



# **UAV Systems in C4ISTAR**

## **RUSI Conference**

### **Meeting C4ISTAR Requirements**

#### **24 September 2002**

#### **Great Malvern, UK**

Presented by:

**Dr Clayton Stewart**

Corporate Vice President

Manager, Reconnaissance and Surveillance Operation

4001 Fairfax Drive, Suite 450

Arlington, Virginia 22203, USA

703-276-3118

Clayton.Stewart@saic.com

<http://www.saic-arlington.com/rso/>

# Report Documentation Page

Form Approved  
OMB No. 0704-0188

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1. REPORT DATE <b>23 AUG 2004</b>		2. REPORT TYPE <b>N/A</b>		3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>UAV Systems in C4ISTAR</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>SAIC 4001 Fairfax Drive, Suite 450 Arlington, Virginia 22203, USA</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM001711 Meeting C4ISTAR Requirements: Implementing and Exploiting Technology Solutions., The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



# UAV Role in Warfare Rapidly Evolving

*Reconnaissance and Surveillance Operation*



- /// Traditional UAV role is “Dirty, Dull, and Dangerous,” but mostly EO/IR reconnaissance
- /// In Future
  - Enabling dynamic LOS and OTH networks comm relay
  - Multiple (SIGINT, IMINT, MASINT, etc) sensor platforms
  - Jamming
  - Targeting
  - Real-time BDA
  - Strike/ JSEAD
  - Overwatch
  - Decoy
  - Rescue/Recovery
  - Battle Management
  - Boost Phase Intercept



**SAIC Vigilante VTOL UAV**



# UAV Trade Space

Reconnaissance and Surveillance Operation



- /// Operational Performance
- /// Communications (Collection data link and C2)
  - Connectivity to what level?
  - Data rate
  - Analog vs digital
  - Compression?
- /// Timeliness
- /// Launch - Ease of use and tasking
- /// Targeting - Provide data to support attack
  - Image Quality – Interpretability
  - Target Dwell - What is the “in-view” revisit rate
- /// Range - What range is sufficient
- /// Location/Accuracy - What is target geolocation (CEP)
- /// Survivability
- /// Recovery – Recoverable, expendable or disposable
- /// Endurance
  - What on station time is required
- /// Environment/ Meteorology - Wind, altitude, rain, etc
- /// Tactical Mobility –
  - Man or vehicle transportable
  - Air transportability
- /// Interoperability
  - Who needs to know?
  - Who needs to control?
- /// Lethal or nonlethal
- /// Payload performance vs cost and footprint



# Current Pentagon UAV Study Findings

According to Defense News

*Reconnaissance and Surveillance Operation*

- ⚡ UAV unit cost must be reduced drastically.
- ⚡ Demand from U.S. military battlefield commanders is high.
- ⚡ UAVs that have emerged from advanced technology demonstrations
  - are difficult for military logisticians to support and
  - have limited growth potential.



# Key Performance Parameters (KPP)

Reconnaissance and Surveillance Operation



## Payload

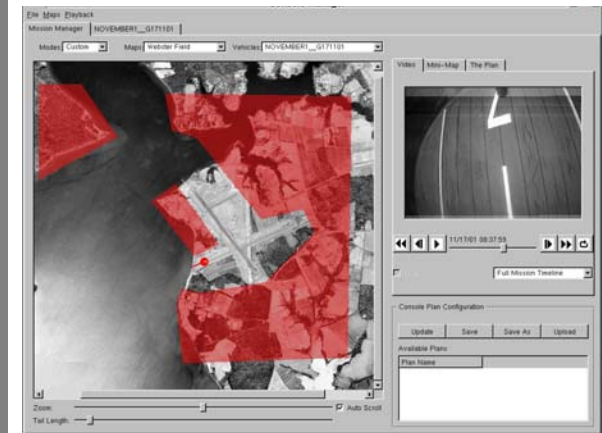
- Field of View
- Resolution
- Weight
- Weather Effects
- Bandwidth Required
- Power Required
- Size
- Cost

## C4I System

- Data Link range
- Bandwidth
- C4I Infrastructure connectivity
- LPI/LPD
- Data integrity

## Airframe

- Speed (Max, Loiter)
- Range
- Endurance
- Span (Max, Min)
- Vehicle Gross Weight
- Payload Weight
- Payload Volume
- Payload Power Required
- Altitude
- Radar Cross Section
- Cost (Acquisition, O&M)



## Operational

- Mission Planning time
- Launch/ Recover time
- Launch/Recover Constraints
- Time to Retask
- Imaging Rate
- Collection Efficiency
- Exploitation Time
- Manpower Required

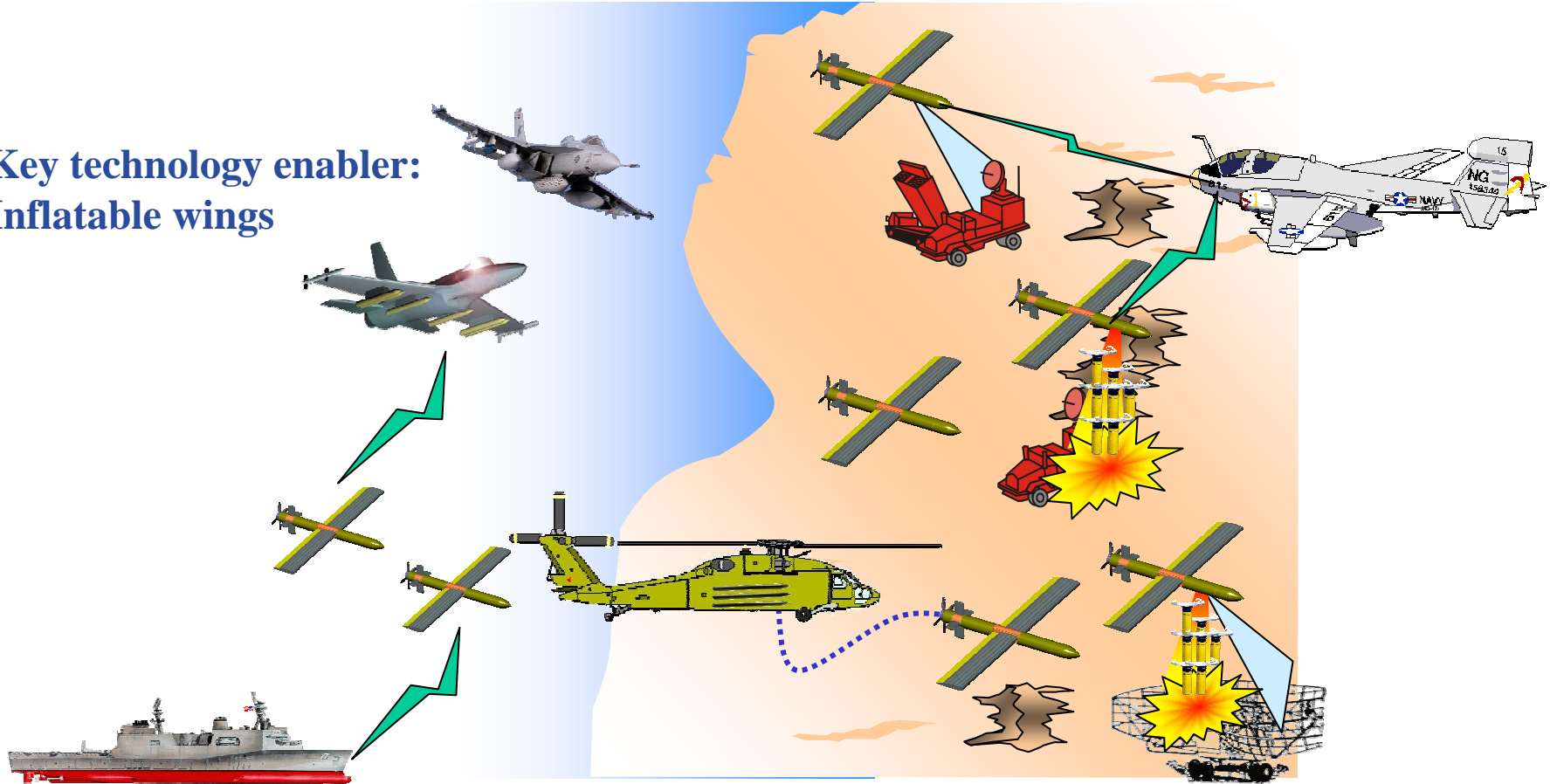


# Loitering Electronic Warfare Killer (LEWK) Concept

Reconnaissance and Surveillance Operation



Key technology enabler:  
Inflatable wings



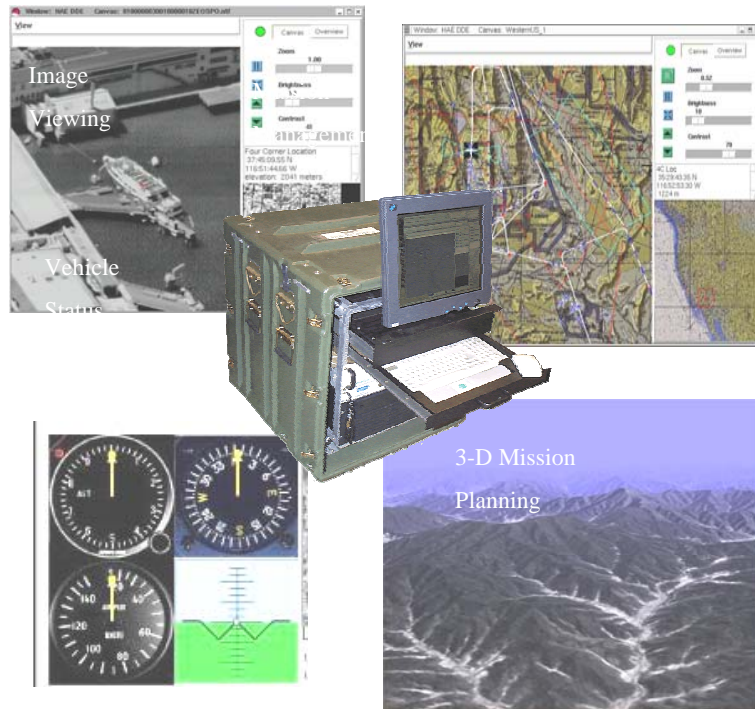


# Tactical UAV Imperatives

Reconnaissance and Surveillance Operation



## Reconfigurable Ground Stations and Analysis Tools



### Adaptable Processes

- ▄ Rapid prototyping to meet steadily evolving requirements
- ▄ Low-cost system design and fabrication
- ▄ Integration of COTS
- ▄ Spiral software development
- ▄ Low cost material fabrication

*QuickLook and LEWK Prototypes*





# UAV's and Network Centric Warfare

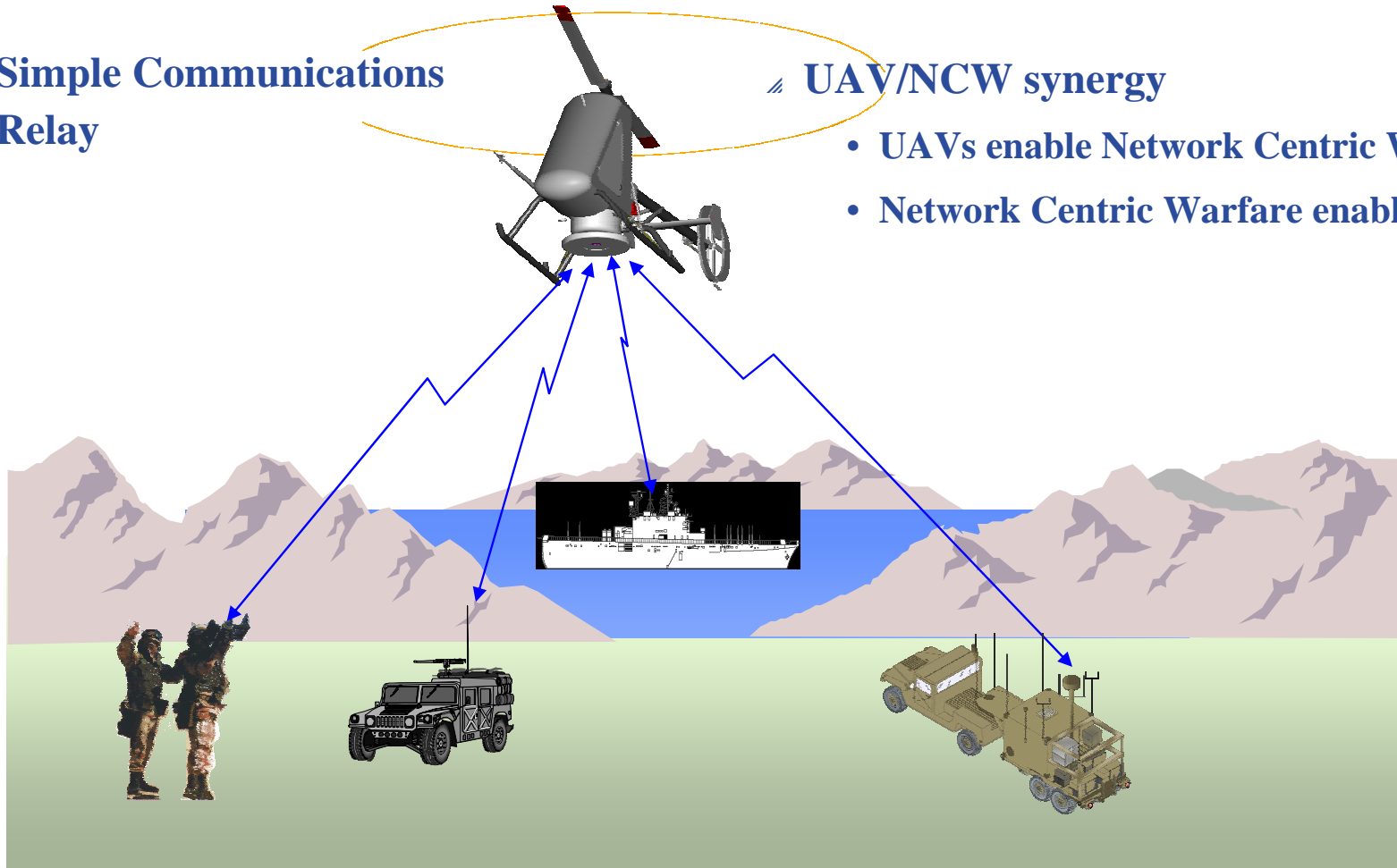
Reconnaissance and Surveillance Operation



Simple Communications  
Relay

UAV/NCW synergy

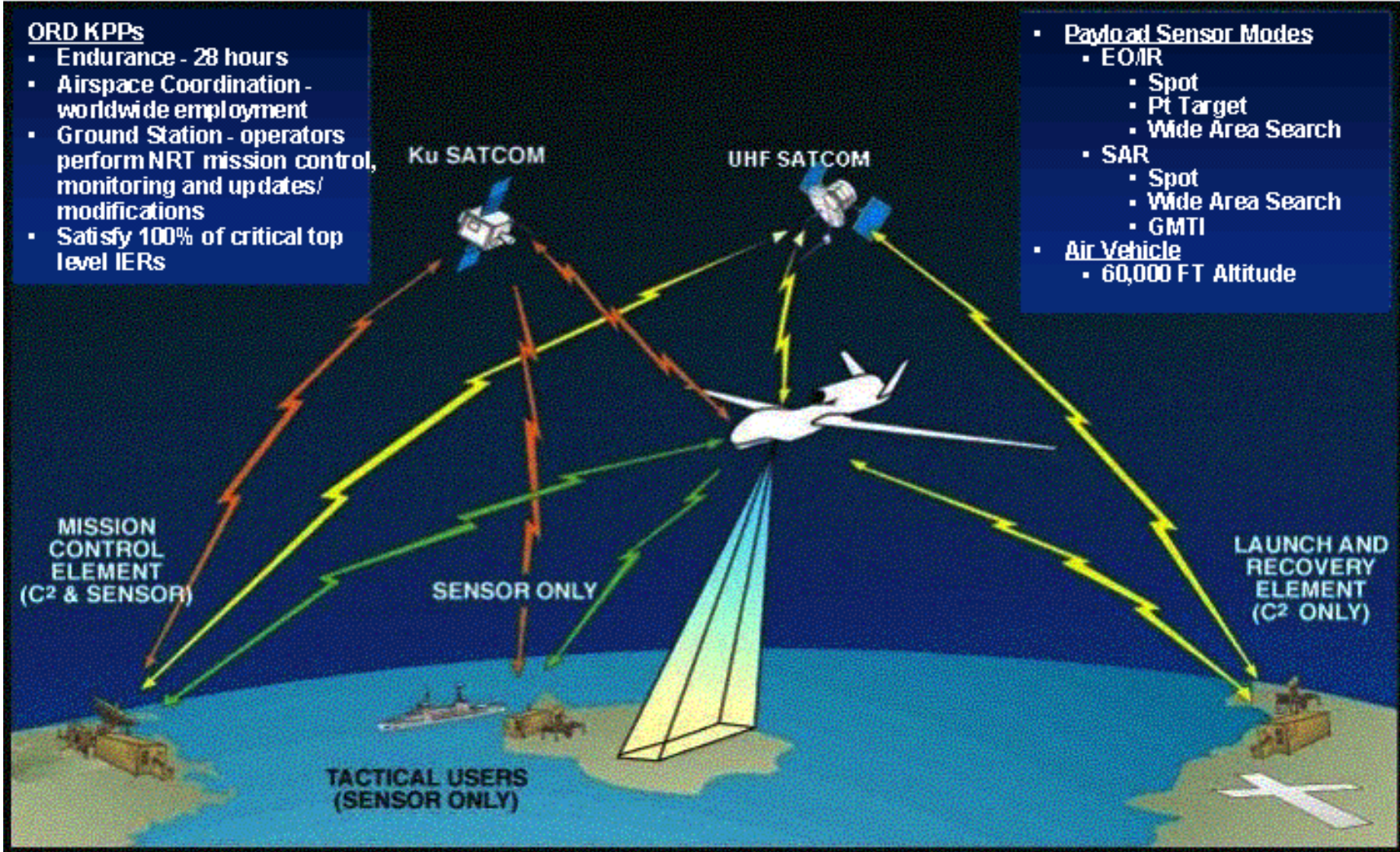
- UAVs enable Network Centric Warfare
- Network Centric Warfare enables UAVs





# Low-Cost Dissemination and Imagery Exploitation Platform for Global Hawk

Reconnaissance and Surveillance Operation



**ORD KPPs**

- Endurance - 28 hours
- Airspace Coordination - worldwide employment
- Ground Station - operators perform NRT mission control, monitoring and updates/modifications
- Satisfy 100% of critical top level IERs

**Payload Sensor Modes**

- EO/IR
  - Spot
  - Pt Target
  - Wide Area Search
- SAR
  - Spot
  - Wide Area Search
  - GMTI
- Air Vehicle
  - 60,000 FT Altitude



# UAV Ground Station Technologies

Reconnaissance and Surveillance Operation



64 kbps  
– 6 Mbps



1.8m dish  
8 watts

64 kbps  
– 6 Mbps



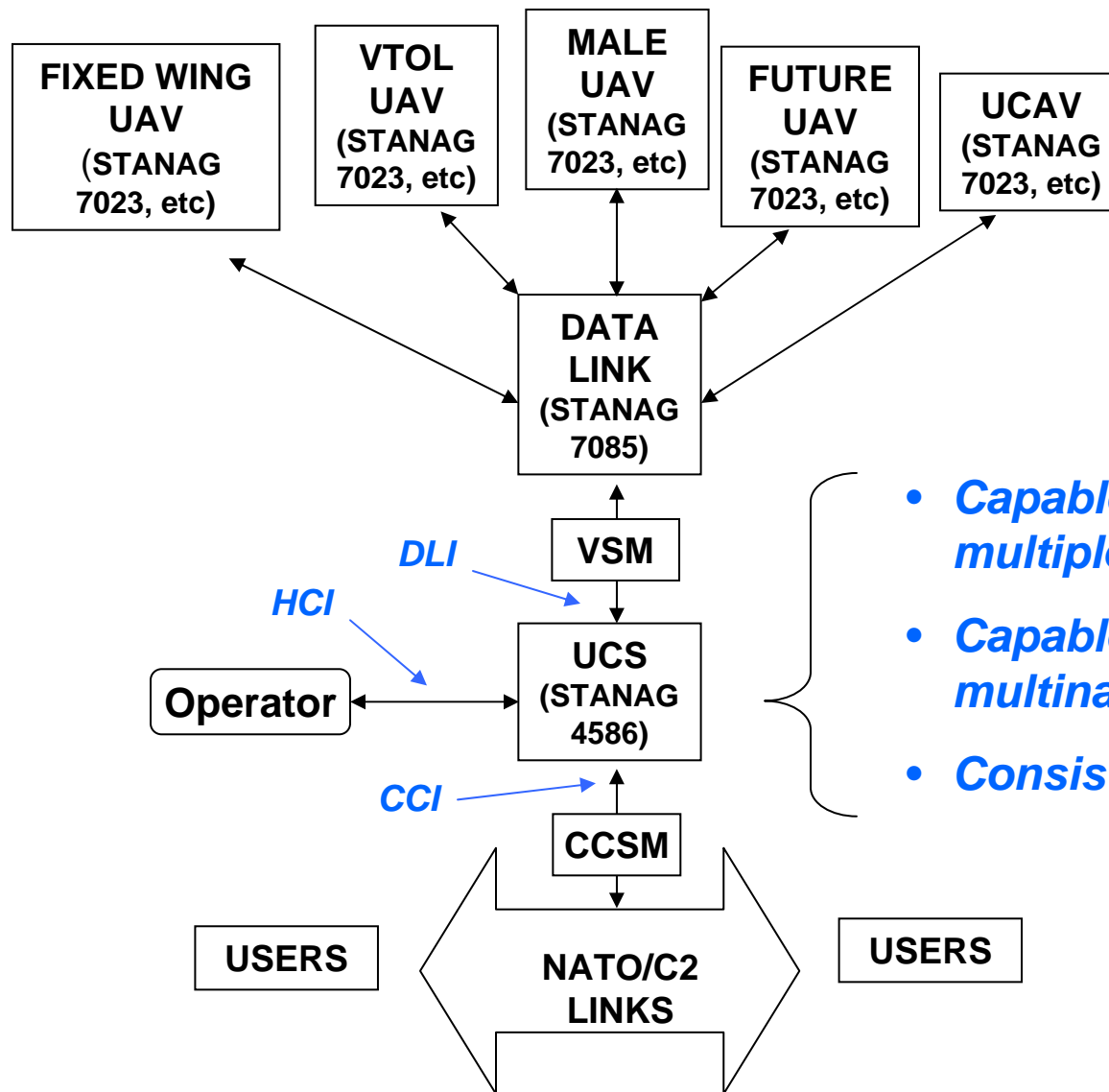
1.8m dish  
8 watts





# Standards Are Important

## NATO UAV Control System Architecture



- Capable of controlling multiple vehicle types
- Capable of interfacing with multinational C4I systems
- Consistent look-and-feel