-line of sight system but, rather than bouncing a signal off the ionosphere as in High Frequency communications, in Tropo signals scatter off atmospheric features such as wind, rain, dust and thermal layers up to about 7000 feet, which allows refraction of those radio signals and unlike many satcom frequencies it not only performs very well in adverse conditions, it positively thrives. Scattering the signal, as its name suggests, requires the signal to be stitched back together, this is



done through Digital Signal Processing (DSP), the better that is the further signals can be sent while retaining coherency.

For many years, the AN/TRC-170 Troposphere Scatter terminals were the only such capability in this category in US service, being used to link air defence batteries supporting a very specific, low latency application supporting missile firing data. The systems and the underlying technology was largely overlooked in favour of satcom for significant periods of time, with little in the way of upgrade throughout the 1980s and 1990s.

New investment in the technology however is now being made with tropo being seen not as an alternative to satcom but as an important and integrated supplement, part of a golf bag approach to communications capabilities.

### RAYTHEON

Raytheon began work on modernising legacy Troposcatter systems in 2004 in response to military interest to meet requirements emanating from OIF and OEF. “We needed to step up and introduce new technology to utilise troposcatter to its fullest capability,” said Dave Hegarty, Director of Ground Systems in Raytheon Network Centric Systems’ SATCOM and Space Systems group.

“Our first look was to make it smaller, simpler and lighter because traditional troposcatter systems are large, temperamental and require a lot of manpower. We wanted to make it as simple to use as a commercial satellite terminal. We have led with the technology and spent the last four years in field testing it in over a dozen different US military and international sites and in all different environments,” Hegarty said

Tests have included the 2009 ‘Earth, Wind and Fire’ air defence communications exercise at Forts Bliss and Sill. Hegarty reported that the tropo system provided by Raytheon ensured around the clock error free IP traffic over several weeks. Raytheon have also participated in the annual Army Expeditionary Warrior Experiment at Fort Benning and C4ISR exercise at Fort Dix.

The new tropo modem technologies used by Raytheon operate at new frequencies. Air Force studies at Hanscom AFB identified the benefits of moving to a higher frequency band, the Ku-band.

“They found it very favourable, because by going to Ku band you are able to move to smaller components, smaller antennas and use less power. That was our key focus. We married the technologies of smaller anten-



nas and high power amplifiers so that we were using less input power and were getting more output power from a new FPGA based modem, a new angle diversity feed and automatic alignment and adaptive bandwidth software,” Hegarty said,

Hegarty argued that others have imitated these techniques but implementing them in C rather than Ku-band solutions, resulting in performance challenges. He believes that the reinvention of tropo has led to its active consideration in ‘mainstream’ programmes, including as part of later increments of the Warfighter Information Network-Tactical (WIN-T) program. He added, “We have had these in the field for over three years and we have had good response from the Army. We have participated in a large number of Army exercises over the past three years with a lot of field time. We have honed the unit’s potential performance and have also done some qualification testing for the Army to prepare for deployment later this year.”

### TROPO SOLUTION

Raytheon’s initial approach was the DART-T, a trailer based Ku-SATCOM solution that also provides a Tropo solution. Subsequently the company developed TELOS, a miniature solution able to be carried in four transit cases. TELOS was an Office of the Secretary of Defence acquisition challenge programme designed to accelerate new technologies by bypassing conventional procurement. It beat over 200 other submissions to win the award and is currently going through qualification testing.

“That has attracted an awful lot of attention from a lot of customers and particularly in environments where there is rough terrain or a shortage of satellite bandwidth. Our system is designed to be light weight, easy to

use, mobile and used by non Signals troops so that almost anybody can be trained to operate it very quickly. We are filling a gap in that requires reliable high bandwidth communications and without the cost of satellite and without the latency and vulnerability of satellite,” Hegarty said.



### BRON:

An excerpt of an article published in July 2010 in Military Information Technology [www.MIT-kml.com], authored by Adam Baddeley, MIT correspondent, baddelya@kmmmediagroup.com.)