



# *US Central Command*

Importance of the Stratosphere to CENTCOM

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**Acting**

**Requirements & Technology Chief**

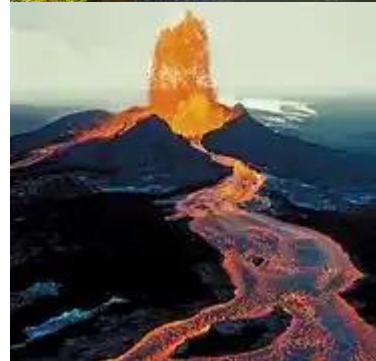
**CCJ8**







# Why North Dakota/Grand Forks?







# Why North Dakota/Grand Forks?







# Why North Dakota/Grand Forks?





# UNIFIED COMBATANT COMMAND'S AREA OF RESPONSIBILITY

**U.S. SPACE COMMAND**



**U.S. NORTHERN COMMAND**



**U.S. EUROPEAN COMMAND**



**U.S. CENTRAL COMMAND**



**U.S. AFRICA COMMAND**



**U.S. INDO-PACIFIC COMMAND**



**FUNCTIONAL COMBATANT COMMAND**

- U.S. Special Operations Command
- U.S. Transportation Command
- U.S. Strategic Command
- U.S. Cyber Command

**U.S. SOUTHERN COMMAND**







# Characteristics of the USCENTCOM AOR

- **World's most energy- rich region**
  - 50% of world's petroleum reserves
  - 45% of natural gas reserves
- **Strategic choke points**
  - Bab al Mandeb
  - Suez Canal
  - Strait of Hormuz
- **Religious, ethnic, and tribal tensions**
- **Youth Bulge**
  - 15-29 age group constitutes over 40% of the population in the vast majority of 20 states
- **Inadequate economic development, insufficient basic services, and poor governance**



- 20 Countries Spanning 4.6M Sq Miles
- 530 Million People
- Home to 3 of the world's 5 Major Religions
- 18 Major Languages/22 Ethnic Groups



# Who Says it's Important?



HOME > ABOUT US > COMMAND PRIORITIES

## Command Priorities

### CENTCOM Priorities



## U.S. Central Command Priorities

### Lines of Effort



1. Deter Iran



2. Counter Violent Extremist Organizations



3. Compete Strategically

### Functional Priorities



Regional Constructs



Integrated Air and Missile Defense/Counter Unmanned Aerial systems



3 Aug 2022



## *Why the Stratosphere?*





# Nat'l Defense Strategy/Nat'l Security Strategy



- **RAPIDLY FIELD INVENTIONS AND INNOVATIONS**: The United States must regain the element of surprise and field new technologies at the pace of modern industry. Government agencies must shift from an archaic R&D process to an approach that rewards rapid fielding and risk taking
- **New commercial technology will change society and, ultimately, the character of war.** The fact that many technological developments will come from the commercial sector means that state competitors and non-state actors will also have access to them, a fact that risks eroding the conventional overmatch to which our Nation has grown accustomed. Maintaining the Department's technological advantage will require changes to industry culture, investment sources, and protection across the National Security Innovation Base.



# Nat'l Defense Strategy/Nat'l Security Strategy



- **Evolve innovative operational concepts.** Modernization is not defined solely by hardware; it requires change in the ways we organize and employ forces. We must anticipate the implications of new technologies on the battlefield, rigorously define the military problems anticipated in future conflict, and foster a culture of experimentation and calculated risk-taking. We must anticipate how competitors and adversaries will employ new operational concepts and technologies to attempt to defeat us, while developing operational concepts to sharpen our competitive advantages and enhance our lethality.
- **Deliver performance at the speed of relevance.** Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting. Current processes are not responsive to need; the Department is over-optimized for exceptional performance at the expense of providing timely decisions, policies, and capabilities to the warfighter. Our response will be to prioritize speed of delivery, continuous adaptation, and frequent modular upgrades. We must not accept cumbersome approval chains, wasteful applications of resources in uncompetitive space, or overly risk-averse thinking that impedes change. Delivering performance means we will shed outdated management practices and structures while integrating insights from business innovation.





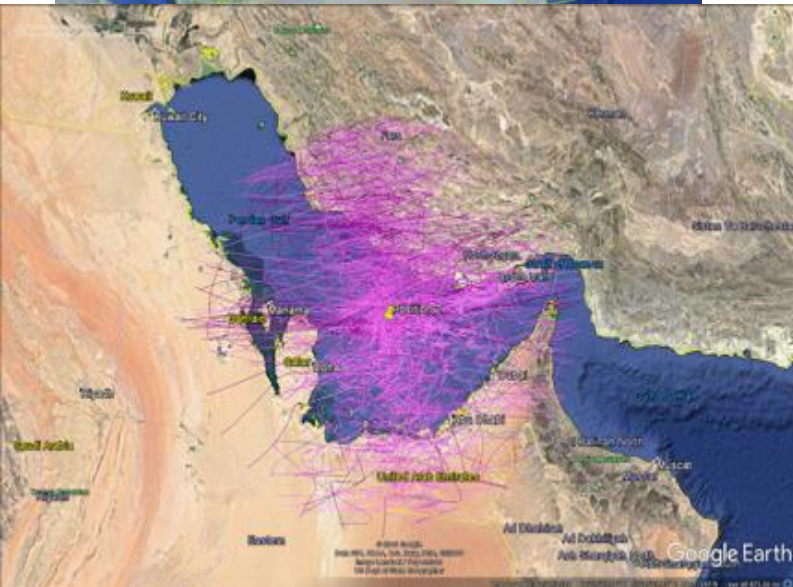
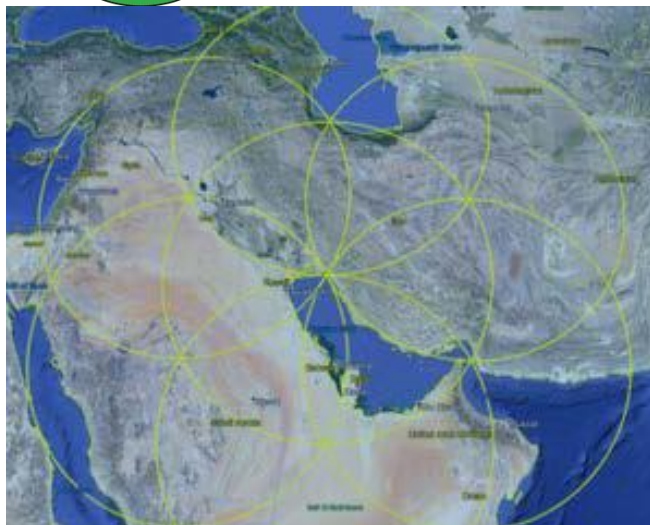
# Nat'l Defense Strategy/Nat'l Security Strategy



- **Organize for innovation.** The Department's management structure and processes are not written in stone, they are a means to an end—empowering the warfighter with the knowledge, equipment and support systems to fight and win. Department leaders will adapt their organizational structures to best support the Joint Force. If current structures hinder substantial increases in lethality or performance, it is expected that Service Secretaries and Agency heads will consolidate, eliminate, or restructure as needed. The Department's leadership is committed to changes in authorities, granting of waivers, and securing external support for streamlining processes and organizations



# Why the Stratosphere?



**AFWERX – U.S. Central Command**





**Operationalizing the Stratosphere**

**Working Group Meeting**

**12–15 June 2018**





# ***CDR USCENTCOM Comments***



**PRESS RELEASE | Oct. 7, 2022**

**U.S. Central Command Hosted an Intelligence,  
Surveillance and Reconnaissance Summit**

**USCENTCOM**

**October 7, 2022**

**Release Number 20221007-04**

**FOR IMMEDIATE RELEASE**



# ***CDR USCENTCOM Comments***



**TAMPA, Fla. – U.S. Central Command hosted an Intelligence, Surveillance and Reconnaissance summit, Oct. 5-6, 2022, at USCENTCOM headquarters. The technology innovation discovery event focused on long-endurance alternate airborne ISR capabilities to solve continuity gaps across the USCENTCOM area of responsibility.**





# ***CDR USCENTCOM Comments***



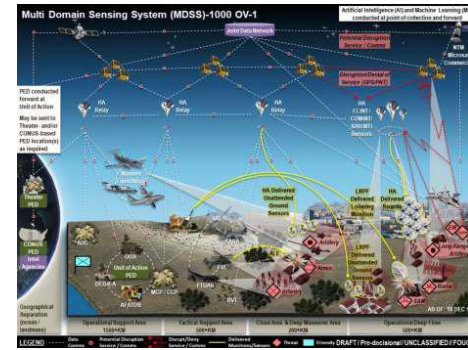
**“The U.S. military does not have a monopoly on good ideas for the employment of new technology,” said Gen. Michael “Erik” Kurilla, commander of USCENTCOM. “We have troops in harm’s way; bringing in leading experts from defense, technology, industry, and academia, along with pioneers in physics research to share knowledge will inspire the kind of innovation our warfighters require. The threats in the region, rapid technological change, and competition for resources in the USCENTCOM area of responsibility require us to reexamine and reinvent our future approach to airborne ISR.”**



# Strategic Guidance



- **Joint Concept Driven, Threat Informed, Capability Development**
  - **Joint Operating Environment 2035**
    - *Emergence of micro/nano-satellites and near-space capabilities.* Micro/nano-satellites, as well as **ultra-high altitude aircraft and balloons**, will continue to replace large satellites because they are considerably cheaper and faster to build and launch. These advances will likely lead to improved reliability, with networks of small satellites and **stratospheric swarms** performing the tasks previously reserved exclusively for large satellites.
      - **Global Hunter Wargame AAR (Classified): INDOPACOM “Right about now we’d be using constellations of stratospheric systems to press ahead with Joint Fires and C5ISR”**
      - **ARMY Multi-Domain Sensing System (MDSS)-1000 roadmap.**
        - **High-Altitude Extended-Range Long Endurance Intelligence Observation System, or HELEIOS,**
      - **Space-Based Solar proposals-Leverages Stratospheric Platforms**

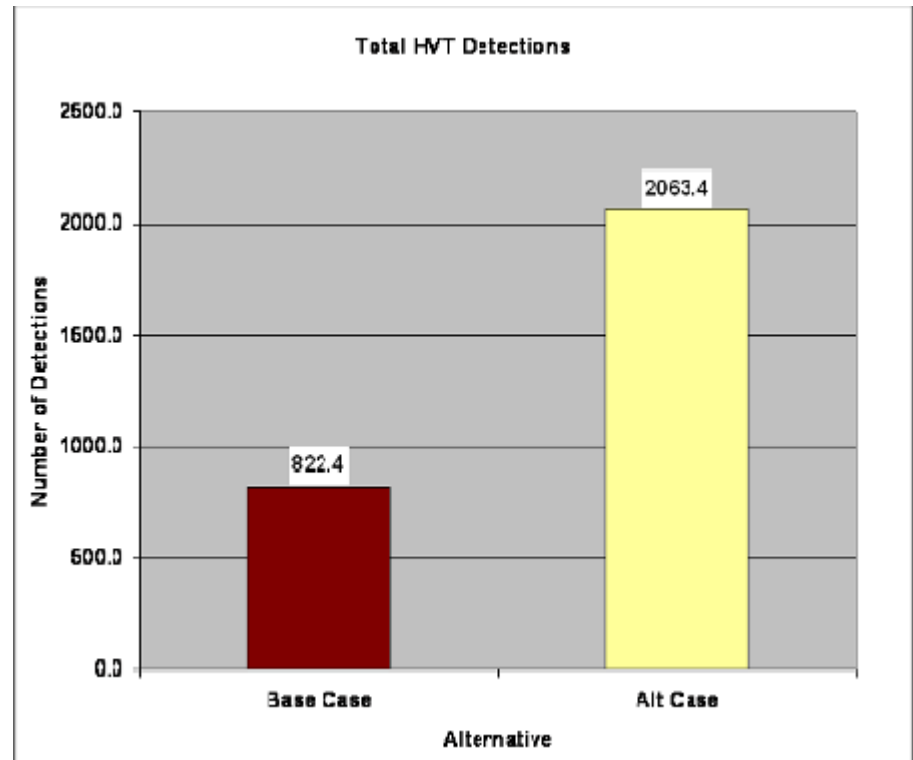




# ARMY Wargame Results



- HA Long Loiter capability provided more robust coverage
  - 145% increase in total HVT identifications
- High Altitude enabled capabilities allow the Blue Force to achieve more situational awareness (SA)
  - 175% increase in cumulative percent SA





# ***The Nature of Our Enemy***

- A network guided by ideology; fueled by militant zeal
- Amorphous global network which operates as a web of cells; stateless
- Powerful “Virtual Caliphate” - All directed toward the eventual establishment of a “Physical Caliphate”
- Seek safe-havens, physical footholds for recruitment, training, financing, and propaganda initiatives which complement its virtual element
- Well financed & has a simplified acquisition/training/fielding strategy
- Does not follow accepted international norms
  - Rule of Law; Law of Armed Conflict
  - Representative Government
  - Generally accepted societal behavior

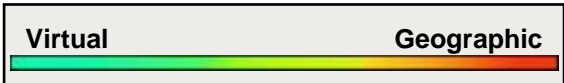


# Violent Extremist Organizations: A Threat in All Realms



Recruitment and Education

Internet and Proselytizing



Media and Propaganda

Ideologically Sympathetic NGO's

Financiers

Facilitators, Smugglers

Technical Expertise, Weapons Suppliers

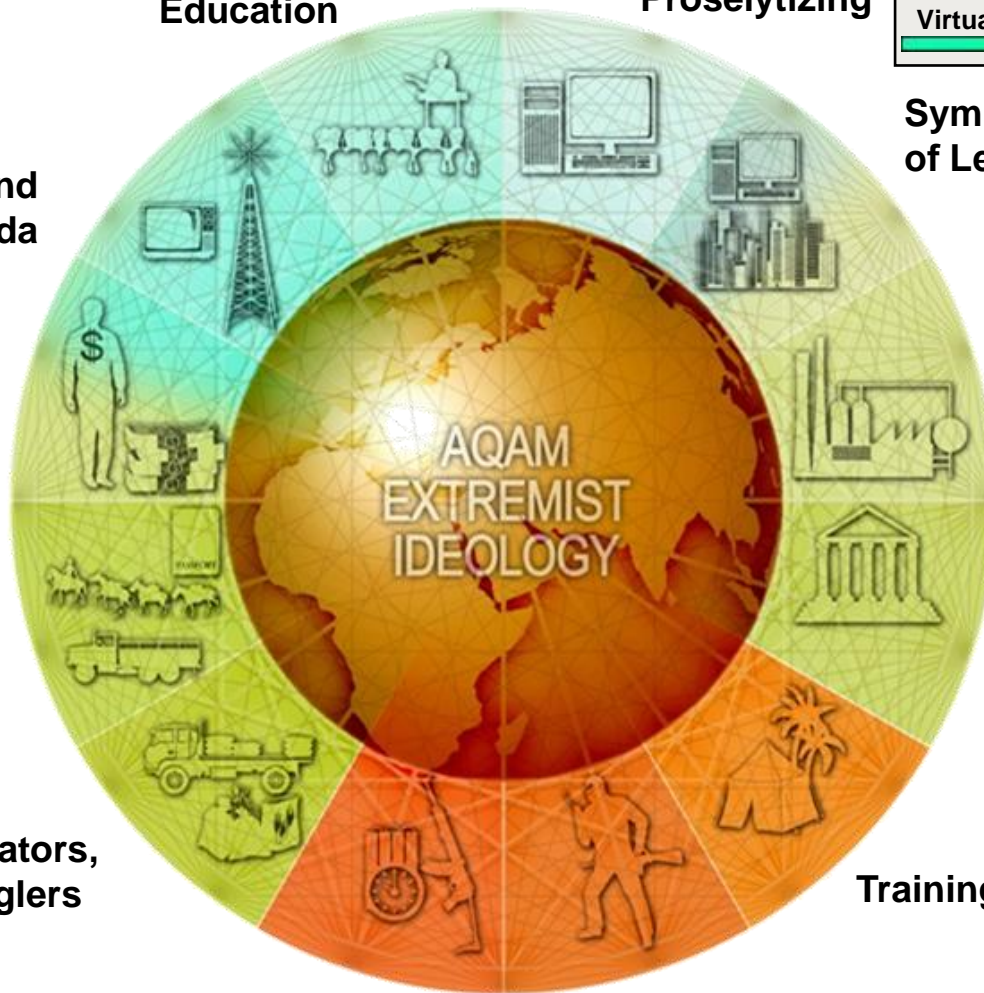
Human Capital, Fighters and Leaders

Sympathetic Members of Legitimate Govt's

Front Companies

Safe Havens

Training Camps







# *It Takes a Network To Defeat a Network*



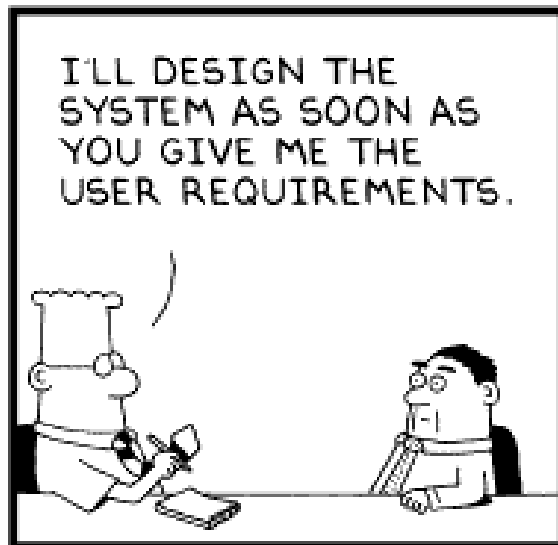












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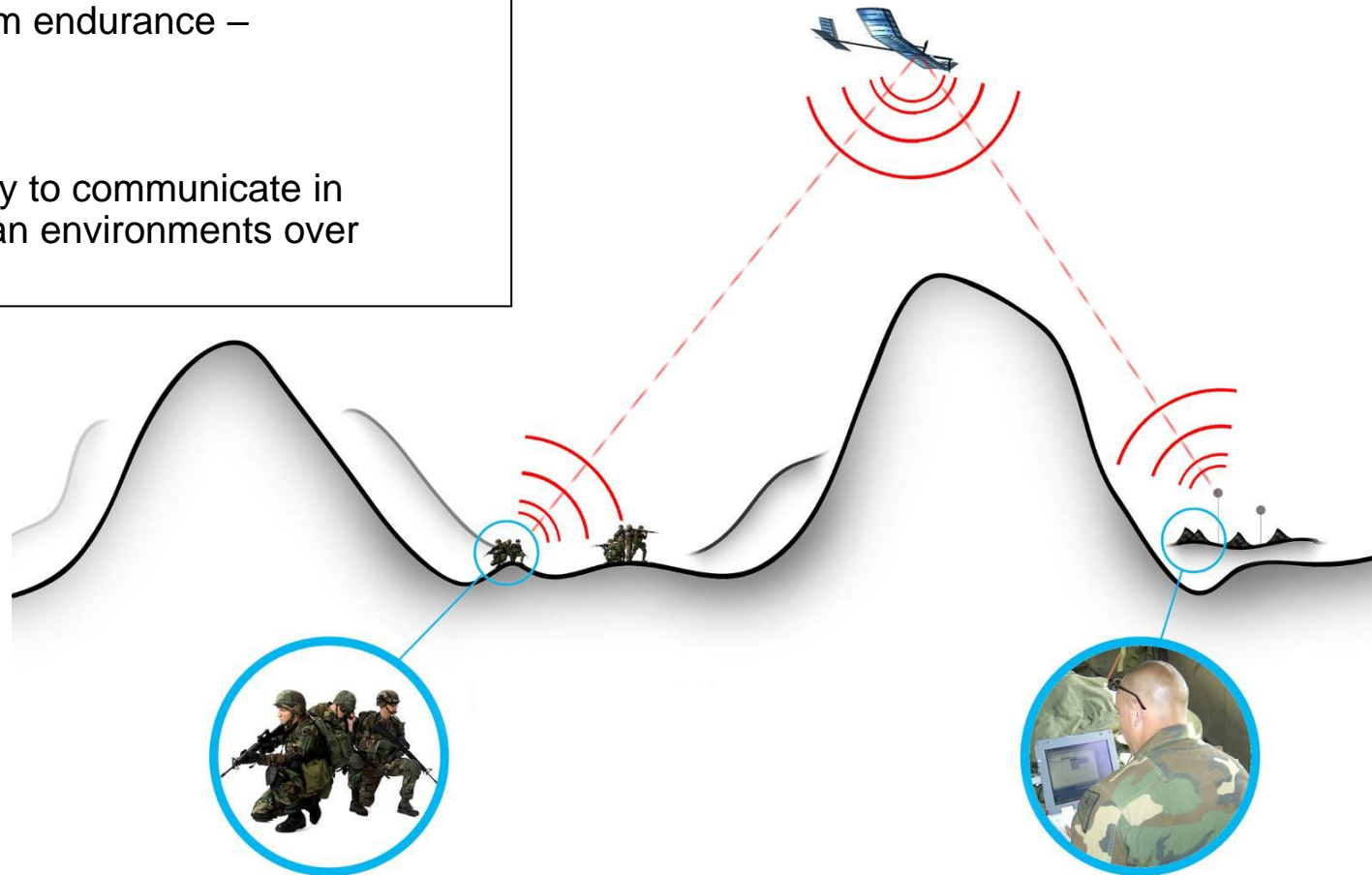


# ZEPHYR JCTD

## Solution



- Integrate a five-pound communications payload
- Demonstrate an objective altitude of 65K ft with a threshold of 45K
- Demonstrate maximum endurance –
  - ❑ *Objective = 2 Weeks*
  - ❑ *Threshold = 1 Week*
- Demonstrate the ability to communicate in mountainous and urban environments over extended ranges





# ~CIRCA 2008 ZEPHYR JCTD

## Problem/Objective



### Problem:

Current operations in Iraq and Afghanistan are stretching the limit of our forces to maintain communications across distance and terrain. The warfighter lacks an affordable tactical and operational means to communicate with dispersed forces. The cost to fill this gap with manned aircraft is approximately \$92 million per year.



### Objective:

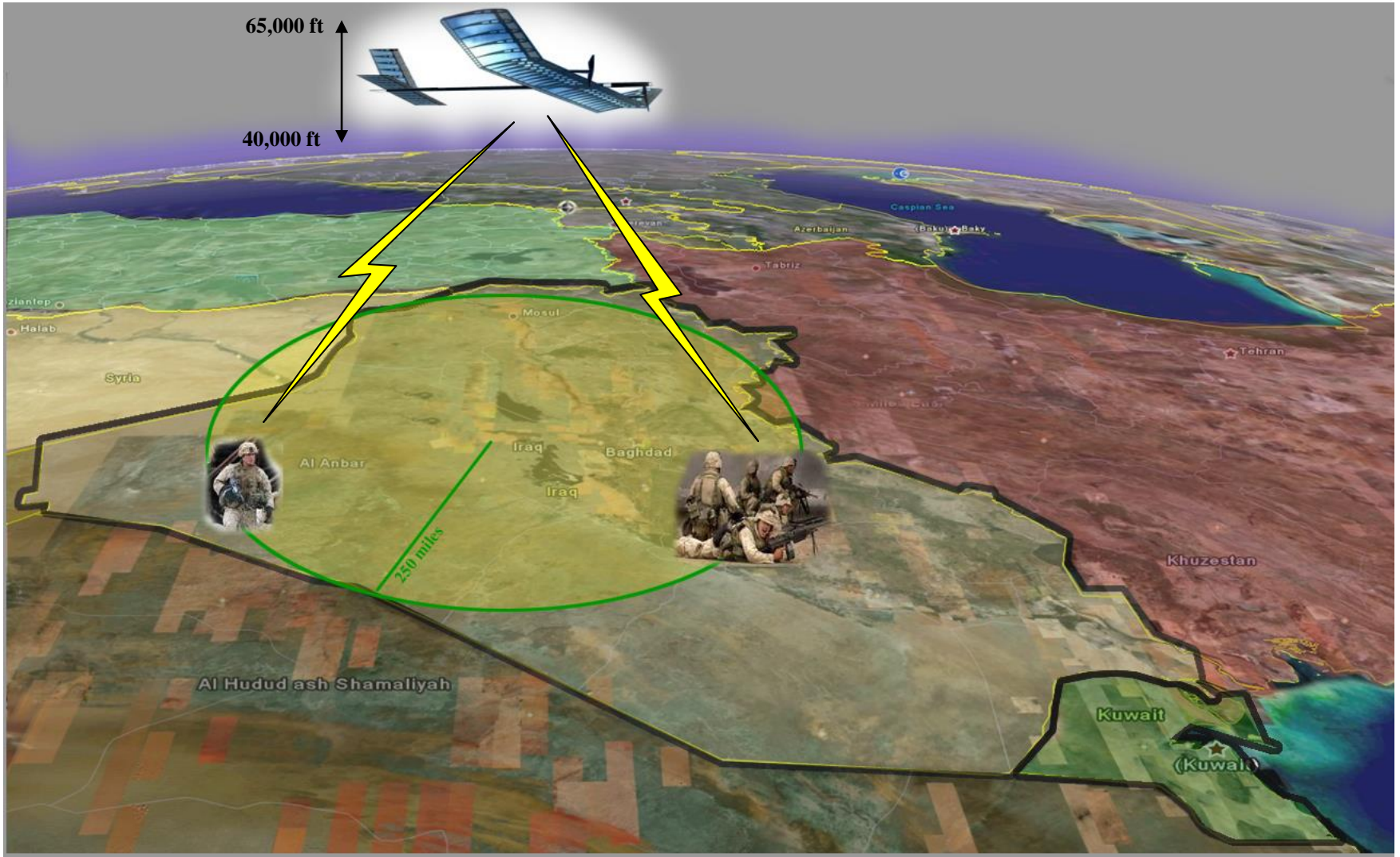
Provide a low cost persistent communications relay platform capable of long endurance and extended range without the need for a significant forward footprint.





# ZEPHYR JCTD

## Concept of Operations











# Aerostat Fleet

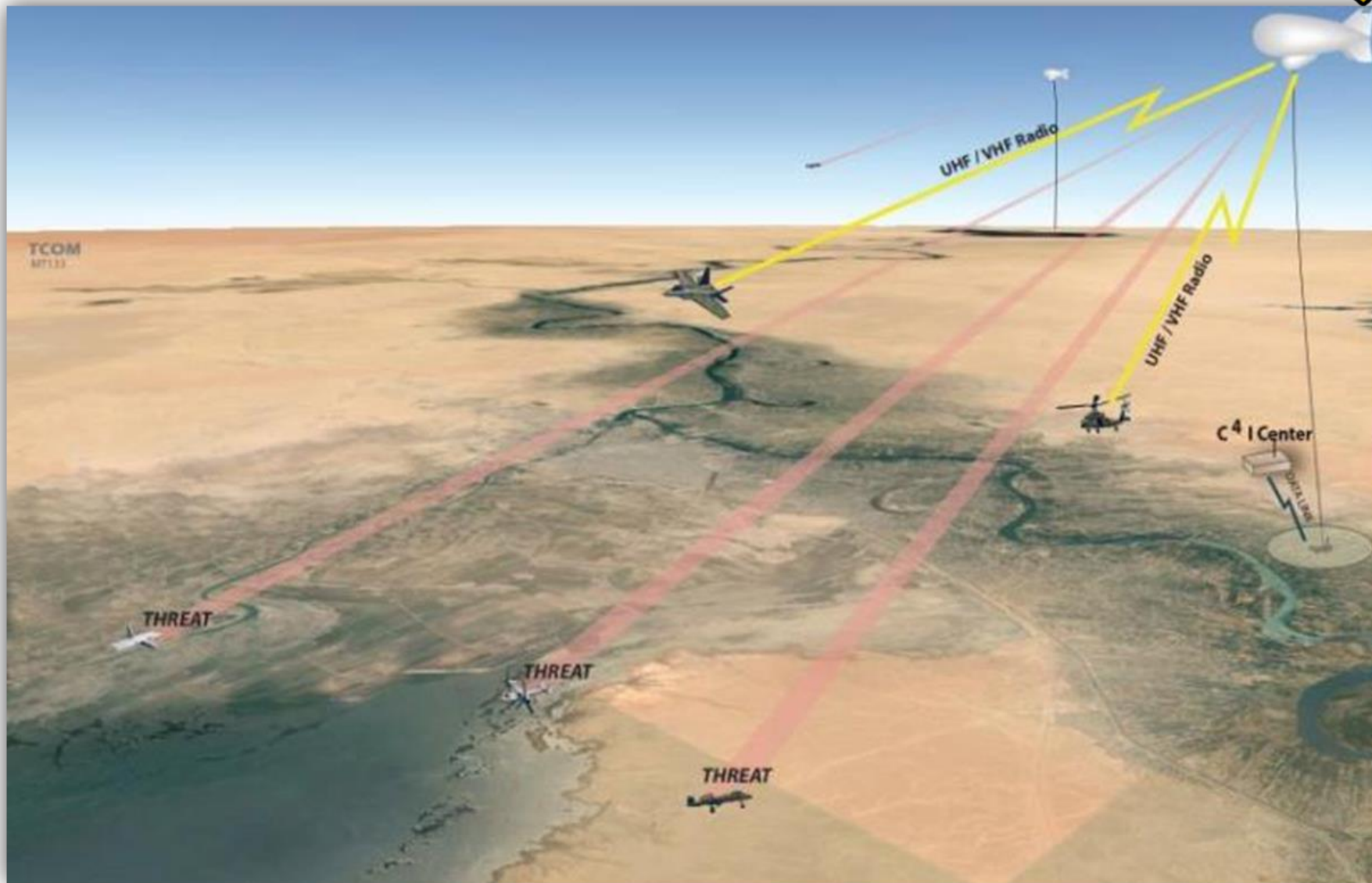
months if not in inventory

\* Procurement could take 6-9

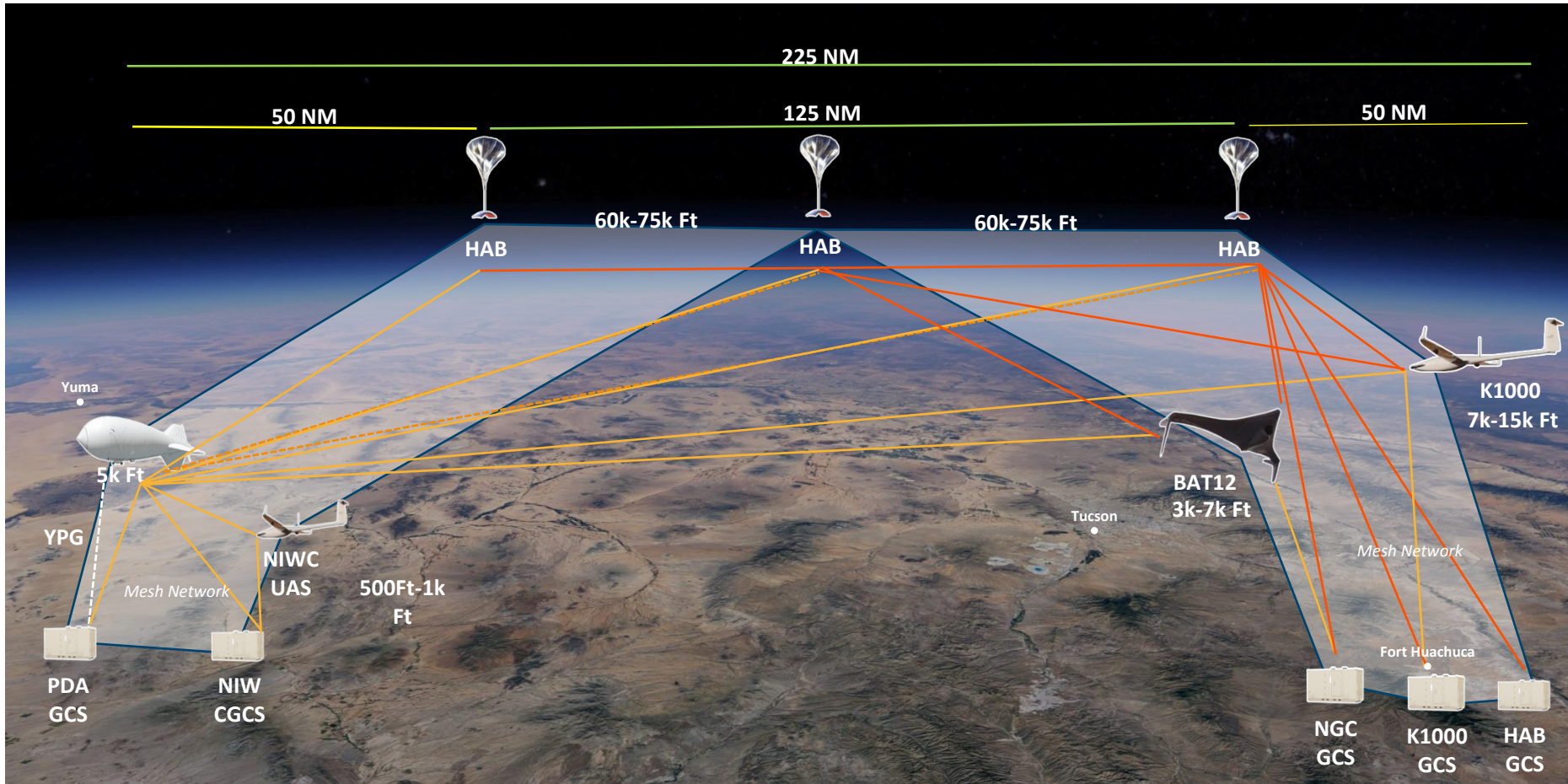
PD Aerostats Fleet	 ★	 ★				
	WASP-L	12M	17M/17M+	PSS-T Medium (22M)	28M	PSS-T Large (34M)
Setup/Deployment Timeframe	30min/*	2 hrs/*	2 hrs/120 days	8 hrs/120 days	24 hrs/120 days	72 hrs/120 days
Footprint Requirements (OEM)	20' x 20'	78' x 78'	158' x 158'/164' x 164'	180' x 180'	250' x 250'	300' x 300'
Integrated Payloads	EO/IR, I2Tech, I2IULS, Tactical HARC	I200LS(EO/IR), TASE400(EO/IR), Simera(WAMI)	I2Tech, FLIR 380 HD, /HARC(2S1U), VRC-99(Radio), SDS – LIDAR(Radar)	MX-15, UTAMS, HARC(2S1U), Kestrel, Vista (F25, F50)	MX-15, MX-20, MX-25 UTAMS, HARC(2S1U), Kestrel, Vista (F25, F50, F50ER)	MX-15, MX-20, MX-25, UTAMS, HARC(2S1U & 4S2U), Kestrel, STARLite, Vista (F25& F50)
Baseline Configuration	TASE400, I2Tech Tactical HARC	TASE400, I2AX	MX-15	(2) MX-15	(2) MX-20, UTAMS, HARC	(2) MX-20, UTAMS, HARC
Flight Endurance (days)	3	5	10	14	28	30
Max Payload Weight (lbs)	15-35 lbs (@ sea level to max operating altitude)	60 lbs (@ sea level to max operating altitude)	200/185 lbs (@ sea level to max operating altitude)	500 lbs (@ sea level to max operating altitude)	1000 lbs (@ sea level to max operating altitude)	1350 lbs (@ sea level to max operating altitude)
Max Altitude (ft)	1,000 ft	1,000 ft	1,000 ft/2,000 ft	3,000 ft	5,000 ft	5,000 ft
Crew Size (24/7 Coverage) Crew size base on contractor operated.	4	4	4	9	9	9
Launch and Recovery Crew	2	2	2	4	4	4
Aircraft Pallet Spaces (463L)	1 Pallet	1xC-17 or 1xC-5 or 1xC-130 (1 pallet)	1xC-17 or 1xC-5 or 1xC-130 (2 pallets)	1xC-17 or 1xC-5 or 3xC-130s (20 pallets)	2xC-17s or 1xC-5 or 5xC-130s (35 pallets)	4xC-17 or 2xC-5s (43 pallets)
Unload Transport Requirements	12k Forklift, 1 LMTV w/Trailer	15k Forklift or 60k Loader, 1 Truck w/40ft Flat-bed	15k Forklift or 60k Loader, 2 Trucks w/40ft Flat-beds	15k Forklift or 60k Loader, 4 Trucks w/40ft Flat-beds	15k Forklift or 60k Loader, 5 Trucks w/40ft Flat-beds	15k Forklift or 60k Loader, 8 Trucks w/40ft Flat-beds
Average Recovery Time	10-15 mins	15 mins (@1,000 ft)	15/20 minutes (@1,000 ft/@2,000 ft)	15 mins (@2,000 ft. AGL)	14 mins (@2,000 ft. AGL)	19 mins (@2,000 ft. AGL)







# Aerostats SiLVUS Mesh Network OV-1





# Proceedings Feb 2023



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Stratospheric Operations and Re: x High-Altitude Pseudo-Satellites / x +

https://www.usni.org/magazines/proceedings/2023/february/high-altitude-pseudo-satellites-are-ready-launch

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SUB MENU

## High-Altitude Pseudo-Satellites Are Ready for Launch

By Captain W. Stone Holden, U.S. Marine Corps

February 2023 | Proceedings | Vol. 149/2/1,440

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High-altitude pseudo-satellite (HAPS) unmanned aerial vehicles (UAVs) are moving rapidly toward maturity, thanks to trends in solar power, battery storage, and artificial intelligence (AI). HAPS could provide a key capability bridge for forces seeking to operate in areas defended by anti-access/area-denial (A2/AD) capabilities. Launched from outside the range of A2/AD systems, a fleet of HAPS with various capabilities operating alone or in concert could support various forces on the ground. Their capabilities could enhance communication, sensing, and

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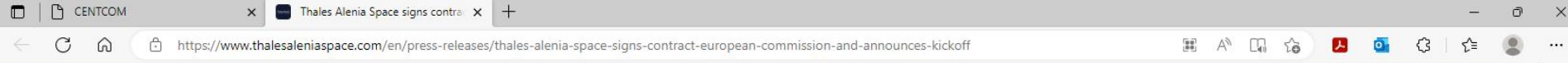




# High Altitude Airships



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- Who we are
- Space Alliance
- What we do
- Innovation in our DNA
- Sustainability
- Press Releases
- Stories
- Talents & Careers

Home > Press Releases > Thales Alenia Space signs contract with European Commission and announces kickoff of EuroHAPS project for the demonstration of stratospheric platforms

## PRESS RELEASES

### Thales Alenia Space signs contract with European Commission and announces kickoff of EuroHAPS project for the demonstration of stratospheric platforms



Available in [IT](#) [FR](#)

[IMG](#) [PDF](#)

MAR 9 2023



**Cannes, March 9, 2023** – Thales Alenia Space, the joint venture between Thales (67%) and Leonardo (33%), has signed a €43 million contract for the EuroHAPS (High-Altitude Platform Systems) demonstration project and announces its kickoff. EuroHAPS was selected by the European Commission on July 20, 2022 after a call for collaborative defense research and development projects from the European Defense Fund (EDF).

Thales Alenia Space is coordinating the European consortium of 21 partners, and 18 subcontractors, from 11 countries handling the project. EuroHAPS aims to develop several stratospheric demonstrators for missions designed to improve intelligence, surveillance and reconnaissance (ISR) and communications capabilities. The main project partners are CIRA, Elettronica and Leonardo from Italy, ONERA and CEA from France, INTA from Spain, and ESG with TAO from









# Solar UAVs



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- Solar Drone
- Fuel Cell UAV
- Solar Powered Drone
- Small UAV
- Puma UAV
- Zephyr UAV
- Solar Panel Drone
- Future UAV
- Solar Aircraft
- Solar Glider
- Solar Power



Small hand-launched solar-powered UAV (unmanned aerial vehicle ...



India's Biggest Renewable Energy Competition



Solar-powered UAV Market Professional Survey Report 2018 | FeedsFloor



Solar UAV to set a new World Record - TFOT



Rainbow solar UAV to make maiden flight soon | News | Eco-Business ...



Drones | Free Full-Text | Sun Tracking Technique Applied to a S...



An overview of the global solar-powered UAV market 2017-2021 ...



Solar-soaring Tech Extends UAV Flight | Engineering360



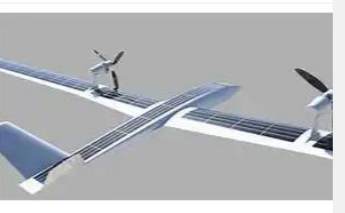
2050 x 1025 - jpeg  
Aionline.com



Solar-powered UAV for Russian Arctic | The Independent Barents Observer



Top 8 Solar Powered Drone (UAV) Developing Companies



Barno TM-01 Solar UAV|Autodesk Online Gallery



Solar-powered drones: What's the secret to one startup's success? - Create



Top 8 Solar Powered Drone (UAV) Developing Companies



First Flight for Production Solar-Powered Silent Falcon Unmanned ...



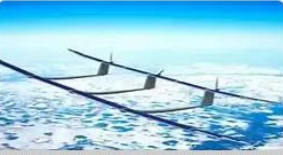
Solar Power Solutions for Drones | UAV Solar Panels | Solar Technology



Drone Fly 5g Solar Uav Nasa Powered Altitude Giant Aerovironment ...



Solar powered day/night autonomous flight achieved: Airborne for 28 ...

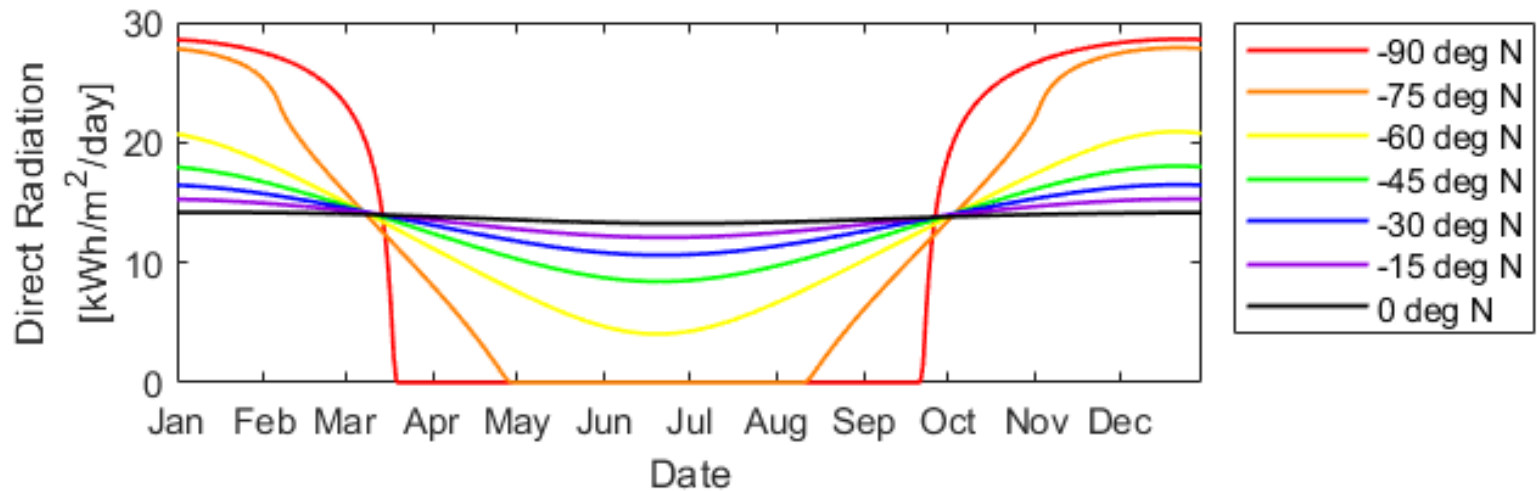
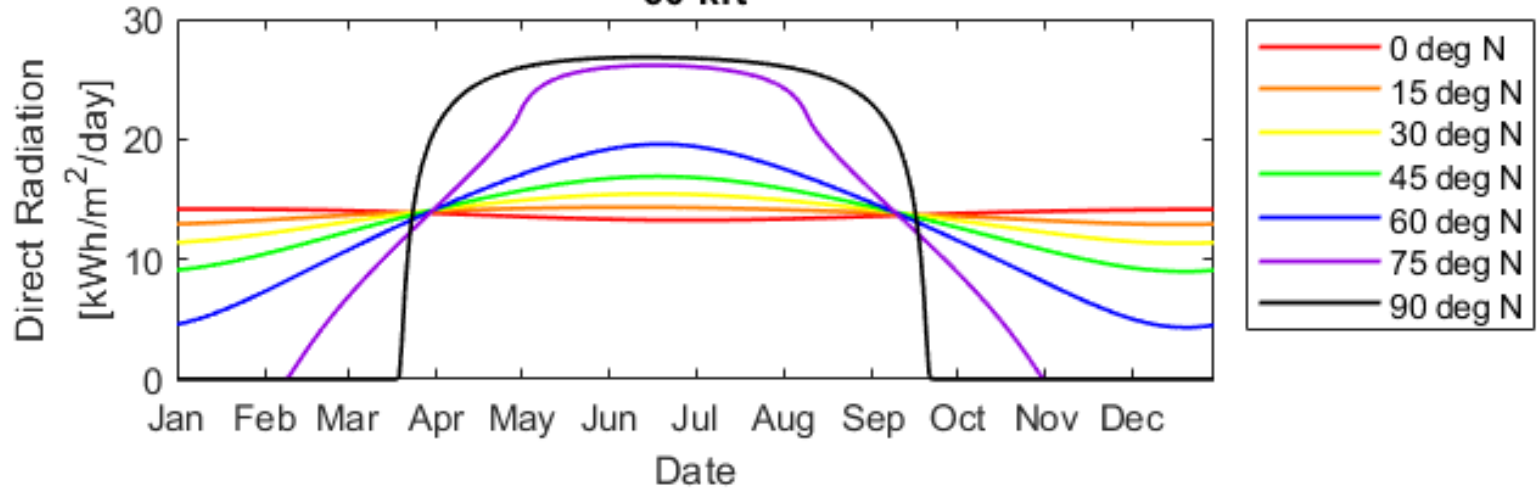






# Photo Voltaic (Solar Cells) Are Critical

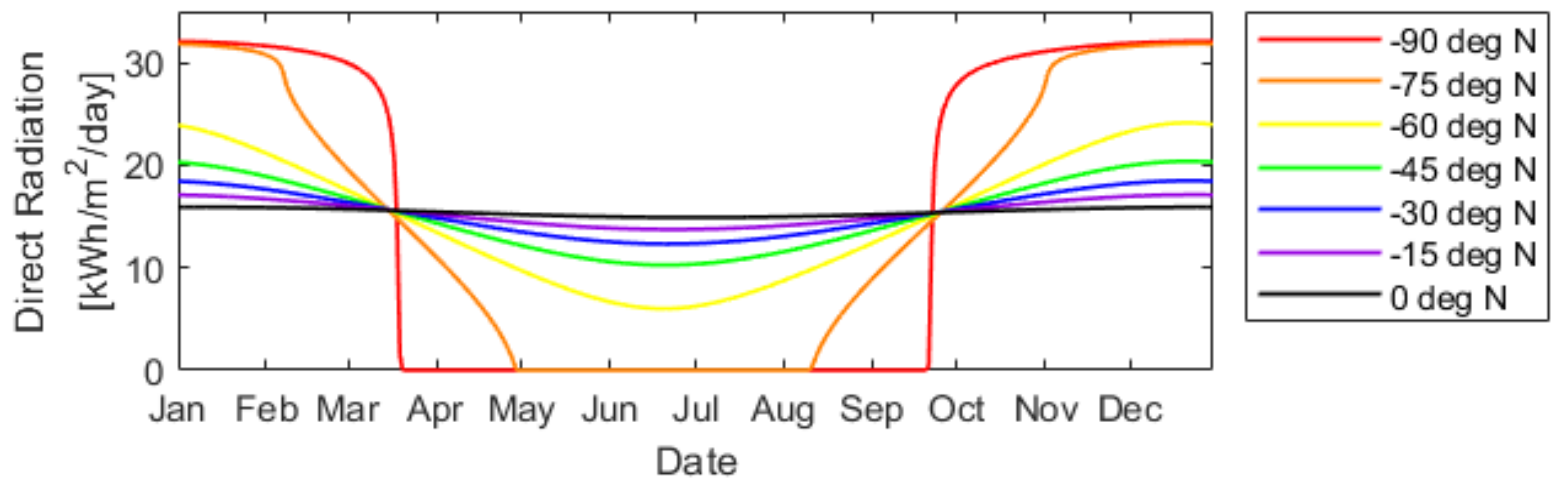
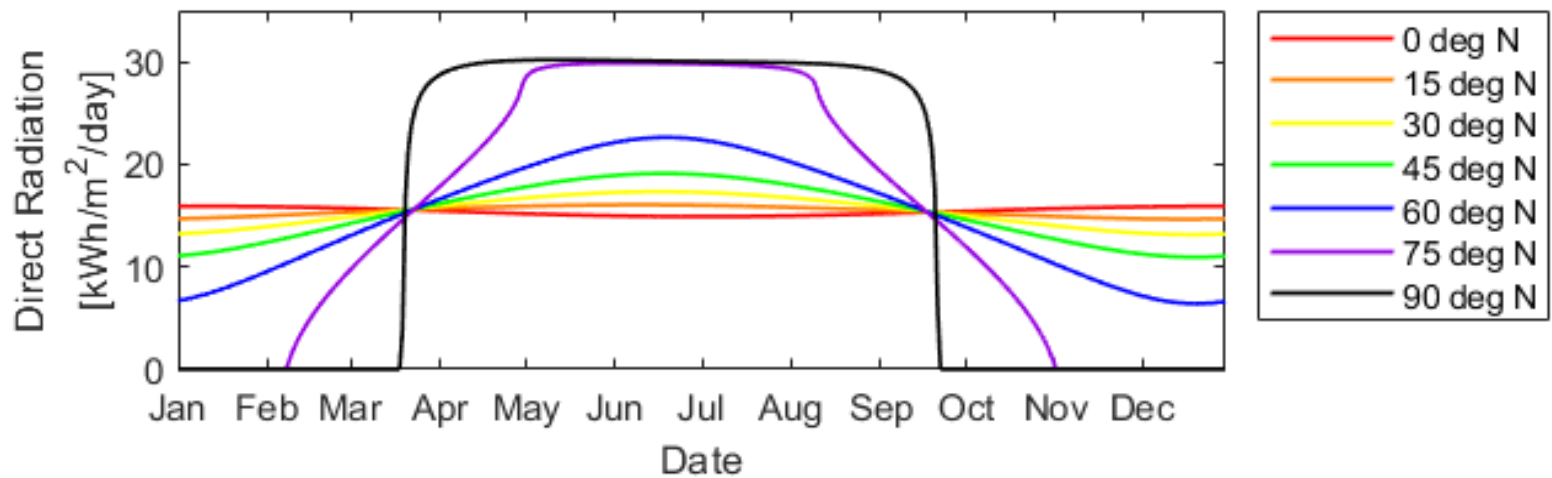
Direct Solar Radiation per Day at Altitude  
60 kft





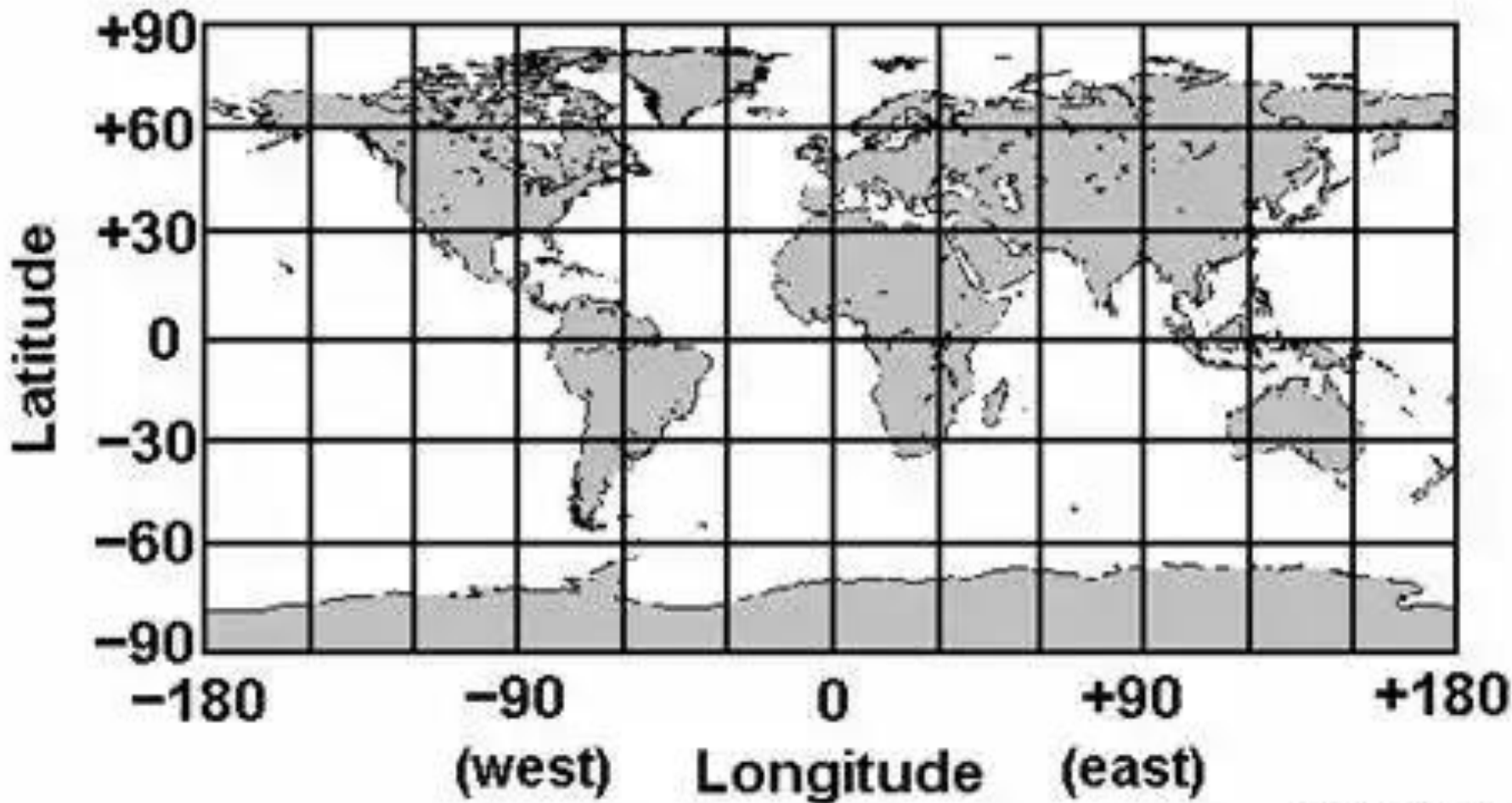
# Altitude Matters

Direct Solar Radiation per Day at Altitude  
90 kft





# Better PVs Extend Operational Reach



[www.satsig.net](http://www.satsig.net)



# Power Beaming to High-Altitude UAVs



- Zephyr HALE (High Altitude, Long Endurance) UAV
  - solar-powered during daytime
  - battery operation during night
  - daytime altitude 65,000 feet

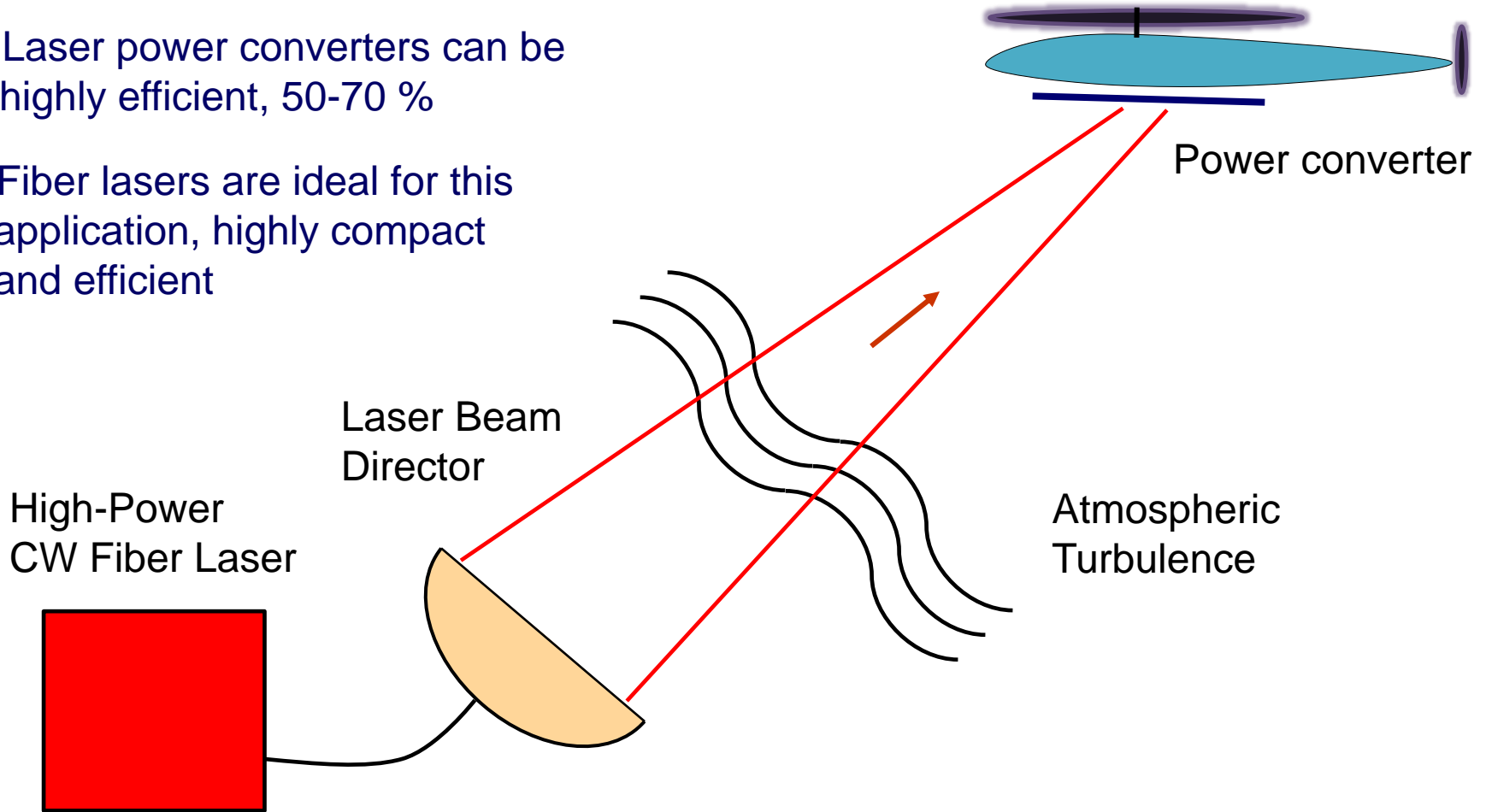
US Central Command  
Army Space and Missile Defense  
NAVAIR  
UK Ministry of Defense  
Airbus (Zephyr)  
MicroLink (solar pv)

- Laser power beaming to UAVs can provide extended flight duration, night-time recharging, possible extended range, and reduced manpower requirements.



# High-Power Fiber Lasers for Power Beaming

- Tens of kilowatts over multiple kilometers
- Laser power converters can be highly efficient, 50-70 %
- Fiber lasers are ideal for this application, highly compact and efficient



U.S. Patent #7,970,040, "Apparatus for Incoherent Combining of High Power Fiber Lasers for Long Range Directed Energy Applications," 28 June 2011.

# Power Beaming to Stratospheric UAV for day & night operations at full tempo



## High Altitude Solar & Laser Powered Airframe

- Optimized photovoltaic receiver on underside of airframe will receive laser power from ground and power flight operations and ISR payload for nighttime operations
- Solar cells power airframe when sunlight is available

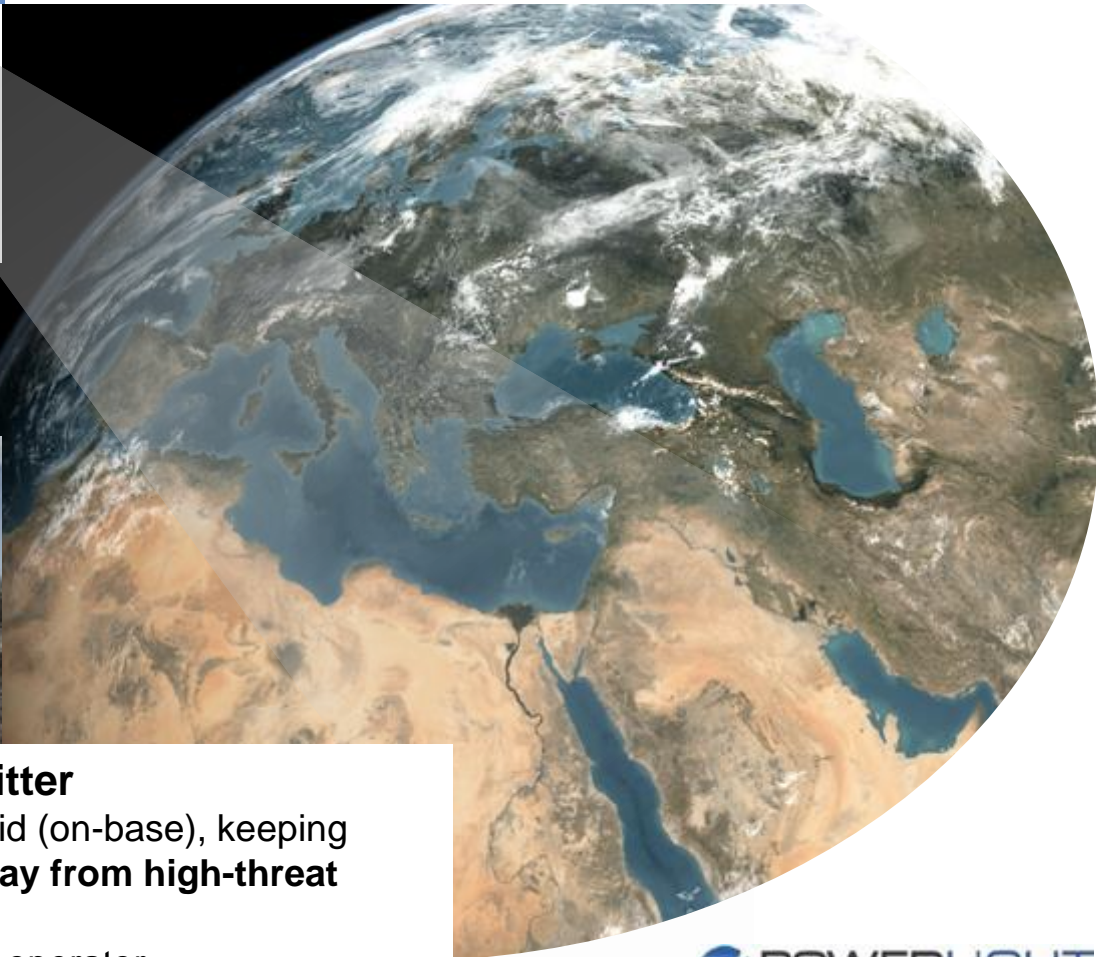
## Sensor Payload Provides Persistent ISR

- SAR, ELINT, Comms Relay
- Detailed Evaluation of Sensors Conducted by CENTCOM: Mar 2019



## Portable, Vehicle Integrated Transmitter

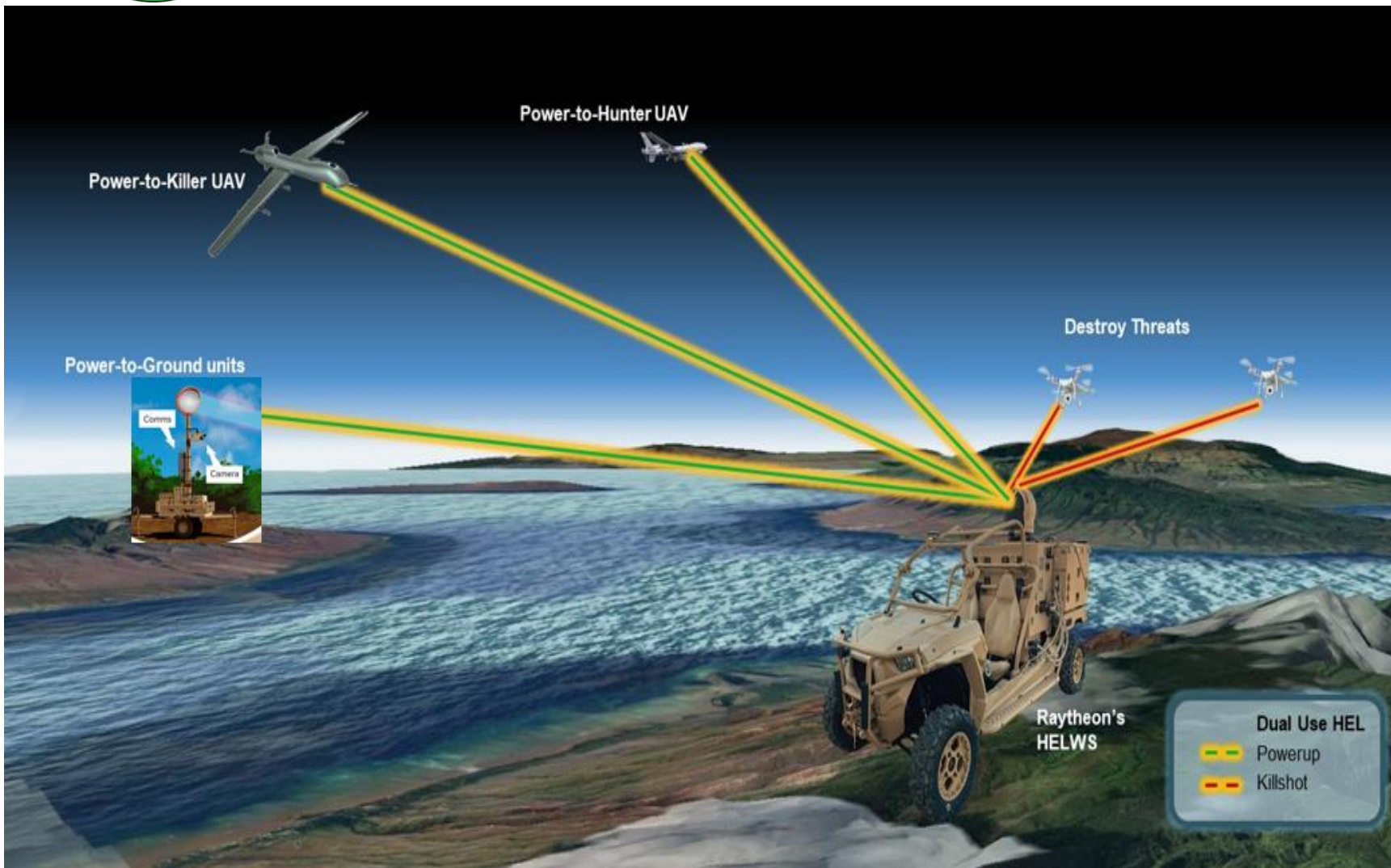
- Powered by generator (forward base) or grid (on-base), keeping assets & personnel up to **1,000s of km away from high-threat domain**
- Active safety interlocks enable safe use by operator





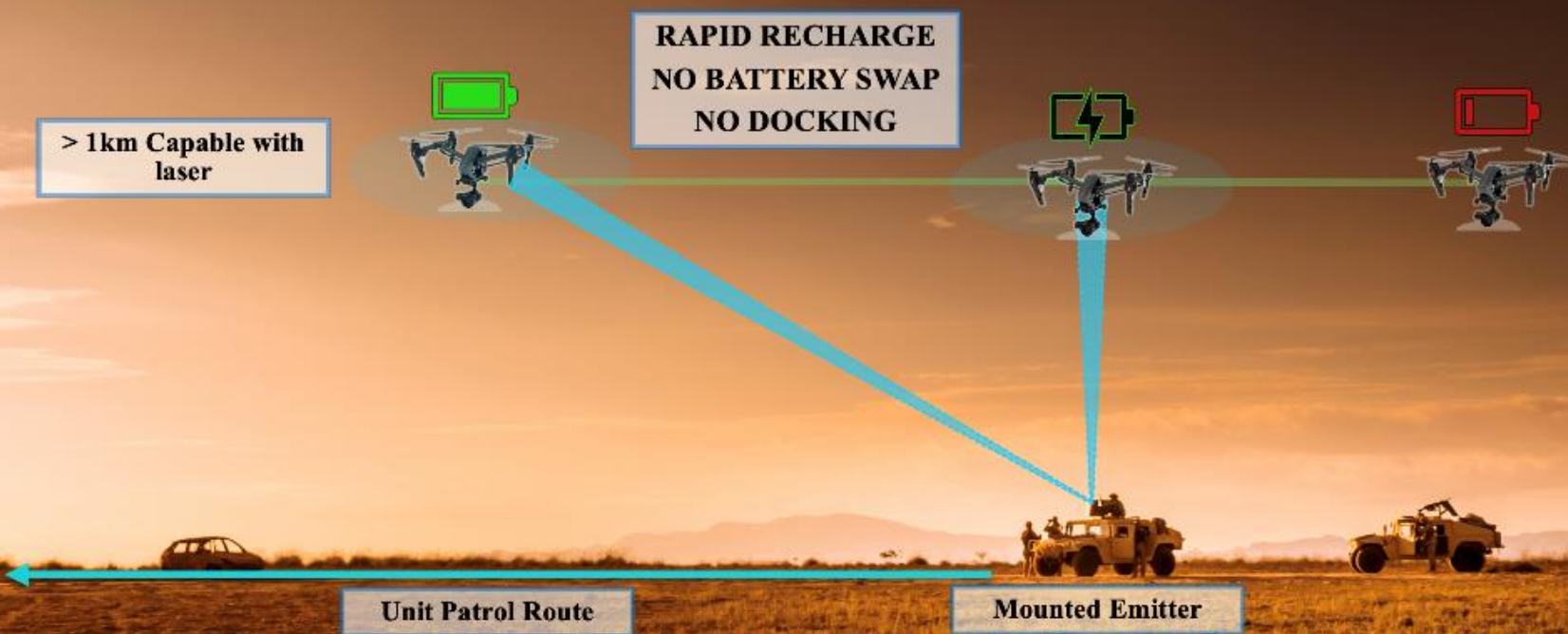


# Dual Use Laser Systems



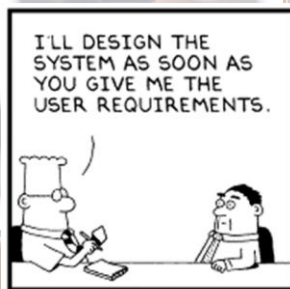


# Optical Recharging for Contested Areas (ORCA)





# Why You Are Here







# Charter



Conduct ***discovery, research, analysis, and sponsor development*** of new and emerging ***technologies*** and ***concepts*** which have the ***potential to provide solutions*** to Headquarters and Component validated Joint needs.

***Review*** USCENTCOM and Component ***plans, operations***, programs, policies and activities for areas where ***technology/new technique*** will improve efficiency and effectiveness.

***Integrate*** across USCENTCOM headquarters and Component staffs for transformational, integrating, and experimentation activities.



# U.S. Central Command Tech Focus



- We focus on the **JOINT** solution that has the potential to satisfy a **JOINT validated** need
- Separate from the many technology needs of our customer(s) those technology challenges which:
  - *Do not have a readily available solution*
  - For high-impact needs there is *insufficient activity pursuing a solution*
- Seek out game-changing technologies which our customer(s) don't know they need



# Potential Focus Area

(not in priority order)



- **A2AD solutions**
- **Detect / Defeat:**
  - IED initiators / initiator systems
  - Buried / concealed IEDs
  - Production and assembly of IEDs
- **HME production standoff detection**
- Culvert access denial / alerting
- **Persistence in surveillance**
- Biometrics (Identity dominance for FP/access)
- Non-lethal vehicle / vessel stop
- **Reduce stress on the force:**
  - **Force Protection requirements**
  - **Increased automation**
- Anti-swarm lethal / non-lethal
- **Enable Partner Support**
- **Predictive analysis techniques**
- **Tunnel detection / defeat**
- **Holding all targets at risk**
- **Messaging / counter-Messaging**
- **Mine Warfare (offensive/defensive)**
- **IAMD overmatch solutions**
- C4ISR systems:
  - Processing, exploitation & dissemination
  - Multi-level security
  - Cross domain solutions
  - **Information access to tactical edge via MIL Comms, Cellular & WiFi**
- **Tagging, Tracking, and Locating (TTL)**
- Denying non-state actors state-like functions
- **Energy & Power efficiencies**
- Scalable non-lethal / lethal effects
  - **Directed Energy**
  - Kinetics
- **True SA for Blue ... Fused Red**
- **Sustaining the force – reduced size, weight, amount, and retrograde**
- **Any sensor any shooter**
- **Cyber Warfare Defense**
- **Detect, track, defeat UAS (Grp 1&2)**

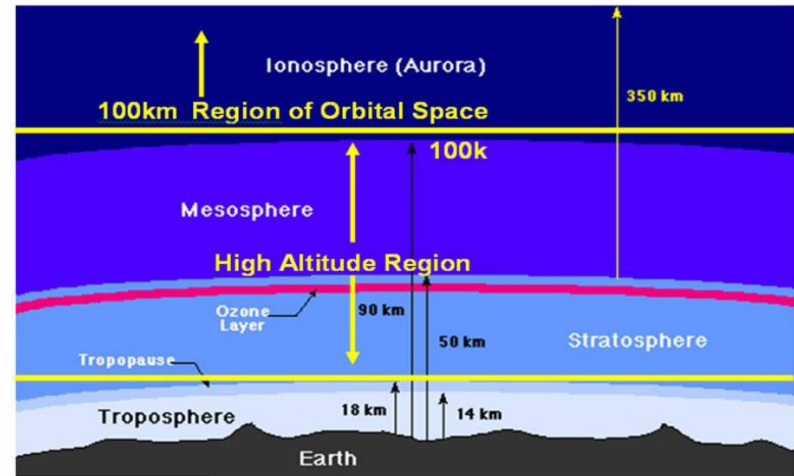




# Specific Missions



- **Space Control (Offensive and Defensive)**
- **Missile I&W**
- **Active Missile Defense**
- **EW**
- **Surveillance (ELINT/SIGINT/MASINT/EO-IR)**
- **Reconnaissance**
- **MILDEC**
- **Alt PNT**
- **Comms (LOS/BLOS/JREAP/etc)**
- **DE**
- **Laser Designator**
- **Others....weather forecasting, sensor/payload insertion, logistics delivery**





# How you can help - Propose a solution

George H. Heilmeier, a former DARPA director (1975-1977), crafted a set of questions known as the "Heilmeier Catechism" to help Agency officials think through and evaluate proposed research programs.



## Tell me:

- **What are you trying to do?**
  - Articulate your objectives using absolutely no jargon
- **Who should care?**
- **How is it accomplished today?**
- **What are the limits of the current practice?**
- **What is new in your approach?**
- **Why do you think you will be successful?**
  - How do you define / measure success?
  - What is your strategy to get there?
- **How long will it take and at what cost?**
- **What are the risks?**
- **What is your risk reduction / mitigation strategy?**
- **What are the payoffs / return on investment?**



# *For Technology Developers ... Some Points to Consider*

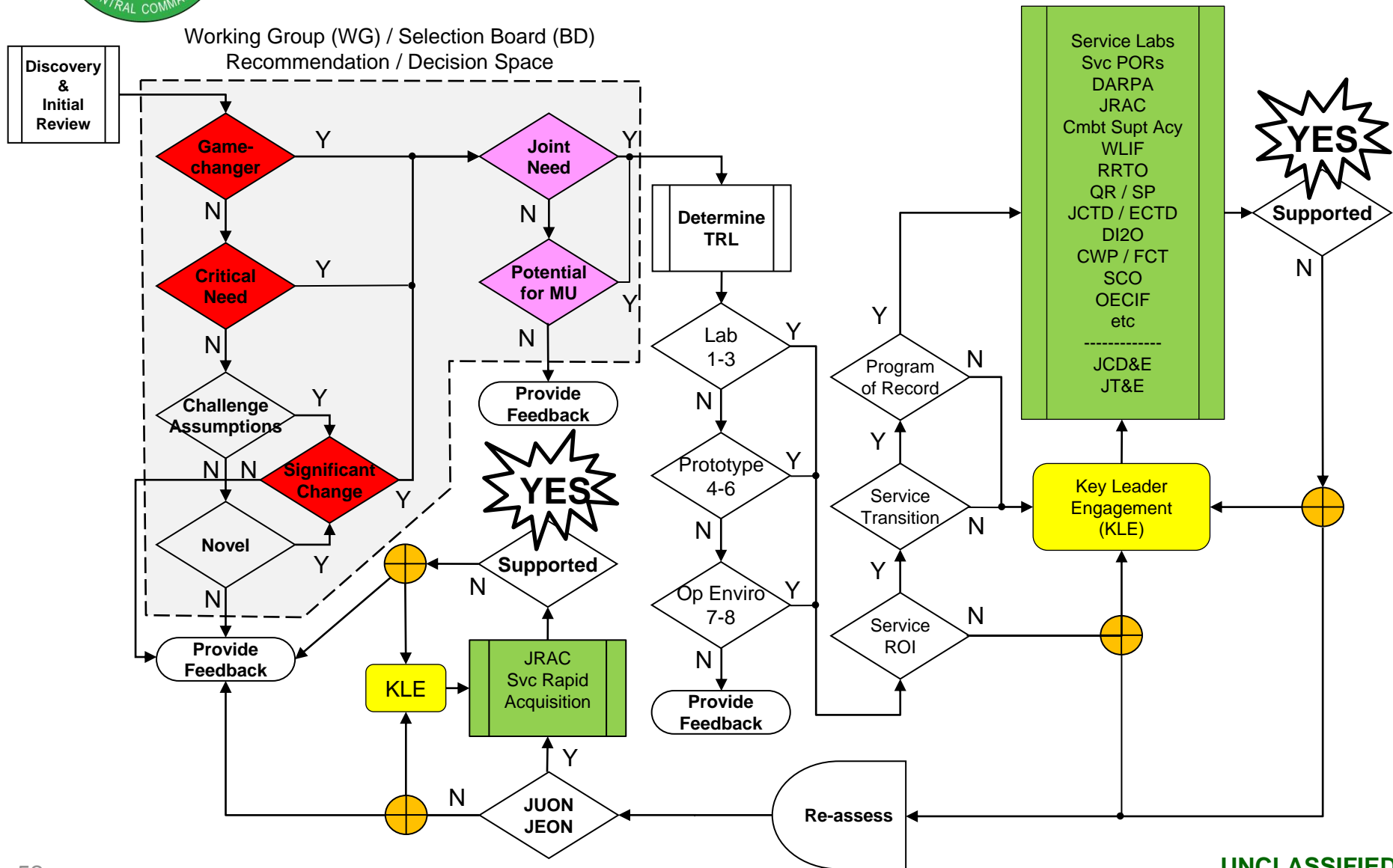


- **Seek to understand how your solution fits in the overall DoD system of systems**
  - Integrate with legacy systems vice replace them
  - Open architectures receive higher interest / support
- **Consider partnering with others to bring a ‘greater’ solution to the table - system best-of-breed vice at the component level**
- **Determine impact to Service programs of record (PORs)**
  - Training
  - Initial fielding
  - Sustainment
- **Substantiate your position with data**
  - Testing
  - Cost-benefit analysis



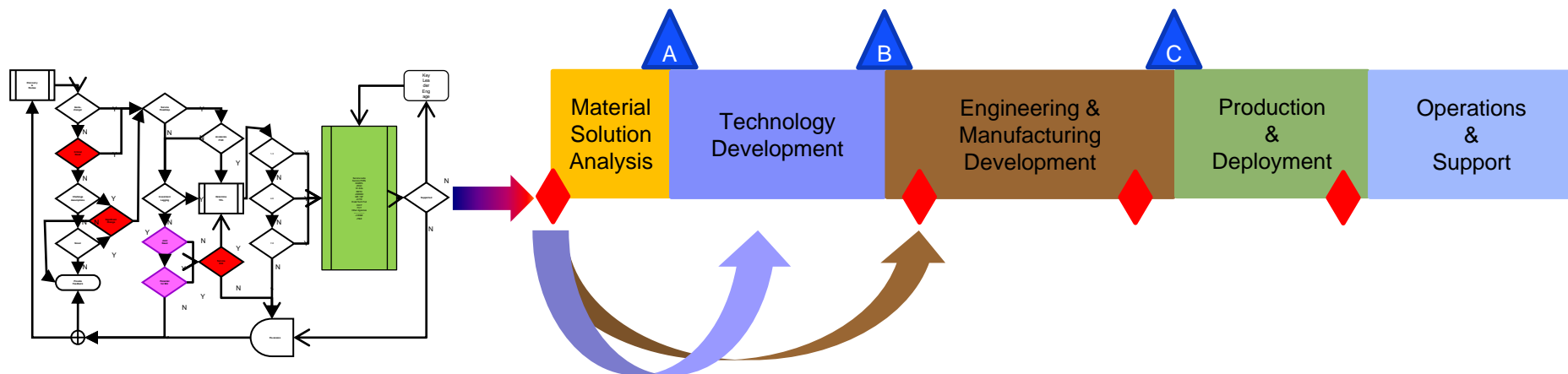


# Proposal Review / Selection Process





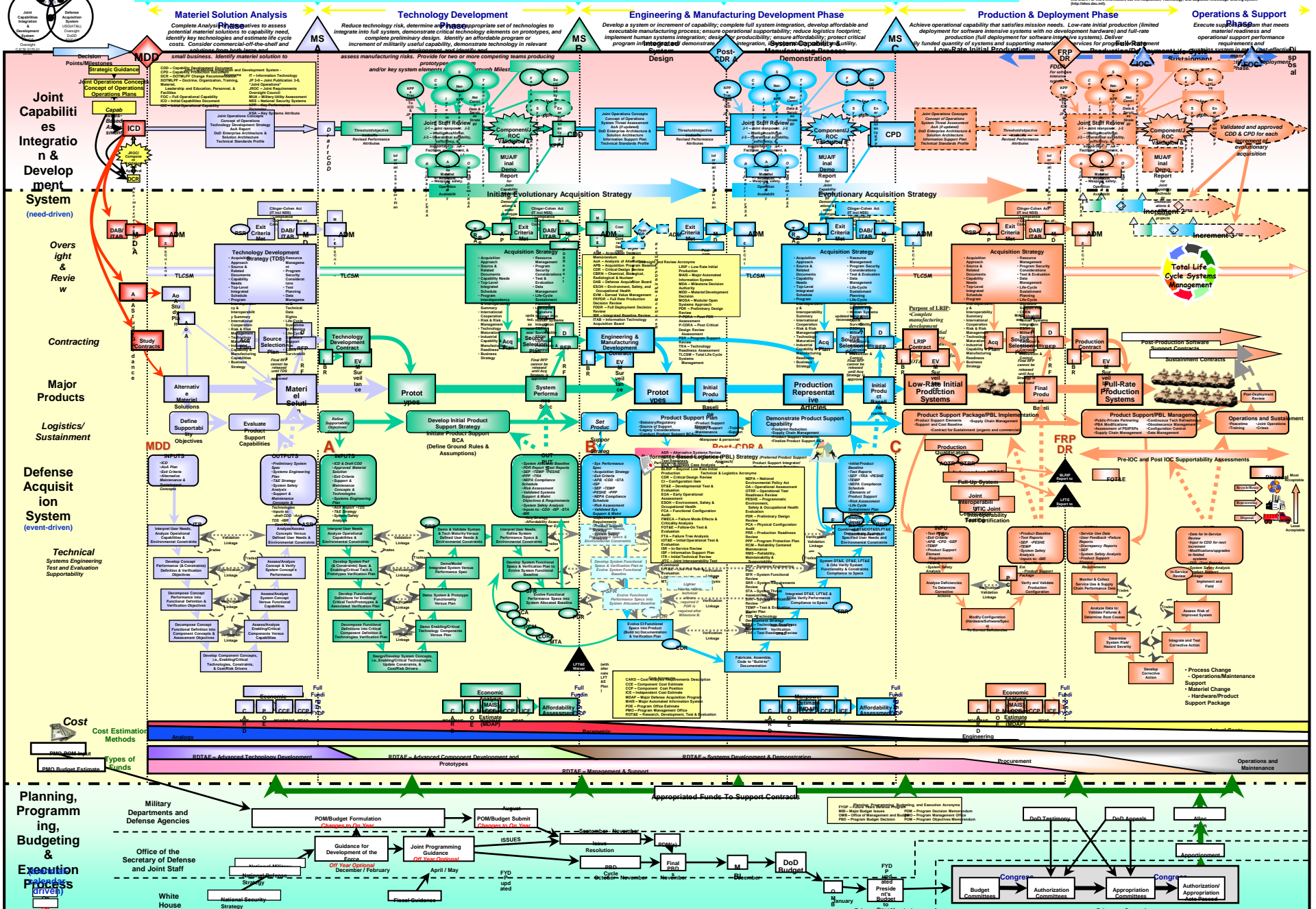
# Simplified DoD Acquisition Process



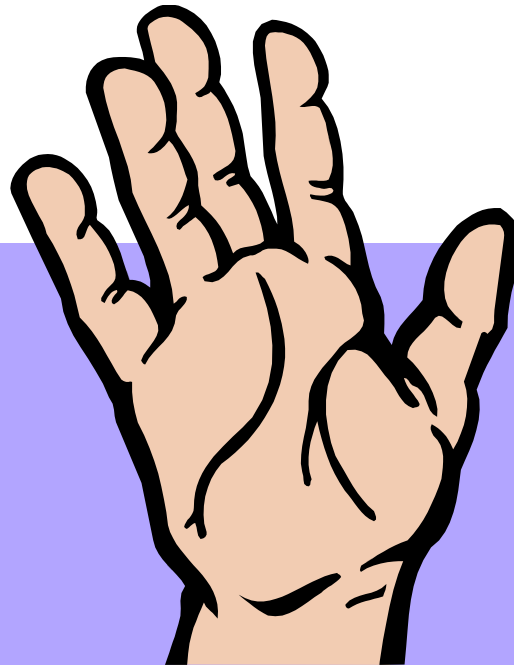
# Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management

Following the Materiel Development Decision, the Milestone Decision Authority may authorize entry into the acquisition process at any point, consistent with phase-specific entrance criteria and statutory requirements

This chart is a reference only for Defense Acquisition University students. It provides a general illustration of interfaces among three major defense acquisition systems used to develop, produce and test a weapon system for military readiness. Defense acquisition is a complex process with many activities shown here and many activities not shown that cannot be depicted in a two-dimensional chart. Supporting information on back of this chart for more information on the Acquisition, Technology, and Logistics Life Cycle Process.







Raise your Hand





# QUESTIONS