

The Product Range



specialists in GPS and microwave downlinks

The Technology

Telenav II

Telenav is a unique, patented system that allows digital data to be encoded into analogue video signals. The system was developed with the support of the British Government DTI and has resulted in Navtech winning several awards for the technological innovation involved.

Although Telenav will accept any serial data in RS232 format, the system was originally conceived as a method of adding GPS positional data to video signals so that each video frame is 'tagged' with information showing where and when the image was captured. Unlike other systems, Telenav does not 'burn' the data into the video frame, rather it inserts the data into the spare video lines of the 'vertical interval'. In this way none of the video image is lost and audio channels remain free for their intended use.

Telenav is an 'intelligent' system, it checks to see if there is already any data on the spare video lines and fits around any that it finds. Once 'encoded', the video signal is securely and permanently tagged with data. The information is available to a viewer at will by playing the encoded video into a Telenav unit set to 'decode mode'. Various display formats are possible at the touch of a button and the data is simultaneously output on a serial port (RS232) for interfacing with a computer-based system.

Applications for Telenav have been diverse with systems in operation around the world. Aerial survey/surveillance is one of the most common uses so that 'post-flight', the recorded video footage has an accurate geographic and time reference. Special software has also been developed to link Telenav encoded video to a moving map display – see RTGIS on page 7 – and Telenav forms the basis for Navtech's auto-tracking antenna system known as 'Telenav *MICROTRACKER*' see page 4.

Telenav is available with a variety of options to suit different applications; an encode/decode unit and sample 'screen shot' are shown below:



The Telenav II
encode/decode unit.

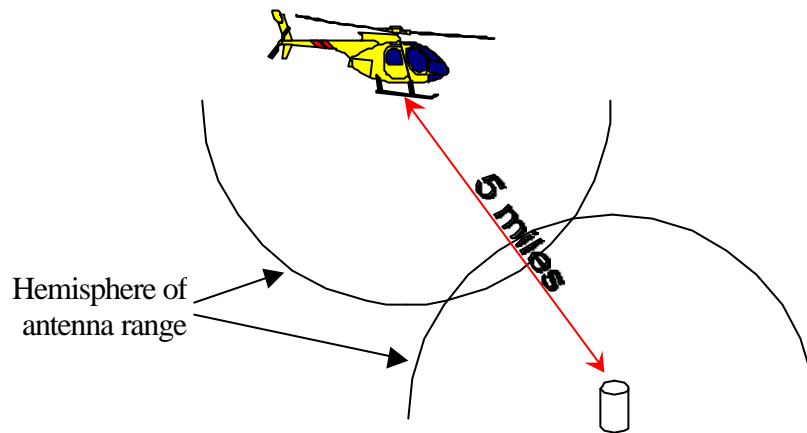


A typical encode/decode screenshot
of Telenav encoded video with time,
date and GPS data all visible.

MICROTRACKER

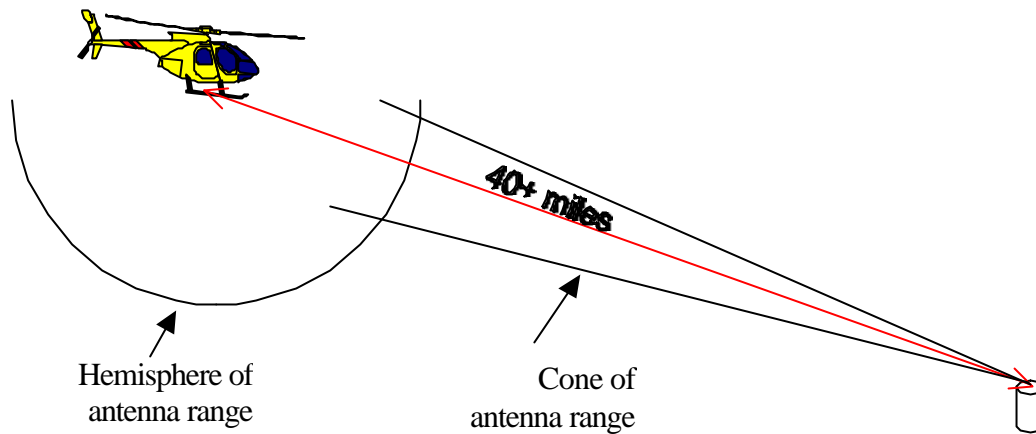
MICROTRACKER is based on Telenav data encoding technology and allows a high gain directional receive antenna to be automatically steered towards a moving microwave video transmission source. It is designed for air-to-ground video downlink applications, in either police surveillance or TV broadcast roles.

In these roles, one can use omni-directional antennas for both the transmit and receive parts of the system but their ability to cover a hemisphere of sight means that the transmission range is reduced, consequently omni-antennas are more suitable for one, rather than both, ends of the system.



'Profile' view of omni-omni system (not to scale)

A more typical configuration for a long-range downlink is to mount an omni-directional antenna (typically 5dB gain) on the transmitting aircraft and to have a high-gain directional antenna (typically 13 –19 dB) at the ground receive site. This increased gain improves the distance over which a signal can be received but in order to achieve this the gain is 'focused' into a cone rather than a hemisphere. Because of this narrowing of the beam it is necessary to steer the antenna in the direction of the transmission source to maintain the signal, otherwise the signal would only be received when the aircraft passed through the cone of reception.



‘Profile’ view of omni-high gain system (not to scale)

Since the signal broadcast from the aircraft is encoded with GPS data (by Telenav), the receiving antenna system needs only to know its own GPS-derived location to perform a simple calculation using these two positions in order to derive the direction in which to steer the antenna. The system incorporates its own high accuracy, integral flux-gate compass that provides the bearing reference.

Once the signal has been received on the ground it can be displayed, distributed, viewed and recorded by various means. The images and data can also be fed to the Real Time Geographic Information System on a PC to display the aircraft’s position on a moving map alongside the video feed (see page 7).

Points to note on the *MICROTRACKER* system include;

- 1) Operation is fully automatic, with software driven search routines that re-acquire the signal if it is temporarily lost for any reason (e.g. signal obscured by a land feature).
- 2) The data does not use any audio or separate telemetry channels – it is carried at full transmission power with the video.
- 3) Standard antenna gains of 13, 16 or 19dB are offered which satisfy the vast majority of requirements. The antennas used incorporate the latest phased-array flat panel technology.

The Navtech Systems *MICROTRACKER* is the result of nearly ten years prior experience in applying GPS technology to the requirements of auto-tracking antenna systems. Navtech was a pioneer in the introduction of GPS-based, long-range microwave video downlinks from a transmitting helicopter platform to base stations. The compact design provides a uniquely flexible, high performance tracking solution at a very attractive cost and is now used by operators around the world. The full *MICROTRACKER* range is outlined on pages 8-14.

Microwave Radios

Navtech has developed its microwave link tracking systems in close cooperation with some of the world's leading suppliers of microwave radios. We work with radio suppliers in both the UK and USA and purposely designed our *MICROTRACKER* system to be compatible with any radio equipment.

Operators thus have the option of utilising their existing transmitters and receivers if they have suitable equipment thereby avoiding the need to invest in new radios.

In most applications however, complete new systems are required. Navtech has selected what it considers to be the most appropriate radio equipment from the ranges available in terms of size, cost, performance and reliability. A popular choice is the range offered by the USA manufacturer, GMS (Global Microwave Systems), one of whose radios is shown below:



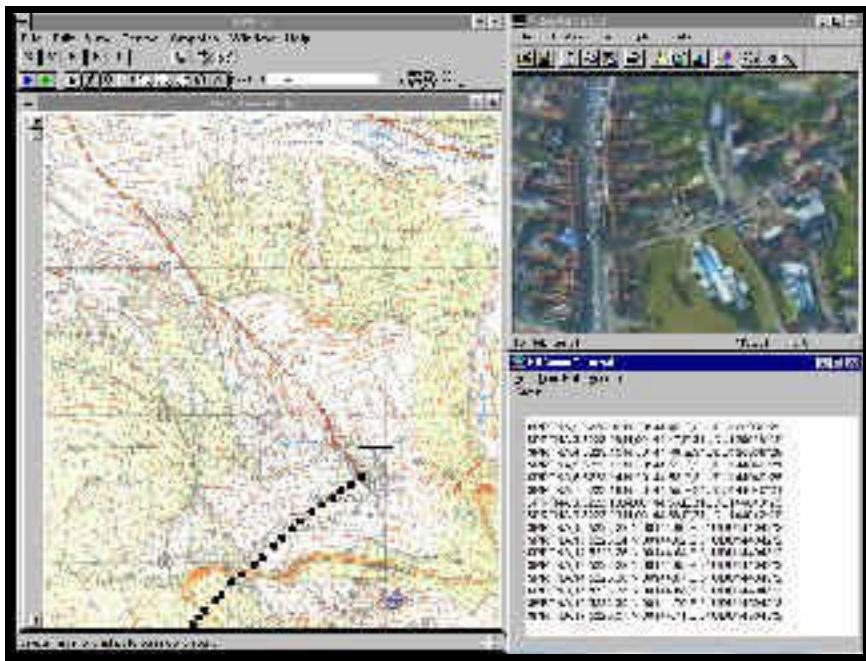
GMS Microwave Radio

RTGIS

RTGIS (Real Time Geographic Information System) is a software package that allows ground-based personnel to view the received video images alongside a moving map display showing the position and track of the transmitting camera platform (aircraft). The system works either in real time as signals are received or can be used with previously recorded Telenav-encoded video footage for 'post-operation' analysis.

The software is designed to operate on a PC and uses industry-standard GIS principles. Most map formats can be utilised; either previously digitised maps that might already be in use on an operator's GIS platform through to printed, 'paper' maps that can be scanned, digitised and geo-referenced.

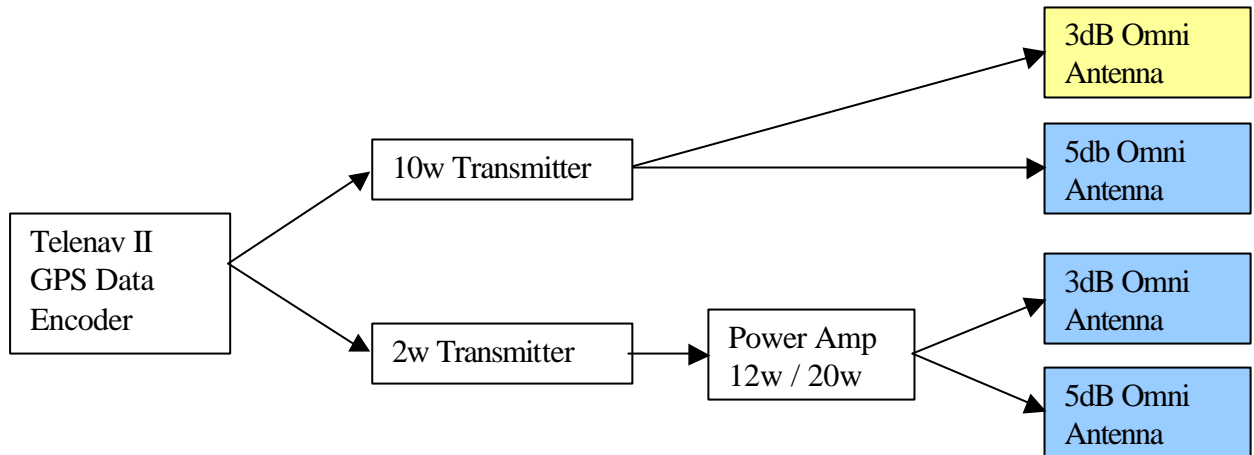
RTGIS forms a very useful tool in a wide variety of survey, surveillance and security applications. In 'live' Policing operations it provides the ground commanders with a complete overview of their airborne assets (and the images they are capturing) and post-event enables the operation to be properly reviewed. At any time, either 'live' or 'recorded' images can be frame-grabbed and stored.



An RTGIS screenshot.

System Overviews - Aircraft Transmission Systems

A variety of options are available to suit different installation and operational requirements. In order to minimise payload, an omni-directional antenna of 3 or 5dB gain, is usually fitted on the aircraft.



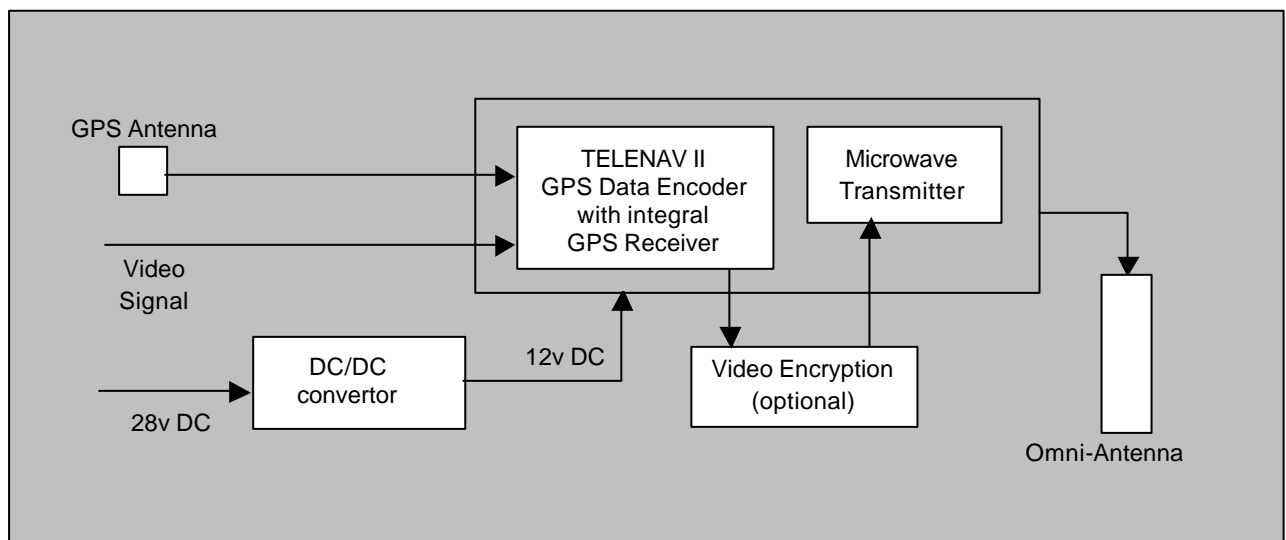
Range Guide:
(assuming clear line of sight and 2.4GHz frequency)

Medium
5-20 miles

Long
20-50 miles

The helicopter equipment can vary in the nature of the installation; permanent, designed to be installed as a fixed feature on a particular aircraft and semi-permanent, designed to be fitted but readily transferable to other aircraft as and when necessary.

The second option makes use of a briefcase containing all necessary encoders, power supply, encryption equipment and microwave transmitter. All systems follow the template below;

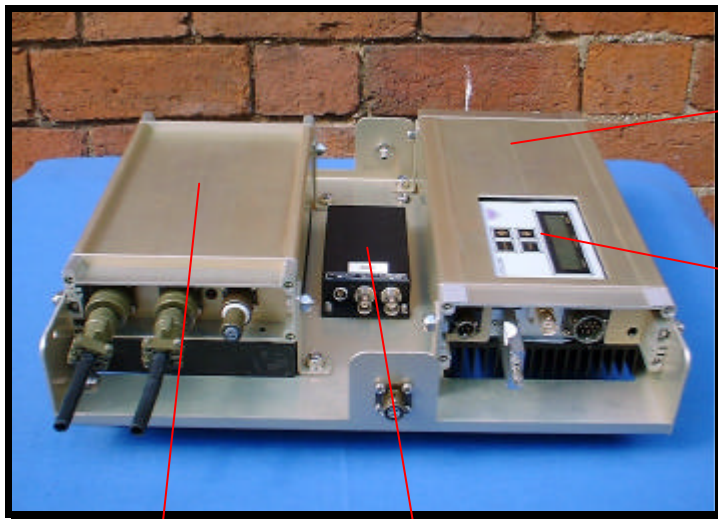


Core Aircraft Equipment

There are several core elements to every aircraft system;

- Telenav GPS Encoder with integral GPS Receiver
- Microwave Transmitter
- Power Convertor
- Transmission Antenna

The photographs below show these components...



Telenav GPS encoder

Microwave Transmitter

DC/DC power convertor

Encryption unit
(optional see below)

5db omni-directional antenna



Aircraft Equipment Options

Options available for aircraft include;

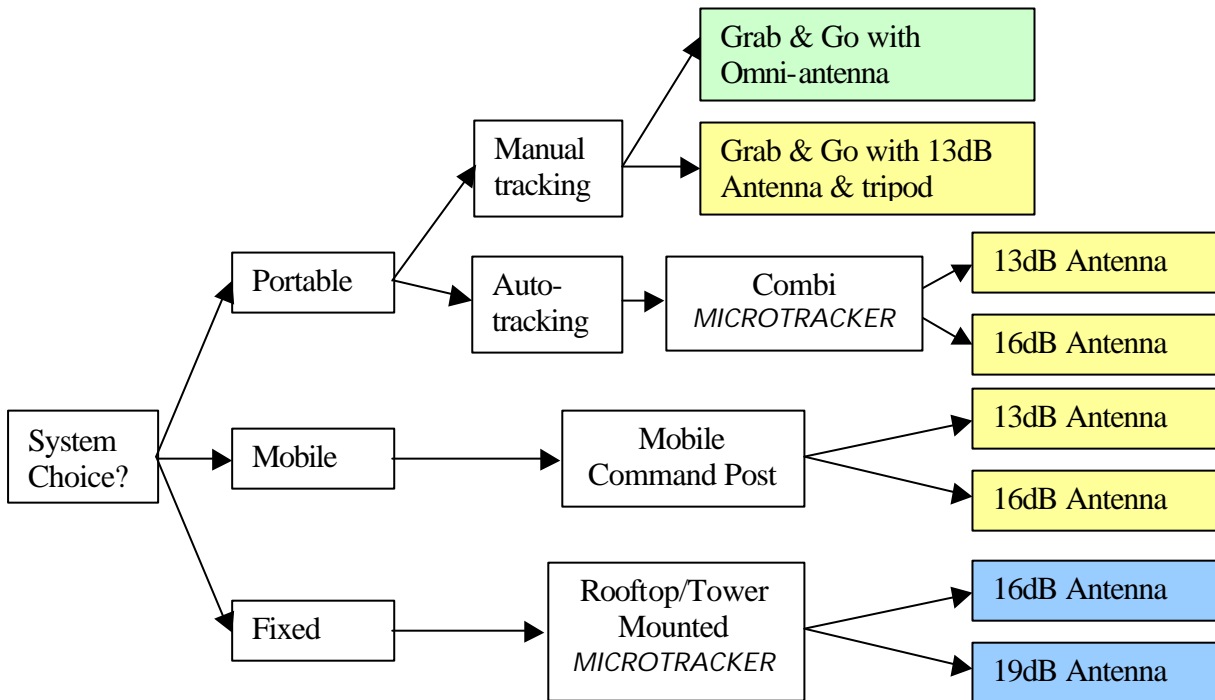
- 1) **Signal encryption** for secure downlink (ground decryption unit required). Navtech utilises the highly regarded Viewlock system from Ovation Technology.
- 2) **Higher power transmitters**. Outputs greater than 10W can be provided by means of an additional power amplifier, subject to local authority ERP restrictions.
- 3) **Antenna actuator**. A skid-mounted actuator can be fitted to deploy the antenna below the aircraft's body and skids whilst in flight. This maximises performance and reduces the possibility of signal shielding during aircraft manoeuvres.
- 4) **Transtenna**. The latest addition to the Navtech range is the Transtenna unit incorporating a 10W microwave transmitter and a 5dB omni-directional antenna into the same unit. By reducing the cable distance between the two units, the potential loss of signal often associated with such systems is greatly reduced.



Combining the two elements also creates a more compact unit meaning that less of the precious space on board is occupied by the equipment. The Transtenna is entirely self-contained, requiring only power and video connections to be made.

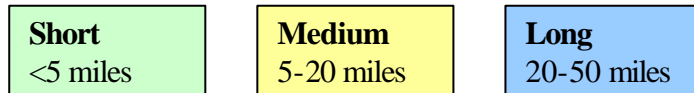
System Overviews - Ground Receive Systems

The diagram below shows the recommended antennas for a variety of applications. These can of course be customised and used simultaneously to receive from one transmitting source. All medium and high gain antennas used in Navtech's downlink systems feature circular polarisation. This, combined with the directionality of the receive antenna, minimises the possibility of multipath interference in difficult receive locations.

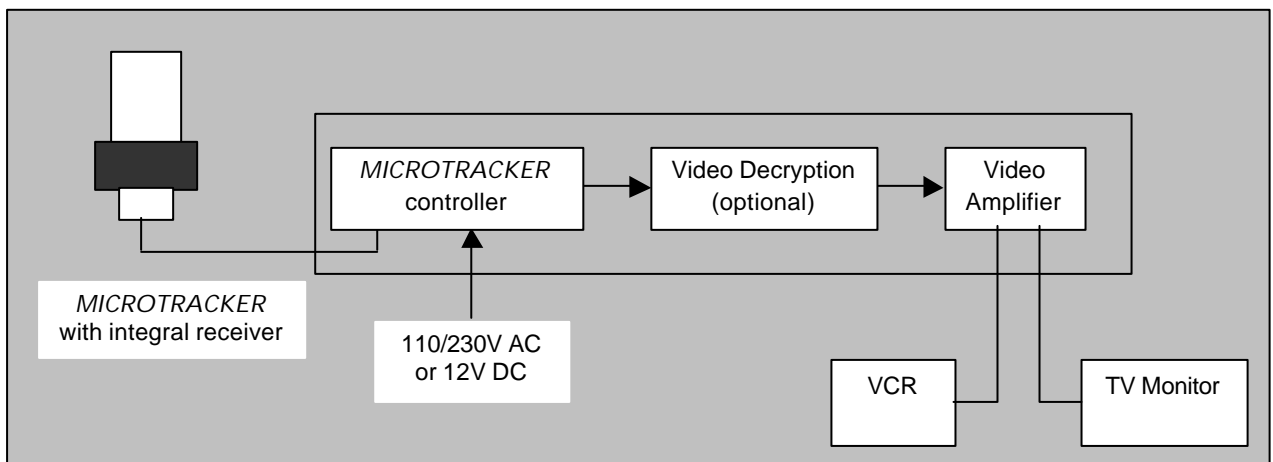


Range Guide:

(assuming clear line of sight and 2.4GHz frequency)



A basic ground receive system configuration;



Fixed Ground Units

Designed for permanent installation on a rooftop or mast (or both), this *MICROTRACKER* system makes use of its permanency by (usually) employing a larger antenna to maximise the system's gain. This is the most common variant of the ground system since most applications involve transmission to some form of headquarters.

Receive antenna options of 13dB, 16dB or 19dB gain are available depending on operational range requirements, together with a 7dB 'up-look' antenna to ensure continuous signal reception in direct 'over-fly' situations.

The system control unit is designed for either 19" rack or desk-top mounting in the HQ control room where an integral LCD display shows system status and the received video picture.

The video signal can be distributed throughout a building or even to remote locations by landline. Further information can be provided by supplying the signal to the RTGIS system.



Mobile Ground Units

Designed with versatility and flexibility in mind there are two mobile variations of *MICROTRACKER*, allowing maximum flexibility for obtaining downlinked pictures.

The first is designed for mobile command posts (MCPs), which in turn can act as a stand-alone tracking centre or a secondary tracker to a fixed site tracker. With the *MICROTRACKER* sited on top of an extending mast on the MCP, this variant can be deployed to any suitable location either in proximity to an incident or at a point of easy access for commanding officers. Naturally, in exceptional circumstances where an aircraft may be operating out of range of a fixed site *MICROTRACKER*, the MCP option provides an ideal alternative.

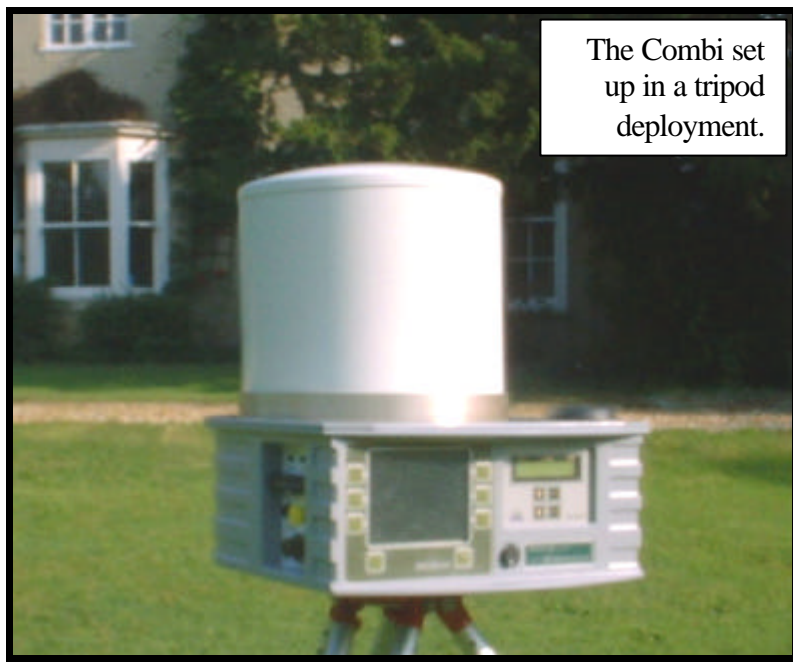
The MCP system uses either a 5dB omni-antenna for short-range applications or a *MICROTRACKER* with 13dB antenna with 7dB uplooker for over-fly situations. The control unit inside the vehicle is either a desk-top or 19" rack unit.



The Combi Microtracker

If a Mobile Command Post or similar is unavailable, the second variation of Mobile *MICROTRACKER*, the Combi presents an ideal alternative. The Combi is compact enough to fit in the rear of a vehicle and is capable of being ready to track an aircraft within minutes of set-up. The unit is light enough to be handled by one person and sturdy enough to handle various weather conditions.

The Combi contains all the necessary items for a stand-alone tracking antenna system – auto-tracking antenna, controller, microwave receiver, video distribution & power supply sockets, emergency battery etc.



'Grab and Go' Cases

To fulfil the requirement for compact, portable systems, Navtech has developed its range of Grab and Go Cases. These are housed in sturdy, shockproof Pelicases and are designed for rapid deployment.

Surveillance Case

This case is used to record Telenav GPS encoded video on-board the aircraft typically in airborne surveillance applications. The case incorporates a Telenav encoder/decoder with an integral 5" LCD display and a Hi-8 VCR allowing both in-flight data encoding and recording and post-flight viewing of encoded video.

Aircraft Transmit Case

This case is used to encode GPS into the video signal prior to its transmission to the ground via a microwave link for real-time viewing. Designed to be used in conjunction with the Transtenna unit (page 10), the case is self-contained with the minimum number of connections needed to aircraft systems and the antenna.



Aircraft Transmit Case.



Ground Receive Case (open) with Surveillance Case

Ground Receive Case

The ground receive case is designed to be carried by vehicles such as police patrol cars and integrates a microwave receiver, Hi-8 VCR and 10.4" LCD TFT display. It is supplied with both a 3dB omni-antenna for short-range reception and a hand-held 12dB helix for longer range use. The system is ready for use as soon as power is supplied to the case; a battery back-up is included to ensure continuous operation in the event of short-term loss of external power.

Contact Details

Should you have any questions or queries, please don't hesitate to contact us at;

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