



Ground Control Station THE UNIVERSAL CONCEPT

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Report Documentation Page

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UGCS - Universal Ground Control Station

The Advanced Silver Arrow GCS
for
Planning and Control of UAV Missions

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UGCS - Universal Ground Control Station



Developed to support easier and faster adaptation for various types of UAVs, Datalinks, HMI and Payloads



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Mission Requirements

- ☰ Full functionality to perform two missions in parallel, including relay operations
- ☰ ISTAR missions
- ☰ SIGINT missions
- ☰ Relay missions

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Engineering Approach

- ☰ Generic design that shall support easy adaptation to various payloads, data links, human-machine interface and air vehicles
- ☰ Identical mission operation consoles
- ☰ Flexible modes designation to consoles
- ☰ A redundant system design concept ensuring the safety of the A/V and mission accomplishment

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Engineering Approach

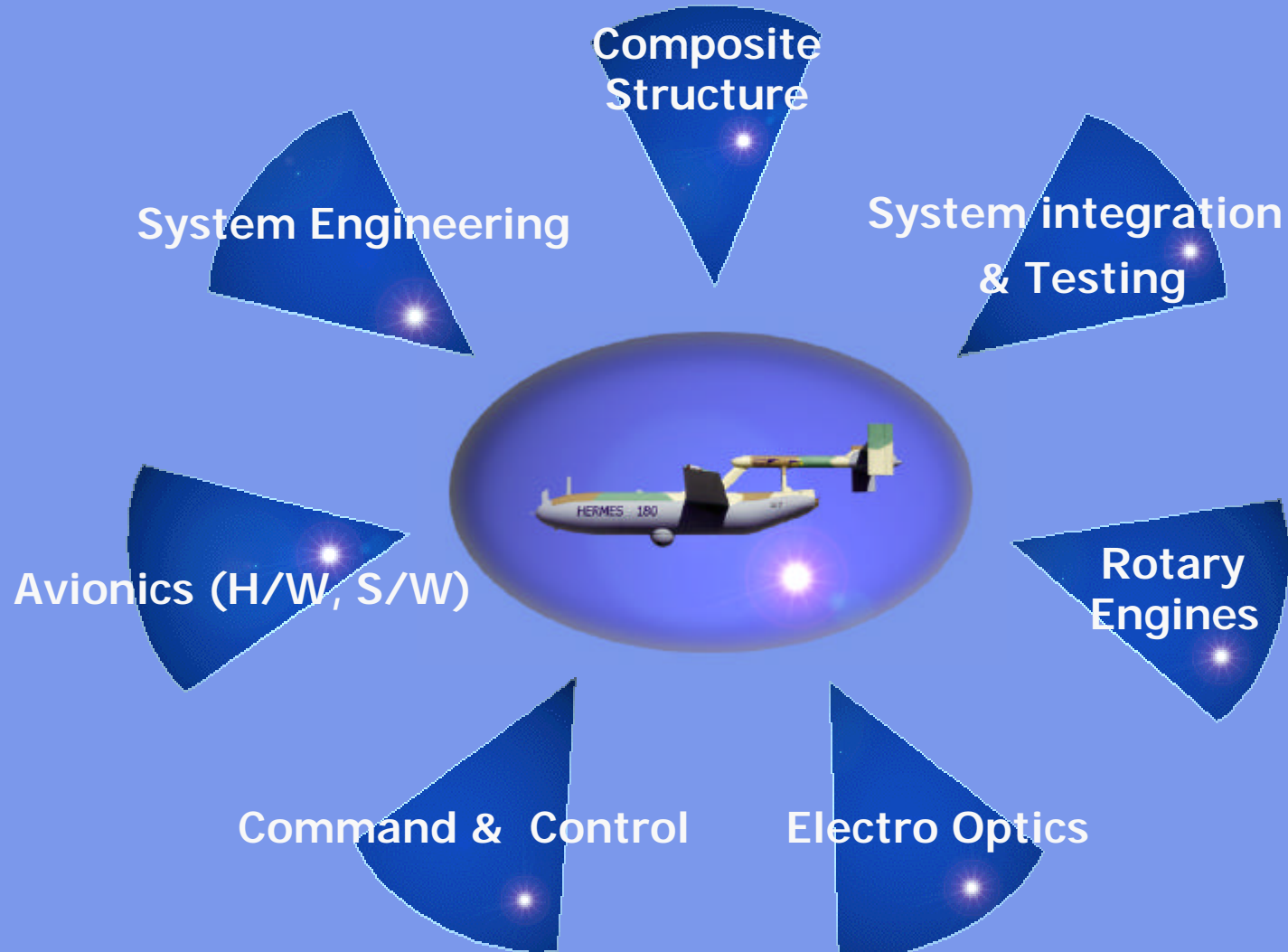
- ☰ Use of main stream technology
- ☰ Use of COTS Hardware & Software
- ☰ Interoperability by easy adaptation to STANAG 4586
(Standard Interfaces for UAV Control Systems)
- ☰ Scalability of the system from RVT to full scale GCS
- ☰ Redundancy and safety emphasis

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Technologies & Expertise



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Human Engineering Approach

- € Advanced operation based on the glass-cockpit design concept
- € Simple and efficient console design that meets the limitations of tactical highly mobile vehicles

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HFE - DESIGN CONCERNS

- ☰ **Multi-function** - the multi-function operation requires a console that gives the operator the means to perform all relevant functions during the different stages of the mission
- ☰ **Grouping** - due to space and manning constraints several functions should be grouped for the same operator to perform
- ☰ **Attention** - most of the functions do not require full time operator attention especially when no malfunction occurs and only monitoring is required

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GCS Positions

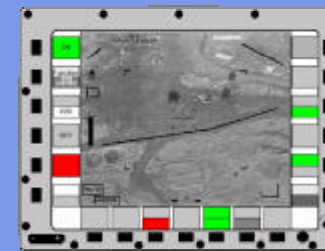
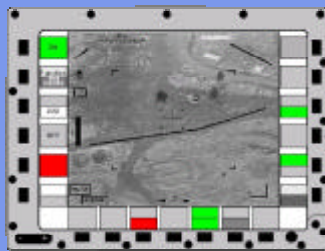
Mission 1



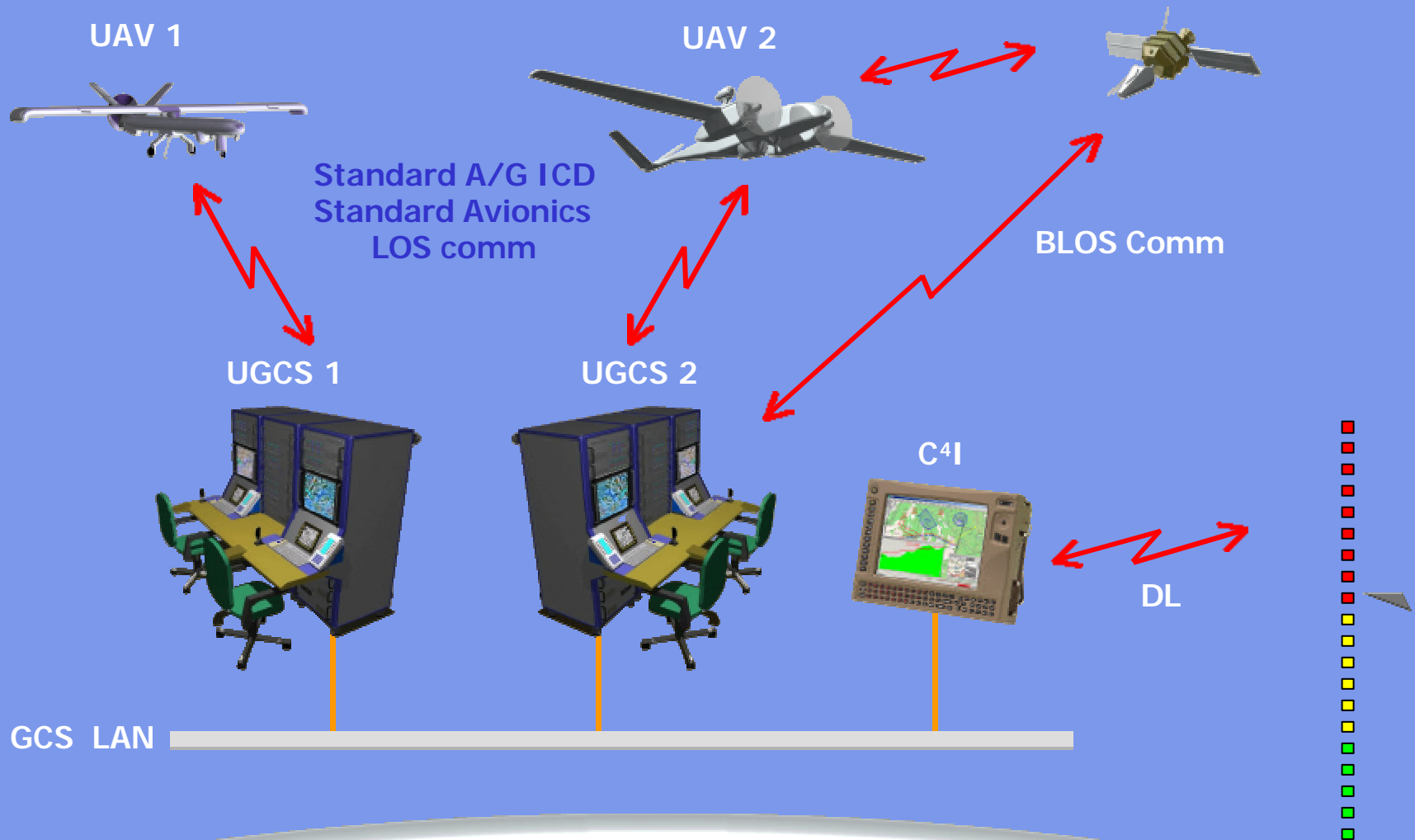
GCS Commander



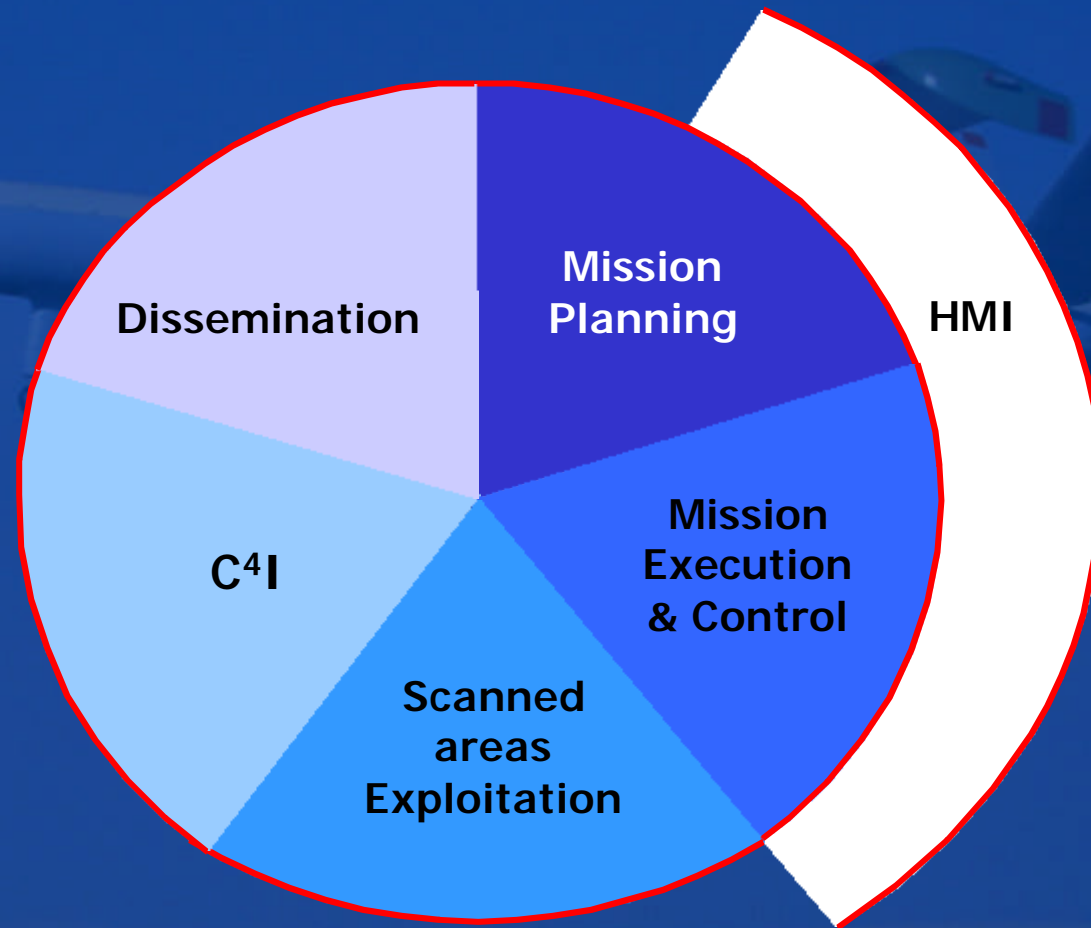
Mission 2



UAV System Concept



SW Modular Components



3 TIER MODEL (Cont')



- Manage user interaction and request application server
- Maps, Forms, Slides, UAV Icon



- Perform business logic & make request to DB
- Components Design distributed to classes
- like devices, payloads, UAV, Data elements Etc



- High performance access to data



Component Based Application

The design of the application components is object-oriented, each object made up of an abstract component and real components

- The abstract component represents the general object (such as a generic UAV)
- the real component represents the real object (such as the Hermes).



Component Based Application

Application components → Modular application

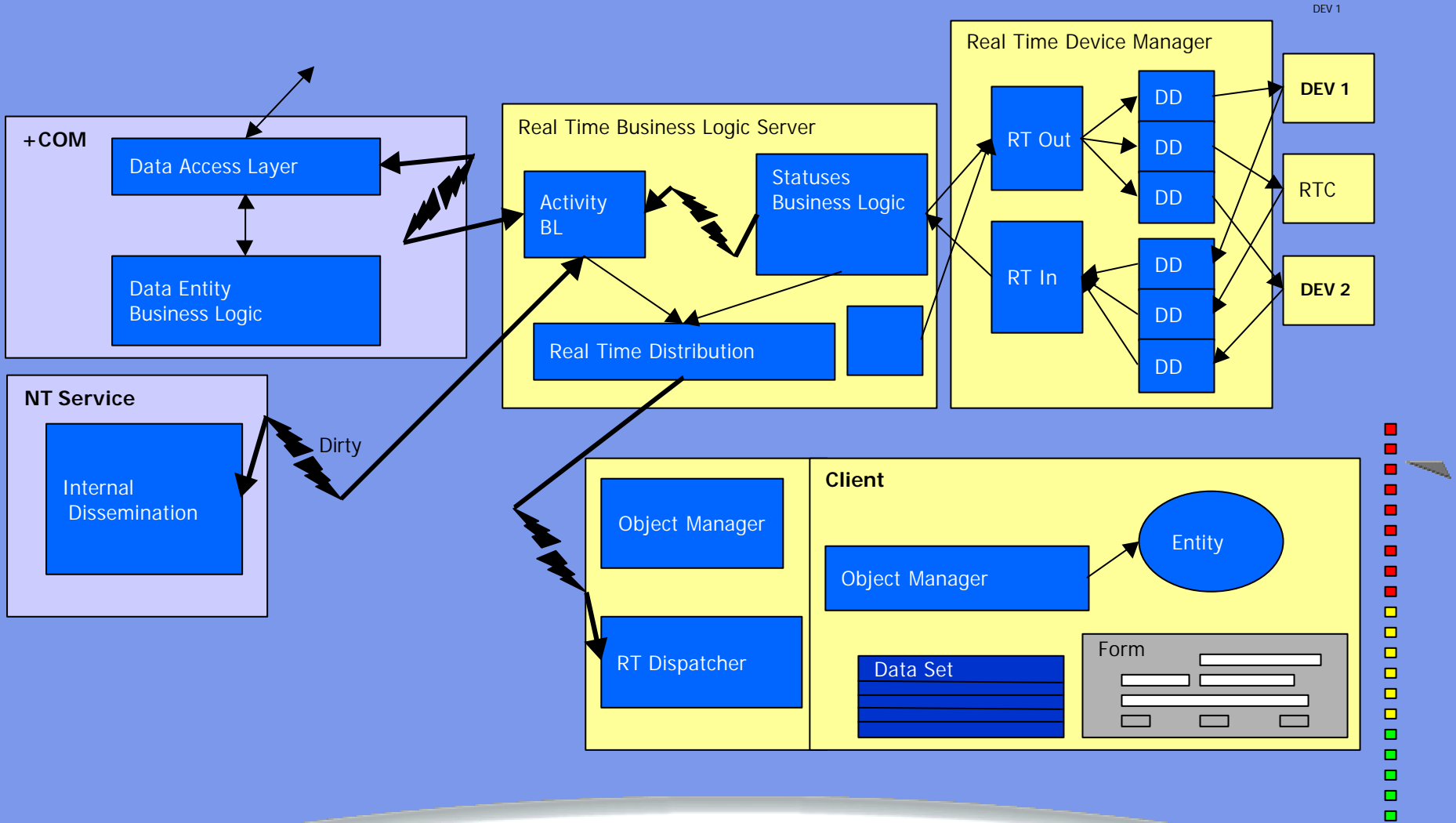
- Easier to maintain - The impact of changes and upgrades can often be isolated down to an individual application component. This isolation simplifies integration and testing.
- Easier to enhance - New capabilities can be added incrementally without impact on the existing functionality usage.
- Easier to reuse

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SW Architecture



Operating Systems

Real Time



VX Works

Client - Server



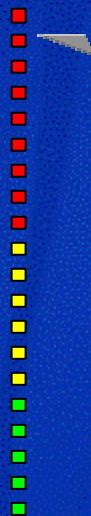
OPS



Fail-Safe Design

The main design principles:

- ☞ RTC and RTC backup controlled by a hot-backup mechanism
- ☞ Similarity of the operator consoles
- ☞ Backup server for the Application Server using a clustering mechanism.
- ☞ Backup DB for the DataBase using RAID 1-level mechanism.
- ☞ Dual redundant LAN.
- ☞ Backup terminal server for the master terminal server using software mechanism in the server for handling the backup.



Safety design

- ☞ Detailed analysis of hazards generators (HW & SW) was done
- ☞ Special treatment (active and tests) is conducted for each hazard and the route that leads to it.

Example -

special CRC is added to uplink messages by the function that generates them. Recheck is performed before transmission to the air vehicle

- ☞ Certification process of the HERMES family UAVs and the UGCS was started.

