CAPABILITY DEVELOPMENT DOCUMENT FOR
COMBAT SEARCH AND RESCUE REPLACEMENT VEHICLE
(CSAR-X) / PERSONNEL RECOVERY VEHICLE (PRV)

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Executive Summary

The Combat Search and Rescue Replacement Vehicle (CSAR-X) / Personnel Recovery Vehicle (PRV) is a new acquisition program to replace the HH-60G helicopter for the United States Air Force (USAF) with a new medium-lift aircraft. The primary mission of the CSAR-X (PRV) is Combat Search and Rescue (CSAR). This Capability Development Document (CDD) is based on the Joint Requirements Oversight Council (JROC) validated Operational Requirements Document (ORD) CAF 315-97-B Personnel Recovery Vehicle 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 Oct 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 tasking.

Air Combat Command (ACC) mission area planning generated a Combat Air Forces Mission Needs Statement (CAF MNS 315-97) validated by JROCM 005-99, 13 Jan 99. The MNS 315-97 highlighted HH-60G capability shortfalls in service life, flight characteristics, survivability, responsiveness, cabin space, adverse weather capability, mission equipment, hoist, NVG compatibility, avionics human factors, 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. An update to the AoA was conducted to address changes to the original AoA. The finding of the update confirmed the findings of the original AoA however the size of the force structure was increased to 141 production aircraft to conform to the Strategic Planning Guidance.

The CSAR-X (PRV) has 9 unique Key Performance Parameters (KPPs) essential to execution of the CSAR mission: Combat Radius, Rotor Downwash, Net Ready, Deployability, Self Defense, Survivability Electro-Optic/Infrared, Radio Frequency Threat Countermeasures, and Payload and Cabin Space. 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), Cryptographic Modernization Mission (CM) and Close Air Support (CAS) Mission Area Initial Capability Documents (MA ICD). In the ORD to CDD conversion process the High Performance Team (HPT) promoted 6 attributes to Key System Attributes (KSAs). The KSAs include: Hover Performance, Airspeed, Tactical Navigation and Adverse Weather, Aerial Refueling, Availability; and Readiness and sub-bullets from the Self Defense KPP. The KPPs remain the same from the JROC approved PRV ORD. The 6 KSAs consist of requirements from the original ORD.

The primary mission of the CSAR-X (PRV) is to recover isolated personnel (IP) from hostile or denied territory. As such, the CSAR-X (PRV) is a “critical asset” with operations that are integrated in accordance with (IAW) the seven USAF Concepts of Operations (CONOPS). The CONOPS specifically address the USAF 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 CSAR-X (PRV) will be a dual-piloted, multi-engine, vertical takeoff 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 MA-ICD and NR-KPP requirements. All electromagnetic effects on, of, and between the CSAR-X (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, Air Force Special Operations Command (AFSOC) has determined that the required IOC is 2010. Full Operational Capability (FOC) is defined when all HH-60Gs have been replaced with 141 production PRV aircraft. The CSAR-X (PRV) will use 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 CSAR-X (PRV) is $12B with an estimated unit cost of $50M.

To define the required CSAR-X (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 CSAR-X (PRV) requirements to provide the most efficient and effective training possible.

Revision History

The CSAR-X (PRV) CDD is a JROC approved (Feb 2004) ORD to CDD effort. There are no previous versions
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Points of Contact

Lt Col David McCombs, David.McCombs@hurlburt.af.mil, AFSOC/XPRV, DSN 579-1693, Comm. 850-884-1693.
Maj Gregory M. Meek, Gregory.Meek@hurlburt.af.mil, AFSOC/XPRV, DSN 579-5520
**Table 1-1: Joint Operating Concepts Correlation Table**

<table>
<thead>
<tr>
<th>Necessary Capability</th>
<th>Major Combat Operations</th>
<th>Stability Operations</th>
<th>Strategic Deterrence</th>
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</tr>
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<td>Overseas Presence (Forward Regions)</td>
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<td>Allied Cooperation</td>
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**Table 1-2: Joint Functional Concepts Correlation Table**

<table>
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<th>Battlespace Awareness</th>
<th>Focused Logistics</th>
<th>Force Application</th>
<th>Command &amp; Control</th>
<th>Protection</th>
<th>Training</th>
<th>Net-Centric</th>
<th>Force Management</th>
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Personnel Recovery of isolated personnel is an enabling capability supporting the Joint Force Application Functional Concept as outlined in USAF Master Capability Library Version 5.4. Section 64 defines the required capability attributes to generate CSAR forces capability to conduct the CSAR mission.

The following are shortfalls of the existing system and C4ISR architectures that are summarized in CAF MNS 315-97 (validated by JROC Jan 99), updated in the AFSOC FY04 Personnel Recovery/Recovery Operations (PR/RO), and identified in the CR AoA (approved by AFROC Jun 01).

### 1.1. Existing Capability Gaps

Specific capability shortfalls include:

- **Service Life.** The HH-60G is approaching the end of its useful service life.
- **Flight Characteristics.** Aircraft and rotor system design limit unfueled combat radius, mid-mission hover capability, and speed. In certain theaters, these characteristics do not meet Combatant Commanders mission requirements for mission execution or deployment.
- **Survivability.** Insufficient survivability (susceptibility and vulnerability) to ensure mission success against the Defense Planning Guidance (DPG) validated threat environment. This includes a limited electronic warfare suite, insufficient defensive armament for suppression of air and ground threats, and inadequate protection from small arms fire for cabin occupants.
- **Responsiveness.** Deployment shortfalls that prevent current combat rescue forces from being mission ready upon commencement of hostilities – the most likely time for aircraft losses and the period of highest demand for CSAR missions.
- **Cabin Space.** Extremely limited cabin space for stowage and employment of mission equipment and crew served weapons, infiltration of Recovery Teams, exfiltration of Recovery Teams and isolated personnel, and medical treatment of isolated personnel.
- **Mission Equipment.** Mission and survival equipment adopted from other USAF mission areas not optimized for Personnel Recovery mission.
3.1.2. **Train Forces.** The training of CSAR Forces includes training for maintenance, operations, intelligence and support personnel. Training must include initial qualification training, recurring currency requirements, upgrade training, and specialized (altitude chamber, NBC, Intelligence Formal Training Unit, etc) ground training. CSAR training events must include integration and immersion training with Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) organizations and functions, and integration into major force employment through major exercise training. It pre-supposes availability of appropriate training systems, simulators, and courses of instructions to ensure expertise in execution of operational and sustainment/support tasks.

3.1.3. **Deploy/Re-deploy Forces.** CSAR is among the most time-sensitive operations. Recovery forces must be prepared for rapid deployment to meet Joint Force Commander (JFC) tasking. Dependent on recovery force tasking, CAF planners must ensure recovery forces are [within theater] prior to or at the start of hostilities. Deployment includes the immediate preparations, deployment by airlift or self-deployment depending on recovery vehicle capability and deployment range, and re-deployment of units to and from main operating base (MOB) and FOL (deployment intra-theater to support FOL operations), and US Navy air-capable ships. Factors include time to tear-down/build-up aircraft (if required), time to mission ready, deployment footprint, C4ISR reach back from FOL, and logistics support.

3.1.4. **Develop Mission Plans.** CSAR forces proactively and collaboratively accomplish mission planning tasks to execute missions based on theater OPLAN and CONPLAN. Effective pre-mission planning is essential due to the unpredictability associated with CSAR operations. Pre-mission planning permits CSAR forces to anticipate multiple responses to common scenarios, significantly reducing response times. Planning requirements include, but are not limited to, weather, threats, mission status (ground versus airborne alert), staging/basing, assigned/tasked forces and capabilities, route of flight (pre-planned waypoints/spider routes), communications plan, decision matrix for go/no-go, TST procedures, insertion/extraction procedures, and roles and responsibilities of force protection assets. CSAR operations are subject to operational risk assessment and threat analysis in the same manner as other operations.

An isolation event is typically located by either a wing man or intelligence and reconnaissance assets and passed to the Rescue Coordination Center (RCC). The RCC reviews the available information to select and tailor the mission plan and tasks needed forces (On-Scene Commander (OSC), Airborne Mission Commander (AMC), Rescue Escort (RESCORT), Rescue Combat Air Patrol (RESCAP), Suppression of Enemy Air Defenses (SEAD), rescue vehicle, pararescue forces, and tankers). A voice or chat instant message warning may be sent to the alert rescue vehicle during the time the mission plan is under development to reduce their response time. A 9-line message is sent to employ the force.

3.1.5. **Employ.** Employment includes mission launch, ingress to the terminal area, terminal area operations, and egress. Specific sub-tasks include:

- **Initiate/Launch Mission.** Addresses the methods, timing, and technology to generate and disseminate a launch order. Characteristics are timeliness, coordination, clarity, contingency tolerance, and inclusiveness of all necessary forces. This function considers action by Surface-based C4ISR (SBC4ISR), Airborne C4ISR (ABC4ISR), and Recovery Forces. This sub-task presumes that isolated personnel are detected in the battlespace and located/identified/authenticated sufficiently to initiate the phase of the mission being conducted. To reduce the time an enemy has to react and possibly thwart a recovery operation, the CSAR-X (PRV) will employ airborne alert postures and/or improve their position in the battlespace.

- **Ingress to the terminal area.** Addresses the flight from the staging point (orbit, FOL, or airfield) to the terminal area and typically executed using the two-ship Recovery Vehicle element, but may be flown
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responsibilities show that these minimum requirements are needed to prepare and conduct effective CSAR mission. This requirement is applicable in the enroute and terminal area phases of the mission. CID ICD KPPs, Interoperability Requirements are listed in Appendix B. Tactical datalinks are systems that exchange information with other participating aircraft and ground forces according to preset message formats and update rates. During experiments conducted by the USN and USAF, a properly integrated/implemented CSAR a tactical datalink has shown a dramatic improvement in: locating and identifying Isolated Personnel; threat avoidance/disengagement/suppression effectiveness; communications effectiveness clearing the limited voice channels to only critical transmissions; and CSARTF player Situational Awareness and Workload. When combined all these improvements serve to increase the speed of the rescue mission by reducing the Vietnam era C2 delays and increase mission success. The CSAF envisions machine-to-machine (M2M) communications between platforms, manned and unmanned, on the ground, and in the air to move the USAF toward Joint Vision 2020 (JV2020).

6.4. Deployability (KPP): The CSAR-X (PRV) must be capable of supporting worldwide operations (4000 nm) within 24 hours of departing home station. The aircraft must be configurable for deployment (self-deployment or USAF C-5 or C-17) within 3 hours and be flight ready within 3 hours of arrival at destination (T); (self-deployment or USAF C-5 and C-17) within 2 hours and be flight ready within 2 hours of arrival at destination (O). (KPP)

If the CSAR-X (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 CSAR-X (PRV) system (3 aircraft and deployment package to include: support equipment, spares/consumables, 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 will not exceed 8 pallet positions (T); 4 pallet positions (O) in support of a 50 hour per month UTE rate.

CSAR-X (PRV) support equipment shall be capable of being transported by commercial and military truck and by USAF AMC Cargo aircraft to include the C-130, C-17, and C-5 (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. The CSAR-X (PRV) must be capable of supporting these operations by accompanying Global Strike Forces or pre-positioning in support of Global Strike Operations. Key to this capability is the CSAR-X (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 CSAR assets.

6.5. Self Defense (KPP). The CSAR-X (PRV) RESCORT will consist primarily of fighters such as the F-16, F-15E, F/A-18, A-10, AV-8, F/A-22 and F-35. The capabilities, limitations, and vulnerabilities of these likely RESCORTs are drivers in CSAR 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. Additionally, to provide mission flexibility, the CSAR-X (PRV) must provide power provisions for alternate weapons (i.e. GAU-2, etc).

- Force Protection KPP: The CSAR-X (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)(KPP). This suppression level must be achieved within 5 seconds after first round on target. Suppression capability must be available in all quadrants (T); 360 degree coverage (O) against infantry around the CSAR-X (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)(KSA). The sequence from threat detection to putting ordnance on infantry targets should not exceed 3