



# USA Natick Soldier RDEC Personnel Airdrop



***TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.***

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US Army Natick Soldier RDEC

13 May 2009  
For: APBI

**UNCLASSIFIED**

# WHAT IS JPADS?

MicroLight  
0-150lbs (many US  
investments)

**ICTD**

Many options  
USMC ULW Lead  
**250-700lb**

Many US  
investments

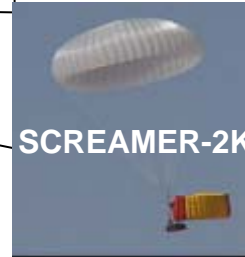


Firefly

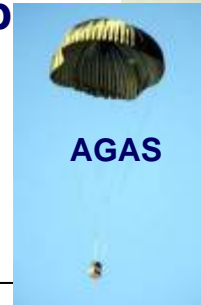


Sherpa

**700-2.4Klb**



SCREAMER-2K



AGAS



Onyx

**Common Mission Planner:**  
"All" High altitude systems

**ACTD**



Military Free Fall (head  
&/or Chest mounted)



**30K+lbs**



Megafly

**5-10Klbs**



Dragonfly



SCREAMER-10K

High altitude deployable cargo self guided airdrop systems: 24.5Kft MSL+ deployments, 50M accuracy (objective). All wirelessly linked to a common JPADS-Mission Planner

**★ Selected system and current POR with PM-FSS**

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# THE REALITIES OF COMBAT AIRLIFT



Unclassified

# ***NOT THE TRADITIONAL ENVIRONMENT FOR A DROPZONE (DZ)...***

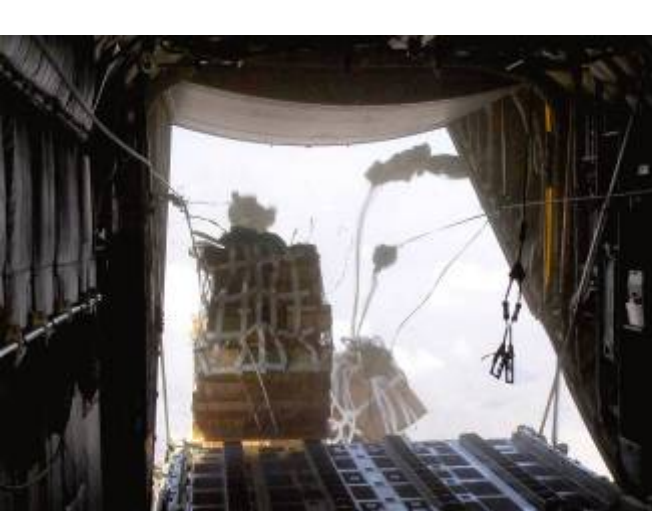


Unclassified



# What is JPADS-MP? (JPADS-Mission Planner)

- **Atmospheric Modeling**
- **Airdrop Planning & Modeling**
- **Predicts/Displays**
  - CARP, aircraft track, FalconView Map Overlay
  - PI and impact point error ellipses (delivery footprint)
  - Impact point with failed parachute and error ellipses
  - Reference “steer to” trajectory for many JPADS systems
- **Transitioning into PFPS-CAPS and then JMPS**
- **Will be utilized with all DoD MFF systems**



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# JPADS-MP

## Joint Precision Airdrop System Mission Planner

### Key Components

- Panasonic CF-29 Data Processor with 802.11g Wireless Interface
- 4-Channel UHF Rx
- GPS Hand-launched sondes
- GPS RTK

Total Weight w/Portable Case: 75 Pounds

802.11 Wireless Link to Airborne Guidance Units (AGUs)

Developers:

PSI = HW  
 Tybrin = SW  
 Draper = Orig. SW

SW transitioning  
 →PFPS-CAPS → JMPS

USAF ESC = Lead PM office

Unclassified



**BLOCK II Hardware**



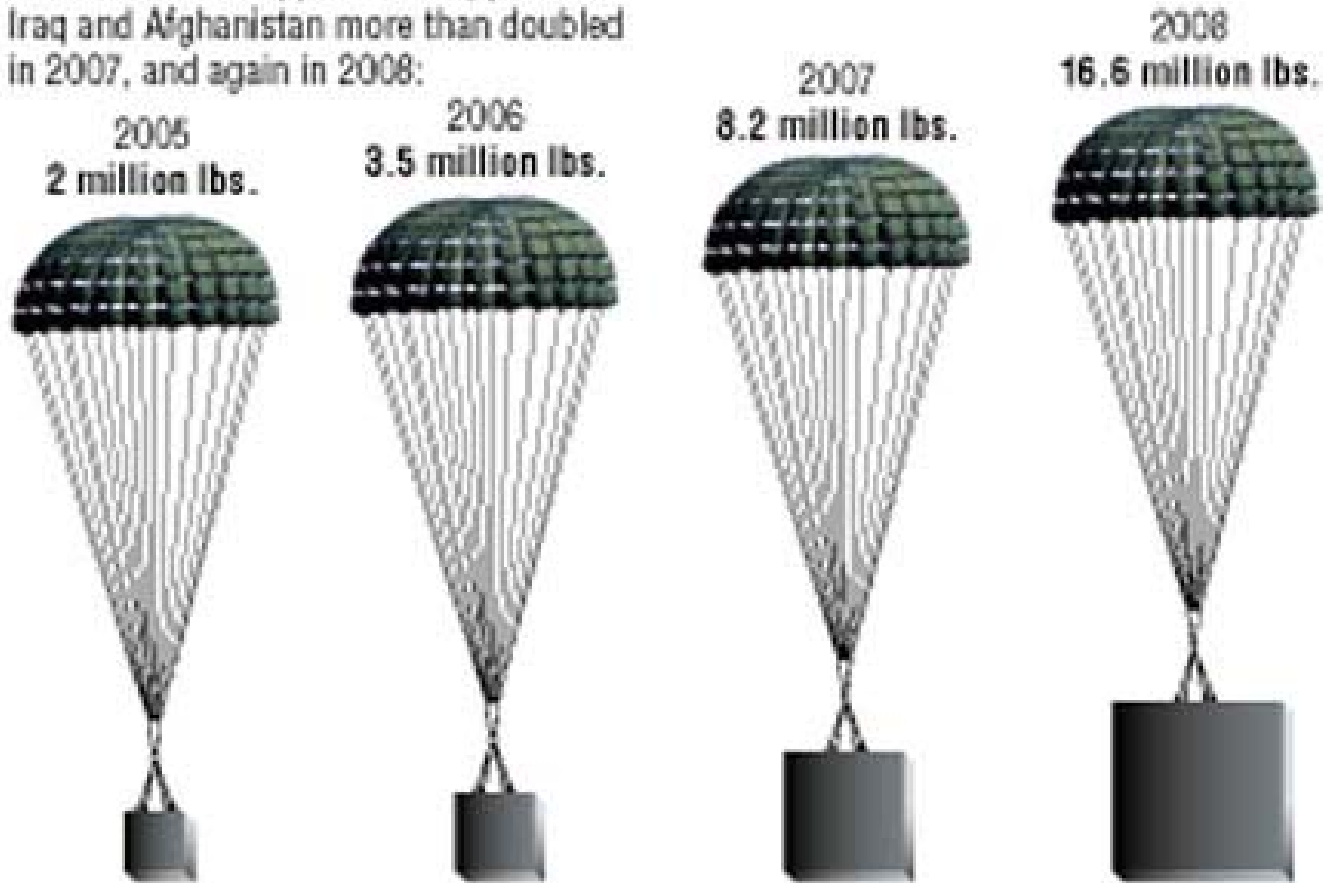
**Self Contained Kit**



**BLOCK III Hardware**

## AIR DELIVERY

The amount of supplies airdropped into Iraq and Afghanistan more than doubled in 2007, and again in 2008:

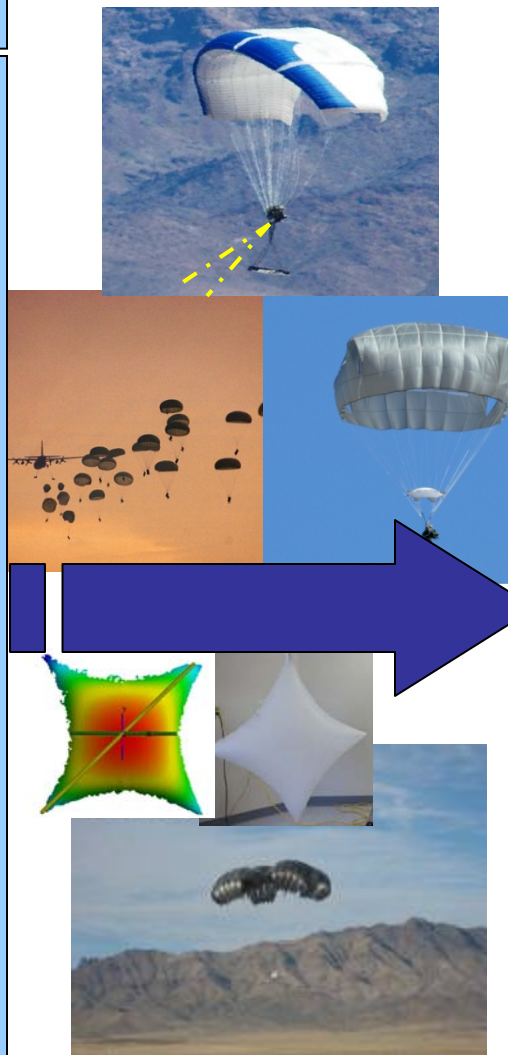


Source: Air Force Central

MARLA STAMERSTAFF

## Science & Technology Focus Areas

- Precision Airdrop Enhancements
  - Guidance, Navigation & Control algorithm development
  - Advanced sensor and remotely sourced data integration
- Airborne Insertion Technologies
  - Incremental enhancements to new generation of systems
  - Navigation and safety related sensor integration
- Enabling Research and Technologies
  - High Performance Computer modeling
  - Instrumentation and experimentation technologies
  - Aerodynamic decelerator (Parachute) design and development
- Advanced Rotary Wing Aerial Delivery Technologies (Potential Future Focus Area)
  - Auto hook-up, JPADS integration
  - Modeling and Simulation for future aircraft application (including UAV and VTOL)



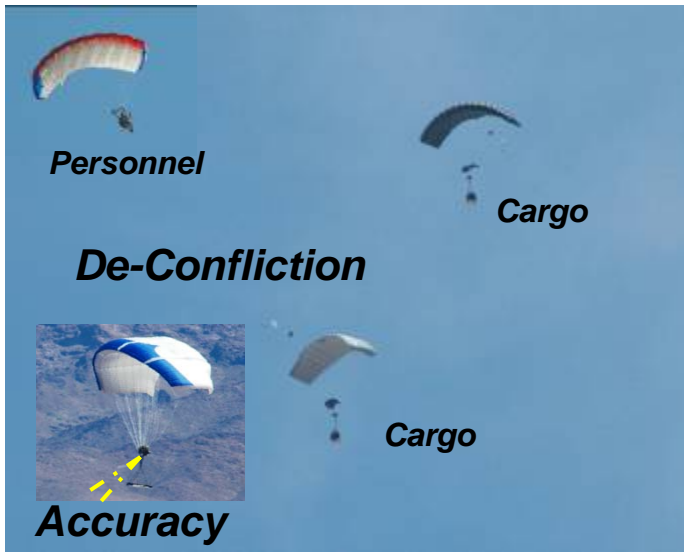
## Warfighter Capability Areas Supported

- Cargo Aerial Delivery of combat equipment, supplies and (future) sensors and munitions
  - High Altitude, Precision Airdrop
  - Low Altitude Airdrop
  - Helicopter Sling Load Operations
- Personnel Airborne Insertion
  - Mass Airborne Assault
  - SpecOps Personnel Insertion and (future) Exfiltration

## Warfighter Benefits

- Improved Safety
- Reduced Injuries
- Reduced aircraft and ground Soldier vulnerability
- Significantly enhanced, just-in-time delivery
- Support Remote Warfare Operations with low cost delivery systems
- Improved Combat Effectiveness

# Precision Airdrop Enhancements



## Purpose:

- Achieve improved accuracies, reliability and safer landings for all JPADS weight classes
- Establish in-air and on the ground situational awareness of cargo

## Products:

- Algorithm development and integration of sensors/data to achieve safe, accurate, cargo delivery under all weather conditions and any terrain
- Smart GN&C software that auto corrects for damaged decelerators or user input errors
- Technologies to prevent in-air collisions and tracking payload visibility in the air and on the ground

## Payoff:

- Soldiers located in remote, challenging terrain are able to receive required supplies
- Improved successful payload delivery rate
- Soldiers are able to identify payload locations
- **Transitions to PM FSS & PM-CIE**
  - And all other Services

## Schedule & Cost

Milestones	FY09	FY10	FY11	FY12	FY13	FY14	FY15
Integration of technologies into SW/HW suite to meet JPADS accuracy and survivability objectives		6		6		6	
Adaptive flight SW and new HW	4			6			
Net-centric in-flight de-confliction and tracking			4		5		6

◆ Software/Technology Readiness Level

# Advanced Personnel Insertion Technologies



## Purpose:

*To improve insertion safety, security and allow for expanded follow on mission capability by:*

- *Next Generation Mass Tactical Aerial Insertion to improve maneuverability, reduce vulnerability, and landing velocity*
- *Increasing offset, altitudes and landing accuracies*
- *Reducing personnel injury*
- *Improving navigation and communication between personnel and payloads*

## Products:

- *Technology insertions to improve ATPS performance and safety*
  - *Automatic activation & towed jumper detection*
- *Higher glide canopies with increased maneuverability*
- *Personnel navigation technologies with flocking capability for situational awareness and communication*

## Schedule & Cost

<b>Milestones</b>	<b>FY09</b>	<b>FY10</b>	<b>FY11</b>	<b>FY12</b>	<b>FY13</b>	<b>FY14</b>	<b>FY15</b>
Advanced personnel aerial insertion	4	6			6		
Advanced navaid, comms and payload comms/tracking	4	6			6		
	3	6			6		
Aerial exfiltration of personnel					3	4	

## Payoff:

- *Situational awareness tools for targeting and to reduce in-flight/landing dispersion and avoid mid-air collisions*
- *Reduction in landing injuries and vulnerability while in the air*
- *Increased mission capability and security for aircraft and jumpers*
- *Injury reductions*
- *Transition to PM-CIE & SOCOM*

◆ SRL    ◆ TRL

# Aerial Delivery Advanced Research & Enabling Technologies

## Purpose:

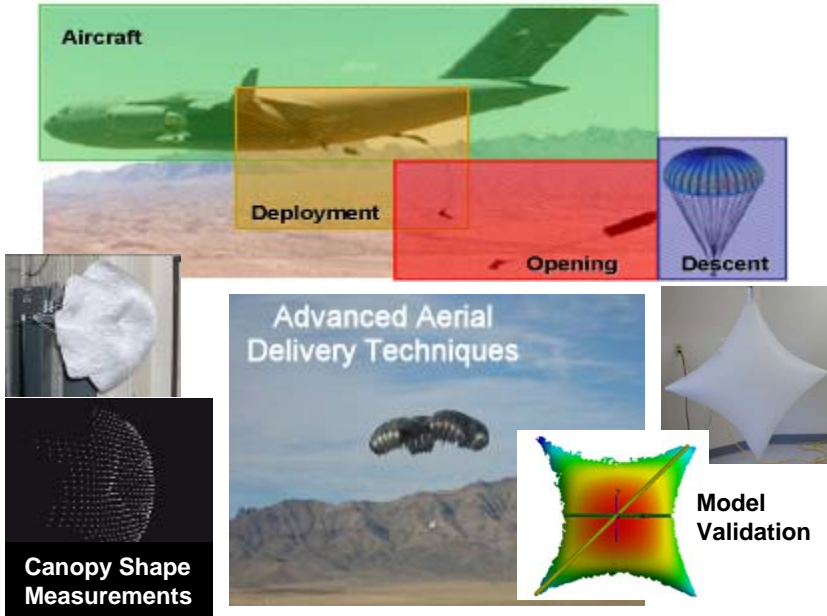
- To improve predictability and understanding of the dynamics of aerial delivery systems through application of modeling & simulation tools
- Increase understanding of aerial delivery systems (ADS) dynamics; develop & validate M&S tools
- Research advanced aerial delivery concepts using advanced sensor and instrumentation suites
- Improve heavy cargo aerial delivery from low altitude with Mass Assault

## Products:

- Validated High Fidelity and Reduced-Order M&S tools for assisting in development of all types of personnel and cargo aerial delivery systems
- Sensor/instrumentation integration to aid in the collection of aerial delivery data
- Advanced Low Velocity Aerial Delivery System (ALVADS) parachute technologies
- Technologies to reduce payload landing velocity

## Payoff:

- Improved design process for future concepts
  - Reduce test costs/increase prototype options
  - Assist in hardware upgrade trade offs
- Validated virtual aerial delivery proving ground
- Increased ability to collect aerial delivery data
- Improved Low Altitude Airdrop capability for:
  - Heavy Equipment, Fuel, Ammunition
- Transitions
  - M&S transitions to multiple other programs
  - FY10 for ALVADS-L SDD to PM FSS
  - FY14 for ALVADS-H SDD to PM FSS



## Schedule & Cost

High Performance Computer Modeling (Verification & Validation)	3	6					
Physics enhancement							
Reduced Order Computer Modeling: Expand DSSA Modeling capabilities to include highly dynamic maneuvers	3	6					
End-to-end Modeling of Sys Trajectory - including Inflation				3		4	
Advanced Instrumentation & Sensor Development		3				6	
Development of Advanced Low Altitude Aerial Delivery Techniques	5	6	4	5		6	
TOTAL							

◆ SRL ◆ TRL



# Investments and Interest Areas



## Near Term:

- M&S of personnel airdrop systems (HPC)\*
- M&S of Strategic Brigade Airdrop (formations, spacing, vortex locations)\*
- Navigation aids for MFF systems\*
- Post jump analysis tools for Training After Action Reviews
- MFF Jump integrated with Autonomously Guided Precision Bundles
- Jumper to Jumper, Jumper to Autonomously Guided Precision Bundles deconfliction
- Pre-Jump training simulation with deconfliction and navigation system integration
- Secure comms for jumper to jumper and jumper to cargo “combined drops”\*
- Automatic Opening device for Mass Assault\*
- Towed Jumper Detection System
- Instrumentation for all aspects of personnel airdrops\*



# Investments and Interest Areas



## Potential Future Investments/Requirements?:

- Safe and reliable “tree” top deployable personnel systems
- Parachutist Oxygen System (Re-Breather) near 100% O<sub>2</sub>, small size, 3+ hour duration
- High or low altitude vehicle airdrops with personnel
- High glide &/or powered systems
- Exfiltration systems

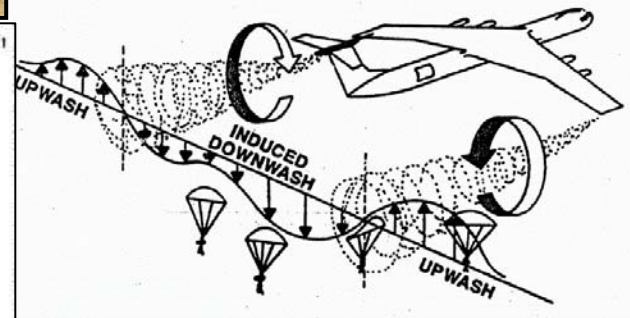
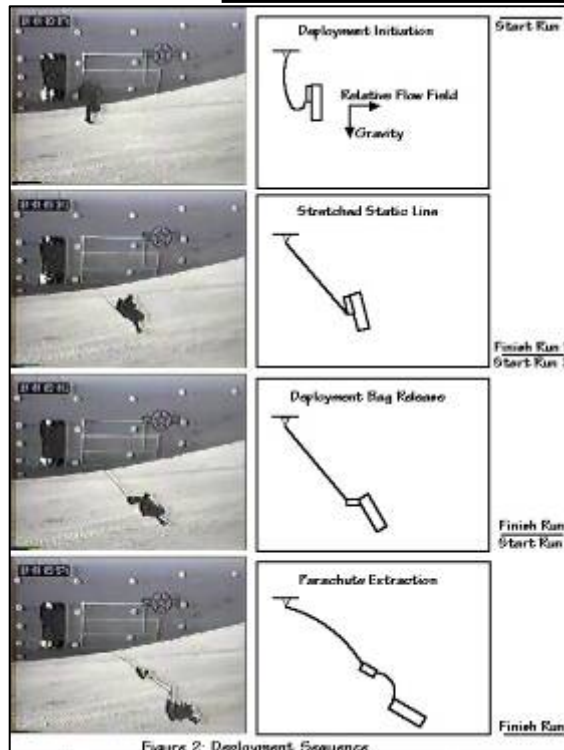
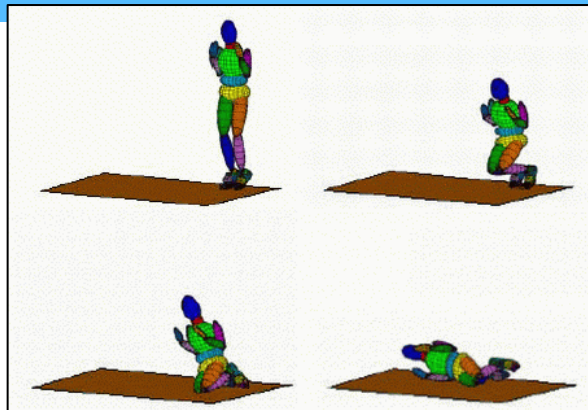
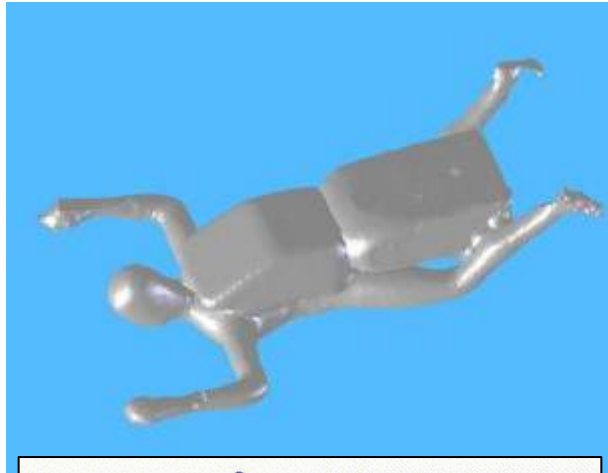
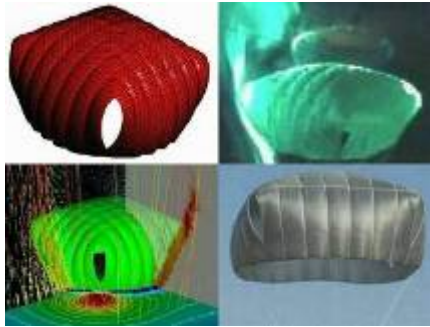
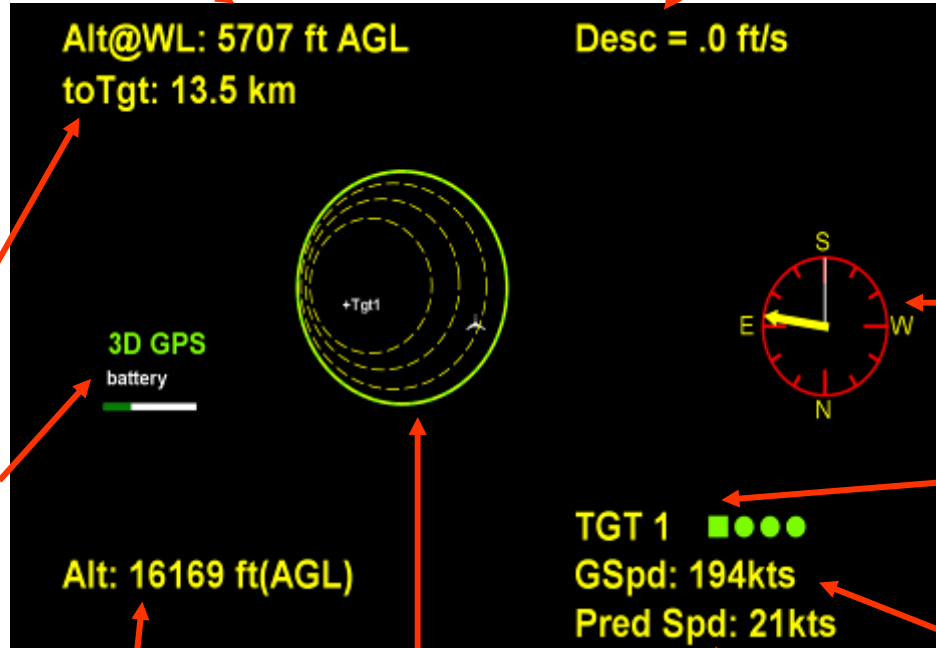


Figure 2: Deployment Sequence



Predicted altitude when you reach funnel centerline

Descent rate



Distance to target

Direct-to-target display

GPS status  
Battery Life

Selected target + target status

Current altitude

Actual ground speed

Navigation display

Predicted speed (wind+canopy)

# Vehicle with Personnel Airdrops?





**Gryphon**



**Fusionman**



**XWing**



**Skyboard**

**Precision Airdrop Technology Conference and Demonstrations  
PATCADs: 2001, 2003, 2005 in US**

**Precision Airdrop Capability Demonstration (PACD) 2006  
3-6 July 2006 in France**

**Joint Precision Airdrop Capability Demonstration (JPACD)  
Australia & US (20 Sept 07) \***

**PATCAD 2007 (22-26 Oct 07 in Yuma)**

**PACD 2008 (26-29 May 08) in France**

**\* Not NATO sponsored**



26ft RS LCDS



US

Firefly



US

Mosquito



US

Spades300



NL

Spades 1K

JPADS-MP



US

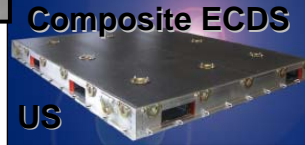
5 ACs, Sondas, GPS-RTK, Self Contained Kit

Skyboard



NZ

Display



US

Composite ECDS

Dragon Train



US

AGAS



US

SNCA



FR

# Systems at PATCAD 2007

PATCAD 2007 featured over 250,000 lbs of cargo dropped with more than 25 systems from 7 countries. Three days included 157 drops ranging from 5lbs - 25,200lbs from 14 lifts from 4 aircraft: 2 US C-130s, US C-17, and a contracted C-130.

Megaflly



US

2K SCREAMER



US

10K SCREAMER



US

HiV LCADS



US

Sodar Height Sensor



US

Panther



FR

Sherpa



CA



UK MoD Jumpers



ParaFinder

GE MoD Jumpers



CADS

UK

PARANAVSYS US Army Jumpers



US

MANPACK



CA

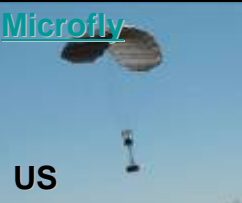
ONYX 300



US

ONYX 500

Microfly



US

Wireless Gate Release System



US

**Next:**

**Precision Airdrop Technology Conference and Demonstration**

**PATCAD 2009: Week of 19-23 October 2009 at YPG!**

**Websites:**

**Contact me to be added (GOV POCs only) to PATCAD09 dist-list**

**Examples include:**

**Natick maintains an active Broad Agency Announcement (BAA)**

**<http://nsrdec.natick.army.mil/business/index.htm>**

**Open for ideas/responses in ALL areas of Aerial Delivery**

**Cooperative Research & Development Agreement (CRADA)**

**For US Small Businesses only:**

**See the SBIR website...."many" opportunities:**

**OSD: <http://www.acq.osd.mil/osbp/sbir/>**

**Army: <http://www.armysbir.com/>**

**See FebBizOps website:**

**<http://www.fbo.gov>**

**Or**

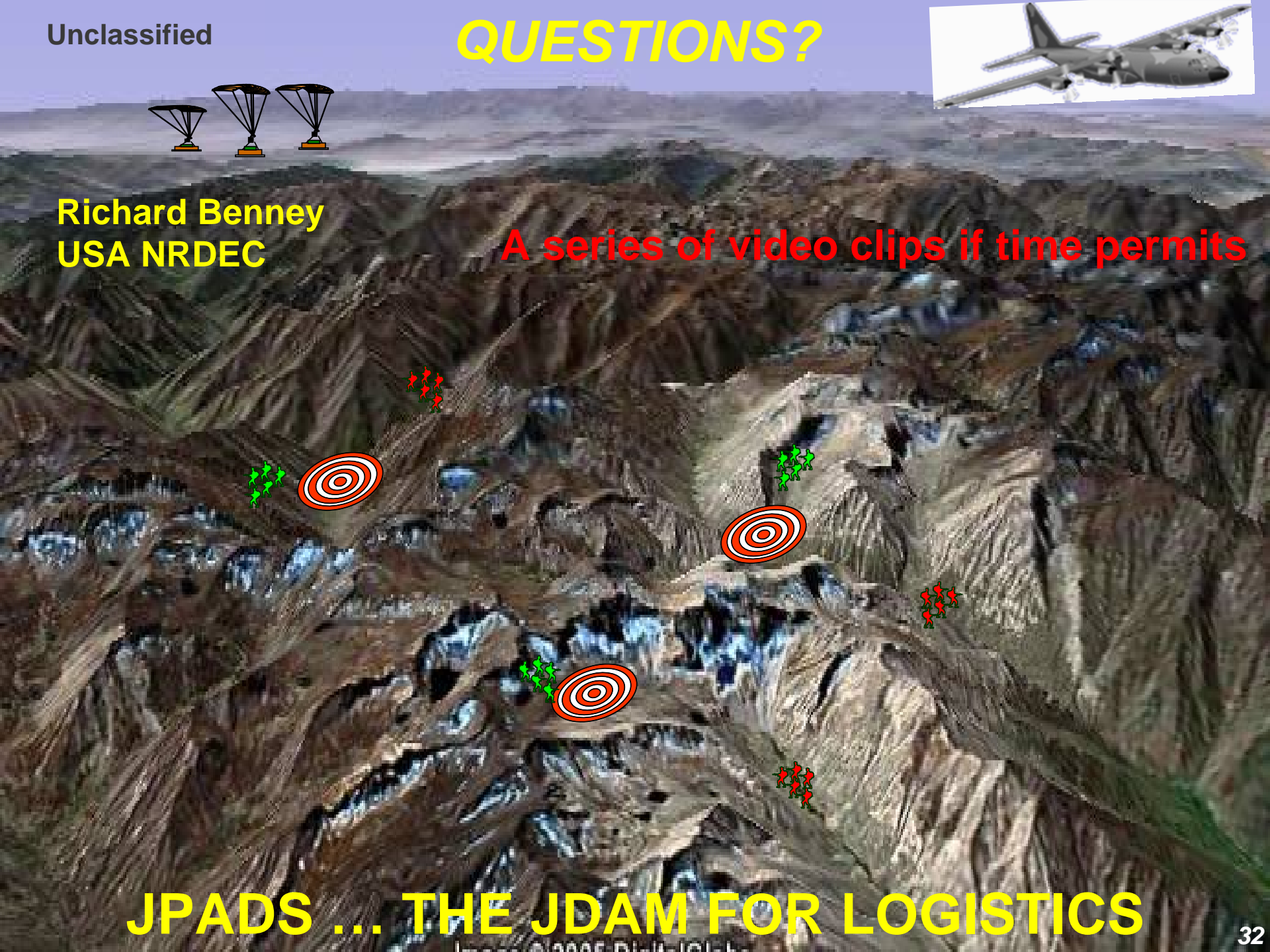
**[www.fedbizopps.gov](http://www.fedbizopps.gov)**

# QUESTIONS?



**Richard Benney**  
**USA NRDEC**

**A series of video clips if time permits**



## JPADS ... THE JDAM FOR LOGISTICS