

Headquarters Air Mobility Command



Precision Airdrop Improvements AMC Industry Days 1 July 2009

**Maj Erin Staine-Pyne
AMC/A3D**

Unrivaled Global Reach for America ... ALWAYS!



PURPOSE



-
- Describe Current Improved Conventional and Precision Airdrop System
 - Detail Future Airdrop Capabilities

Unrivaled Global Reach for America ... ALWAYS!



ACRONYMS



-
- | | |
|--|---|
| ■ AFWA: Air Force Weather Agency | ■ JMIP: Joint Module Inter-modal Platform |
| ■ AGU: Autonomous Guidance Units | ■ JPADS: Joint Precision Airdrop System |
| ■ AMWC: Air Mobility Warfare Center | ■ LAR: Launch Acceptability Region |
| ■ CARP: Calculated Airdrop Release Point | ■ LCADS: Low Cost Aerial Delivery System |
| ■ CDS: Container Delivery System | ■ MAF: Mobility Air Forces |
| ■ CEA: Circular Error Average | ■ MTT: Mobile Training Team |
| ■ CJTF: Coalition Joint Task Force | ■ NSC: Natick Soldier Center |
| ■ CSA: Chief of Staff, US Army | ■ OEF: Operation ENDURING FREEDOM |
| ■ DARPA: Defense Advanced Research Projects Agency | ■ OIF: Operation IRAQI FREEDOM |
| ■ DRS: Dropsonde Receiver Subsystem | ■ PFOR: Peace Force |
| ■ DZ: Drop Zone | ■ PM-FSS: Program Manager-Force Sustainment Systems |
| ■ ECDS: Enhanced Container Delivery System | ■ RDT&E: Research, Development, Test & Evaluation |
| ■ FCS: Future Combat System | ■ SAFIRE: Surface-to-Air Fire |
| ■ HV/LV: High Velocity / Low Velocity | ■ SECAF: Secretary of the Air Force |
| ■ HVCDS: High Velocity Container Delivery System | ■ SOF: Special Operations Forces |
| ■ I-CDS Improved Container Delivery System | ■ UAV: Unmanned Aerial Vehicle |
| ■ JDAM: Joint Direct Attack Munitions | |
-

Unrivaled Global Reach for America ... ALWAYS!



ACRONYMS



-
- UHF: Ultra High Frequency
 - USTC: United States Transportation Command
 - VCJCS: Vice-Chairman, Joint Chiefs of Staff
 - WEZ: Weapons Engagement Zone
 - WX: Weather

Unrivaled Global Reach for America ... ALWAYS!



OVERVIEW



■ Background

- History
- Partners
- Current Systems

■ Future RD&TE

- Single Pass Airdrop
 - ♦ Data Link Capability
- Laser Guidance
- Use of Optics/Terrain Awareness



Unrivaled Global Reach for America ... ALWAYS!



BACKGROUND



■ OEF SOF Experience

- Airdrops Often Inaccurate
- Cargo Left Vulnerable to Enemy
- SOF Teams Vulnerable During Cargo Recovery Ops

“ We can drop bombs right onto 10 digit grid locations, but miss with logistics drops by half a mile. We need the equivalent of JDAM for logistics drops.”

- Dr Chatham (DARPA) Report On SOF OEF Brief Highlighting MAF Deficiency In "Precision" Air Drop Resupply ~ Aug 02

■ SAFIRE On MAF Aircraft During Airdrop Indicate:

- Enemy/Terrorist Intent Has Increased **AND** Adapted Tactics

Unrivaled Global Reach for America ... ALWAYS!



HISTORY



- 1993: Army Requests Improved Airdrop Capability
- 1999: 1st Formal Precision Airdrop Demo
- *2004-06: Multiple CJTF-7, 101st Airborne Div, 10th Mtn Div Precision Airdrop Urgent Needs Statements*
- AMC/CC Directed Program Acceleration → \$3.8M Seed Money
- AMC Stands Up Tiger Team → AMWC Lead
- Jun 06: USTC/CC PFOR to CSA → Accelerate JPADS Delivery
- *CSAF Says, "... Faster"*
- AMC MTT Deployed To OEF → I-CDS/JPADS Employed Jul 06!
- \$6.1M End-Of-Year Funding
- *3 Oct 06: VCJCS Memo to the Vice Chiefs*
 - Directs Army to Accelerate JPADS 2K Fielding
- *24 Oct 06: SECAF Directs JPADS/I-CDS in OIF/OEF in 60 Days*

Unrivaled Global Reach for America ... ALWAYS!



JOINT PARTNERS



- US Army (Lead)
 - Natick Soldier Center (NSC)
 - Product Manager-Force Sustainment Systems (PM-FSS)
 - Combined Arms Support Command
- US Joint Forces Command
- US Transportation Command
- US Special Operations Command
- US Central Command
- Deputy Under Secretary of Defense Advanced Systems and Concepts Office
- US Marine Corps
 - Marine Corps Systems Command
- US Navy
 - Naval Special Warfare Development Group
- Industry Partners



Unrivaled Global Reach for America ... ALWAYS!



CONCEPT OF EMPLOYMENT



-
- **Employ JPADS When Following Conditions Exist:**
 - **Airdrop Altitudes Forced into the Med/High Altitude Structure**
 - ♦ Conventional Drop Altitudes Place Aircraft in WEZ
 - ♦ Extreme Terrain
 - **High Degree of Accuracy Required**
 - ♦ User Exposure a Concern
 - ♦ Delivery to an Urban Area
 - **Require More Stealthy Delivery of Supplies**
 - ♦ Stand-off Range
 - **Need to Deliver Multiple Loads to Multiple DZs**

Unrivaled Global Reach for America ... ALWAYS!



JOINT PRECISION AIRDROP SYSTEM (JPADS)



Steerable Canopy



Mission Planning
Hardware/Software

Electro-Mechanical
Steering Actuators
Airborne Guidance Unit

DropSonde



FAMILY OF SYSTEMS FOR DIFFERENT WEIGHT RANGES

- EXTRA LIGHT VERSION~220-2400 LBS
- LIGHT VERSION~2201-10,000 LBS
- **MEDIUM VERSION~10,001-30,000 LBS**
- ~~HEAVY VERSION~30,001-60,000 LBS~~

Guided System Program of Record:

- 500lb Microfly (USAF)
- 2K Firefly (USA)
- 10K Dragonfly (USA)

Unguided System: Improved CDS

- 2K HV/LV CDS
- 2K HV/LV LCADS
- 5-10K Systems



SOF/USMC/USA Small Team Resupply

ECDS

JMIP

FCS



Unrivalled Global Reach for America ... ALWAYS!



JPADS EQUIPMENT



-
- **Common to All JPADS/I-CDS Airdrops**
 - **Mission Planner Software**
 - ◆ **AFWA Forecast**
 - **Aircraft GPS Retransmission Kit**
 - **Used for I-CDS**
 - **Dropsonde & UHF Dropsonde Receive Subsystem**
 - **Ballistic Parachutes**
 - **Used for JPADS Guided Drops**
 - **Dropsonde & UHF Dropsonde Receive Subsystem (Rare Cases)**
 - **Autonomous Guidance Units**
 - **Parafoils**
-

Unrivaled Global Reach for America ... ALWAYS!



JPADS SOFTWARE



■ JPADS Mission Planning Laptop



JPADS-MP - Unnamed_Mission

Mission Edit Options Weather Help

Load: Screamer 2k (A-22) + X Plot Load Trajectory Wx Compute Cancel Plot

Release Pass: + X 1 2 3 4 5 6

NOSE

C-130 CARGO AREA

1 Load 1 Dropso

4 Load 2 Dropso

Load "Load 7" (Scream

General Waypoints Footprints

Load Info

Name (Label) Load 7

Bundle Type A-22

Release Delay From GL (s)

Total Rigged Weight (lbs.)

Flight Station (in.)

Exit Strategy Rollout (Gravity)

Communication ID

Glide Safety Factor 0.89

Planned Drop

Release Pass: 3 of 6

Point of Impact: N 32 54.879
W 092 18.111

Drop Time: 08/26/2007
(zulu) 12:30

Drop Altitude: (ft
MSL) 9000

Weather Source Inventory Age (hh:mm)

4D Forecast 0

1D Forecast 0

Dropsondes 0

Climatology 1 00:00

Ballistic Wind 0

Pilot Report 0

Acquire 4D Fcst Acquire 1D Fcst Acquire Climo

GRIB Files Location: E:\GRIBSFromWRF\2006080306_00_04_4 Browse...

Acquire 4D Forecast Acquire Status Idle * Download GRIB Files to Location * Push Acquire Button

Sonde Ops

Receiver Setup... Sonde Monitor... Sonde Setup...

Sonde Database

List / Plot / Find...

Download Weather Files

Internet Explorer... Windows Explorer... FTP

Acquire Sonde (Optional)

Acquire Sondes by Time... Acquire Sondes by ID...

WFP (Optional)

Force Best WFP What's this? Wind File Production...

Tools

Configure PADS... Dropsonde Database Maintenance... Environmental Database Maintenance... Capture System Snapshot... Close

Unrival



AFWA WX DOWNLOAD



<https://weather/afwa.af.mil/PADS/padsGUI.html>

PADS



☐ 1D Vertical Profile

☒ 3D Gridded Fields

☒ Mountainous Terrain

☐ Flat Terrain

Login

Password

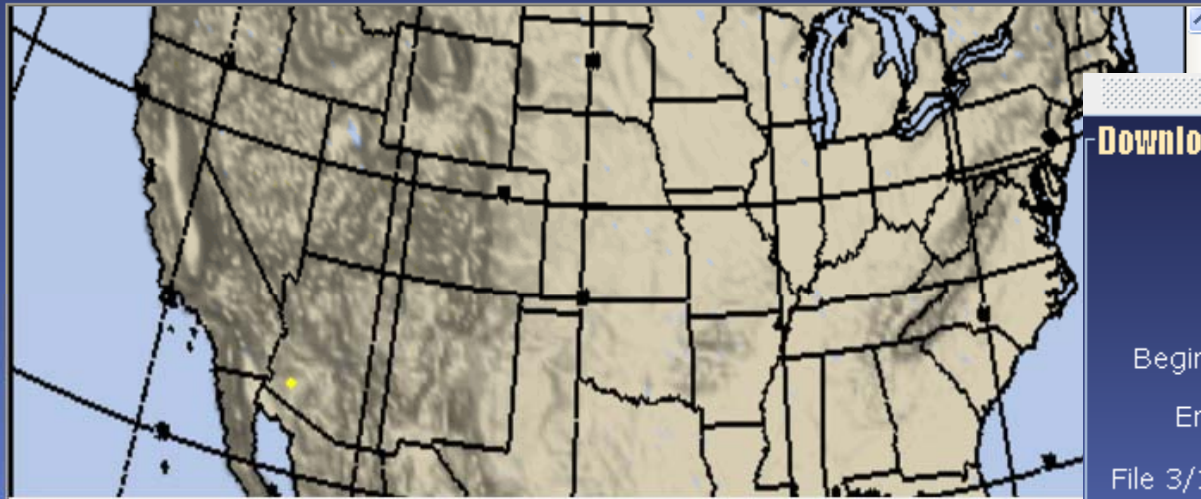
Login

Register

MAP: CONUS 15-km

☒ Map Display

Review and Download



1. Point of Impact (PI)

Latitude : 32.46

Longitude : -113.27

Save PI Profile

☒ Display Lat / Long

2. Enter Forecast Period

Date

Time

Beginning : 11-Apr-2007

14:00

End : 12-Apr-2007

23:00

* Date/Time is in Greenwich Mean Time (GMT)/Zulu

Save Data Location : C:\Documents and Settings\Neil.Richardson

Downloading Forecast Data For

Latitude 32.46

Longitude -113.27

Beginning Forecast 11-Apr-2007 14:00

Ending Forecast 12-Apr-2007 23:00

File 3/14 Progress

8813 KB of 8813 KB downloaded

Transfer rate 0 KB/sec

Processing...

Overall Progress

17148 KB of 122914 KB downloaded

Estimated time left 10 min 8 sec

13%

Cancel



AIRCRAFT EQUIPMENT



UHF-DRS

UHF DRS

- Receives Signal From A Dropsonde
- Sends Data to Mission Planner



GPS Antenna Control

GPS Retransmission

- Broadcasts GPS Across Cargo Compartment
- Used by Dropsonde/AGU

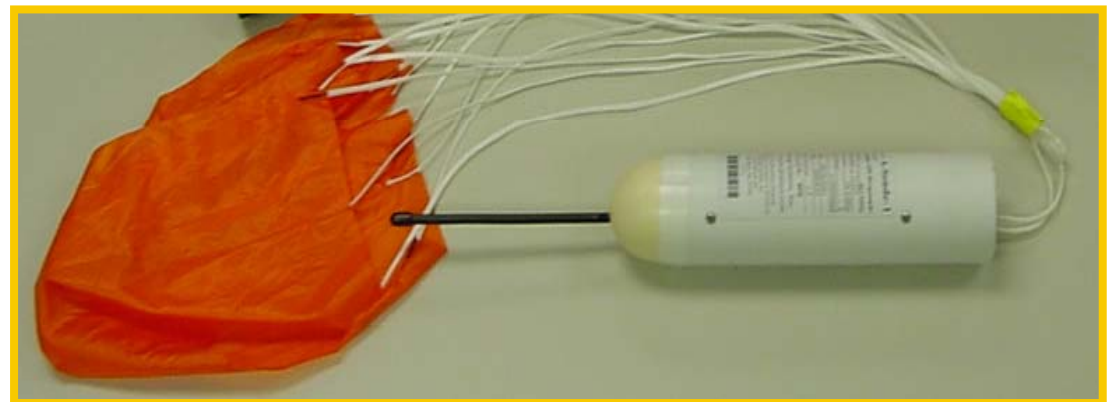
Unrivaled Global Reach for America ... ALWAYS!



DROPSONDES



- Required for I-CDS Airdrop
- Dropped 15-20 min Prior to Payload Airdrop
 - Within 30 km of the DZ
- Programmable Frequency
- Bundle Transmits Position/ Instantaneous Velocity & Differential GPS Position (overlays w/AFWA model)
- Requires Aircraft UHF Antenna
- 70+ fps
- Reusable Twice



Unrivaled Global Reach for America ... ALWAYS!



PAYLOAD I-CDS BALLISTIC SYSTEMS



**I = Improved
Due to Weather Forecast and
NRT Dropsonde Information**

**CDS
HVCDS
LCADS-LV/HV**



Unrivalled Global Reach for America ... ALWAYS!



PAYLOAD AUTONOMOUS GUIDANCE UNIT



FIREFLY

- Compass/GPS Guidance Unit
- 900 MHz Transceiver
- Self Locking Servo Motors
- Optional Remote Capability
- AGU Weight 70.5 lbs
 - 137.5 lbs Total Weight



Reusable 20+ Times!

Unrivalled Global Reach for America ... ALWAYS!



PAYLOAD FIREFLY DATA

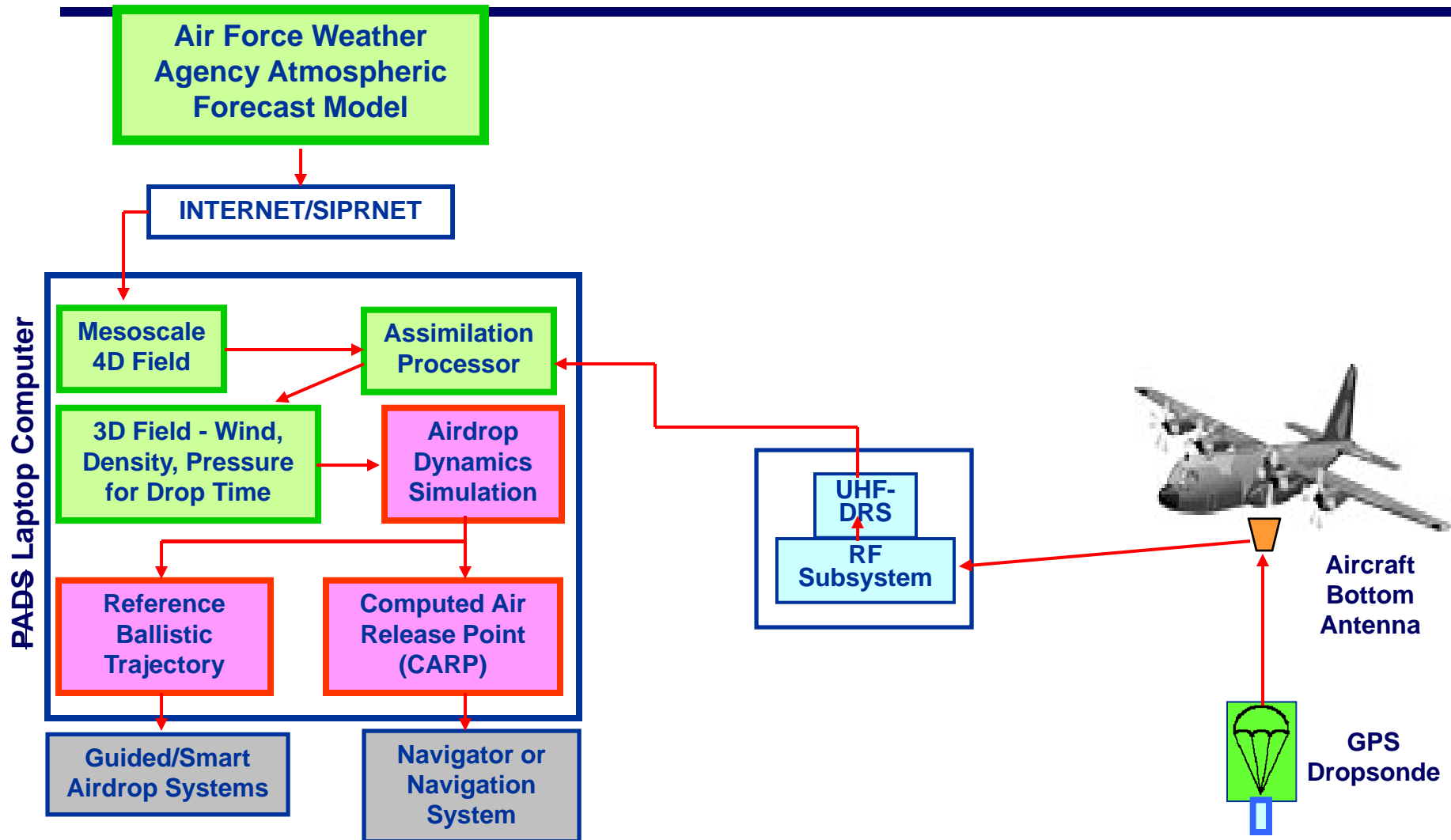


- **Single Parafoil System**
 - Proportional Steering/Flare
 - Optional Remote Control
- **Compass/GPS Guidance**
- **Standoff: 16nm @ 25k**
- **Payloads: 500-2,200 lbs**
- **Time Aloft: 10-25 min**
- **Current CEA: 200m x 40m**

Unrivalled Global Reach for America ... ALWAYS!



JPADS AIRDROP INPUT/OUTPUT DATA FLOW



Unrivalled Global Reach for America ... ALWAYS!



FUTURE CAPABILITIES



- Single Pass Airdrop
- Delivery System Terrain Awareness
- Laser Guidance

Unrivaled Global Reach for America ... ALWAYS!



ONE PASS OVER THE DROPZONE



■ Wind Data

- **Sondes Require Aircraft to Fly Over DZ Twice**
 - ♦ **Exposes Aircraft & Forces on Ground**
- **Requirement For Near-Real Time Data to Aircraft Laptop for CARP & LAR Updates & Reduce Exposure**

■ Possible Solutions

- **Aircraft “Sense” Wind/WX Autonomously**
 - ♦ **RADAR/LASER or other Technology**
 - **Aircraft Receive Airborne Networked Wind/WX Data**
 - ♦ **Theater Weather System Using Unmanned Resources (UAV, Balloon, Satellite etc)**
 - **Data Link Capability**
 - ♦ **May Require Data-link to Pass Information**
 - ♦ **Allow Entire Formation to Use Data**
-

Unrivaled Global Reach for America ... ALWAYS!



OPTICS/TERRAIN AWARENESS



- **Make GPS Guided Systems “Terrain Aware”**
 - **Some Initial Drops in OEF Impacted Terrain**
 - ◆ Firefly Flight Path in Unknown
 - ◆ Does not Account for Terrain in Flight Path
 - **Possible Solutions**
 - ◆ Load Digital Terrain Database in AGU
 - ◆ Ability to Plan “No-fly Zones”
 - ◆ Add Optics/Height Sensor to Payload

***Predominately US Army Requirement With Correlating
System Level Requirements for US Air Force Airdrop
Capability***

Unrivaled Global Reach for America ... ALWAYS!



LASER-GUIDED JPADS



- **“Develop a Laser Guided Precision Payload System”**
 - **Payload Detects Laser and “Flies” to Target**
 - ◆ **GPS Independent System**
 - **Possible Solutions**
 - ◆ **Strap-On Seeker Kit**
 - ◆ **Ties into Steering Control System**

***Predominately US Army Requirement With Correlating
System Level Requirements For US Air Force Airdrop
Capability***

Unrivaled Global Reach for America ... ALWAYS!



REVIEW



■ Background

- History
- Partners
- Current Systems

■ Future Capabilities

- Single Pass Airdrop
- Delivery System Terrain Awareness
- Laser Guidance

Unrivaled Global Reach for America ... ALWAYS!



QUESTIONS?

Unrivaled Global Reach for America ... ALWAYS!