



Sensors R&D Strategy

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Sensors - Background

- The History
 - The UK has a long history of world-leading R&D in traditional military sensors
 - And a good track record of in-service systems
 - e.g. SAMPSON, TICM, CAPTOR, 1010 NAVFLIR, Type 996, TIALD, MSTAR, TOGS, Searchwater, Pirate IRST...
 - However, sensor development has frequently taken many years and been very costly
 - e.g. MESAR/ MESAR2/ SAMPSON ~ 20 years
- The Threat
 - The old has not gone, but newer threats have appeared
 - Newer threats are often “people-based” and are frequently very difficult to detect, track and identify
 - IEDs, rockets & mortars, small, slow DIY UAVs...
 - No single sensor is likely to be sufficient to detect, track and identify newer threats



Sensors - Background

- The Economics
 - The totality of traditional sensor development programmes for land, sea and air is unsustainable
 - The overhead of maintenance and upgrade of the wealth of in-service sensors is unsustainable
 - Sophisticated technology is expensive and takes time to develop
 - Integration introduces further large costs
- The Technology
 - RF and EO/IR technology is beginning to allow multi-band multi-function operation from a single sensor
 - Networked sensor operation is feasible
 - Storage and processing are cheap (but power isn't)
 - Databases can be distributed
 - Processing methods enable effective fusion of outputs from multiple heterogeneous sources distributed across a network



Sensors R&D – Strategic Response

- Migrate R&D effort towards developing a new sensor architecture based on common modules re-used across multiple applications in land, sea & air
 - modular, scalable, multi-band, multi-function RF and EO/IR sensors underpinned by robust design and validated performance and cost modelling
- Integrated sensor operation on single platforms
- Networked operation of distributed sensors
- Future sensor concepts
 - e.g. interactive, problem driven collection
- Retain existing demonstrator programmes as far as possible under PR09
 - migrate as headroom becomes available



RF Sensors

- Design and demonstrate the ‘software defined RF sensor’
 - A highly linear, modular, scalable broadband array acting as a transducer between EM radiation and digits
 - All functionality (e.g. radar, EW, comms) is a software mode
 - Covers land, sea and air environments
 - Configurable with mission/ platform/ application specific modes
 - Dynamically adaptive to environmental conditions
 - *But without letting generality lead to mediocrity*
- Enabling technologies
 - Wideband arrays, compact receivers, compact transmit/receive modules
 - Wide bandgap semiconductors (e.g. GaN) for wideband high power amplification
 - High speed digitisation
 - Tuneable RF filters to reduce susceptibility, channelised to allow sub-sampled digitisation



EO/IR Sensors

- Shift R&D emphasis to demonstration of EO/IR technologies at the system level
- Demonstrate dual mode 3D imaging in the air
 - Long range target ID capability
- Local situational awareness processing for mounted close combat
- Compact rangefinding and designation
 - Compact and efficient lasers
 - Will require sophisticated thermal management
 - Integrated into airborne system and demonstrated



Integrated Sensors

- Real-time integrated sensor operation
 - Covering sensor control and processing
 - Sensors co-located on a single platform
 - ISTAR HIRID and Above Water Integrated Sensor Suite
- Persistent and pervasive, scalable, all-source sensing & processing architecture
 - Focused initially on urban operations
 - Scalable in terms of number and type of sensors
 - Covering RF, EO/IR, signals, acoustic, voice, text and multimedia sources (dismounted, mounted and airborne)
 - From small numbers of sophisticated high value sensors to large numbers of unsophisticated low value sensors
 - Integrated with the wider C4ISTAR architecture
 - Supports evaluation of new sensor technologies from suppliers
 - Urban & Rear Area ISTAR TDP



Future Sensor Concepts

- Defence sensor architecture
 - Multi-band, multi-function sensor designs for land, sea & air with requirements capture, CONOPS, whole life costs, benefits, integration and acquisition plan
 - Networked sensor designs using distributed data storage and processing across assets - interactive with users and between assets
- Problem driven collection
 - Matching sensors to the mission
 - ‘Context aware’ sensors ‘knowing’ what to collect & how to process
 - e.g. optimised use of power through choice of sensor mode
- Charting the MIMO landscape
 - Understand the applicability of MIMO techniques to RF sensor applications in all environments
- New EO/IR modes
 - What more can be done with phase?
 - What is the next big thing in optics?



Defence Technology Plan

- Sensors domain will be covered by 4 R&D Objectives
 - RF Sensors
 - EO/IR Sensors
 - Integrated Sensors
 - Future Sensor Concepts
- Next DTP update at end of September 09
- Programme begins in FY10

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