

A Modular, Reconfigurable Surveillance UAV Architecture

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METEOR SURVEILLANCE UAVs Road - Map



Mirach 2000 Falco
Family

PERFORMANCE INDEX:

$$IP = \left(\prod_{i=1}^4 F_i \right) \cdot 1.0e - 03$$

- Loading capability

$$F_1 = \frac{W_{PL}^{MAX}}{W_{TOG}}$$

- Ceiling

$$F_2 = \frac{h_C}{b}$$

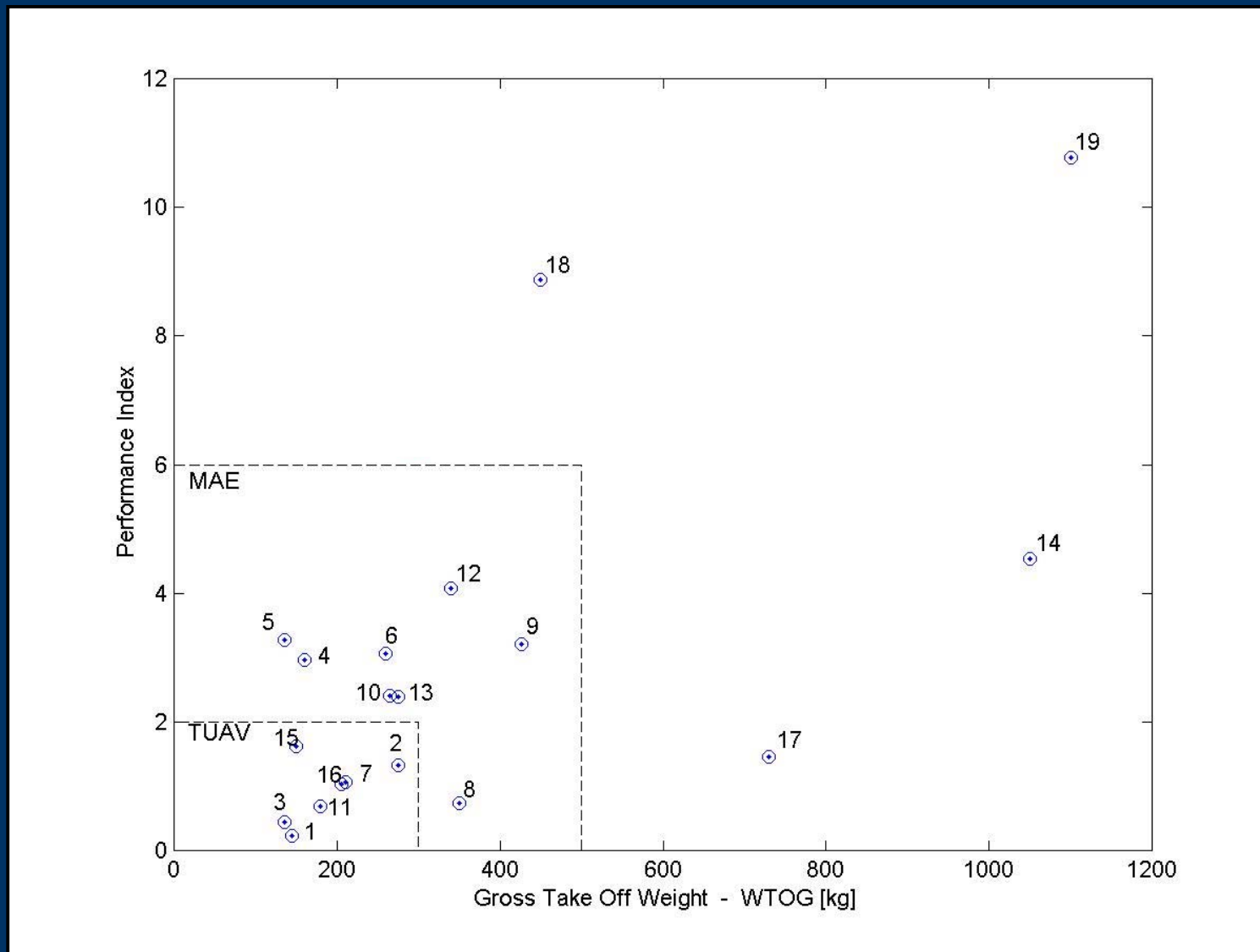
- Permanence flexibility

$$F_3 = \frac{E_{MAX}}{(R/V_{MAX})}$$

- Excess power margin

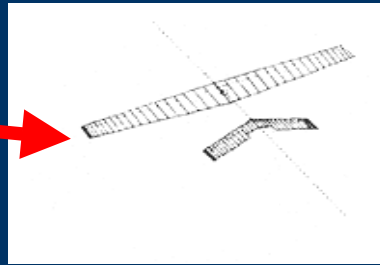
$$F_4 = \frac{V_{OPER}}{V_{MIN}}$$

SURVEILLANCE UAV SYSTEMS : PERFORMANCE INDEX

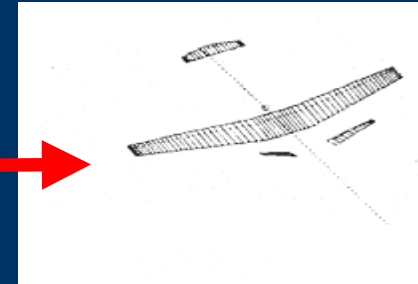


LIFTING SURFACES CONCEPT SELECTION

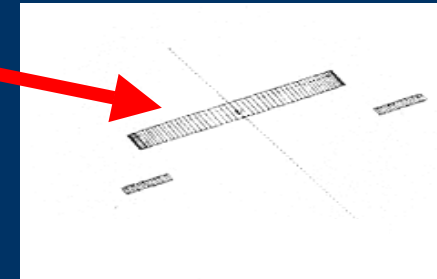
- Conventional



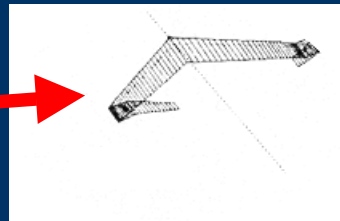
- Three-Surface



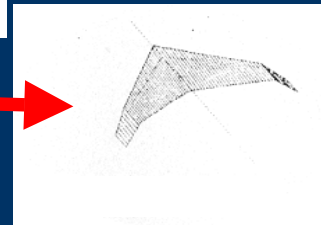
- Outboard Horizontal Stabiliser



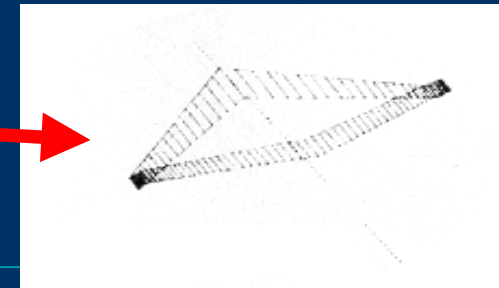
- C-wing



- Flying wing

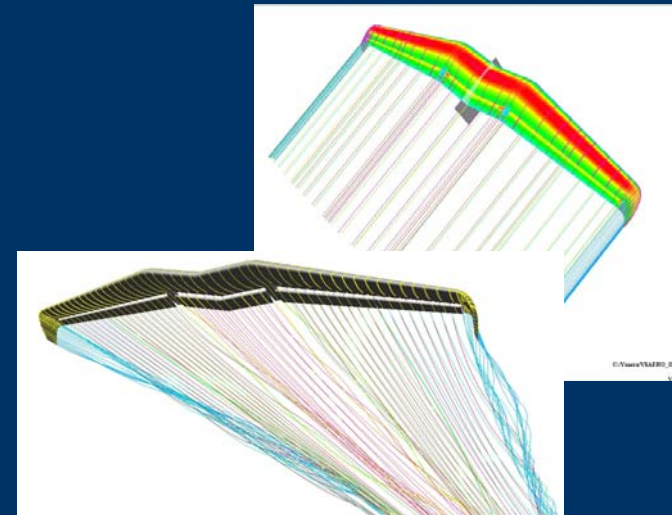
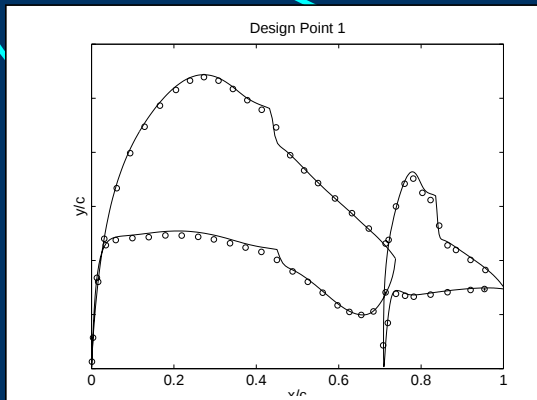


- Joined wing



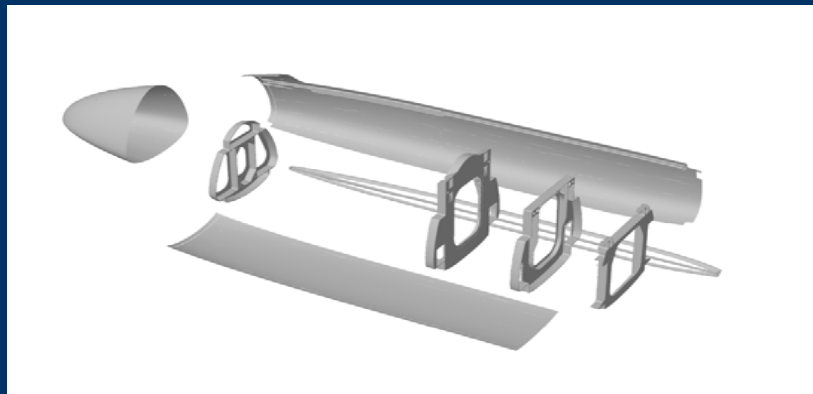


LIFTING SURFACES DESIGN PATH



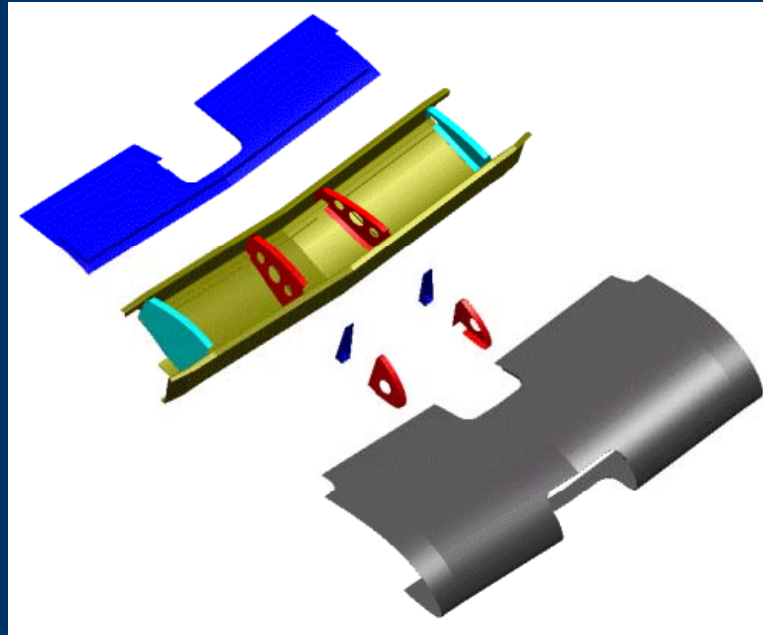
Modular Structure - Fuselage

- ✓ Length variable via modification of constant profile mid section
- ✓ Outer skin made of a stiff, thin, lightweight carbon fibre/foam sandwich structure
- ✓ Numerous large access hatches on top and bottom



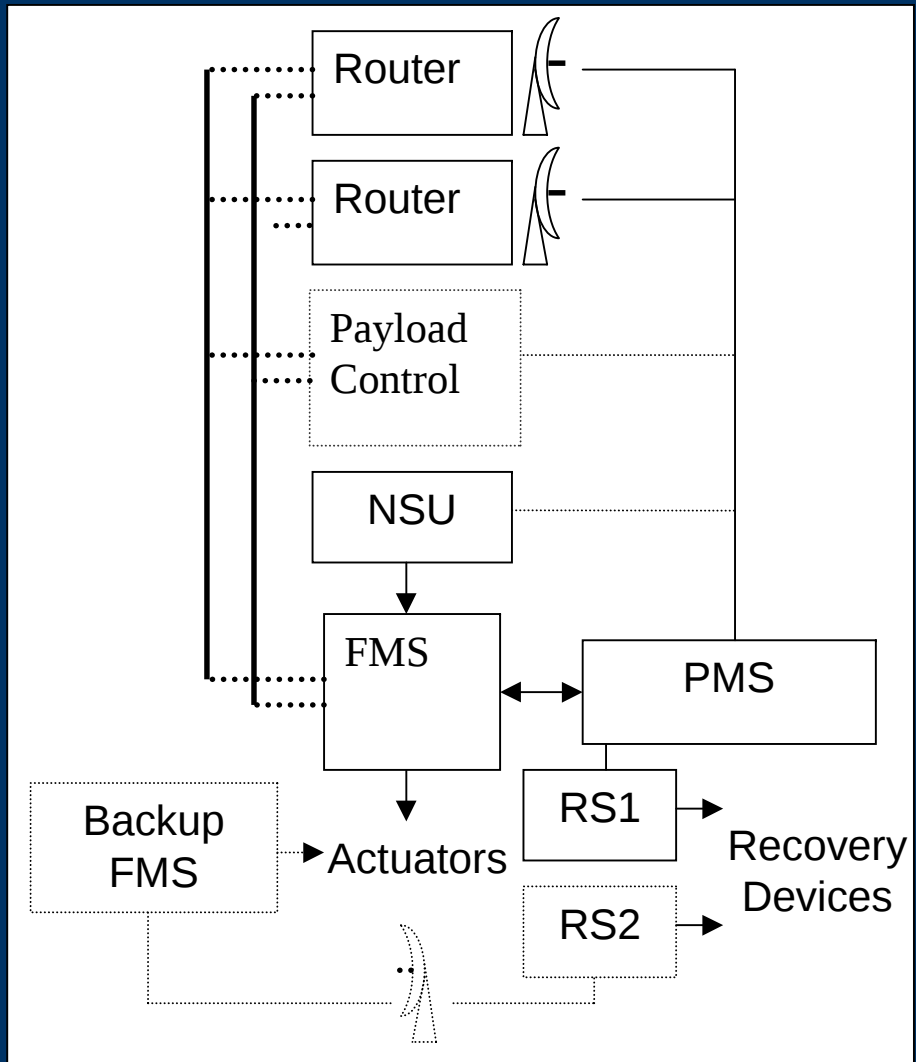
Modular Structure - Wing & Tail

- ✓ Modular design permits resizing of wing and tail
- ✓ Tool free, rapid assembly
- ✓ Extensive use of composite materials
- ✓ Robust design resilient to impact damage



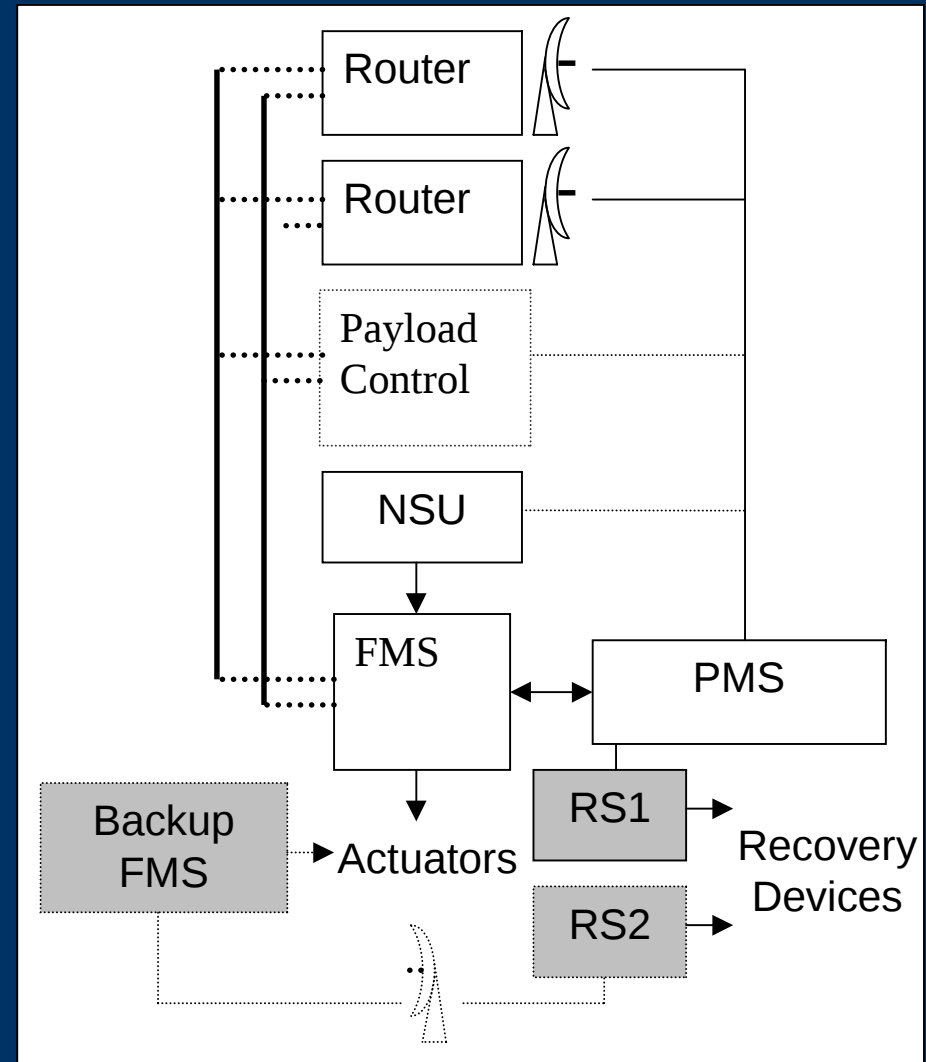
Avionics Architecture

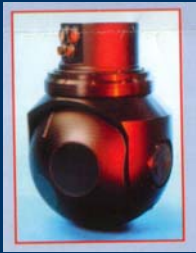
- ✓ Flexible multiple mini cabinet approach facilitates access and maintenance
- ✓ Extensive use of COTS components
- ✓ Bus architecture based on a robust, redundant Ethernet implementation



Avionics Architecture

- ✓ Backup FMS permits safe control of vehicle to recovery zone
- ✓ Redundant recovery system
- ✓ Full recovery possible even in event of complete power loss
- ✓ Modular design permits redundancies to be added or removed as required for a particular configuration.





- Daylight TV Camera
- IR Sensor
- HR Spotter
- Laser Range Finder



Linescanner



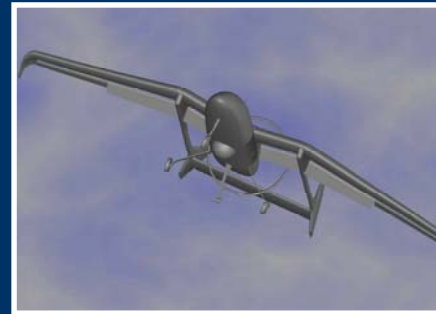
ELINT



SAR/MTI



Autoprotection System



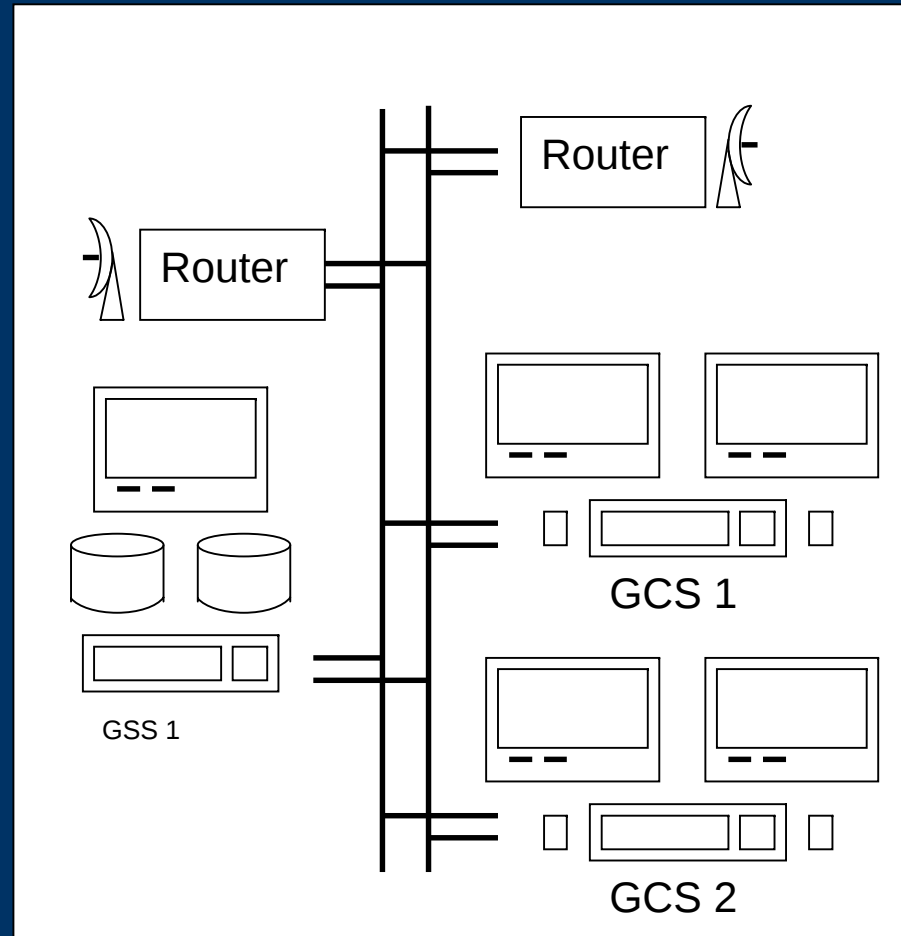
GCS



Portable Station

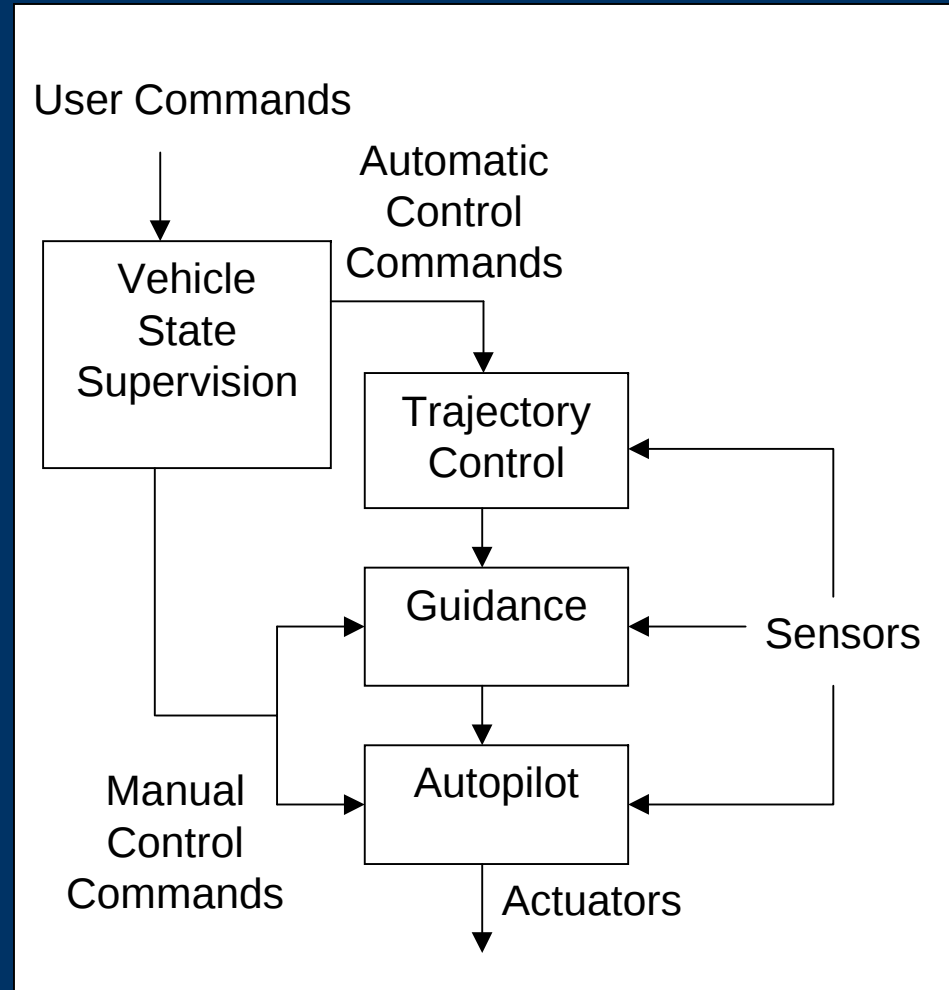
Ground Station Architecture

- ✓ Architecture based on industry standard PC workstations
- ✓ Multiple terminals and storage servers are connected to each other and the radio links via a redundant network
- ✓ WAN operation possible



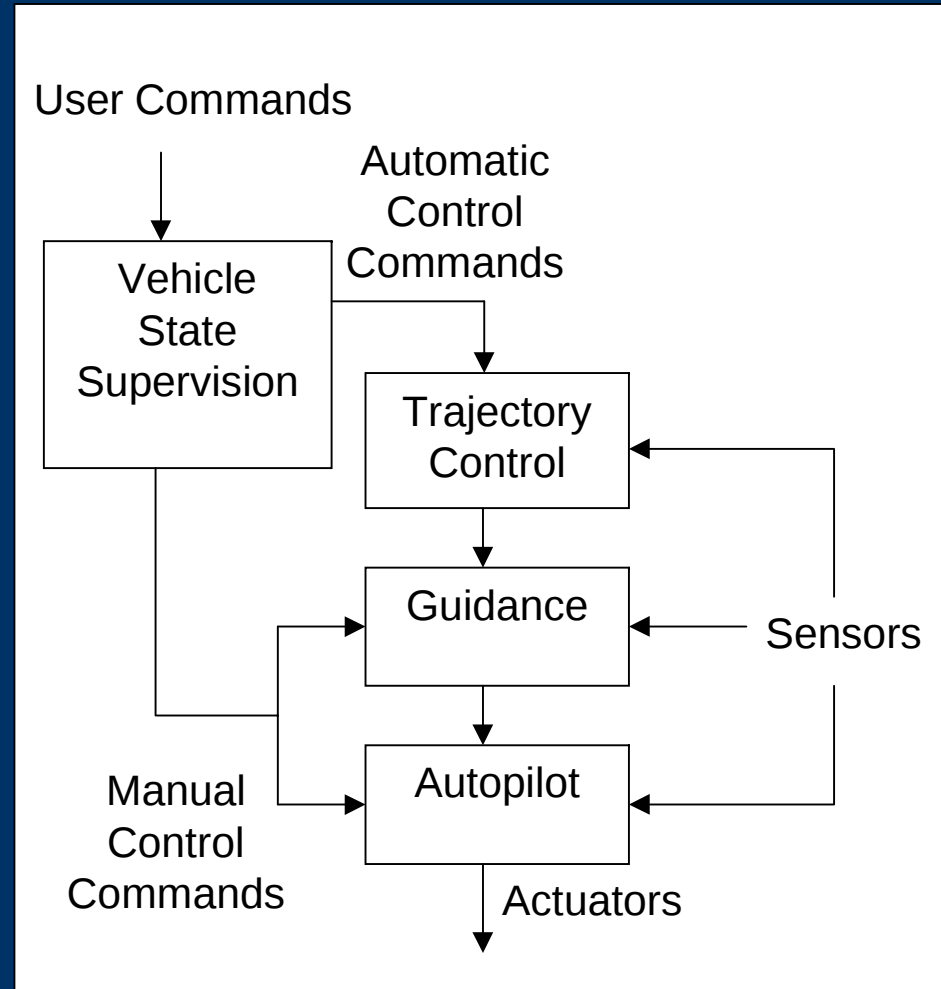
Flight Control System - Architecture

- ✓ Hybrid robust optimal / classical design
- ✓ Extensive use of automated optimisation systems permits rapid recalculation of gains for new configurations
- ✓ All flight surfaces used optimally in all flight conditions

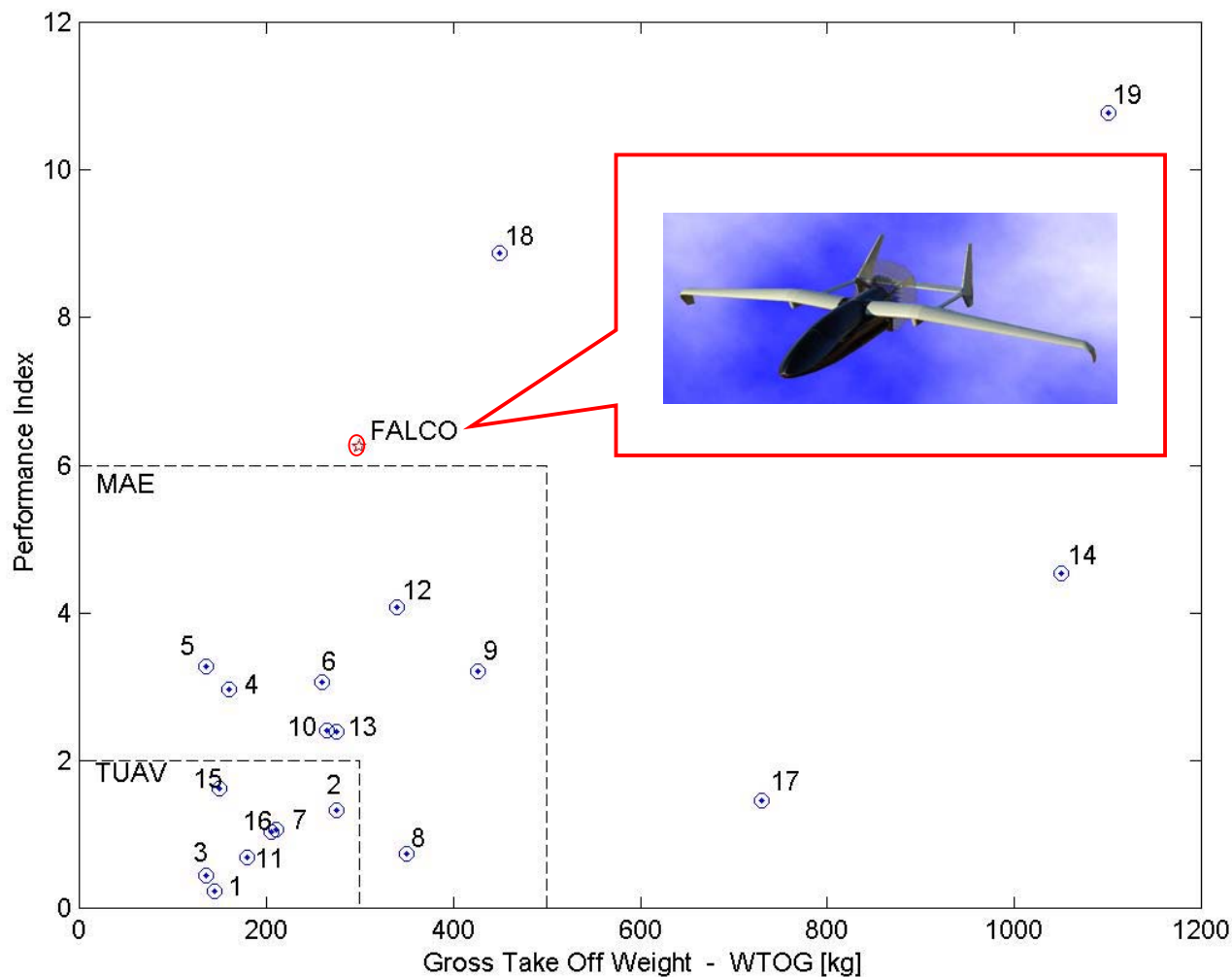


Flight Control System - Control Modes

- ✓ Wide variety of assisted manual control modes
- ✓ Semi automatic mode allows for “Click and Go” control
- ✓ Fully automatic mission control mode
- ✓ Automatic mission creation based on observation plan
- ✓ Automatic STOL takeoff and landing



SURVEILLANCE UAV SYSTEMS : PERFORMANCE INDEX



Role: - Area Surveillance, Targets Acquisition and Identification
- Target Designation

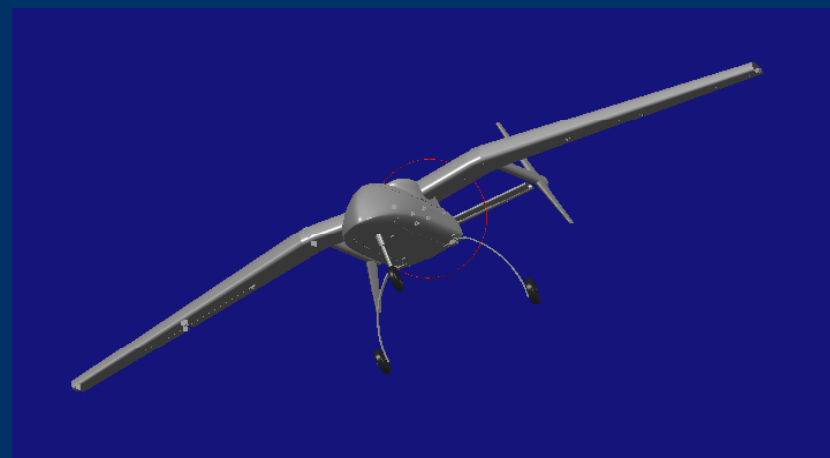


Technical Characteristics

Take-off weight: > 250 Kg
Endurance: > 8 hrs
Link range : > 150 Km
Service ceiling: > 6000 m
Payload: > 70 Kg

Operational Capabilities

- Automatic STOL capability
- Intelligent multi-payload interface
- System designed according to:
 - STANAG 4685 (Interoperability)
 - Dual-use criteria (ATM Integration)



Conclusions

- √ **A modular, reconfigurable vehicle architecture has been created which permits the creation of a broad range of UAV systems**
- √ **An example of a vehicle design based on the architecture has been presented**
- √ **This new vehicle design, called Falco will commence flight trials in 2003**



Questions ?