Respiratory and Ocular Protection Integration Issues and Advanced Concepts

JPM-IP / JPM-CP Industry Day

Mr. Lowry Brooks

JPM-IP Future Acquisition Team

July 22, 2008

Outline

- Traditional Challenge Levels
- Evolving Challenge Levels
- Traditional Approaches
- JPM-IP Vision and Strategy
- Joint Chemical Ensemble
- Current Integration Efforts
- Concepts

Keep in mind…


I'VE BEEN ASKED TO GIVE A PRESENTATION AT THE TRADE SHOW.
I'D LIKE YOU TO PUT THAT TOGETHER FOR ME, ALICE.
WHAT'S YOUR TOPIC?
TECHNOLOGY. THEY DIDN'T SAY IF I'M FOR IT OR AGAINST IT.
I'LL LEAVE SOME WIGGLE ROOM.
S. Adams
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Traditional Challenge Levels

A HISTORICAL PERSPECTIVE OF THE LIQUID AND VAPOR CHEMICAL AGENT CHALLENGE LEVELS IN CHEMICAL DEFENSE RDT&E

Joint Decontamination & Protection Conference & Exhibition

October 2007

JAMES C. BYRNES
JRAD, Inc.
50 TECH PARKWAY
STAFFORD, VA 22556
240.377.1137
jbyrnes@jrad.us

Evolving Challenge Levels

- Recently completed and ongoing studies on operationally relevant challenge levels and mission profiles
- 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.
- Efforts to reconsider challenge levels in the light of the likely threats of tomorrow are underway
- The difficult part is developing the new rationale, adjudicating the position among the Services, and weighing the risks
- CBD community needs to come to consensus in the tradeoff between operational effectiveness and risk exposure

Evolving Challenge Levels

The Changing Nature of the Threat

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Protecting the Warfighter

PRESENTED TO:
IP / DECON / CP Conference
Virginia Beach, VA

STEPHEN V. REEVES
Major General, USA
Joint Program Executive Officer

Traditional Separate Approaches

Individual Service Soldier Protection Approach

+

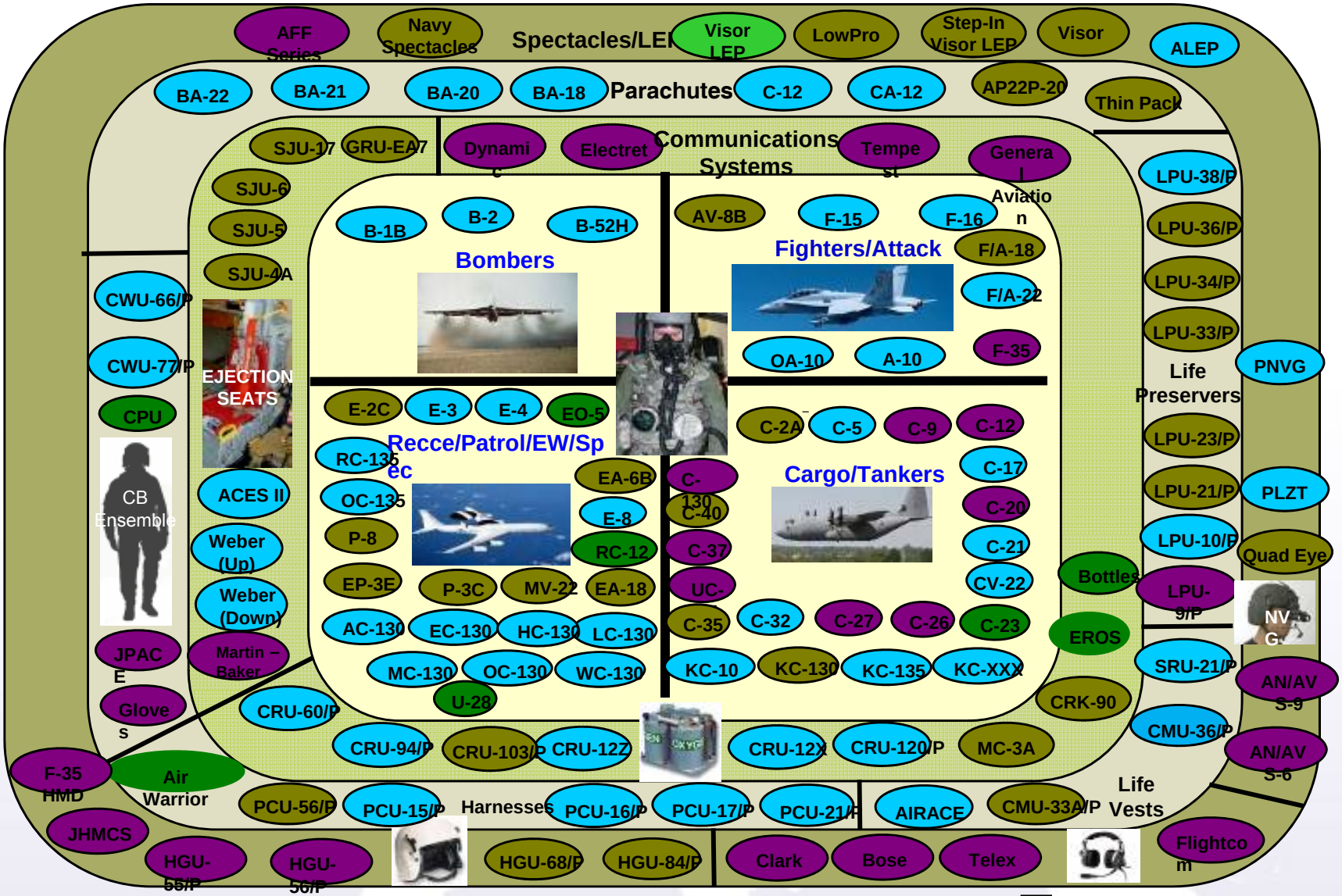
CB Component Integration Approach

=

Encumber:

1. To put a heavy load on; burden
2. To hinder or impede the action or performance of

Integration Challenge: JSAM Fixed Wing Interfaces



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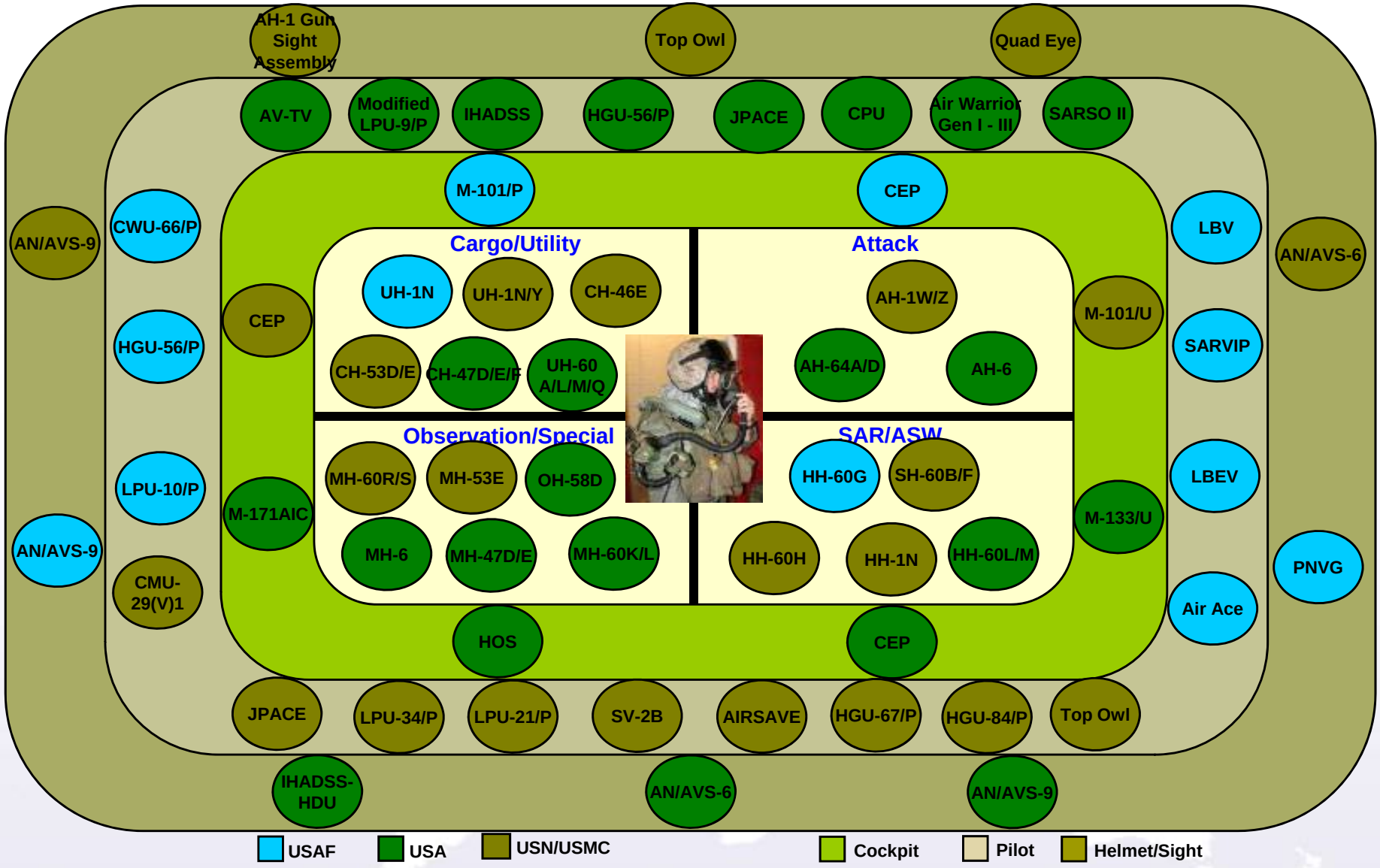
Integration Challenge: JSAM Rotary Wing Interfaces



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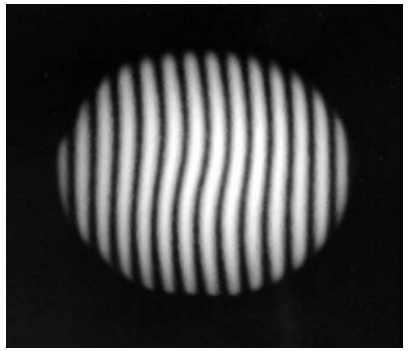
Integration Issues

- **Optics**
  - Refractive power and distortion in the critical viewing area
  - False visual cues and nausea reported during day flights

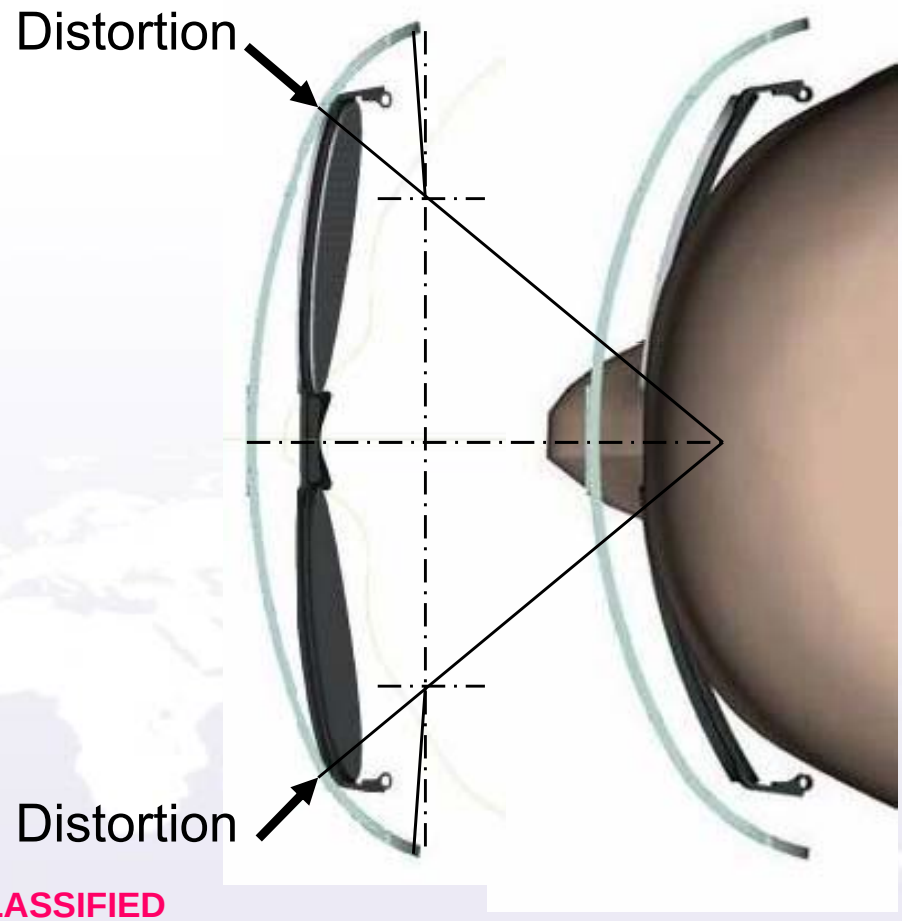


- **Head Mobility**
  - Interference with body armor and flotation collar
  - Limited range of motion

- **NVG Integration**
  - Not rated safe to fly at night due to limited head mobility
  - NVG displacement caused by helmet / hoodring interface

Integration Issue – Optics

- **Mutually agreed to a single lens design that was a compromise for**
  - **NVG use**
  - **Spectacle use**
  - **Helmet integration**



Integration Issue – Head Mobility

Hard Body Armor Chest Plate

- The hard body armor plate in the chest reaches to the top of the sternum.
- If the plate could be lowered when flying in MOPP 4, significant head mobility gains could be realized.
- Initial feedback from user community is to NOT compromise ballistic protection (i.e. lowering chest plate).

Integration Issue - NVG
A Competition for Limited Real Estate

Will compatibility with JSAM drive unacceptable trades in the MACH helmet edge roll?

Integration Issue – Torso
A Competition for Limited Real Estate

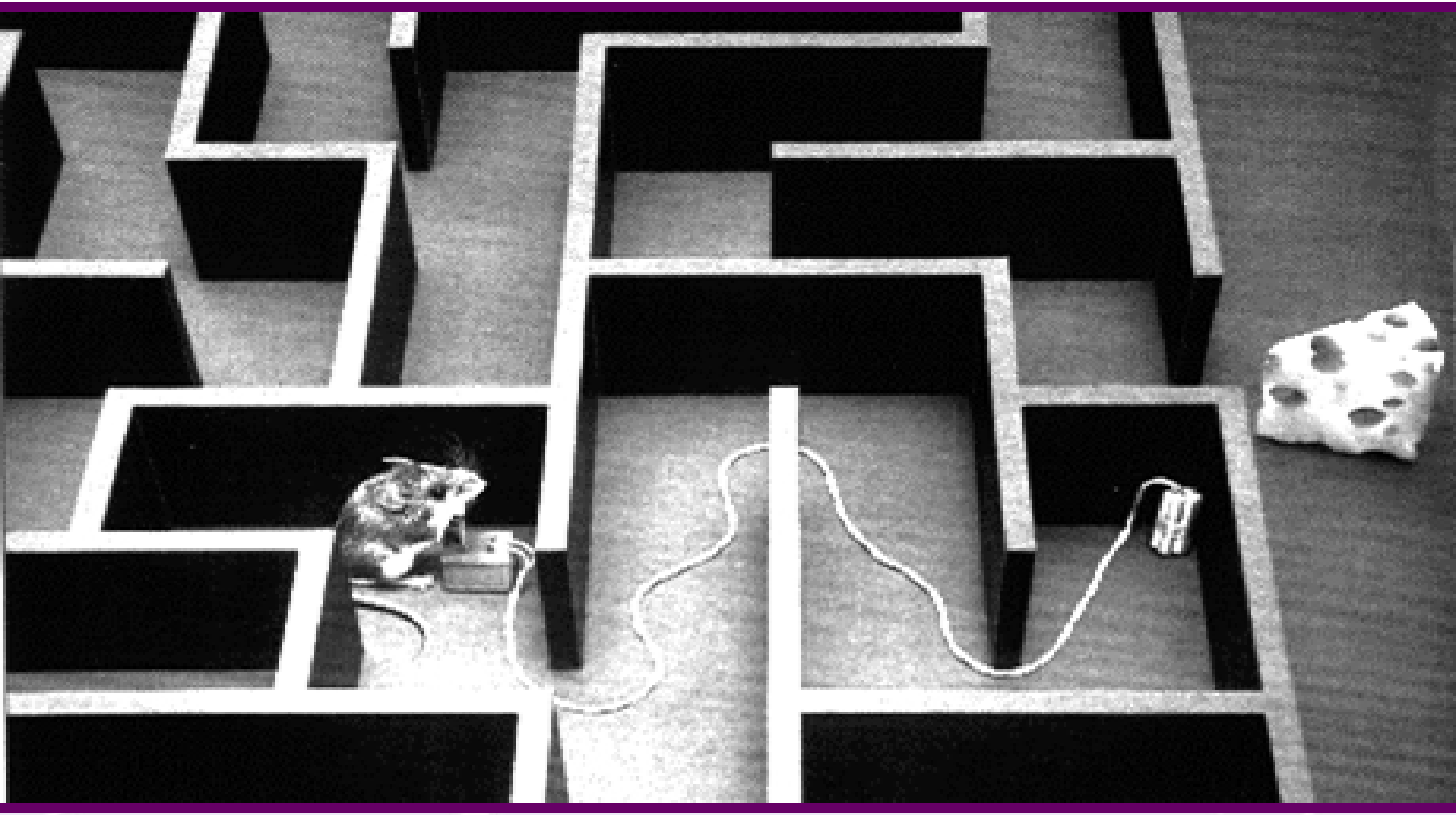
JPM-IP Vision

To provide enhanced ocular, percutaneous and inhalation protection against CB threats thru a modular family of systems solution while maintaining the Warfighters' ability to shoot, move, fly and communicate.

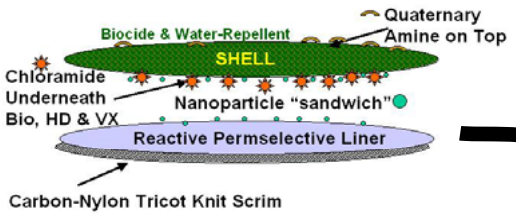
- **Guiding Directives**
  - **CBRND Capabilities Baseline Assessment (CBA)**
    - **FAA/FNA/FSA**
  - **Quadrennial Defense Review**
  - **DoD Program Strategy Guidance**
  - **JPEO-CBD**

"The far-term goal is to develop a combat uniform that possesses CBRN protective capabilities and IPE tailored towards specific user communities that require additional protection." – FNA/FSA Chapter 13, pg.4 (et al) *Tactical Shield Tasks*

New Approaches



Integrated Ensembles

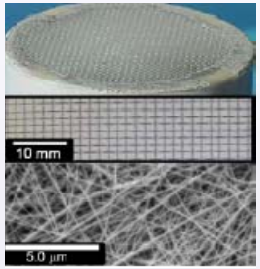


Integrated Fabrics

Clothing Design

Human Performance

Service Specific Equipment Design



Air Purification and low profile filters

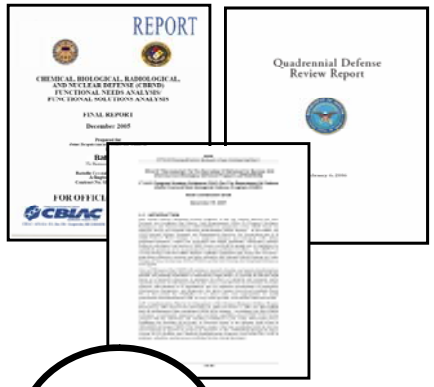
Integrated System of Systems Design Environment

Respirator and Helmet Design

JCE

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

Acquisition Strategy



ICD

JPM-IP

Inhalation & Percutaneous

JSTO, Industry & Academia

MDAP

SaaS-G

SaaS-A
IAE / MACH
JSF

Ground

Air

Sea

SOCOM

MERS

Spiral & Incremental Development

Leverage & Exploit Success

Integration and Evaluation

JCE

JPM-IP Overarching Obstacles

- Integration and synchronization with Service uniform and ballistic protection developers
- Timely JCIDS documentation
- Operational realism and appropriate ORM
- Rapid and timely technology transition
- Proactive T&E strategies
- Introduction of more mission-tailored IPE to inventory
- Emerging requirements supporting WMD Interdiction and Elimination Operations

Approach

- JCE approach:
  - Grounded in OSD Strategic Guidance
  - Framed around JRO-published CBRN CBA
  - Grounded in Operational Realities
- Multiple evolutionary avenues being pursued for revolutionary solutions
  - LCBPG allow development of capabilities that will feed into JCE
  - JSTO Projects/Industry Partners

Evolutionary *gains*, meeting *operational* needs, transitioned to JCE program of record

Joint Chemical Ensemble Program Vision

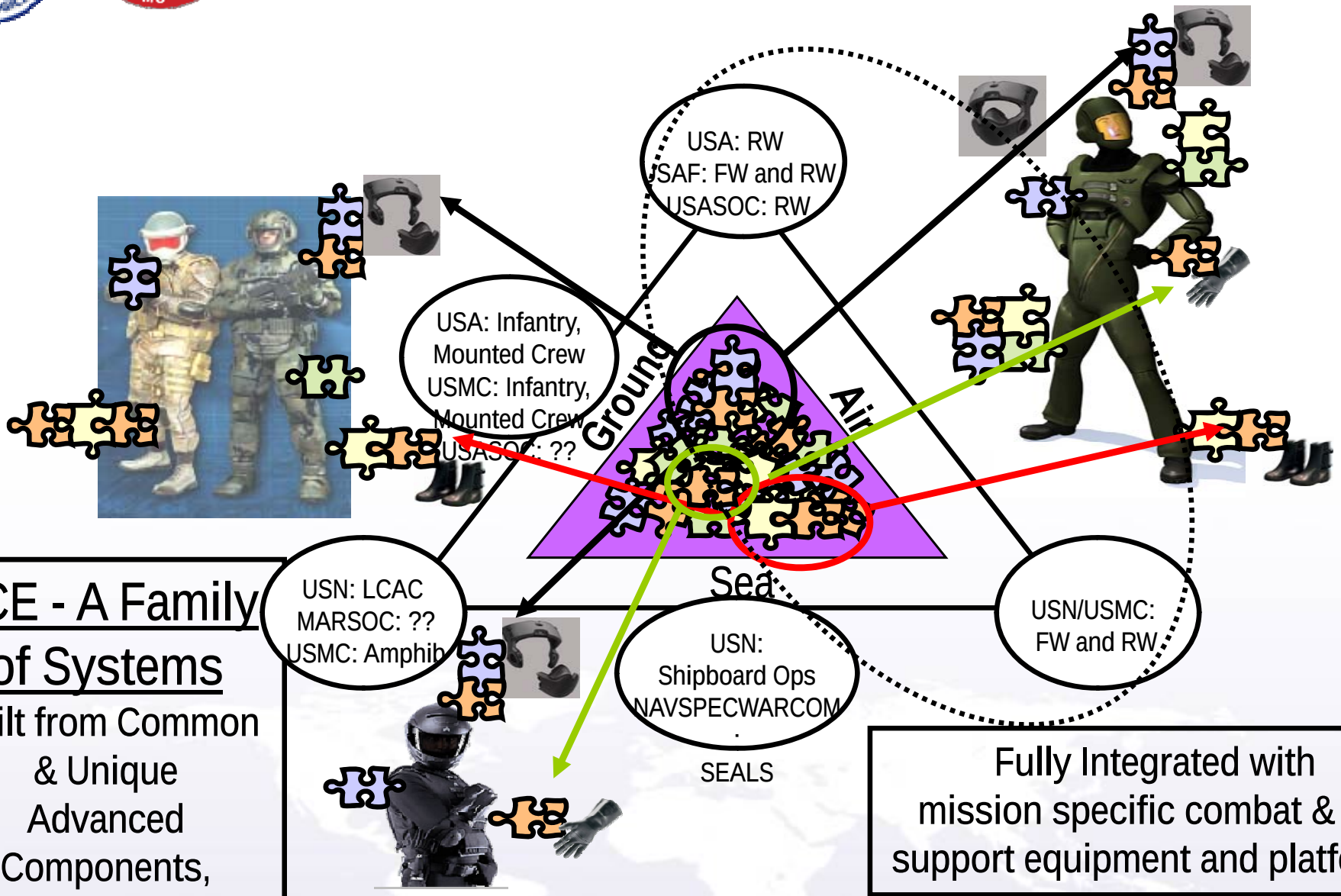
Through emerging technology, information and a disciplined but flexible approach to systems development improve respiratory and percutaneous protection against an ever-expanding spectrum of agents with significant reductions (or elimination if possible) of physiological effects such as heat stress, breathing resistance, etc. while achieving significant reductions in life cycle cost.

Joint Chemical Ensemble

- Fully integrate Chem-Bio protection into the combat duty uniform tailored for specific missions as required by the warfighter.
  - Head-to-toe solution encompassing both percutaneous and respiratory and ocular protection.

- Foundation:
  - 24 S&T efforts scheduled for transition between 4QFY09 and 4QFY12 support JCE.
    - 13 percutaneous, 11 respiratory and ocular protection (including filtration).
  - JSTO studies examining the physiological and psychological effects of IPE on the individual warfighter.
    - Quantify the degree of thermal burden reduction and performance degradation caused by the wear of IPE.
  - Technology Demonstration
  - Technologies from industry as viable solutions

JCE Notional Commonality

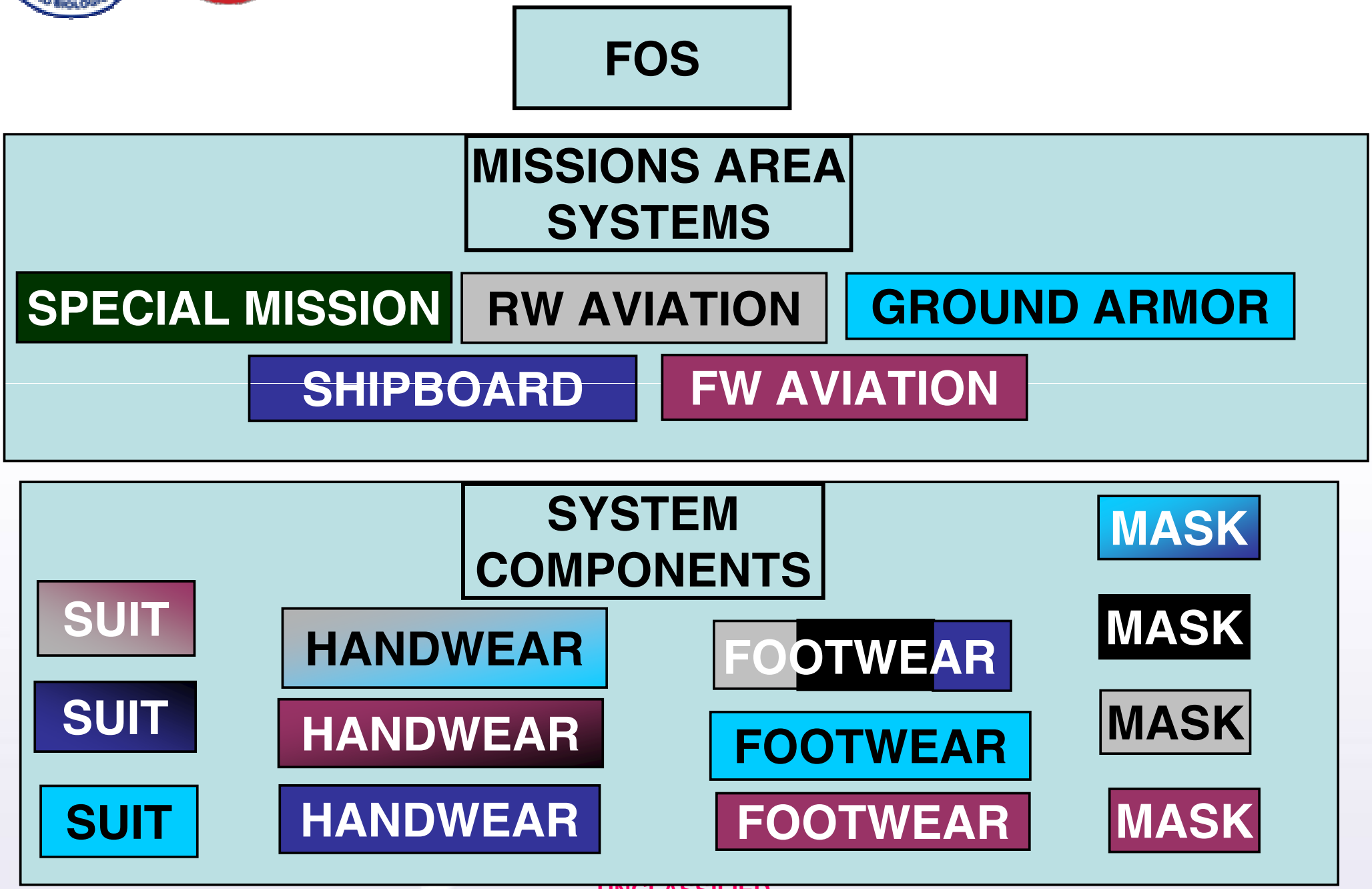


JCE - A Family of Systems

Built from Common & Unique Advanced Components, Modules & Sub-systems

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

Notional System Relationships



Acquisition Strategy

- NTA Protection
- Improved seams/closures
- JSGPM

- Perm-selective Materials
- TIC, TIM, etc. Protection
- Advanced sorbents

- Thermal stress reduction
- Residual life indicator

- Self-decon materials
- Leakage detector

- Intelligent materials
- Full integration

Next Generation Protective Ensemble:

- Cool & Lightweight; CB Protective
- Standard Duty Uniform
- Mission Dependent/Profile
- Modular--Fully Integrated With Mask, Boots, Gloves, Helmet, Body Armor & Weapons
- Reduced Logistical Footprint

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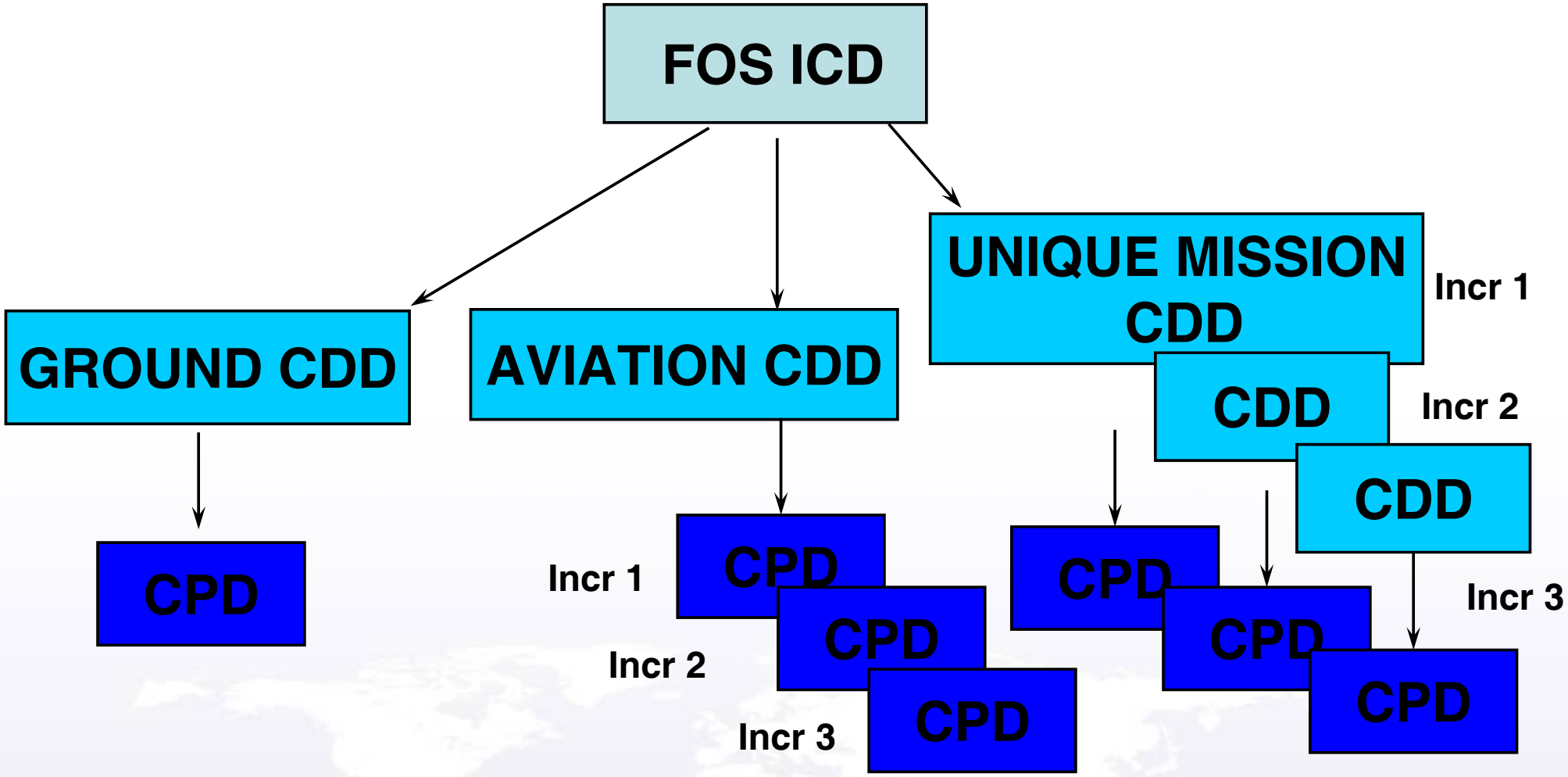
Capability Document Relationships (Notional)



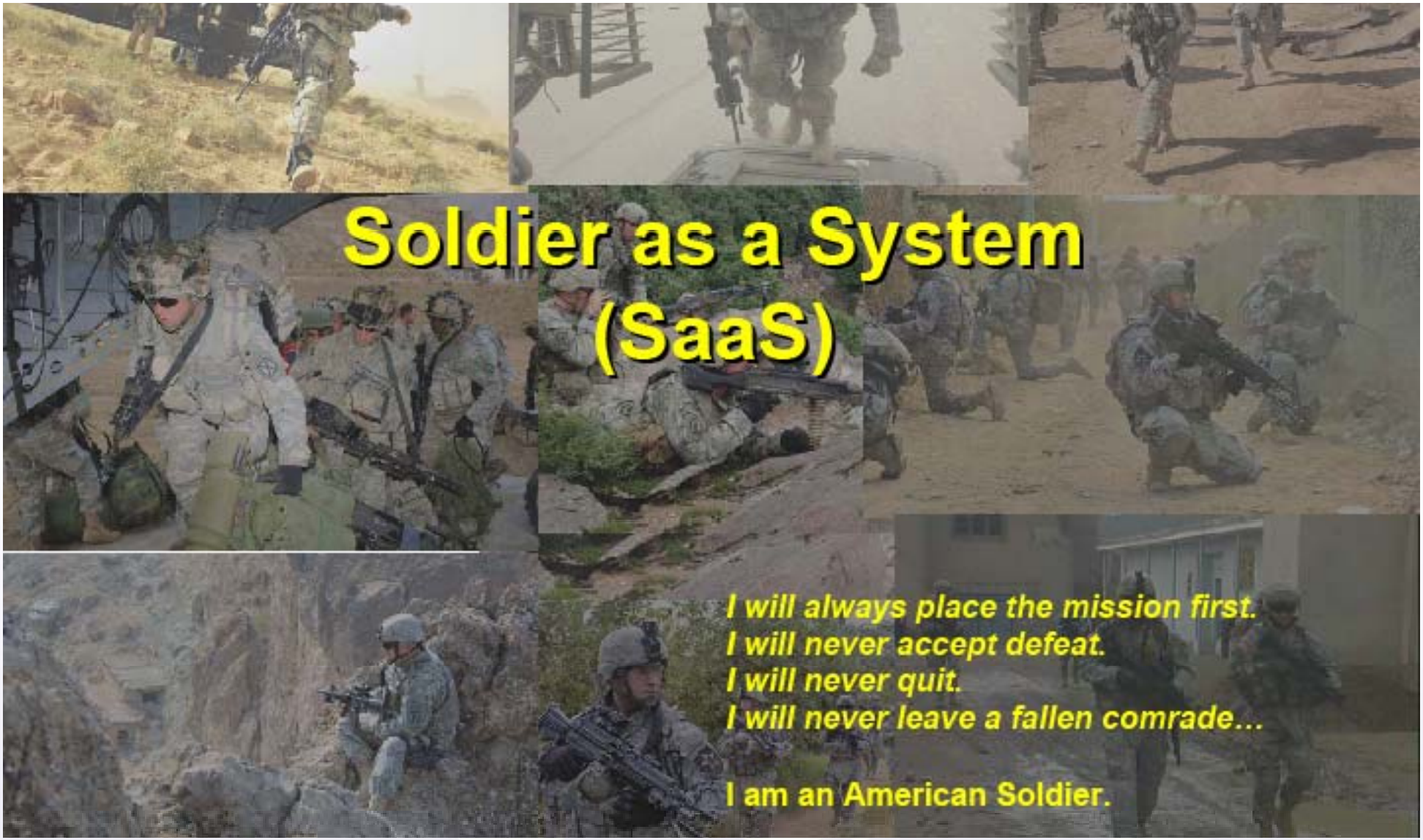
- Draft ICD in KMDS
- JPM-IP pre-milestone A activities to date have been driven by the CBRND Capabilities Baseline Assessment (CBA), which includes the FAA, FNA and FSA (FOUO)

JCE Improvements

- Respiratory / Ocular Protection
  - Protection Against Toxic Industrial Chemicals/Materials (TICs/TIMs)
  - Improved Seals/Integration with Suit/Helmet
  - Residual Life Indicator
  - Operate at Higher Flow Rates
  - Longer Life, Lighter and Smaller Filters
- Vision and Comfort
  - Increased Field-of-View
  - Reduced Breathing Resistance
  - Reduced Lens Fogging
  - Reduced Lens Distortion
  - Minimize Physiological Burden
    - Heat Stress and Sweat Management

How Hard Can That Be?

Soldier Load

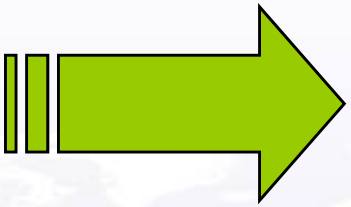


Opportunities

- **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, Ground – USA**
  - **Will leverage JPM-IP efforts to provide Next Gen CB solution**
  - **Key System Attributes demonstrated in MOPP-IV**
  - **Transition Technology via IP Technology Demonstration**
- **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**

IP Technology Demonstration

- *Focus on revolutionary technologies and new materials*
- *Demonstrate an integrated low-burden concept in FY2010*
- *Use thermal burden as an independent variable*

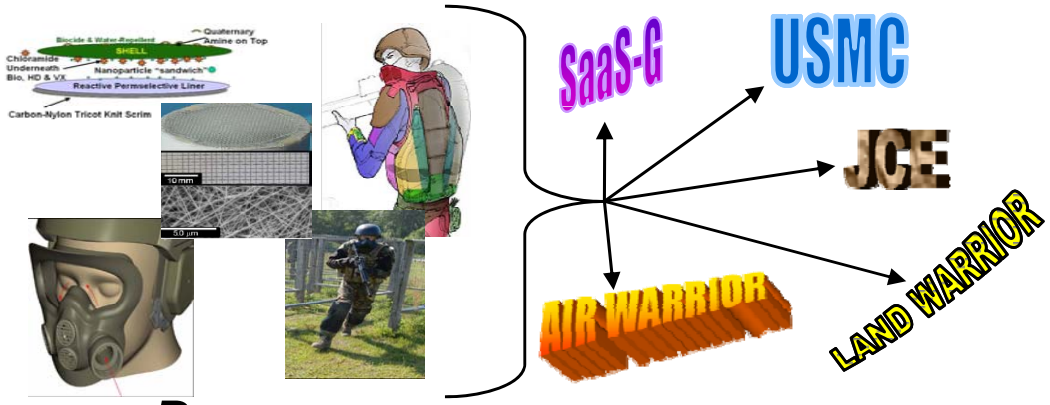


Mitigation –

Demonstration Objectives

- Demonstrate integration of CB individual protection technologies into a ground Warfighter "system" (SaaS-G)
  - CB Protection into duty uniform
  - Respiratory/ocular protection into helmet
  - CB sensor and warning data into Soldier network
- Break new ground for lowering physiological and cognitive burden
  - Investigate Trade-space: Develop and demonstrate a CB protective system thermal performance similar to the Flame Resistant (FR) Army Combat Uniform (ACU)
- Assess trade-space (thermal, CB, human performance, doctrine, cost) and demonstrate “What we could do” to help users and developers define future requirements
- In FY11 transition demonstrated technologies and lessons learned to Joint PM- Individual Protection's (JPM-IP) and PM- Soldier Warrior (PM SWAR) and PM- Soldier Equipment (PM SEQ)
- Address other platforms (air/mounted) beginning in FY11

Future CB Ensemble Technology Demonstration



Integrated CB Ensembles

Purpose:

- ***Demonstrate one or more concept integrated CB Warfighter system to increase mission performance and CB related Situation Awareness (SA) and to reduce thermal & physiological burden***

Results/Products:

- ***SaaS-G system designs(1-3) & prototypes (3-5 per design) integrated with CB technologies***
- ***Data / evaluations assessing:***
  - ***Mission performance, user acceptability, CB and network integration***
  - ***Trade-space***

Payoff:

- ***Improve operational mission performance of Warfighter in CB contaminated environment***

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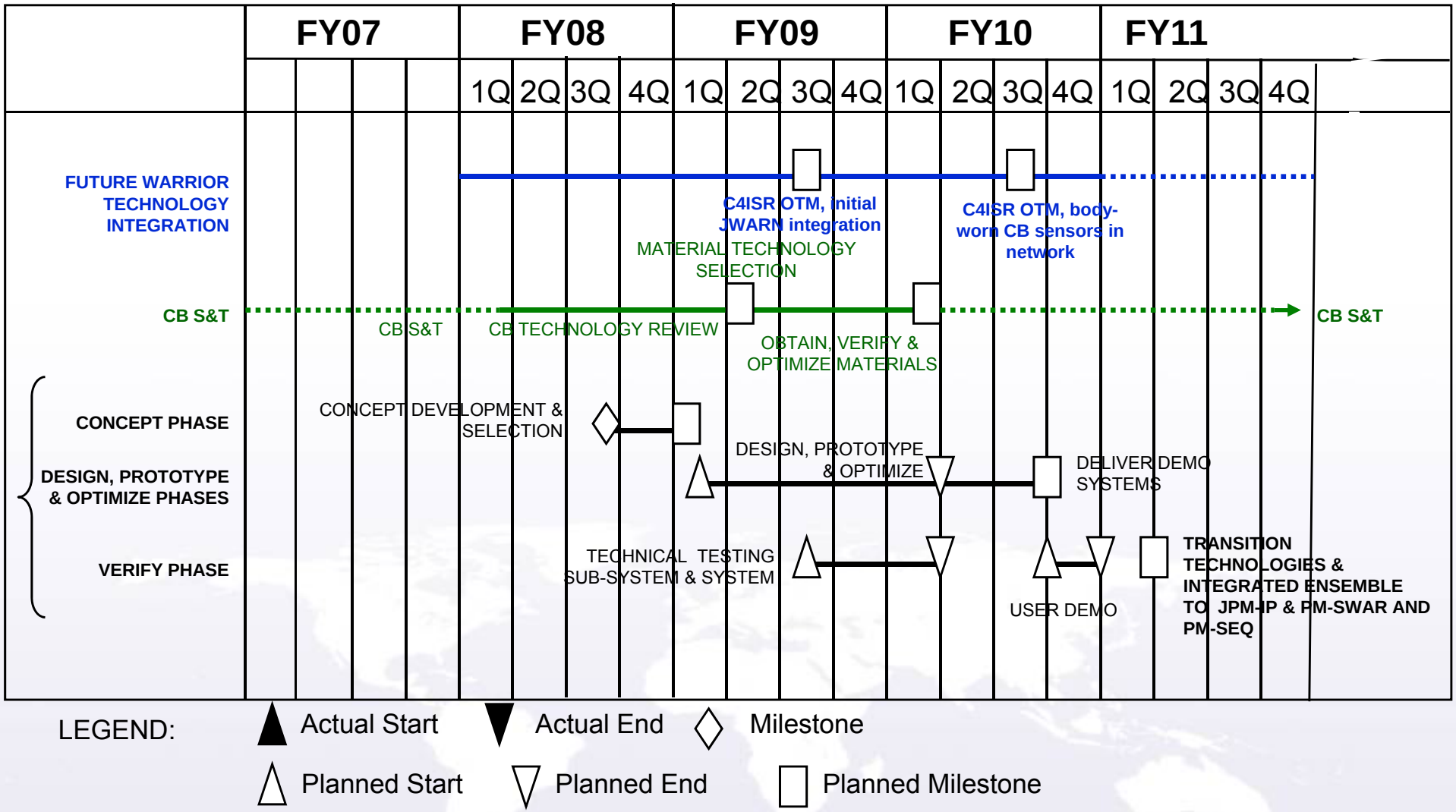
Future CB Ensemble SaaS-G Technology Demonstration

This schedule needs to be made current



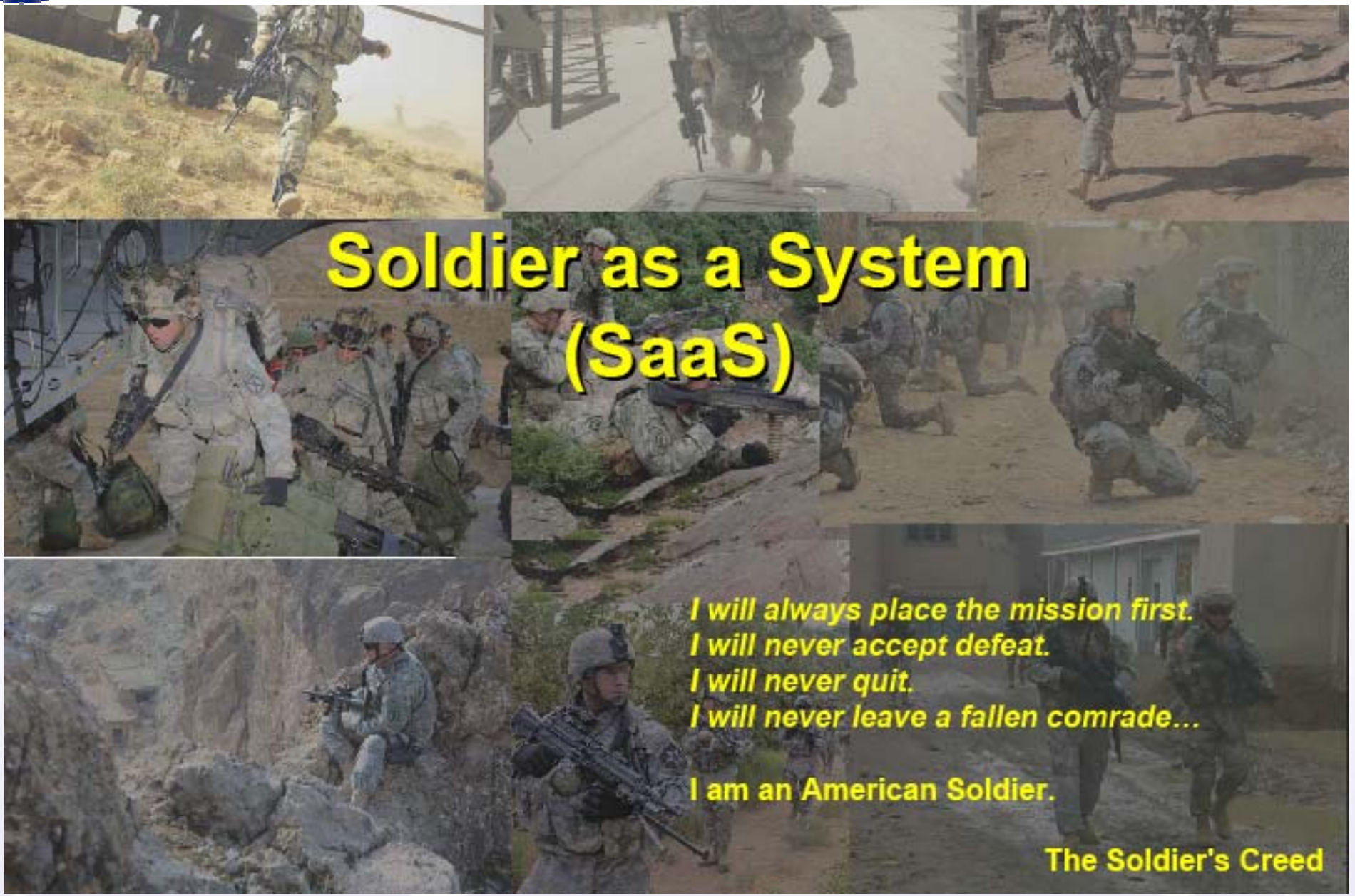
SaaS-G CB Requirements

- GSS CDD includes CB protection requirements
  - **GSS CB requirements will be addressed beyond FY10**
  - **Opportunity to leverage and integrate CB S&T into GSS**

Examples of GSS Desired Future CB capabilities

- Improved Passive Thermal Management (Im/Clo >0.2) (6.2.7.12)
- Active Thermal Management (Active Cooling > 150 W) (6.2.7.12)
- Waste Management capability (6.2.2.8.10)
- Positive Respiration (6.2.2.8.6)
- Positive Pressure Suit (6.2.2.8.6)
- Built-in CB Detector/Monitor (6.2.2.8.20)
- Enhanced CB closures (……)
- De-contaminable Ensemble for re-use (……)
- Ability to re-fill Hydration system in CB environment (6.2.2.8.17)

Soldier as a System Concept



Air Warrior/Air Soldier System

Joint Service Aircrew Mask (JSAM)

Night Vision Goggles

Microclimate Cooling System

Aircrew Wireless Intercom System (AWIS)

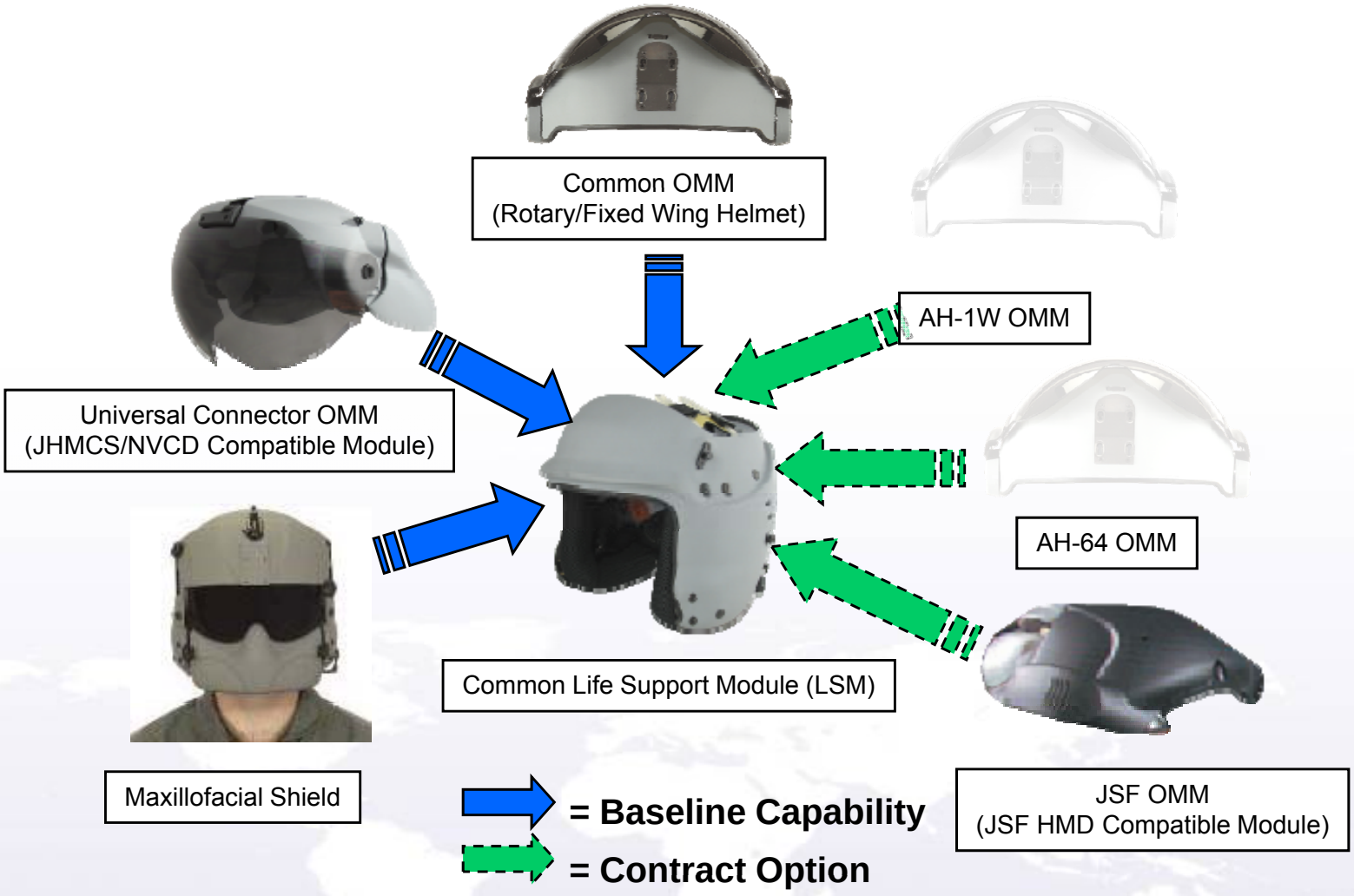
Air Warrior Body Armor

Combat Survivor Evader Locator (CSEL) Radio

Fire Resistant Envir. Ensemble (FREE)

HGU-56/P/IHADSS Helmet and Bag

MACH System Overview
System View



MACH System Overview

Common

Common w/MBU-23/P O2 Mask

Common w/Maxillofacial Shield and Dual Visor Kit

Common w/MBU-23/P O2 mask and AN/AVS-9 NVGs

Universal Connector w/MBu-23/P O2 mask and JHMCS Module

MACH

- **JPM-IP Vision:**
  - **Interface for future CB platform built into MACH from ground up**

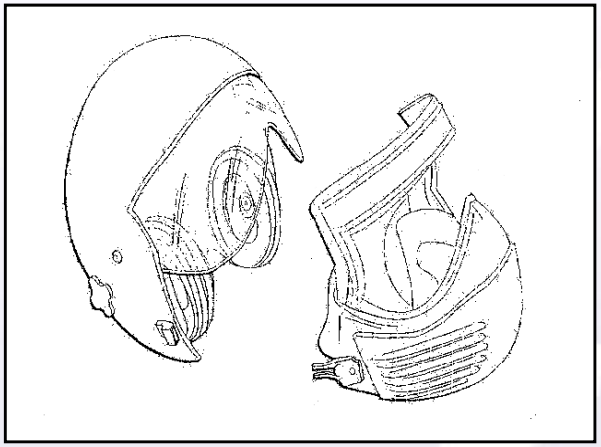
MACH compatibility with legacy and concurrent respirator development

JPM-IP / MACH Approach

- Combined Mask Helmet Study
- Attempt to overcome historical issues plaguing separate helmet and CB development efforts and offer solutions for a truly integrated system for the future
- Establish the groundwork in MACH for executing the JPM-IP vision for integrated mask/helmet
- Supporting MACH development with lessons learned regarding backwards compatibility
- MACH program is willing to add combined mask / helmet effort to existing contract
- Deliverables (w/ Government partnership)
  - Study and analysis
  - Incorporation of lessons learned
  - Development of prototypes
    - Near term
    - Mid term
    - Long term

Integration Concept
Module Approach

Potential Advantages:
- Improved Protection
- Improved Filter Capacity
- Reduced Breathing Resistance
- Improved Visual Field-of-View
- Improved Comfort
- Improved Compatibility
- Improved Center-of-Gravity



✓Overall Comfort and Fit

✓Unblown Protection/Defog

Faceplate Stowage

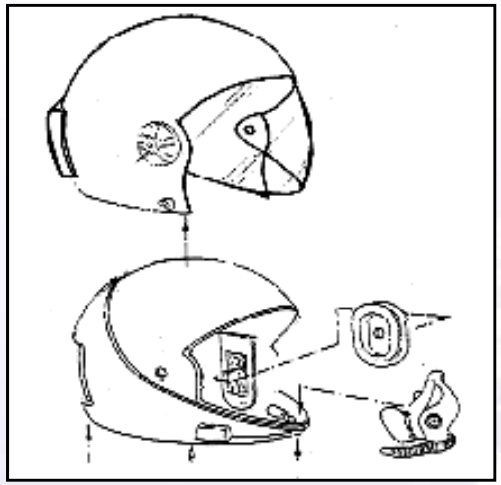
Protection w/o Helmet

Overall Weight/Bulk

Integration Concept
Shell Approach

Potential Advantages:

- Improved Protection
- Improved Filter Capacity
- Reduced Breathing Resistance
- Improved Visual Field-of-View
- Improved Comfort
- Improved Compatibility
- Improved Center-of-Gravity



✓Overall Comfort and Fit

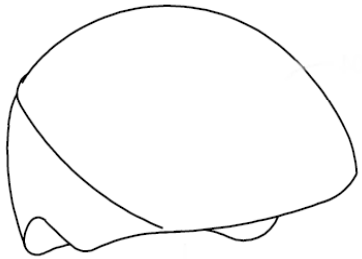
✓Unblown Protection/Defog

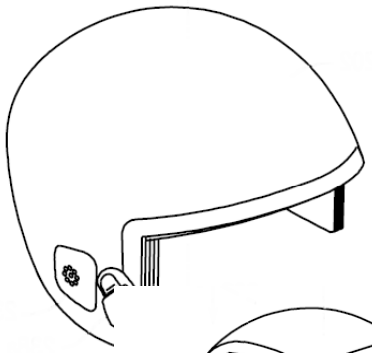
✓Faceplate Stowage

Protection w/o Helmet

Overall Weight/Bulk

Integration Concept
Liner Approach





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✓Overall Comfort and Fit

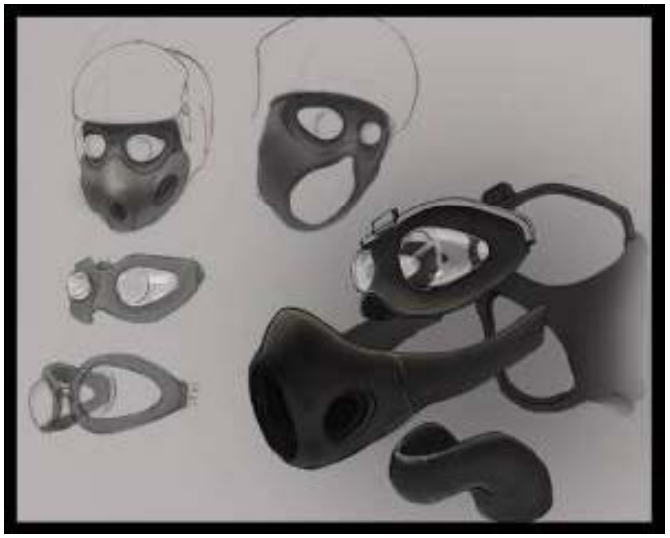
✓Unblown Protection/Defog

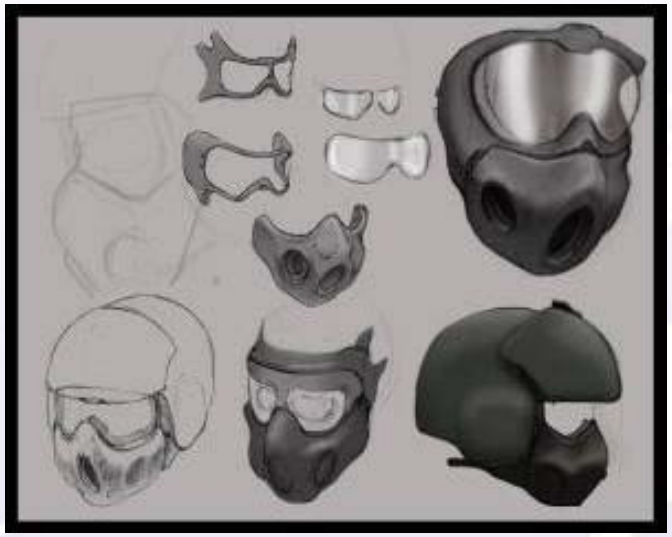
Faceplate Stowage

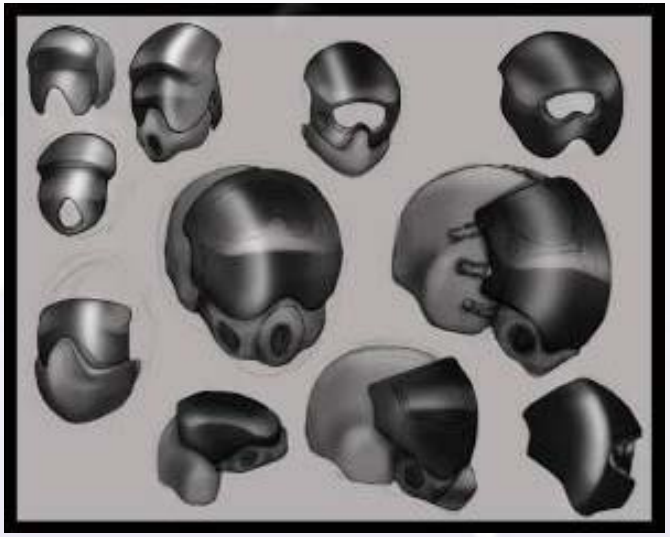
✓Protection w/o Helmet

Overall Weight/Bulk

JPM-IP Concepts

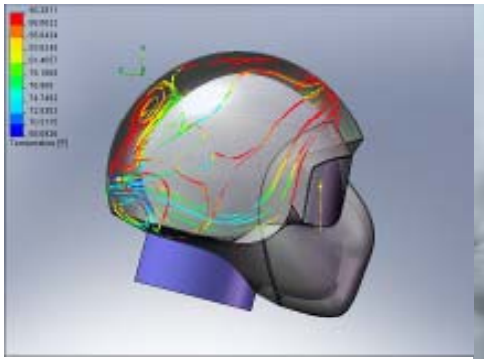






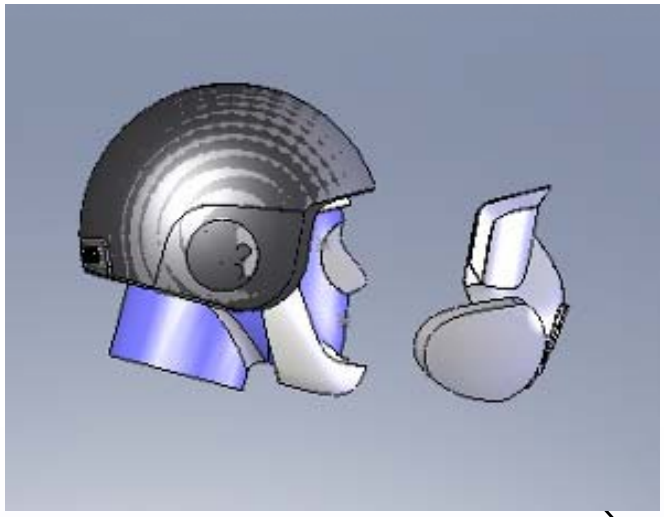
Filter Locations

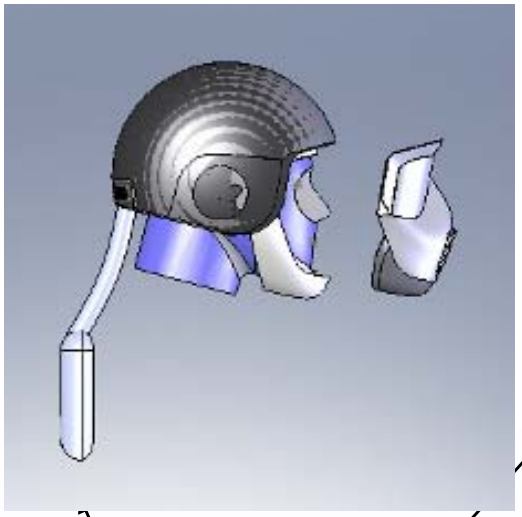


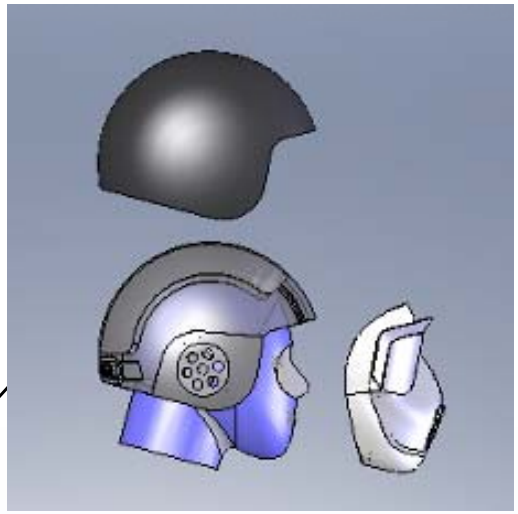




Option	Description	Comments
1	Filter located in the back part of the helmet	Air would circulate through the filter and up to the front module through a ducting system located in the helmet shell.
2	Filter located in front part of the helmet	Air would circulate through the front module in a way similar to standard masks
3	Filter part of helmet liner	In this option the filter would actually serve a dual purpose. Filtration would occur through the helmet liner and the media would crush in a fashion similar to the existing helmet liners to provide crash protection
4	Filter located on body	As with current aircrew and some CVC systems. This option would require a hose and hose connections could be placed in either the front or back helmet module
5	Filter part of hood	Air would be ducted to the front module and some type of connection would be required once the front module is mounted

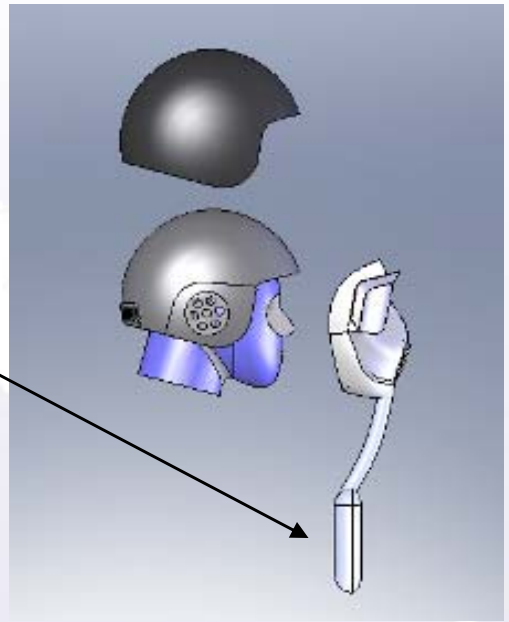
Integrated Helmet-Mask Systems





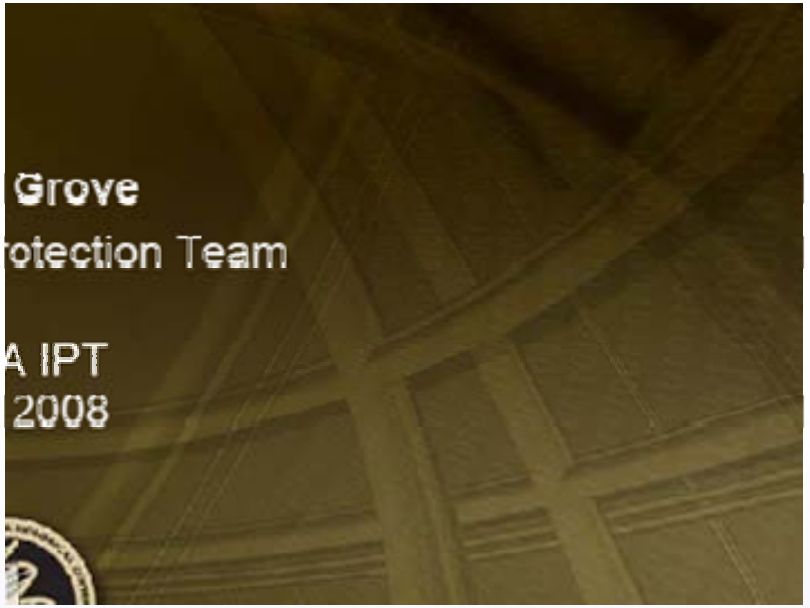


Filter Location Options



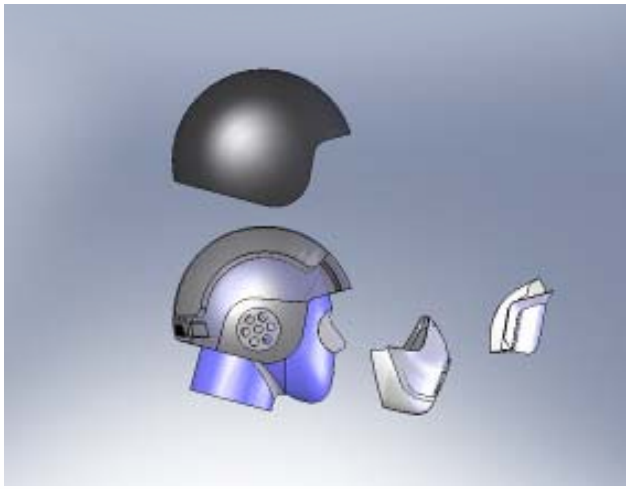
Integrated Helmet-Mask Systems

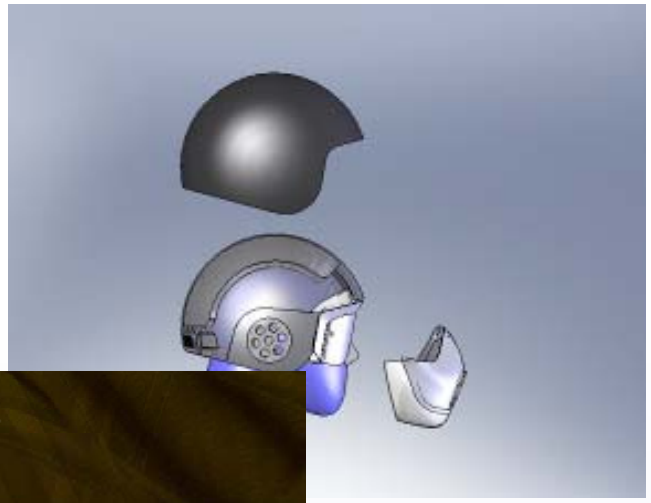
Ratchet Options

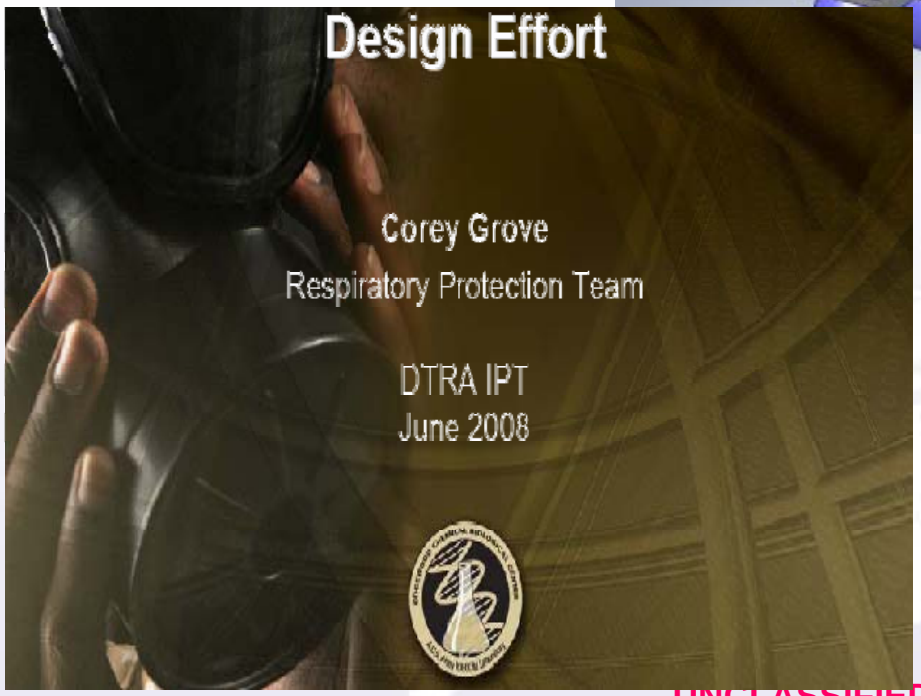


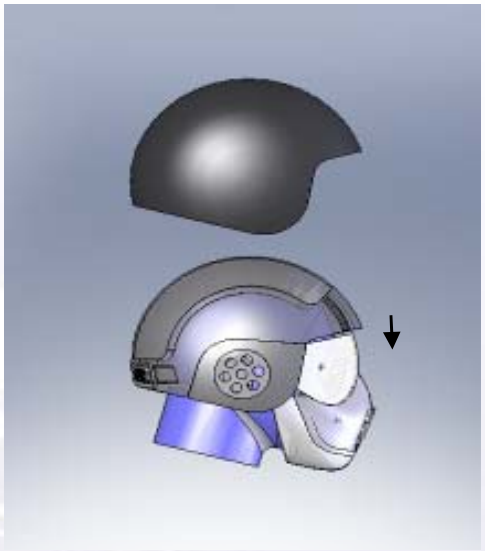
Integrated Helmet-Mask Systems

Future Options









Ground Helmet Interfaces

USMC ECVCH

US Army ACH

SOCOM MICH

US Army CVC

USMC HBSI

USMC LWH

USMC ECVCH

Aviation Helmet Interfaces

HGU-68/P

HGU-55/P

HGU-56/P

IHADSS

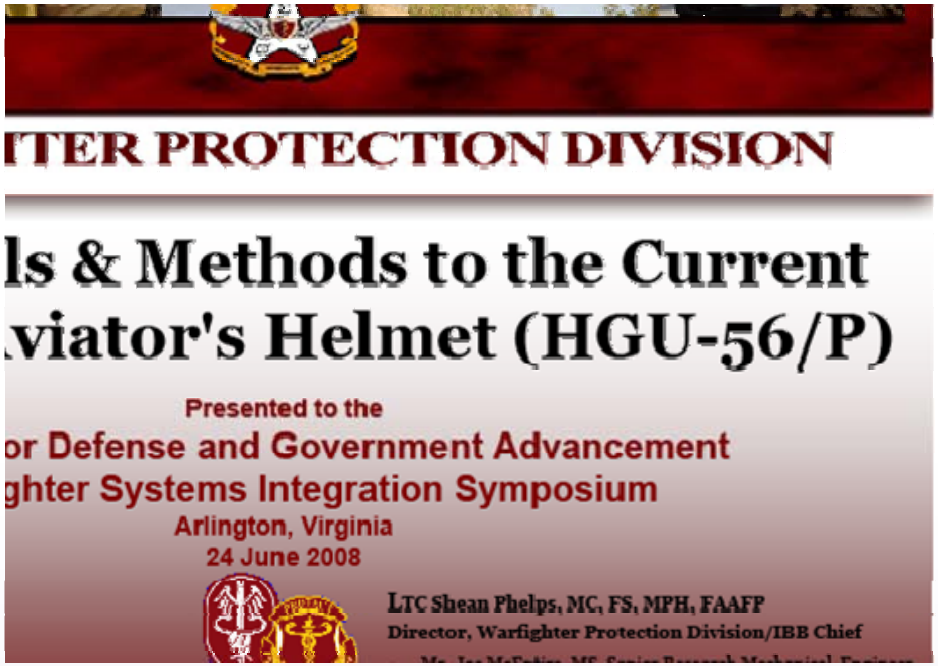
HGU-84/P

Multi-Purpose Technology

Helmet Liners and Combat Caps

Can these be used for:

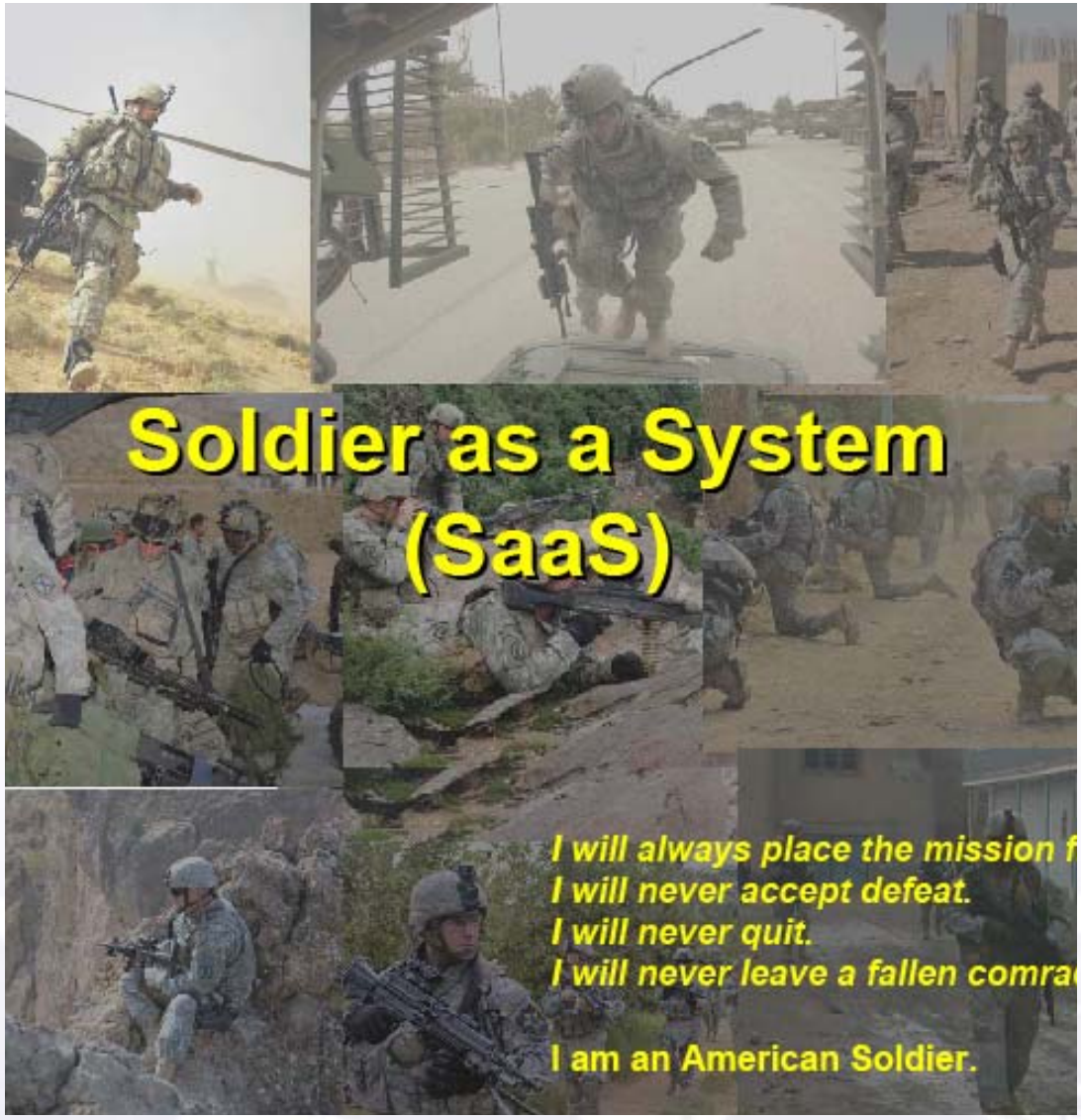
Improved fit and comfort / energy absorption / increased fragmentation protection
AND
Filtration?



Conclusion

- Evolving threat
- Traditional approaches encumber warfighters
- Partnering with associated programs of record is key to IP vision of integrated ensembles
- Key enablers:
  - Multiple use technology
  - Family of systems, integrated approach
  - IP Tech Demo
  - Tradespace decisions based on operational risk assessment
- Advanced technology coupled with integration imperatives

Questions ?


Soldier as a System
(SaaS)
I will always place the mission f
I will never accept defeat.
I will never quit.
I will never leave a fallen comra
I am an American Soldier.