



U.S. UNCLASSIFIED

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***United States Military  
Unmanned Aerial Systems  
(UAS)  
Spectrum Management  
Challenges - Update***

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# *UAS Trends*

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- **Substantial U.S investment far beyond 2020**
- **New strike, surveillance, and special forces missions**
- **New communication and sensor requirements being evaluated**
- **Wide mixture of platforms with flexible tasking – DoD (now with DHS and FAA interest)**



# *UAS Trends*

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- **Growing bandwidth and multiple band requirements**
- **Sensors and communications driving factors**
- **Potential Mitigation Techniques**
  - **Data compression**
  - **Bandwidth efficient modulation techniques**
  - **Smart Pull**



# *Example UAS Spectrum Needs*

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	<b>&lt;1GHz</b>	<b>1 – 6 GHz</b>	<b>6- 10 GHz</b>	<b>&gt;10 GHz</b>
<b>Dragon Eye</b>	<b>X</b>	<b>X</b>		
<b>Pointer</b>	<b>X</b>	<b>X</b>		
<b>Shadow</b>	<b>X</b>	<b>X</b>		
<b>Hunter</b>		<b>X</b>		
<b>Predator</b>		<b>X</b>		<b>X</b>
<b>Global Hawk</b>	<b>X</b>		<b>X</b>	<b>X</b>

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# UAS Spectrum Needs

(Communications Links, NAVAIDS, Sensor)

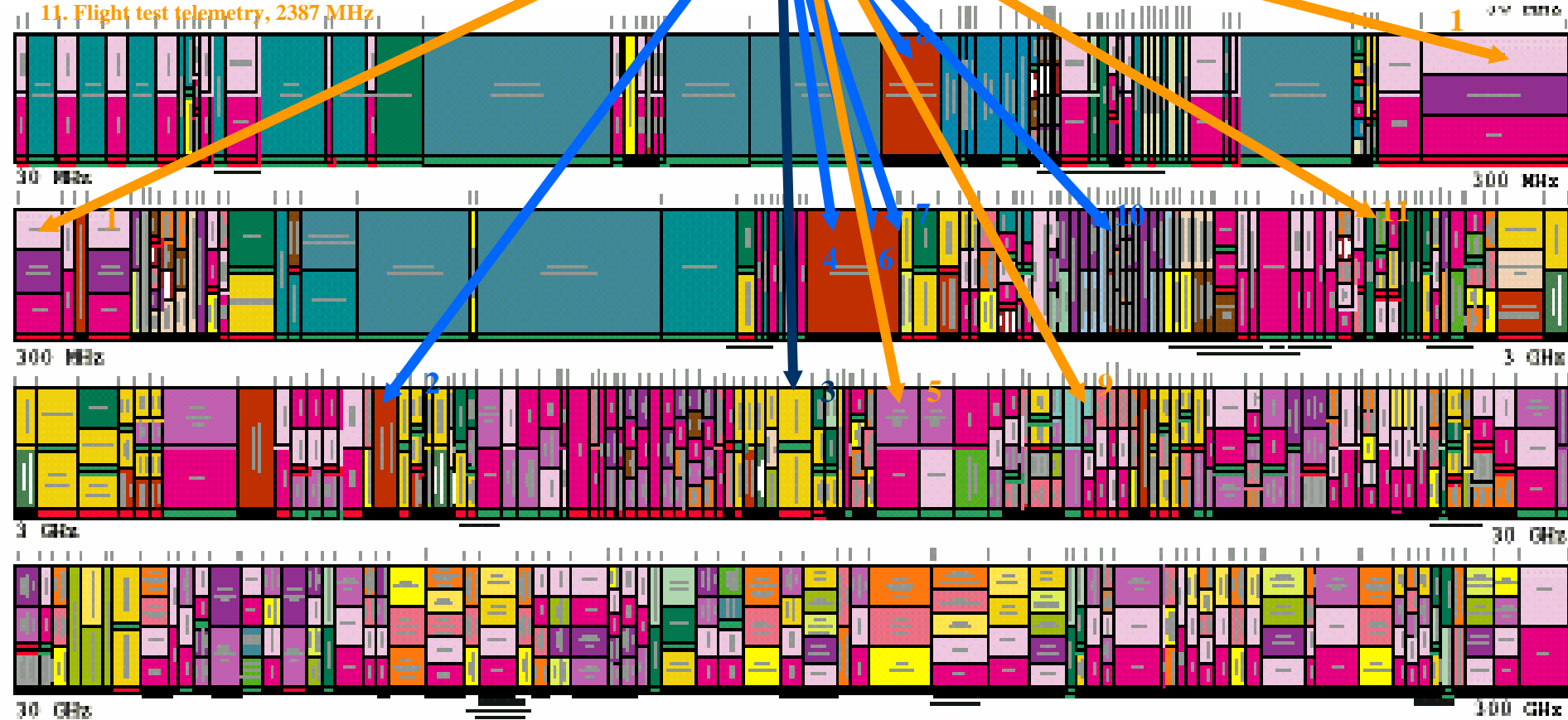
## RF Link, Frequency

1. UHF Satcom, 225 - 400 MHz
2. Radar Altimeter, 4300 MHz
3. Sensor suite, 8 - 10 GHz
4. IFF, 1030 MHz
5. Ku Commercial Satcom Downlink, 11.7 GHz
6. IFF, 1090 MHz
7. GPS L2, 1227 MHz
8. Differential GPS, 113 MHz
9. Ku Satcom Uplink, 14.0 GHz
10. GPS L1, 1575 MHz
11. Flight test telemetry, 2387 MHz



## Band Allocations

- █ = Exclusive Federal
- █ = Exclusive Civil
- █ = Shared Federal/Civil



# Current UAS Architecture

## Altitude

High (>50K ft.)

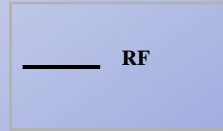
Medium (10-40K ft.)

Low (<15K ft.)

Surface



Satellite Segment



RQ-4 Global Hawk



Hunter UAS



Predator



SUAS



Pioneer

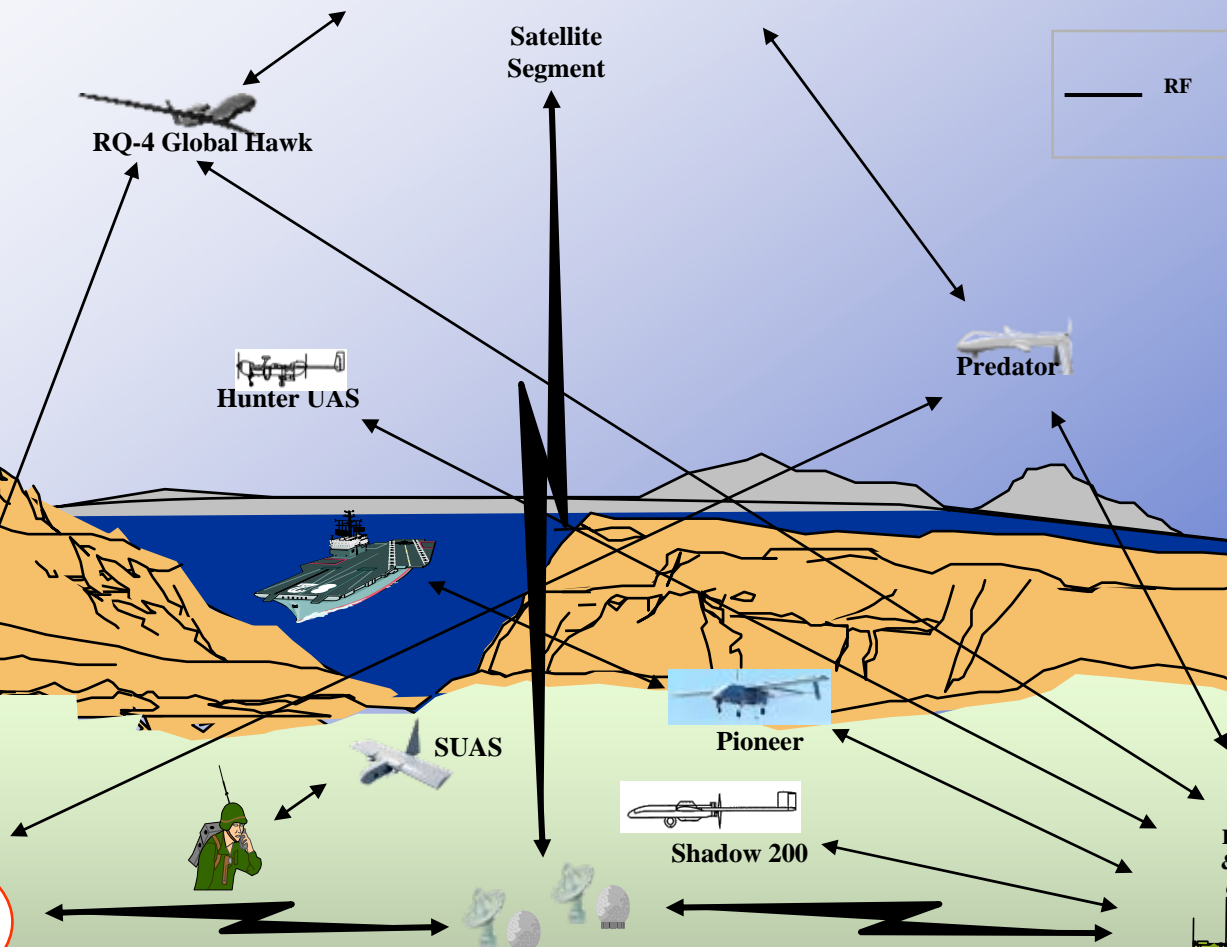


Shadow 200



Fixed UAS  
Processing and  
Exploitation  
Node

Forward Deployed UAS  
Processing and  
Exploitation Node/Launch  
& Recovery Element (may  
or may not be collocated)





# *DoD Goals*

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- **Medium-Large UAS:**
    - Line of sight links UAS migrate to 14/15 GHz Band for some systems (alternative bands noted)
    - Beyond line of sight links migrate to military satellite platforms 20/30 GHz considered the best solution
  - **SUAS:**
    - Spectrum flexibility with multiple channels & multiple bands
    - Prior notification and coordination of SUAS usage in theater with the COCOMS is essential
  - **National Air Space Concerns:**
    - Work closely with NTIA, FCC and FAA to address safety and control issues
    - Evaluating Spectrum Requirements for Support of U.S. Policy Goals
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