CAPABILITY DEVELOPMENT DOCUMENT FOR
PERSONNEL RECOVERY VEHICLE (PRV)

ACAT: 1D
Validation Authority: JROC
Approval Authority: CSAF
Milestone Decision Authority: OSD AT&L
Designation: JROC Interest
Prepared for Milestone B Decision
Date: November 2005
Executive Summary

The Personnel Recovery Vehicle (PRV) is a new acquisition program to replace the HH-60G helicopter for the USAF with a new medium-lift Aircraft. The primary mission of the PRV is Personnel Recovery (PR) (Combat Search and Rescue (CSAR)). This Capability Development Document (CDD) is based on the Joint Requirements Oversight Council validated Operational Requirements Document (ORD) CAF 315-97-B Personnel Recovery Vehicle (PRV) dated 09 Feb 2004. This ORD to CDD conversion was necessary to meet new Joint Staff policies and guidance for requirements development and validation needed to meet an ACAT 1D Milestone B decision in XXX 2005. The current HH-60G does not meet mission requirements. This CDD identifies capabilities to satisfy capability shortfalls experienced in the current HH-60G in support of CSAR mission taskings.

Air Combat Command mission area planning generated a Mission Needs Statement (CAF MNS 315-97) validated by JROCM 005-99, 13 Jan 99. The MSN highlighted HH-60G capability shortfalls in flight characteristics, survivability, responsiveness, cabin space, adverse weather capability, and C4ISR interoperability. A Combat Rescue Analysis of Alternatives (CR AoA) was subsequently conducted that included requirements analysis, system concept studies, operational effectiveness, cost, cost-effectiveness, and sensitivity analyses. Using three Defense Planning Guidance (DPG) scenarios, the evaluation criteria included eight Measures Of Effectiveness (MOE): Deployment Time, Deployment Footprint, Aircrew Rescued, Rescue Time, Survivability, Supporting Assets, Terminal Area & Payload, and Supportability. Each candidate concept was evaluated against these criteria and an acquisition risk assessment was performed. The CR AoA recommended the acquisition of 132 medium lift helicopters as the optimal solution with an Initial Operational Capability (IOC) of 2010.

The PRV has 4 unique Key Performance Parameters (KPPs) essential to execution of the CSAR mission: Combat Radius, Rotor Downwash, Net Ready, and Deployability. The Net-Ready KPP will support interoperability within the Net-Centric information environment and addresses the requirements of the Combat Identification (CID); Global Air Traffic Management (GATM), Global Information Grid (GIG), and Close Air Support (CAS) Mission Area Initial Capability Documents (MA ICD). In the ORD to CDD conversion process the High Power Team (HPT) promoted 10 attributes to Key System Attributes (KSAs). The KSAs include: Self Defense, Vulnerability Reduction, Electro-Optic/Infrared Countermeasures, Radio Frequency Threat Countermeasures; Cabin Space and Payload, Hover Performance, Airspeed, Tactical Navigation and Adverse Weather, Aerial Refueling; and Availability. The KPPs remain the same from the JROC approved PRV ORD. The 10 KSAs consist of requirements from the original ORD. No new attributes were added in the ORD to CDD conversion.

The primary mission of the PRV is to recover isolated personnel (IP) from hostile or denied territory. As such, the PRV is a “critical asset” with operations that are integrated in accordance with (IAW) the six United States Air Force Concepts of Operations (CONOPS). The CONOPS specifically address the Air Force unique capabilities that support Joint Functional Capability requirement of Force Application and Force Protection across the full spectrum of political and military operations in all environments.

The PRV will be a dual-piloted, multi-engine, vertical take-off and landing platform that will bring the latest vertical lift and command and control communications technology to meet CSAR mission requirements. The platform shall be capable of employment day or night, in adverse weather, and in a variety of threat spectrums from terrorist attacks to Chemical, Biological, Radiological, and Nuclear (CBRN) threats. The platform shall be designed as a safe, reliable, available, and maintainable platform. Additionally, the system shall have enhanced survivability capabilities for the recovery of personnel from denied territories. Joint interoperability, compatibility, and connectivity with Joint Force command and control infrastructure and supporting agencies and assets are essential to the execution of the mission. The platform will address all command, control, communications, computer and intelligence (C4I) requirements and other standardization considerations. C4I systems acquired under this CDD will comply with all applicable GIG ICD and NR-KPP requirements. All
electromagnetic effects on, of, and between the PRV aircraft, its equipment, supporting systems, and operations environment shall be mitigated, minimized, or countered, to avoid mission degradation.

As a result of the Global War on Terrorism, AFSOC has determined that the required IOC is 2009. Full Operational Capability (FOC) is defined when all HH-60Gs have been replaced with 132 PRV aircraft. The acquisition strategy for PRV Increment 1 will be an evolutionary strategy employing a block upgrade approach to achieve the full required capability. AFSOC will program for replacement aircraft beginning in FY05. A budgetary planning estimate for the PRV is $11B with an estimated unit cost of $45M.

To define the required PRV training components, Air Education and Training Command (AETC), in conjunction with AFSOC, will conduct a formal Training System Requirements Analysis (TSRA) to determine the training capabilities, numbers, and locations of all required aircrew, intelligence, and maintenance training devices. The TSRA must be completed in time to support required Aircrew, Intelligence, and Maintenance Training Device and development/procurement activities. All training device functions and performance must be consistent with the PRV requirements to provide the most efficient and effective training possible.

Revision History

None
1. Capability Discussion. .................................................................................................................. 1
  1.1. Existing Capability Gaps. ........................................................................................................... 2
  1.2. Existing C4ISR Architecture Capability Gaps. .......................................................................... 3
2. Analysis Summary. .......................................................................................................................... 4
  2.1. Analysis Background. ................................................................................................................ 4
  2.2. Concept Selection. ..................................................................................................................... 4
  2.3. Force Structure Analysis. ......................................................................................................... 7
  2.4. Global War on Terrorism (GWOT) Analysis. .......................................................................... 9
3. Summary Concept of Operations (CONOPS). .............................................................................. 10
  3.1. Mission Tasks. .......................................................................................................................... 10
  3.2. Operational Support Concepts. ............................................................................................... 12
  3.3. C4ISR (Information Exchange) Operational Concept. ........................................................... 14
4. Threat Summary ............................................................................................................................. 16
5. Program Summary. ........................................................................................................................ 17
  5.1. Force Structure ........................................................................................................................ 17
  5.2. Technology Drivers. ............................................................................................................... 17
  5.3. Timing ....................................................................................................................................... 17
6. System Capabilities Required for the Current Increment. .............................................................. 18
  6.1. Combat Radius (KPP). .............................................................................................................. 23
  6.2. Rotor Downwash at mid-mission gross weight (KPP). .............................................................. 23
  6.3. Net Ready (KPP) ...................................................................................................................... 23
  6.4. Deployability (KPP) ................................................................................................................ 27
  6.5. Self Defense (KSA) .................................................................................................................. 28
  6.6. Vulnerability Reduction (KSA). ............................................................................................... 29
  6.7. Electro-Optic/Infrared (EO/IR) Threat Disengagement (KSA). ............................................. 30
  6.9. Payload and Cabin Space (KSA). ............................................................................................ 31
  6.10. Hover Performance (KSA) .................................................................................................... 32
  6.11. Airspeed (KSA). ..................................................................................................................... 33
  6.13. Aerial Refueling Capability (KSA). ...................................................................................... 33
  6.15. Turn Time. ............................................................................................................................. 34
  6.16. Refueling Capability. ............................................................................................................ 34
  6.17. Altitude. .................................................................................................................................. 34
  6.18. Power-out Flight and Landing. ............................................................................................... 34
  6.19. Maneuverability and Flying Qualities. .................................................................................. 34
  6.20. Environment in the PRV ........................................................................................................ 37
  6.21. AIE Features. ......................................................................................................................... 37
  6.22. Medical Treatment Features. ............................................................................................... 37
  6.23. Payload Features .................................................................................................................. 38
  6.25. Surveillance Systems. ............................................................................................................ 38
  6.26. Survivability. .......................................................................................................................... 40
7. Family of System and System of System Synchronization. ............................................................ 43
8. Information Technology & National Security System Supportability. ........................................ 44
  8.1. C4ISR ....................................................................................................................................... 44
  8.2. Information Assurance. ........................................................................................................... 44
8.3. Computer Resources.............................................................................................................. 45
9. Intelligence Supportability........................................................................................................ 47
9.1. Data and Data Fusion Requirements.. .................................................................................... 47
9.2. Geospatial Information and Services (GI&S)......................................................................... 47
9.3. Intelligence Information Requirements.................................................................................. 47
10. Electromagnetic Environmental Effects and Spectrum Supportability............................ 48
10.1. Electromagnetic Environment........................................................................................... 48
10.2. Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC)............. 48
10.3. Spectrum Supportability..................................................................................................... 48
10.4. Electromagnetic Pulse. Flight critical components of the PRV must be hardened to operate through
an electromagnetic pulse (EMP) event, as described in the threat environments described in Section 4
(and supporting references) and in accordance with appropriate (and/or TBD) federal and military
standards for EMP protection, mitigation, and recovery. ................................................................. 48
11. Assets Required Achieving Initial Operational Capability (IOC). ......................................... 49
12. Schedule and Initial Operational Capability (IOC)/Full Operational Capability (FOC) Definitions ................................................................. 50
(DOTMLPF) Considerations ............................................................................................................ 51
13.1. Doctrine............................................................................................................................... 51
13.2. Organization....................................................................................................................... 51
13.3. Training.............................................................................................................................. 51
13.4. Material............................................................................................................................. 52
13.5. Leadership and Education ................................................................................................ 52
13.6. Personnel........................................................................................................................... 52
13.7. Facilities............................................................................................................................. 52
13.8. Key Logistics issues............................................................................................................ 52
14. Other System Attributes........................................................................................................ 57
14.1. Environmental Quality....................................................................................................... 57
14.2. Human Systems Integration (HSI)...................................................................................... 57
14.3. Embedded Instrumentation................................................................................................. 57
14.4. Electronic Attack (EA)...................................................................................................... 57
14.5. Information Protection Standards and Information Assurance....................................... 57
14.6. Wartime Reserve Mode (WARM)....................................................................................... 57
14.7. Conventional and Initial Nuclear Weapons Effects......................................................... 57
14.8. Nuclear, Biological, and Chemical Contamination............................................................ 57
14.9. Natural Environmental Factors........................................................................................ 57
14.10. Unplanned Stimuli............................................................................................................ 58
14.11. Hazards of Electromagnetic Radiation to Ordnance (HERO). ........................................ 58
14.13. Environmental, Safety, and Occupational Health (ESOH).............................................. 58
14.15. Natural Environmental Support....................................................................................... 58
15. Program Affordability........................................................................................................... 60
15.1. Program Funding................................................................................................................ 60
15.2. Initial Cost Estimate........................................................................................................... 60
15.3. ROM Estimates - COA-2, Block-0/10................................................................................ 60
Table of Tables

Table 1-1: Joint Operating Concepts Correlation Table ................................................................. 2
Table 1-2: Joint Functional Concepts Correlation Table ................................................................. 2
Table 2-1: Concept Summary ........................................................................................................ 6
Table 2-2: Operational Effectiveness Results .................................................................................. 7
Table 2-3: Acquisition Risk Results .............................................................................................. 7
Table 2-4: Cost Results – FY01 BY$M .......................................................................................... 7
Table 3-1: AF CONOPS – PRV Capability Matrix ......................................................................... 10
Table 6-1: Key Performance Parameter Summary Table ............................................................. 19
Table 6-2: Key System Attribute (KSA) Table .............................................................................. 20
Table 6-3: Key Interface Profiles (KIPs) ...................................................................................... 24
Table 6-4: Category 1 Flying Qualities Requirements .................................................................. 36
Table 6-5: Category 2 Flying Qualities Requirements .................................................................. 36
Table 6-6: Category 3 Flying Qualities Requirements .................................................................. 36
Table 13-1: BIT Thresholds and Objectives ............................................................................... 54
Table 15-1: AoA (2001)- Base Year 04 ....................................................................................... 60
Table 15-2: Program of Record 2004 - Base Year 04 .................................................................. 60

Table of Figures

Figure 2-1: Concepts ..................................................................................................................... 5
Figure 3-1: PRV High Level Ops Concept (OV-1) ..................................................................... 13
Figure 6-1: Response to Enemy Kill Chain ................................................................................. 40
Figure 8-1: IDM Information Transfer Time Requirements ....................................................... 46

Table of PRV CDD Appendices

Appendix A: Mission Area Initial Capability Document Crosswalks
Appendix B: Integrated Architecture Products
Appendix C: References (AV-1)
Appendix D: Acronym List (AV-2)
Appendix E: Requirements Correlation Table
Appendix F: Threat Warning and Countermeasures Requirements
Appendix G: Personnel Recovery Mission Scenarios and SCLs
Appendix H: PRV Supporting Documentation

Common Vertical Lift Support Platform (CVLSP) Annexes

Annex A - Air Force Space Command (AFSPC) CVLSP
Annex B - Air Mobility Command (AMC) CVLSP
Points of Contact

Lt Col David McCombs, David.McCombs@hurlburt.af.mil, AFSOC/XPRV, DSN 579-1693, Commercial 850-884-1693.

Maj. Gregory M. Meek, Gregory.Meek@hurlburt.af.mil, AFSOC/XPRV, DSN 579-5520, Commercial 850-884-5520.
2 channels capable of transmitting and receiving BLOS voice and data in HF or SATCOM bands (T=0).

Presets for these channels must allow manual and software loading capability via data transfer device. The LOS UHF radios must be jam resistant and compatible with joint jam resistant radios (T=0). Where practical other radios and frequencies should be made jam resistant. All channels must be compatible with all DoD secure voice and data formats (T=0).

The PRV requires the capability to communicate directly (voice and data) with current and planned combat survival radios (T=0). The ability to determine isolated personnel Location and ID and send and receive messages via data direct (LOS) from isolated personnel to PRV independent of GPS or C4ISR element is required (T=0). Direct communication BLOS (voice and data) with isolated personnel equipped with BLOS capable Survival Radios is required (T=0).

Location, identification, and tracking of two (T); five (O) simultaneous isolated personnel using internal aircraft assets in addition to any off board SA information.

Detection, location, identification and tracking of fixed and mobile blue forces and threats (ground and air) contained in the threat lay down in Appendix F using internal aircraft assets in addition to any off board SA information (T=O). This requirement is applicable in the terminal area and enroute within the limits of the threat capabilities along the route. CID ICD KPPs, Identification Criteria, Operational Capability, General CID FoS, and Other Interoperability Requirements are listed in Appendix B.

The equipment must have a back-up capability to allow manual use of one line-of-sight radio and one BLOS radio in case of radio system failure (T=O). Communication gear must be accessible to pilots, cabin crew, and recovery team and securable from on-board the aircraft (T=O). The communication avionics must accept software loads from the mission planning system to select communications modes and frequencies (T=O). The communications system must provide an aural signal to the crew that is understandable under operational conditions (T=O). All voice and data communications will include both wide and narrow band secure voice and data capabilities in accordance with Joint Staff directives to ensure joint interoperability with all existing and planned UHF SATCOM radios (T=O).

Communications system that supports:

- External communications accessible by all crew and recovery team members (T=O).
- Dedicated internal communication channel for cabin crew and recovery team members (T=O).
- Non-jammable and LPE wireless intercommunication system that permits unobstructed movement within the PRV, Cabin Crew, and Recovery Team to 1000 meters from the aircraft without losing communications with the PRV and force protection assets (T=O).
- Systems intended for use by any dismounted combatant must not exceed acceptable soldier/marine weight limitations or weight limitations associated with the intended mission (T=O).

Rationale: This requirement is applicable in the terminal area and close proximity. CID ICD KPPs, Identification Criteria, Operational Capability, General CID Family of Systems (FoS), and Other Interoperability Requirements are listed in Appendix B.

6.4. Deployability (KPP). The PRV must be capable of supporting worldwide operations (4000 nm) within 24 hours. The aircraft must be configurable for deployment (self-deployment or USAF C-5 or C-17) within 3 hours and be mission ready within 3 hours of arrival at destination (T, KPP). Two hours for deployment configuration and 2 hours for mission ready (O); USAF C-5 and C-17 (O).

If the PRV meets the deployability KPP by strategic airlift it still must be capable of 2000 nm self-deployment with or without aerial refueling support; in 24 hours with less than a 5 percent abort rate (T=O).
To support a 14 day Task Force Operation, the PRV system (3 aircraft and support equipment, and weapons) must be capable of being deployed on 2 C-5's or 3 C-17's (T=O). Support equipment to sustain operations should not exceed 8 – 463L pallets (T); 4 – 463L pallets (O) in support of a 50 hour per month UTE rate.

PRV support equipment shall be capable of being transported by commercial and military truck and by USAF AMC Cargo aircraft to include the KC-135, C-130, C-17, and C-5. The support equipment shall be able to be transported on 463L pallets (T=O).

**Rationale:** Transportability requirements listed above shall be in accordance with the appropriate sections of MIL-STD-1366D. The key tenant of Air Force Global Strike and Global Persistent Attack CONOPs is to execute the assigned mission anywhere in the world within 24 hours of tasking. As part of the total force concept, the PRV must be capable of supporting these operations. Key to this capability is the PRV rapid deployment capability. Showing up late leaves strike forces without a Personnel Recovery option and increases the risk that a single downing event will deleteriously impact operational objectives as a result of political pressures. A 4000 nm deployment range is required for global coverage based on current locations of PR assets.

### 6.5. Self Defense (KSA)

The PRV ESCORT will consist primarily of fighters such as the F-16, F-15E, F/A-18, A-10, AV-8 and F-35. The capabilities, limitations, and vulnerabilities of these likely ESCORTs are drivers in PR weapon needs. The Joint Munitions Effectiveness Manual (JMEM) definitions for kill levels are used throughout this section. Consideration must be given to using multi-purpose weapons.

- **The PRV must be capable of inflicting a 50% (T); 70% (O) probability of incapacitation (30 second assault criteria) on a grouped 8 man enemy element in the open (i.e., not dug in) out to 1000m (T); 1500m (O).** This suppression level must be achieved within 5 seconds after first round on target. Suppression capability against infantry should be provided 360 degrees around the PRV with elevation coverage from plus 2 to minus 75 degrees from the aircraft waterline (T); +5 to – 90 degrees elevation coverage is desired (O). The sequence from threat detection to putting ordnance on infantry targets should not exceed 3 seconds (plus munitions time of flight) (T=O). Sufficient ordnance for 10 engagements per sortie per weapon is required (T); 15 desired (O).

- **The PRV must be capable of inflicting 50% (T); 70% (O) probability of firepower kill on infantry transport vehicles out to 1000m (T); 1500m (O).** Catastrophic kill of the vehicle is desired (O). Suppression capability against all vehicles can be accomplished by any combination of crew served and pilot weapons. Coverage against thin skin vehicles must be available in all quadrants with crew served weapons out to 1000 m (T). Sufficient ordnance for 2 engagements per sortie is required (T); 4 desired (O).

- **The PRV must be capable of inflicting 50% (T); 70% (O) probability of firepower kill on vehicles with SAMs, AAA, or crew served weapons out to 5,500 m (T); 6,500 m (O).** Catastrophic kill is desired (O). Sufficient ordnance for 2 engagements per sortie is required (T); 4 desired (O).

- **The PRV must be capable of inflicting 50% (T); 70% (O) probability of mission abort kill on maneuvering fixed wing and rotary wing threats in clear air out to 4,000 m and 5,000’ higher (T); 7,300 m and 10,000’ higher (O).** Capability must be all aspect (T=O). A catastrophic kill (JMEM defined K-Kill) of the threat aircraft is desired (O). Primarily forward fire weapons can accomplish suppression capability against all aircraft; however, a high off bore sight targeting capability using a helmet mounted cueing system is desired. Sufficient ordnance for 1 engagement per sortie is required (T); sufficient ordnance for 2 (O).

The PRV should have the capability to carry and employ munitions to mark targets or illuminate the target/recovery area (O). Target designation capability for off board weapons is desired (O).

Non-lethal technologies should be considered as a supplement to lethal technologies for threat suppression (O).

**Rationale:** The CR AoA Final Report highlighted the need to suppress threats in the terminal area. A 30-second assault incapacitation criteria is the minimum needed to deny the capability for personnel threats to return fire on the PRV. The probabilities of incapacitation requirements were derived from Joint Munitions Effectiveness Manuals (JMEM). These incapacitation requirements drive the capability to carry the weights of weapons and...