

IMAGE TECHNOLOGY DEVELOPMENTS WILL TAKE TACTICAL FIELD INTELLIGENCE GATHERING TO NEW HEIGHTS

Good command and successful military operations are extremely reliant upon good intelligence. Modern warfare is less conventional and often guerrilla in nature. Under these conditions the deeper the intelligence that can be obtained, the more time there is for preparation and the better the chances of success and the reduction of casualties, including civilians. Technology can strongly influence intelligence gathering and improve its quality.

Dr Bennie Coetzer, joint managing director of Thales Advanced Engineering, which designs, manufactures and supplies specialised image processing, data communications and digital CCTV surveillance systems for defence and commercial security applications, outlines recent development work on intelligence gathering using state-of-the-art image capture and transmission equipment:

The importance of images in intelligence gathering cannot be overestimated. Images contain considerable amounts of information and detail, enabling rapid tactical decisions to be made. Image surveillance is also passive and therefore undetectable.

There are, of course, disadvantages associated with image surveillance. It is limited to relatively short distances, typically less than 10km and visibility conditions such as mist, fog, rain and nightfall are also limiting factors. Night vision infra red/thermal technology can be used to overcome the nightfall limitation at a cost. The transmission of images from the observation point to the rear echelon can also be problematic because of the high bandwidth requirement.

The ideal solution will accommodate many image capture devices such as camcorders, digital cameras, IR cameras, night vision devices, binoculars and others. It will be designed for high resolution images, will incorporate special image processing technology to reduce the transmission time and will be LinkZA compatible in South Africa.

Cameras have many advantages over binoculars in that they record images and store them for later use, work in bad light conditions, have a greater magnification capability of typically 20x and more, can accommodate IR and night vision attachments and can record both wide area views for orientation and narrow or focused views for detail. The disadvantages are the equipment is heavier and is attached to the messaging system and to the transmission device.

A typical image size is 3072x2048 pixels, which is 18MB in uncompressed format and 2-5MB in compressed format. The transmission time over a tactical radio with 9600 bits/sec capability would be between 27 and 70 minutes while what is needed is a system able to transmit over distances of up to 100km in less than 60 seconds. The system will also have to cope with ECM threats such as SIGINT, COMINT and with signal jamming.

True intelligence is also more than just the image. It also requires temporal and spatial information such as when and where, and should be supported by other information

such as sounds and observations regarding vehicle and people movement, civilian settlements, bridges, dominant ground and so on.

Objects should be extracted out of the images and detail provided regarding location, whether fixed or mobile, distance, size, type and speed.

At tactical command there will be a message centre to receive and transmit orders and tasks, a reporting centre to report messages and images, an image control centre to manage and manipulate information and a transmission centre to manage the transmission of reports.

The system and technology being developed by Thales is called Foxeyes. It provides intelligent tactical imaging through a capture system consisting of a high resolution digital camera with a long focal length lens and a night vision detector. This is coupled to a tactical imaging control unit known as Arion. Other components are a TacPOV or tactical position view orientation sensor, the Glamdring, which comprises tactical imaging software, a remote work station (typically a laptop computer) and a central workstation (at the tactical intelligence control centre), an image classification, management and storage system called Hercules, a digital video streaming system called Daedelus and an image analysis system called Archimedes.

All of these are encapsulated in complete, portable units. The TacPOV establishes the position of the camera using GPS, the orientation of the camera such as its bearing and tilt, as well as the type of view according to the lens focal length at the time the image is captured. From this data the position of specific objects such as stationary vehicles, barracks, bridges and the like can be accurately plotted.

The Arion man-portable imaging unit supports multiple image capturing devices such as cameras and is able to transmit and receive tasking and reporting information in the form of text, sketches and photographic images. It will also handle the attachment of voice and drawn annotations to any image. It provides selective image compression and optional video recording and storage. Its communications protocol is compatible with LinkZA and it also provides interface to other sensors such as ground radar and seismic devices.

The Foxeyes' selective compression facility in the Arion will compress an original image of 4MB to less than 100kB. This will transmit on VHF in less than 60 seconds and via satellite in less than 7 seconds. Serious compression to less than 30kB will halve the transmission times. An airborne version of the Arion has also been designed.

Communication protocols within the Foxeyes system support satellite, V/UHF and HF and are completely compliant with LinkZA. Image transmissions can be split into shorter bursts and images can be encrypted (optional). ECCM-enabled radios can also be used.

The Glamdring tactical imaging software for PCs or laptops has a comprehensive imaging capability and enables selective compression, annotations, tasking and reporting. It is LinkZA compatible and the remote workstation functions as a capturing sensor while the central work station acts as interface between all of the Foxeyes systems and the tactical intelligence centre.

The Daedalus digital video streaming system provides X-Band transmission, MPEG2 coding, operates at 2/4Mb/second and offers wideband DSSS to ensure low probability of intercept, anti-jamming and uplinks for control purposes.

The Archimedes image analysis system enables images to be enhanced to improve identification. It locates the image and its objects onto GIS and measures distances and object sizes. The GIS pictures can be pre-loaded with standard military symbols and special tools are available for texture analysis and histogram analysis. Access routes can be clearly marked.

The Hercules image classification, management and storage system classifies objects, areas and threats and can classify in time so as to assist with historical analysis. It is capable of managing large volumes of data over long periods and of handling sophisticated queries to help with scenario-building. The storage is comprehensive and redundant with full replication and back-up of all information while the system is compatible with command database and control programs.

To summarise, Foxeyes is a comprehensive, intelligent tactical imaging system, completely self-contained and adaptable to many systems. It constitutes a long-term strategy in line with developments in imaging and provides full support for SANDF requirements.

The advantages behind the local development of such a system include: local expertise in a rapidly developing environment, close contact, support of local technology to maintain and strengthen local capabilities and the export potential for such a standalone system because needs exist in Africa and other developing countries.

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Note to Editors: Thales Advanced Engineering is a wholly South African company, formed in 1987 and headquartered at Lonehill, Sandton. It should not be confused with a French defence electronics company now calling itself Thales but formerly known as Thomson-CSF.

Thales Advanced Engineering specialises in image processing, data communications and digital CCTV surveillance systems for defence, commercial security and specialised imaging. Thales provides system engineering, high-speed digital design, image processing, embedded software design, digital signal processing, high level software design, data communications and general RF communications.

ISSUED BY: COPYWISE
Dave McDermott +27 11 478-2055 or +27 82 608-0019
dave@copywise.co.za

ON BEHALF OF: THALES ADVANCED ENGINEERING (PTY) LTD
Dr Bennie Coetzer +27 11 465-4312
Web site: www.thales.co.za