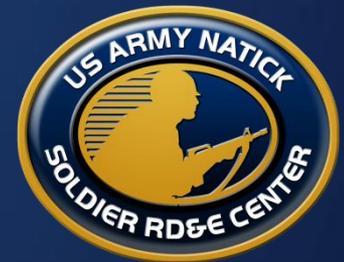


Aerial Delivery Overview & Areas of Investigation For Personnel Airdrop

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Team Leader
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US Army Natick Soldier RDEC

APBI 12 May 2011



- Airdrop in Afghanistan
- JPADS & Mission Planer
- 2K JPADS JUONS
- Aerial Delivery S&T
 - Precision Airdrop Enhancements
 - Communication
 - Personnel
 - Helicopter Sling Load
- Opportunities

Combat Airdrop Summary

Increased Use of LCADS Vs. Conventional

USAF Airdrop Summary in Afghanistan (Pounds)

2005:	2,000,000
2006:	3,500,000
2007:	8,182,066
2008:	16,576,297
2009:	32,267,606
2010:	60.4Million

→ Conventional → LCADS

Parachute Usage Per Month

3000

2000

1000

0

Mar-09

Sep-09

Apr-10

Oct-10

- Aerial Delivery in OEF continues to increase
- Lowers reliance on convoys (IED exposure)
- Only valid method for some DZs (no roads, too dangerous for Helo airland)
- Cargo Airdrop resupply includes: Food, Water, Fuel, Ammunition, etc.

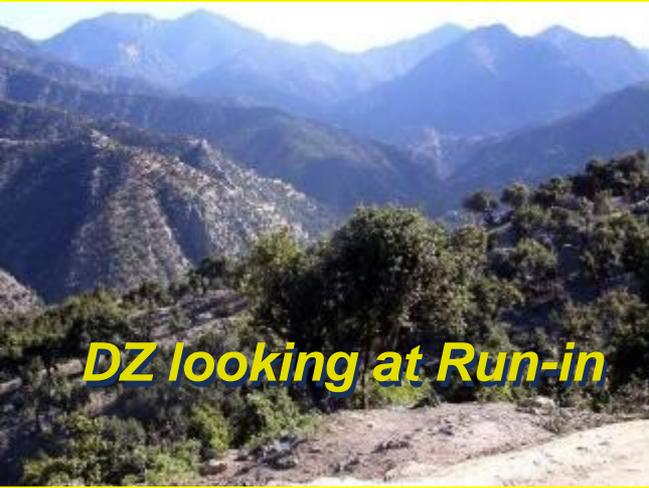
“These airdrops are critical to sustaining ground forces at austere locations where other means of resupply aren’t feasible” Col David Alman, USAF, Director Combined Air and Space Operations Center’s Air Mobility Division in 2010. “The continued sustainment of our warfighting forces is key to counterinsurgency operations, which require persistent presence and logistics”

- **LOW COST CONTAINER (LCC):**
 - Reduces costs by at least 55% over current CDS
 - 2,200 lb. load capacity
 - Delivers serviceable load in 13-knot ground winds
 - Thousands fielded since FY06
- **LOW VELOCITY & HIGH VELOCITY PARACHUTES**
 - 2200 load capacity – low to high altitude
 - Performance Similar to 26-Ft High Velocity and G-12 Low Velocity Parachutes
 - Pre-packed by the manufacturer
 - Simple design, easy to build, able to meet surge requirements
 - Broad manufacturing base
 - Thousands fielded since FY08
 - LCADS Low V has become system of choice in OEF when threat allows



4 Chute LV-LCADS HALO

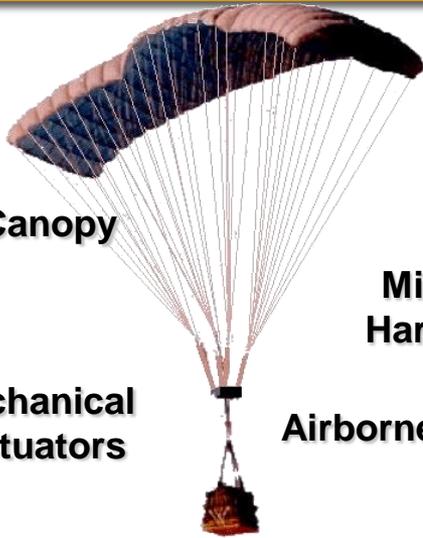




100 x 350 m

30° Slope Either Side Of
Centerline

50° Slope on Trailing Edge



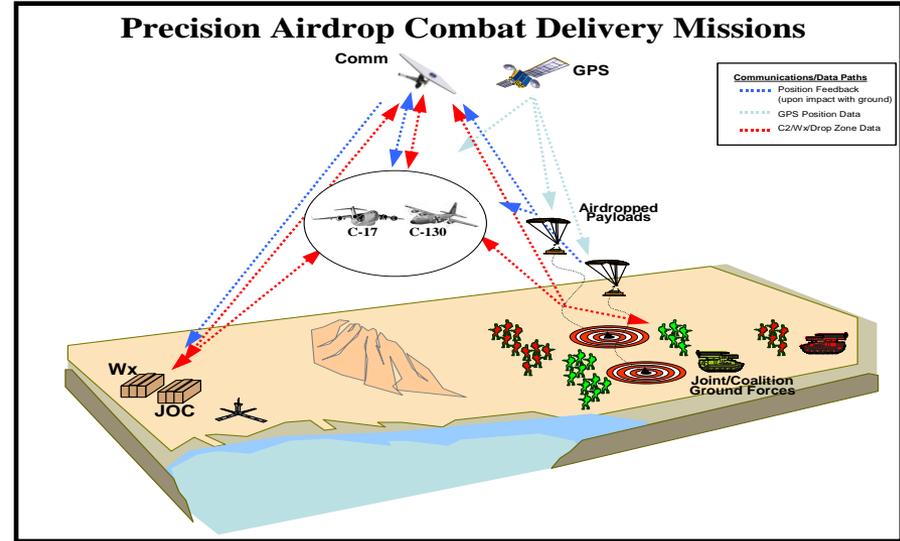
Steerable Canopy



Mission Planning Hardware/Software

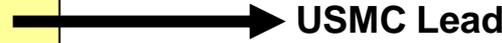
Electro-Mechanical Steering Actuators

Airborne Guidance Unit

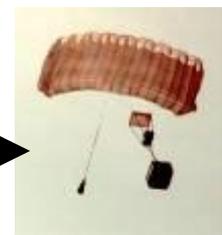


FAMILY OF SYSTEMS FOR

- **MICRO LIGHT (JMDSE JCTD): 10-150lbs**
- **ULTRA LIGHT VERSION~250-700 LBS**
- **EXTRA LIGHT VERSION~700-2400 LBS**
- **LIGHT VERSION~5001-10,000 LBS**
- **MEDIUM VERSION~10,001-30,000 LBS**
- **HEAVY VERSION~30,001-60,000 LBS**



UNCLASSIFIED



USMC ULW Lead
Contract Award
March 17, 2011

250-700lb

Micro Light
(multiple US investments)
10-150lbs

ICTD



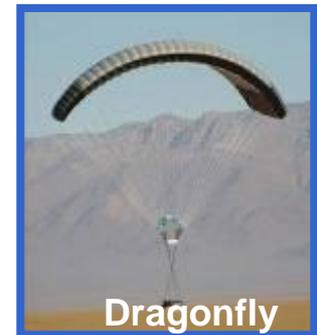
Firefly

700-2.4Klb

Military Free Fall (head
&/or Chest mounted)



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



Dragonfly

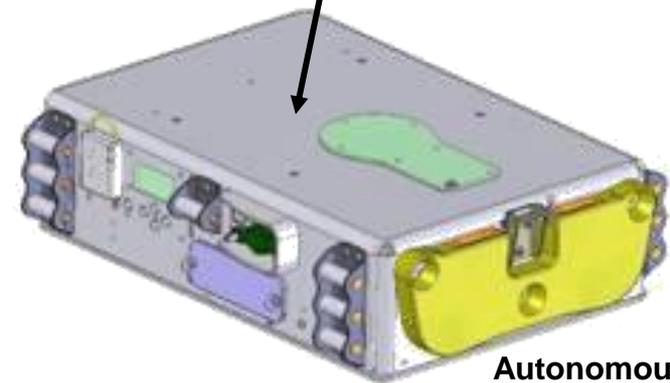
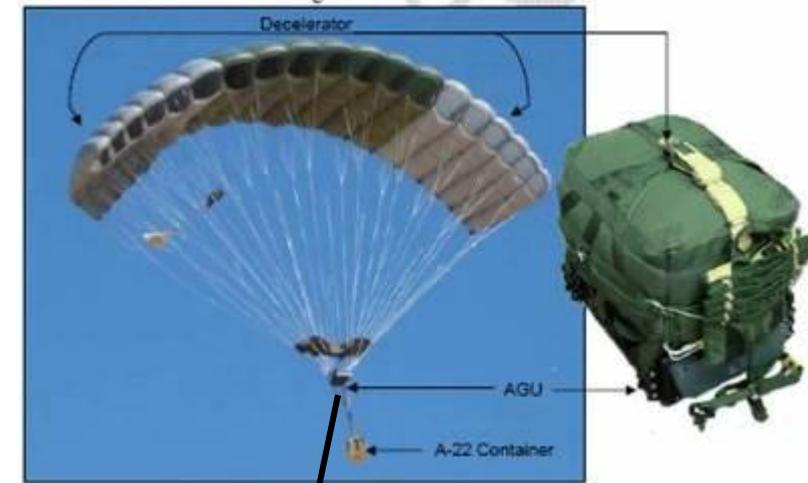
5-10Klbs

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

- **DESCRIPTION:**
 - Autonomously navigates along a predetermined glide and flight path to accurately deliver supplies and equipment
 - Utilizes two primary components: a decelerator and an Autonomous Guidance Unit (AGU), which interface with the USAF JPADS mission planner
 - Compatible with A-22 Container

- **STATISTICS:**
 - Weight – 160 lbs.
 - Max Payload – 2,400 lbs
 - Release Altitude – 3,500ftAGL-25,000ftMSL
 - Surface Area – 1025 ft²
 - Offset – >20Km
 - Accuracy ~110 m CEP (80%) (T-150m)

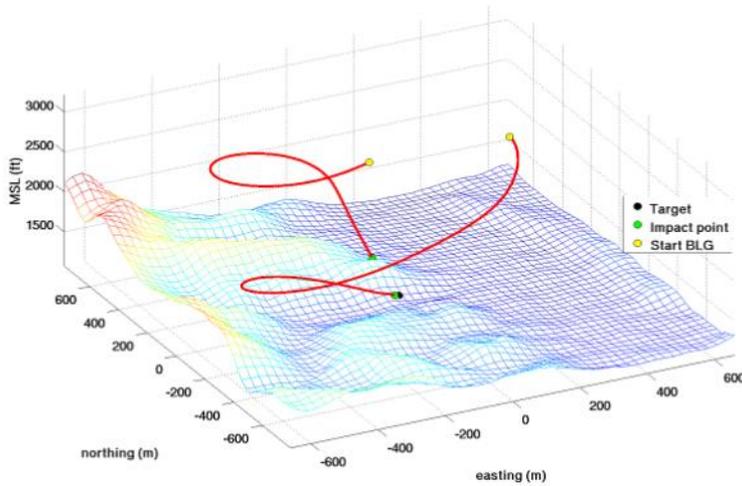
- **STATUS:**
 - Under Contract to Airborne Systems North America (now Hunter Defense Technology)
 - Systems Urgently Fielded to OEF in Sep 08
 - Materiel Release & Full Rate Production Approved May 09
 - 200+Systems Fielded Since Jul 09



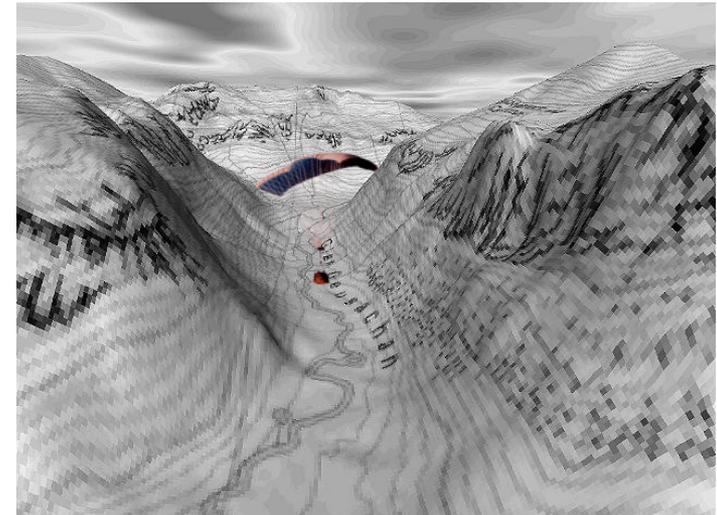
**Autonomous
Guidance Unit (AGU)**



- Three major requests:
- 1) Obstacle/Terrain avoidance
 - 2) One time use HW
 - 3) Improved accuracy



- **Weather sensing**
 - Share wind knowledge up a stick (leader/followers)
 - Forward wind knowledge will improve accuracy
- **Height sensors**
 - Improve AGL data for terminal guidance, flare timing, and obstacle avoidance
 - Increase accuracy and load survivability
- **Digital Terrain Elevation Data (DTED)**
 - Avoid mountains, ravines and adapt to undulating drop zones
 - Improve flight path and increase accuracy/survivability
- **In-flight tracking/Asset Location**
 - Communication among systems (deconfliction), A/C and soldiers
 - Improve ability to locate payloads
- **Adaptive flight software**
 - Maintain planned mission with damaged AGU or parafoil
 - Improve reliability, accuracy, and survivability



- JPADS Accuracy Challenges

- Winds
- High Aspect Ratio/Glide Canopy
 - Unstable Sink—Dynamic Stall
 - Full Brakes—Fast Ground Speed



Average miss = 50+ m
3+ yrs

- AccuGlide: Glide Slope Control,
Landing—Like a Round

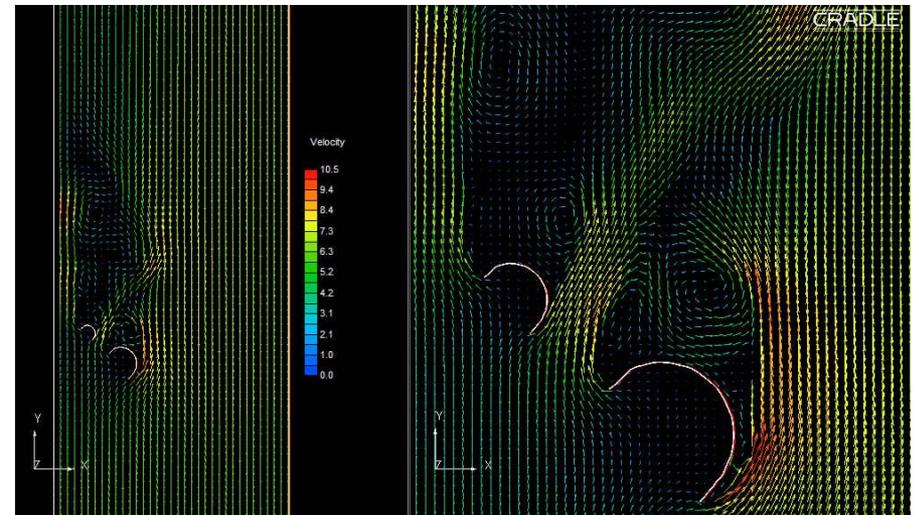
- Design = Personnel Accuracy, Low Aspect Ratio
 - Stable Sink—Stall Recovery
 - Full Brakes—Slow Ground Speed
- FY09/FY10: AG100 = 100 ft² (80 lbs payload)
 - New Guidance and Control System
- FY10/FY11: AG580 = 580 ft² (600 lbs payload)
 - Variable Trim with enhance glide control



Miss = 2 m
3rd week of Testing

High Speed Container Delivery System (HSCDS)

- Novel canopy design concept – Concentric Annular
- Fills capability gaps that current inventory cannot handle
 - Faster drag area generation
 - Reduced oscillation
- Designed to survive opening at 250 KIAS. High geometric porosity reduces damage.
- Design can be applied other existing Army needs – Advanced Low Velocity Air Drop Systems – Heavy (ALVADS-H)
- Light weight (50% the weight of a G-12 with the same drag area)





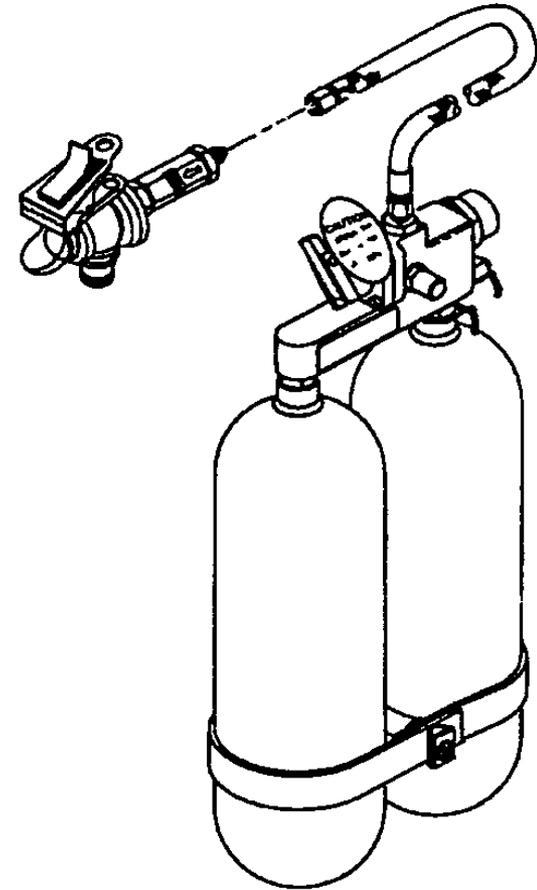
- Currently JPADS does not know location of other systems.
- Occasional “mid air” collisions.
- Comms between systems allows:
 - Addition of deconfliction SW
 - Follow the leader GN&C
 - Passing of wind estimates (or measurements) from “lower” to higher systems when heading to same DZ
 - Passing of “position” (to include impact) up chain (last system SATCOM connected)
- Testing with unsecure comms (S&T)
- Currently investing in next gen JPADS avionics.



- De-confliction: JPADS <-> JPADS
- Combo drops: JPADS & MFF
- Soldier load reduction
- Also desired with HALO option
- Comms extended between jumpers and bundles
- Jumpmaster with “optional” controls
 - Change mission in flt, (alternate IP)
- SATCOM on JPADS (or MFF)
- Limiting overload SA to jumper is key
- Personnel de-confliction at night more difficult
- Pass wind estimates up chain
- Track all systems via LOS comms, pass all via SATCOM
- Exact payload location on ground, flare direction...



- Current bottle rated as 106 cu in at 1800 psi
- Aircraft exit altitude increasing by 10,000 feet up to 35,000 feet AGL, and increasing time under canopy to potentially 45 minutes or longer
- Working with PM-SCIE to provide parachutists with more oxygen with a higher psi bottle



- Recently fielded the improved Parachutist Oxygen Mask (POM)
- Current Military Free Fall helmet-worn equipment does not provide adequate thermal protection in extreme cold environments
- Investigating development of full-face oxygen mask for greater thermal protection of face and neck with increased exit altitudes up to 35,000 feet AGL



Parachutist Extreme Cold Weather Thermal Protective Equipment

- Current maximum exit altitude for High Altitude Military Free Fall training/operations is 25,000 feet AGL. This will be increasing to 35,000 feet AGL.
- At 35,000 feet AGL, soldiers could experience temperatures of -60°F, and land at drop zones with temperatures in excess of 100°F.
- There is no equipment available to provide the necessary thermal protection during time aloft and account for the thermal differential between aircraft exit and surface temperatures.
- While there exists some thermal equipment, it is lacking in protecting extremities, such as hands and feet.





- **Conduct Air drop from the cargo hook of a helicopter**

- No required drop order
- Air Drop/ Air Land capability
- Release system within the aircraft
- Integrate with any parachute system
 - Guided
 - Unguided
 - HALO
- Integrate with any Helicopter (cargo hook required)



- **New HSL Equipment**
 - **High Strength**
 - **UV/particulate resistant**
 - **Light Weight**
 - **Low Cost**
- **One Time Use Equipment**
 - **Low Cost Materials**
 - **Low Cost Manufacturing practices**

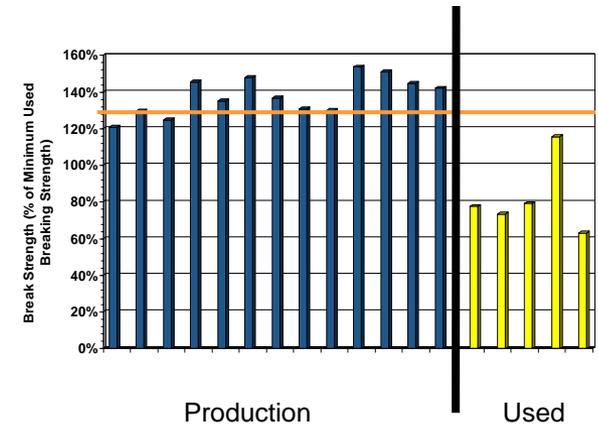


Problem:

- Up to 40% strength loss after 18 months of use in Iraq
- Strong evidence of sand ingestion and degradation
- Currently no service life on the equipment
- Visual inspection prior to use

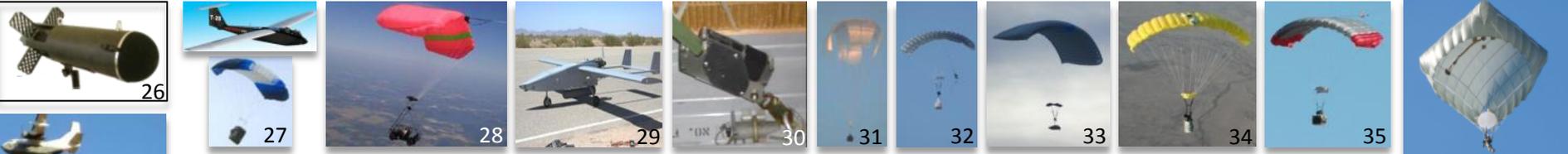
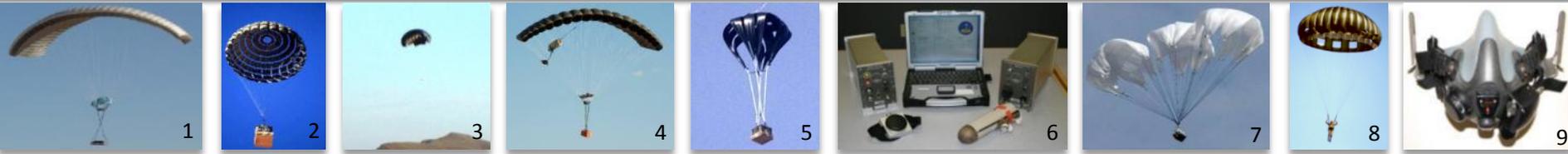
Program:

Identify non-destructive tests methods
it identify damaged ropes and cords



Current RFI Link:

https://www.fbo.gov/index?s=opportunity&mode=form&id=62ee2b4317486aaa81c037bd32346f50&tab=core&_cview=0



Operational &/or POR	S&T	S&T (Cont.)	Foreign
1: 10K JPADS (Dragonfly)	11: 2K ICDS (HALO)	22: Onyx UL, jumpers following	31: CA - Low Cost
2: 26ft RS ICDS	12: 5-10K ICDS HALO (1)	23: Onyx ML	32: CA - Sherpa 2K
3: LV LCADS (ICDS)	13: 10K Screamer (RCFd)	24: Panther 500	33: CA - Sherpa 10K
4: 2K JPADS-Firefly	14: BPADS	25: PCADS	34: NL - Spades 300 (UL)
5: HV LCADS (ICDS)	15: CopterBox	26: QuickMEDS	35: NL - Spades 1000 (2K)
6: JPADS-MP	16: GlideLine Parachutist Navigation	27: Snowflake via Arcturus UAS	NL- MFF Jumpers: not shown
7: LCLA (3 variants)	17: 5-10K ICDS HALO (2)	28: Strong ATV (Prowler)	
8: MC-6	18: Maverick UAS, dropping 3 systems	29: Tigershark UAS with Provider	
9: Parachutist Oxygen Mask	19: Megaflly (18K-30K)	30: Wireless Gate Release System	
10: T-11	20: Microfly		
	21: Mosquito Delivery System 3		

Systems at PATCAD 2009

A broad selection of systems were showcased at PATCAD 2009. Approx. 40 lifts utilizing 400,000 lbs of cargo tested from 3-30,000 lbs. Systems drop from C-130 (H and J), C-17, C-23, V-22, Commercial C-130, and Tigershark, Maverick and Arcturus UASs.



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

For US Small Businesses only:

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

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

Army: <http://www.armysbir.army.mil/>

See FebBizOps website:

<http://www.fbo.gov>

Or

www.fedbizopps.gov

QUESTIONS?



Brian Bagdonovich
USA NRDEC

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