

**Presentation at Robotics Workshop  
Warwick University  
Nov 26th**

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## Presentation Format

- Introduction
- Areas of Interest to BAE SYSTEMS
- Robotic projects in Aerospace
- Other relevant technologies
- Questions

## Introduction

Advanced Technology Centre, Bristol

Group Leader, Informatics Group

14 staff studying range of company-related research problems in autonomous systems, data processing, data fusion, etc.

## Robotics Areas of Interest \*

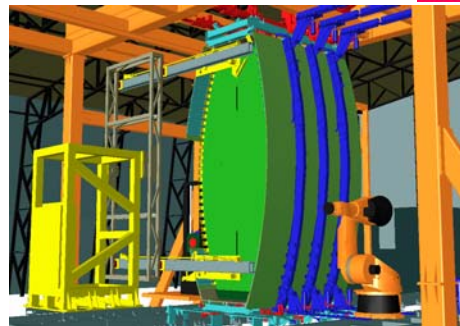
<b>Manufacturing</b>	Automated Assembly Non-Destructive Testing Painting, Cleaning
<b>Autonomous Systems</b>	UAVs, UUVs, etc. EOD

\* Emphasis : Guided by metrology systems

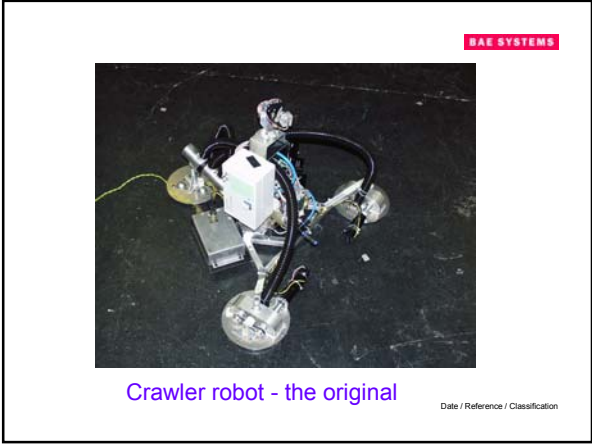
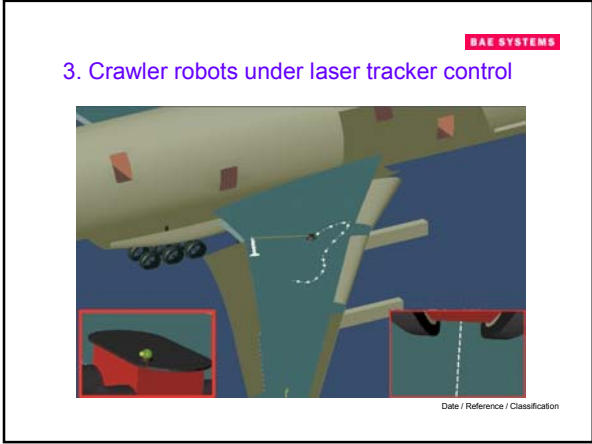
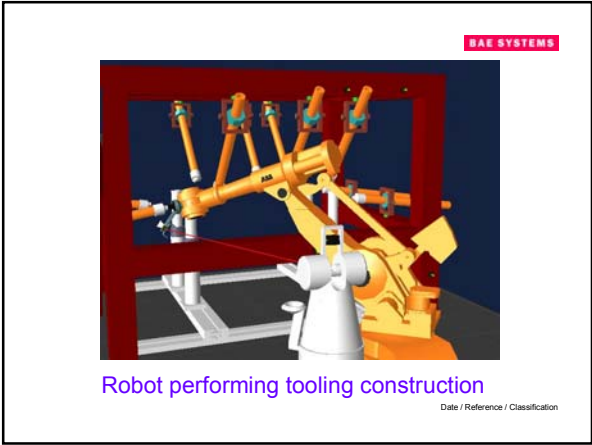
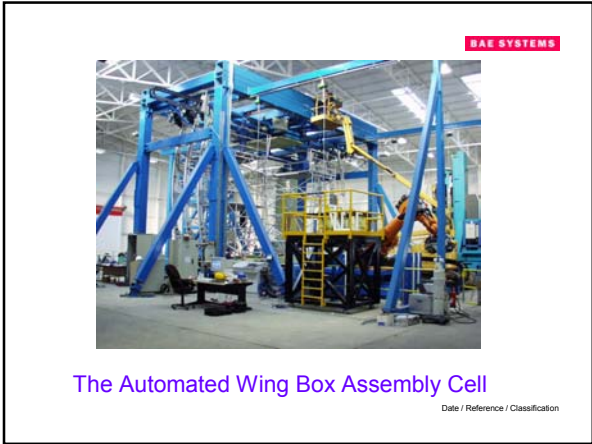
- **On-Board** : Using cameras, laser rangefinders, radar
- **Off-Board** : Using laser tracker

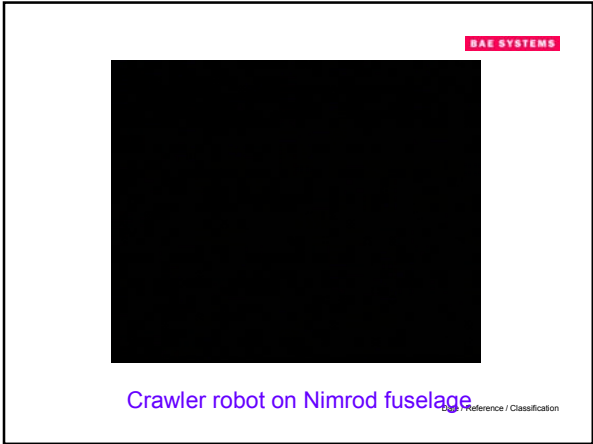
## Projects

- **AWBA II** - Automated aircraft assembly
- **ADFAST** - Laser trackers for machine control
- **Crawler Robot** - Surface-mounted automation
- **Robovolc** - Volcano exploration
- **ANSER** - UAV testbed for Data Fusion and SLAM
- **Behavioural Robotics** - Emergent Behaviour



1. AWBA II Wing-Box Assembly





## 5. UAVs - Brumby Mk III Manufacture

BAE SYSTEMS



- Five Identical platforms
- Mainly Nomex/fiberglass
- Carbon fibre in key areas
- All parts interchangeable
- Common moulds/jigs
- All modular pay-loads
- One month/vehicle production time

Date / Reference / Classification



BAE SYSTEMS

## The Squadron

Date / Reference / Classification



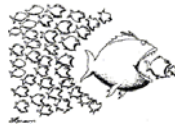
BAE SYSTEMS

## Brumby flight

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## 6. Multi Agent Systems

BAE SYSTEMS



- **Swarm Intelligence**
  - Intelligence arising from on mass presence of homogeneous agents.
- **Emergent Behaviour**
  - Higher-level behaviour arising from interplay of lower-level components.

### • Key Challenges

- Co-ordination, Communication, Control.
- MAS Engineering Methodology (Design, Analysis, Test)
- Adaptation, Learning, Self-Organisation.

### • Key Benefits

- Robust, Cheap, Massively Parallel, Distributed Problem Solvers.

Date / Reference / Classification

## Autonomous Group Defence

BAE SYSTEMS



- Autonomous
- Decentralised
- Adaptive
- Collective UAV Force

- Behavioural
- Local Sensing
- Local Decisions
- Self Organising



BAE SYSTEMS

## Formations

CIAS July 2002

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### Other Technologies

- Image Processing
- Data Fusion
- Situational Assessment

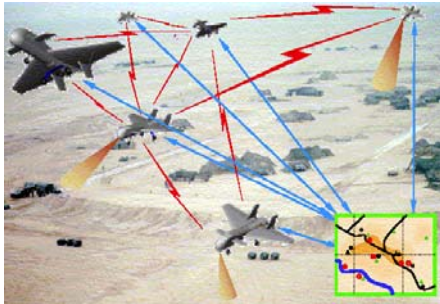
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### TALEOS - Highlights (Landing Aid)

- TALEOS currently involved in Flight Trials at RAF Boscombe-Down
- BID submitted for applying TALEOS technology within Advanced Civil Flight-decks
- Initial Pocket TALEOS Demonstrator on a Sony Vaio completed.
- Conferences: BMVC-2001, CVPR-2001
- Started contract on Manchester University for systems study.



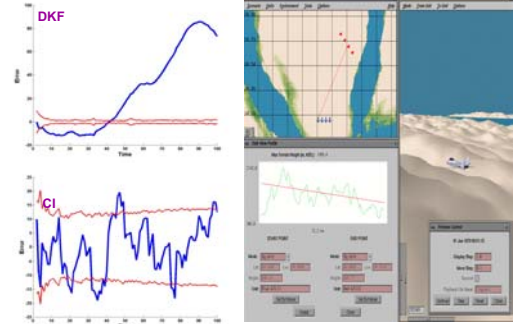
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Data Fusion problem for multi-UAVs

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### Distributed Data Fusion SAR + RADAR



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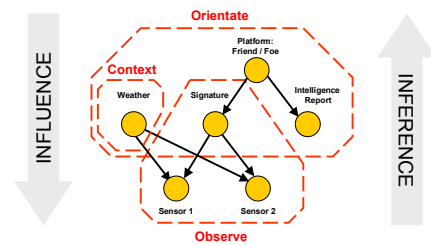
- New Pan and Tilt With new Sensors
- I Band Antenna
- Old Pan and Tilt with B&W Camera
- F Band Antenna



The MSDF sensor suite at Great Baddow

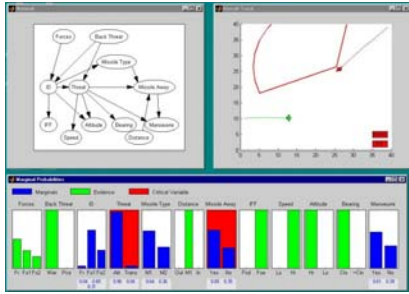
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### Situational Assessment : A graphical model



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### Missile Away!



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The End

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