Aviation Individual Protection Acquisition Strategy Brief

(Caveat: This is a Deputy JPM IP, Aviation Concept Brief. What the Future CB Aviation system is or is not requires additional coordination with all involved DoD agencies)

Mr. Lowry Brooks
Deputy Joint Project Manager – Individual Protection, Aviation
October 25, 2007
Outline

• Current Programs (JSAM, JPACE, JSMLT)
• Traditional Approaches
• Aviation Requirements
• Systems Engineering Approach
• Vision and Strategy
• Integration Efforts
• Technology Needs
• Current and Near Term Efforts
• Path Forward
Joint Service Aircrew Mask (JSAM) Family of Systems Schedule
JSAM Family of Systems Solutions
Per Platform

Six Planned Increments:

• **Increment 1 - JSAM Apache Variant (Type IA):**
  – Fully compatible with the Integrated Helmet and Display Sighting System (IHADSS)
  – Platforms integrated with: AH-64A/D

• **Increment 2 - JSAM Fixed Wing Variant (Type II):**
  – Compatible with Pressure Breathing for G (PBG) in high performance aircraft
  – Platforms integrated with:

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JSAM Family of Systems Solutions
Per Platform

- **Increment 3 - JSAM Rotary Wing Variant (Type I):**
  - Incorporates don-in flight capability to allow face free flight in non-CB threat environment
  - Platforms integrated with:

  **USN/USMC:**
  AH-1W, UH-1N, HH-1N, HH-60H, SH-60B/F, MH-60R/S, CH-46E, CH-53D/E, MH-53E
  HH-60H, SH-60B/F, MH-60R/S

  **USA:**
  AH/MH-6, AH64D, MH-47D/E
  CH/MH-47D/E/F, OA/OH-6, OH-58D
  MH-60K/L, HH-60L/M, UH-60A/L/M/Q
  LRA, LUH

  **USAF:**
  UH-1N, HH-60G

- **Increment 4 – Joint Strike Fighter Variant (F-35):**
  - Integrates JSAM Type II capabilities into JSF development upfront and early
  - Platforms integrated with: F-35 (JSF) A/B/C
JSAM Family of Systems Solutions
Per Platform

• **Increment 5 – Top Owl Variant (Type IB):**
  – Integrates JSAM solution into Top Owl development upfront and early
    • Top Owl is the new helmet and helmet mounted display sighting system being developed by the Navy
    • Schedule being synchronized with TOP OWL
  – JSAM Type I or II may be adapted for TOP OWL integration
  – Platforms integrated with: AH-1Z, UH-1Y

• **Increment 6 - Integrated Mask-Helmet Variant: (notional)**
  – A revolutionary product that incorporates CB protection in the next generation aviation mask-helmet technology
  – Potential to demonstrate via an Advanced Technology Demonstration (ATD)
JSAM Increments 1-3

JSAM Increment 1
(Apache Variant)

JSAM Increment 2
(Fixed Wing Variant)

JSAM Increment 3
(Rotary Wing Variant)
Joint Protective Aircrew Ensemble (JPACE) Increment I Overview

- JPACE is a Chemical Protective Coverall constructed of carbon based adsorptive liner and a liquid repellant, Nomex outer shell designed specifically for the Air Crew
  - USN/USMC will field Class 1 (sage green); USA will field Class 3 (universal camouflage)
  - Neck Dam component will be fielded for Army use when mask hood is worn over ALSE (Hasty Scenario)
JPACE Increment I Status

• Full Rate Production (FRP) Aug 06
• USN/USMC Delivery Order Sep 06 (Class 1 sage green)
• Material Release/Fielding Decision Jun 07
• Neck Dam Contract Awarded Jun 07
• USA Delivery Order Awarded Jun 07 (Class 3 - universal camouflage)
• Remaining Issues:
  – Thermal Burden reduction
  – High Wind Rotor Wash/TIMs/NTAs performance criteria and test methods
  – Full Anti-Exposure Compatibility
Joint Service Mask Leakage Tester (JSMLT)

- **Production**
  - FRP May 05
  - FUE Jun 06
  - Production rate: 20-30 systems/month
  - 479 systems delivered
  - Users: USMC, USAF, USN, USCG, SOCOM

- **Fielding/NET Progress**
  - Accelerated schedule
  - 416 systems fielded to date
  - 240 additional systems to be fielded in FY08
Joint Service Mask Leakage Tester (JSMLT)

• Expanding Capabilities in FY08
  – JSGPM & M53 Adapter Suite
  – M42 / M45 Hose Isolation Test Adapter
  – M45 Mask Outlet Valve Test Adapter
  – Adapter Prototypes for JSAM DT / OT

• Emerging Issues On Our Radar
  – Changing Threat Condition vs. Mask Testing Standards
  – JSAM Integration & Test Procedures
  – Cost/Time Saving Concepts
Traditional Separate Approaches

Individual Service Aircrew Life Support System Approach

CB Component Integration Approach
Where We Want To Go

A New Teaming Approach

A true system of systems approach with all requirements adjudicated upfront and early in a cooperative all inclusive aviation paradigm
“Pilot Joe”

An epic saga...
Eliminating Encumbered Pilot Joe!

- Paradigm shifting to development of CB protection in a Systems Design Environment focusing on better integrated CB solutions
  - Multi-functional flight gear with CB protection integrated in rather than added on
  - Optimal integration among components providing CB protection and components of mission specific Aircrew Life Support Systems
en•cum•ber (én-küm'ber), adjective
1: To put a heavy load on; burden 2: To hinder or impede the action or performance of

"Pilot Joe"
Integrated CB Protection Concept

Joint Project Manager - Individual Protection
Joint Project Management Office for Individual Protection

integrated (in'tē-grät'əd), adjective
1: organized or structured so that constituent units function cooperatively

Joint Project Manager - Individual Protection

“Pilot Joe”
Integrated CB Protection Concept
Evolving Aviation Requirements

• Recently completed and ongoing studies on operationally relevant challenge levels and mission profiles
  – JRO/IDA “Chemical Challenge Study”
  – JPM-IP/RAND “Chemical Challenge Level Analysis”
  – JRO/IDA “Operational Chemical Challenge Study”
  – OPNAV “Naval Aviation Life Support System Requirements Study”

• Paradigm is beginning to shift from historical challenge level requirements to a capabilities-based view with intelligent Operational Risk Management (ORM) decisions used to bound tradespace.
Multi-Tiered Aviation Requirements

• Multi-tiered requirements are evolving based on threat and mission profiles
  – Fixed Wing Ejection Seat – Lower Threat, more trade space
  – Rotary Wing – Higher Threat; less trade space
  – Fixed Wing Non-Ejection Seat – No threat for some

• Examples:
  – Protection times ranging from 8 to 24 hours
  – Durability/Wear Time ranging from 48 to 480 hours
  – Laundering – ranging from 0 to 10 launderings
  – Challenge levels: (non-KPP)
    • Liquid – ranging from 1 to 10 gm/m²
    • Vapor/Aerosol – ranging from 500 to 5000CT

To address these multi-tiered requirements we are seeking a JCE Family of Systems solution with common components across the warfighter spectrum (ground/sea/air)
New Paradigms

Challenge Level as a Dependent Variable within the tradespace

Utilizing Tradespace Analysis

Note: Illustrative Only: Metrics not yet refined
Integrated CB/Aircrew Ensembles

Integrated Fabrics

Integrated System of Systems Design Environment

Human Performance

Service Specific Aircrew Life Support Equipment Design

Air Purification and low profile filters

Clothing Design

JCE – Aviation

Mission Specific Clothing Modules and Integrated Mask/Helmet .... with optimal integration among CB and ALSS components

Respirator Design
JCE Aviation and Ground Commonality

JCE - A Family of Systems
Built from Common & Unique Advanced Components, Modules & Sub-systems

Fully Integrated with mission specific combat & life support equipment and platforms
Aviation Vision

• Modular System of components and sub-systems some of which are common with Ground users

• Early spiral introduction of modules that address critical needs
  – High Dexterity / High Tactility Gloves
  – Low Threat / Low Burden FW vapor protective layer
  – Maritime compatible CB layer
  – Don-in flight respiratory protection

• Mid-term introduction of modules that address emerging threats
  – NTAs / TICs
  – HWRW Driven agents
  – Low (weight, cube, power) active or passive Cooling
  – Mission/Platform specific respiratory protection (Top Owl, JSF)
  – Modular Mask/Helmet

• Future introduction of multi-functional components fully integrated with other ALSE
  – Integrated Mask/Helmet
  – Self-detoxifying basic CB protection in duty uniform
  – Complete modular Percutaneous capability addressing all missions and environments
How Hard Can That Be?
Integration Challenge: JSAM Fixed Wing Interfaces
Integration Challenge: JSAM Rotary Wing Interfaces
New Approaches
Aviation Programs: Opportunities

- **Integrated Aircrew Ensemble (IAE) - USAF**
  - JPM-IP influencing CDD based on challenge studies; potential for JPM-IP module or technology insertions

- **Modular Aircrew Common Helmet (MACH) – USAF**
  - Seeking opportunity to influence as basis for integrated mask/helmet

- **Soldier as a System (SaaS)-Air – USA**
  - Will leverage JPM-IP efforts to provide Next Gen CB solution

- **Joint Service Advanced Laser Eye Protective Visor – USA, USN/USMC**
  - Opportunity to influence and ensure compatibility initially with JSAM and to integrate capability into combined mask/helmet of the future

- **Combined JHMCS / NVG – USN / USMC, USAF**
  - Opportunity to influence and ensure compatibility initially with JSAM and to integrate capability into combined mask/helmet of the future

- **Aircrew Endurance (LOE) – USN / USMC / USAF**
  - Opportunity to influence and improve mask interface with USN / USMC body armor and LPU
## Aviation Integration Pathway

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### Systems Integration

- Full modular BTN capability; Integrated Mask/Helmet JSAM Inc 6

### Integrated Mask/Helmet Concepts coordination

- UIPE - Aviation

### Low burden FW BTN

- Full modular BTN capability; Integrated Mask/Helmet JSAM Inc 6

### Hi Dext/Tact CB Gloves

- Low burden FW BTN
Modular Below the Neck System

- Envision modules to address various levels of protection while including multi-functional capability to protect against other threats such as flame and immersion hypothermia – example modules include:
  - Coverall with integrated anti-exposure protection
  - Coverall with limited durability/service life to address short term gross liquid contamination or high wind driven agent conditions
  - Hand protection with improved tactility, dexterity and sweat management
  - Accommodation for wear of various mission dependent under-layers such as thermal liners, personal cooling garments
  - Low burden, lightweight CB protective undergarments with sweat management properties for missions with lower challenge requirements
  - Add-on outer layers to enhance liquid agent protection for high risk missions or to protect against gross contaminants (TICs/POLs)
  - Enhancements in materials and interface designs to reduce thermal burden and enhance NTA TICs/TIMs, HW&RW, and Aerosol Protection
  - Duty Uniform with Basic CB Protection Level built in – self-detoxifying
Aviation Head, Eye, Respiratory Vision Integrated Helmet Concept

Features
- Vehicle or Aircrew Focus
- Modular Integrated Design
- Integrated Filters/Seals
- Sorbent Composite
- Nanocomposite Materials

Potential Advantages
- Minimizes Body Mounted Equipment
- Improved Helmet Compatibility and Comfort
- Reduced Breathing Resistance
- Significantly Improved Visual Field-of-View
- Improved Communications Interface
- Option for Improved In-flight Donning
- Improved Center of Gravity
- Improved Display Interface (Internal) and Stability
Technology Needs

• Novel CB-Hardened Garment Pass-throughs
  – Support use of personal cooling systems, communication lines, and personal waste management systems worn under Chem-Bio protective clothing

• Low cost flame retardant CB materials and or treatments

• Improved closure and interface concepts

• Low thermal burden CB materials
  – Improved moisture vapor transport properties
  – Reduced insulation
  – Lighter weight

• Elastomeric CB Protective Materials
  – Undergarment vapor protective material with excellent sweat management properties
  – Hood and interface material with good sweat management properties as well as chemical and biological agent resistance in liquid, vapor and aerosol forms;
  – Glove material with good tactility and dexterity, sweat management properties as well as chemical and biological agent resistance in liquid, vapor and aerosol forms

• Maritime Reactive Fibers
  – Smart CB materials that are permeable in air and become waterproof in sea water; again become permeable and retain CB protective qualities following immersion

• Residual Life Indicator for Protective Garments
  – Provide information to user on remaining CB protective service life of the garment
Technology Needs (cont)

• Revolutionary Aviation Respiratory / Ocular Protection Concepts
  – Low Burden / Low Threat Concepts
  – Low Burden / High Threat Concepts

• Integrated Mask / Helmet Technologies:
  – Conformable Filter Technology
  – Bendable Non-distorting Lens Materials
    » Provide increased FOV without distortion by allowing tighter curvatures
    » Integrated LEP a plus!
  – Miniature Blower Technology
    » Low profile
    » Light weight
    » Low power

• Improved Filter Media with longer shelf life and service life
• Mask testing methodologies
  – Particle size / penetration and relation to standards
  – Impact of changing threat
Potential Market Surveys / RFIs

• Will be seeking information on developmental and commercially available...
  – Materials
  – Components
  – Items or systems

• Ultimate end-product items of interest include...
  – Undergarments and suits including disposable low-cost items
  – Footwear
  – Handwear
  – Head / eye / respiratory (HER) items and systems (hoods, filters, masks, blowers, etc.)

• Performance sought....
  – Protection from chemical agent challenge levels from 1 to 10 gm/m² liquid and 500 to 5000 CT vapor and aerosol
  – Chemical Protection times ranging from 8 to 24 hours
  – Protection from traditional biological agents (primarily respiratory)
  – Traditional flame resistance protection
Potential Market Surveys/RFIs

• Enhanced performance areas of interest:
  – Reduction of thermal burden
  – Improved sweat management
  – Reduction of overall weight and bulk
  – Toxic Industrial Chemical protection (escape only)
  – Protection retained after contamination with common substances found in the aviation environment (e.g. petroleum, oils, lubricants, seawater, and cleaning products)
  – Wind-driven agent protection
  – Improved tactility / dexterity (handwear and footwear)
  – Improved helmet / mask interoperability
  – increased field of view, head mobility, optics, spectacle use/compatibility, and Night Vision Goggle integration.
JPACE Anti-Exposure Risk Reduction (JARR) Effort

- JPACE ORD → Required compatibility with all ALSS including anti-exposure (A-E) suits – UNMET with JPACE Increment I; deferred to Increment II in JPACE CPD

- JARR Focus:
  - Early look at addressing the incompatibility so aircrew who face both a CB and an A-E threat in any given mission can be protected for both
    - Provide CB protection throughout the normal mission and following a crash or ejection over land
    - Provide emergency immersion hypothermia protection following a survivable crash or ejection at sea
    - No expectation that CB protection needs to be maintained following the emergency immersion – current doctrine includes CB mask tear-away prior to water entry in emergency
• JARR Approach:
  – Leveraged CWU-86/P A-E Coverall Design …. fabricated from selectively-permeable membrane material
  – Full battery of tests including Centrifuge and DT Flights underway to be completed early FY08
  – Early indication is that a combined CB/A-E approach is viable

• Lessons learned to be applied to JPACE Increment II in conjunction with other maritime CB requirements of SOCOM and DHS
JPACE Increment II

- CDD Draft – 1Q FY08
  - MACE – (Dev FY08/09; Production FY10/11)
    - Maritime - Anti-exposure CB Ensemble
  - FCT (Test FY09/10; Production FY11/12)
    - High dexterity/tactility CB Glove
    - Foreign Low thermal burden / low threat COTS modules
  - (SDD FY10-12; Production FY12-16)
    - Low thermal burden / low threat Modular System
    - Potentially rolled into JCE
JCE Aviation

• ICD Draft (4Q07)

• CDD (Aviation system) Draft (~4Q09)
  – (SDD FY12-15; Production FY 16-18)
    • Integrated Mask / Helmet
      – Seeking early integration with USAF MACH program or aviation ATD
    • Full Modular BTN System
      – High Wind & Rotor Wash (HWRW) driven agents
      – All threat / environmental scenarios
      – TICs / NTAs Protection
      – Emerging threats
      – Basic Protection in Duty Uniform
        » Self-detoxifying
        » Minimal physiological burden
Near Term Strategy

Requirements Driving the Low Threat Solution:
- IAE CDD (USAF)
- JPACE Capability Gaps
- Thermal Burden
- SOCOM LCBPG CDD (draft)

Studies Driving the Low Threat Solution:
- OPNAV FW Study (USN/USMC)
- JPM-IP RAND and IDA Studies

Requirements Driving MACE:
- JPACE Capability Gaps
- Thermal Burden
- SOCOM Maritime CB Requirements
- USCG Maritime CB Requirements

JPACE Increment II CDD:
Maritime/Anti-Exposure CB Ensemble (MACE) & Fixed Wing Low Burden

Phase One
Pick the low hanging fruit!

- Integrated CB/Anti-exposure Solution(s)
- Low thermal burden suit
  - FW Low Burden Ensemble
  - High Dexterity/High Tactility Gloves
Aviation Strategy

• Near Term: FY08-09
  – JSAM Increments 1 (USA Apache), 2 (Fixed Wing), and 3 (Rotary Wing)
  – Coordinate with USAF IAE Program and MACH Program, USA SaaS-Air Program, and USN/USMC ALSS Development Programs
  – Identify common aviation / ground modules for JCE
  – Issue RFIs to assess COTS technology readiness
  – Propose FCT for Improved Gloves
    – Tactility / Dexterity equal to standard non-CB flight gloves
  – Initiate Maritime Anti-Exposure CB Ensemble (MACE)
    • Anti-exposure compatible CB protection
    • Cooperative effort with DHS and SOCOM
Aviation Strategy

• Mid Term: FY10-12
  – JPACE Increment II
    • Low Burden components for FW Ejection seat
      – Much lower threat
      – Lots of trade space
    • Improved Gloves
      – Tactility / Dexterity equal to standard non-CB flight gloves
  – Continue Maritime Anti-Exposure CB Ensemble (MACE)
    • Anti-exposure compatible CB protection
    • Cooperative effort with DHS and SOCOM
  – JSAM Increments:
    • 2 (Fixed Wing)
    • 3 (Rotary Wing)
    • 4 (Joint Strike Fighter)
Aviation Strategy

- Far Term (FY-13-15)
  - JSAM Increment 5 (Top Owl) – if needed
  - JCE Aviation
    - Full Modular System of Components for Percutaneous
    - Basic protection integrated into Duty Uniform
    - Add-on layers for mission specific threats above basic level and for specific mission environments
    - Integrated Mask Helmet
Teamwork is the Key

Joe and I thank you.....Questions?