COMMON AVIATION COMMAND AND CONTROL SYSTEM

Program Background

The Common Aviation Command and Control System (CAC2S) is a modernization effort to replace the existing aviation command and control equipment of the Marine Air Command and Control System (MACCS) and to provide the Aviation Combat Element (ACE) with the necessary hardware, software, equipment, and facilities to effectively command, control, and coordinate aviation operations. CAC2S accomplishes the MACCS missions with a suite of operationally scalable modules to support the MAGTF, Joint, and Coalition Forces. CAC2S integrates the functions of aviation command and control into an interoperable system that will support the core competencies of all Marine Corps warfighting concepts. CAC2S, in conjunction with MACCS organic sensors and weapon systems, supports the tenets of Expeditionary Maneuver Warfare and fosters Joint interoperability.

The CAC2S program employs an evolutionary acquisition strategy utilizing an incremental and phased approach for development and fielding of the CAC2S. The Capabilities Production Document identifies two increments to achieve the full requirements of CAC2S. Increment I of the CAC2S modernizes the assault support, air support, air defense, and ACE battle management capabilities of the MACCS.

Increment I of the CAC2S is accomplished through a two-phased approach. The CAC2S PMO structured Phase 1 to accommodate rapid fielding of operationally relevant capabilities, to include mobility, situational awareness, tactical communications, information dissemination, and operational flexibility. Phase 1 established the baseline CAC2S capabilities for the MACCS and improved overall Aviation Command and Control performance and effectiveness. Phase 1 was accomplished by upgrading fielded MACCS equipment with mature, ready technologies, and it established an initial product baseline for a Processing and Display Subsystem (PDS) and Communications Subsystems .

Phase 2 addresses the requirements for remaining ACE Battle Management and Command and Control requirements and implements the Sensor Data Subsystem to fuse input from expeditionary sensors as well as real-time and near real-time data from ground force C2 centers, weapon systems,

and Joint Strike Fighter sensors into a common operational picture of the battlespace. Phase 1 Limited Deployment Capability was achieved in 4QFY11. Phase 2 will accommodate the integration of technologies necessary for CAC2S to meet remaining ACE Battle Management and Command and Control requirements. Phase 2 completion will result in delivery of the full CAC2S Increment I capabilities, and full deployment fielding will begin in FY16.

Although requirements beyond Increment I are not yet defined, it is envisioned that CAC2S will continue to be developed in an evolutionary acquisition approach; follow-on increments will be defined and captured in subsequent Joint Capabilities Integration and Development System documents. Those increments will potentially focus on capabilities for an airborne node, integration of Air Traffic Control functionality, ground based air defense node, advanced decision support tools, Unmanned Aerial Systems ground station interoperability, Integrated Fire Control, Single Integrated Air Picture, Integrated Architecture Behavior Model, integration with fifth generation aircraft, and full Network Enabled Command and Control.

Program Status

Phase 1 achieved Full Operational Capability in September 2013. Currently, 20 Phase 1 systems are deployed in units comprising the Marine Air Control Group of the Marine Aircraft Wing and the Marine Corps Communications and Electronics School in 29 Palms, CA.

The Government awarded the Phase 2 Engineering, Manufacturing, and Development prime contract to General Dynamics C4 Systems, which is located in Scottsdale, AZ. The program completed its Critical Design Review in October 2013, conducted a series of three progressive, iterative developmental test periods in 2014, and completed an Operational Assessment in October 2014. Four Engineering Development Models were delivered by the prime contractor to the Government for the Developmental Tests and the Operational Assessment. A Milestone C decision is scheduled for 2QFY15 and seeks authorization from the Milestone Decision Authority to procure four Limited Deployment Units (LRIP) as production articles for Initial Operational Test & Evaluation in 2QFY16.

The success of the new CAC2S technology was publicly highlighted on June 15, 2012, when former Under Secretary of the Navy Robert O. Work and Assistant Secretary of the Navy for Research, Development and Acquisition Sean Stackley recognized the CAC2S program as one of the Department of the Navy's Major Acquisition Activity Awards for their "creative and effective practices that lead to lower costs and better technical performance."

CAC2S' Top Technical Issues

1. Voice Network

Technologies that provide modern hardware and software solutions are needed to replace the aging voice network system to minimize increasing obsolescence issues and increase to system capabilities. The CAC2S currently utilizes Digital Service Access Node (DSAN) software and a gateway (Digital Switching Unit) to access and control military radios from voice workstations. Obsolescence issues require a CAC2S Voice Network upgrade. In addition, these systems must integrate into the current CAC2S Phase 1 network architecture, which would serve to minimize change and decrease the development effort.

2. Direct Air Cooling

The CAC2S Program responds to "Lightening the MAGTF" initiatives by seeking ways to reduce its system size, weight, and power footprint. To this end, the program is seeking alternative technologies and methods to cool electronic equipment without

the use of large, heavy Environmental Control Units (ECU). The current Phase 2 contractor is using a direct air cooling system to cool the CAC2S Phase 2 PDS using high velocity, high capacity fans to accelerate air across the equipment. Cooling of electronic equipment without ECUs continues to be a technical challenge for the program. The program seeks efficient methods of cooling and heating electronic systems without ECUs to further reduce the footprint and power consumption of the CAC2S.

3. Future Data Link Receiver and Processor

The advent of future data links for 5th generation fighter aircraft introduces tremendous opportunities for the MACCS to participate in the exchange of high quality, high fidelity battlefield information collected by an array of airborne sensors. Examples of emerging data link technology include the F-35's Multi-Function Advance Data Links (MADL). To take advantage of the technology and phenomenology aboard these 5th generation airborne assets, the PMO seeks technologies that will allow CAC2S to participate in this currently fighter-to-fighter domain.

4. C2 Command Tools

Collaboration between staff members and other commanders is one of the major contributors to a Commander's situational awareness (SA). To improve SA decision making for the Commander, the CAC2S Program is seeking technologies that address information load and the cognitive demands of future network-centric forces. The program seeks new human-machine systems that translate high-rate inflow of battlespace data into a high-agility battle commands. The PMO seeks integration and awareness tools that continuously and autonomously fuse data into a high-quality shared information portrait. Moreover, the program seeks execution tools that support human-controlled automation of intelligence information, maneuver and air control measures, fires, and battle damage assessment.

5. Multi-Level Security Solutions

As CAC2S integrates with fifth generation aircraft and potentially with coalition forces, the system requires the ability to provide multi-level security processing and dissemination. The PMO seeks tools and systems that will allow the automatic exchange of information with systems in discrete classification domains. The PMO will need NSA-approved, small factor, and lightweight solutions that will permit the system to function in a multi-level security environment.

6. Contextual Search Engines

CAC2S processes inputs from aircraft, sensors, data links, and other C2 systems. The data is stored and fused in a global track file and displayed to the operator for situational awareness and decision making. Typically, operators in C2 systems get overwhelmed by "too much information" and suffer from the "glare" of information. Data typically flows through the system but the operator cannot locate or access the data when it is needed. The PMO seeks technologies that can discern the themes and relationships among data in unstructured content. Search results can identify relevant results based on context, not just keyword matches, by examining contents of a document as well as the files by which it is surrounded.

7. Video Compression

The proliferation of unmanned aerial vehicles in the battlespace has presented a new challenge for the C2 systems and command posts. The large volume of video downloaded from these systems presents a technical challenge for storing and sharing the video products in a low-bandwidth environment. The PMO seeks technologies to effectively compress videos while retaining attributes that make them effective for situational awareness and decision making.

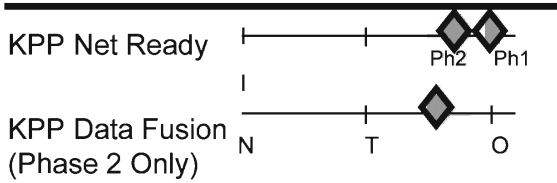
ACAT IAC (MAIS)
Phase 1-Operations & Support
Phase 2-EMD

C Y S G P G

CAC2S Increment I

Phase 2 MS C = Sep 14(O)/Mar 15(T) **AAO** = 50
LDC = Feb 12 **FDD** = Oct 11 **FD** = Mar 22 Threshold

Description: CAC2S is a modernization effort to replace existing Marine Air Command and Control System (MACCS) equipment. Phase 1 has fielded a product baseline Processing and Display Subsystem (PDS) and Communications Subsystem (CS). Phase 2 is the integration of sensor capabilities with the PDS and will provide an Air Command and Control Subsystem (AC2S). Fielding of Phase 2 will complete CAC2S Increment I.



N – No capability **T** – Threshold **O** - Objective

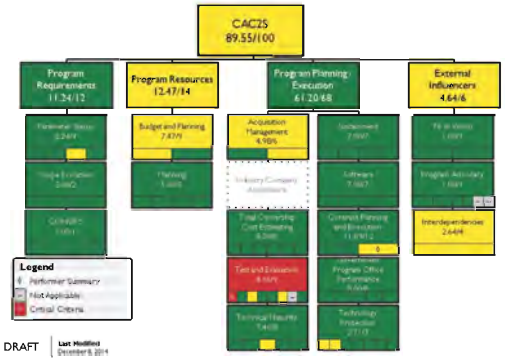
* Assessment is based on an independent evaluation performed by NSWC Corona using results from DT and OA. 4 of the 5 Data Fusion KPP attributes were consistently above threshold. The 5th Data Fusion KPP deals with ATO Association and requires additional testing with more complex ATOs before the requirement can be fully evaluated. Additional testing will be conducted through DT prior to IOT&E to validate test results on production system.

Contract Data: FPIF (EMD RDT&E), 2 FPIF LDU Option CLINS (PMC), 2 FFP S/W Maintenance Option CLINS (OMMC) and 1 FFP Refurb/Initial Spares Option CLIN (PMC)
Contractor GDC4S
Start – Complete 7 Nov 2012 – 3QFY16 (EMD RDT&E)
Next Contract: FRP = 2QFY17

DCMA Schedule Health Assessment = 6/13

ISSUES: Expenditures lag OSD benchmark because of Performance Payment schedule

19 Dec 2014



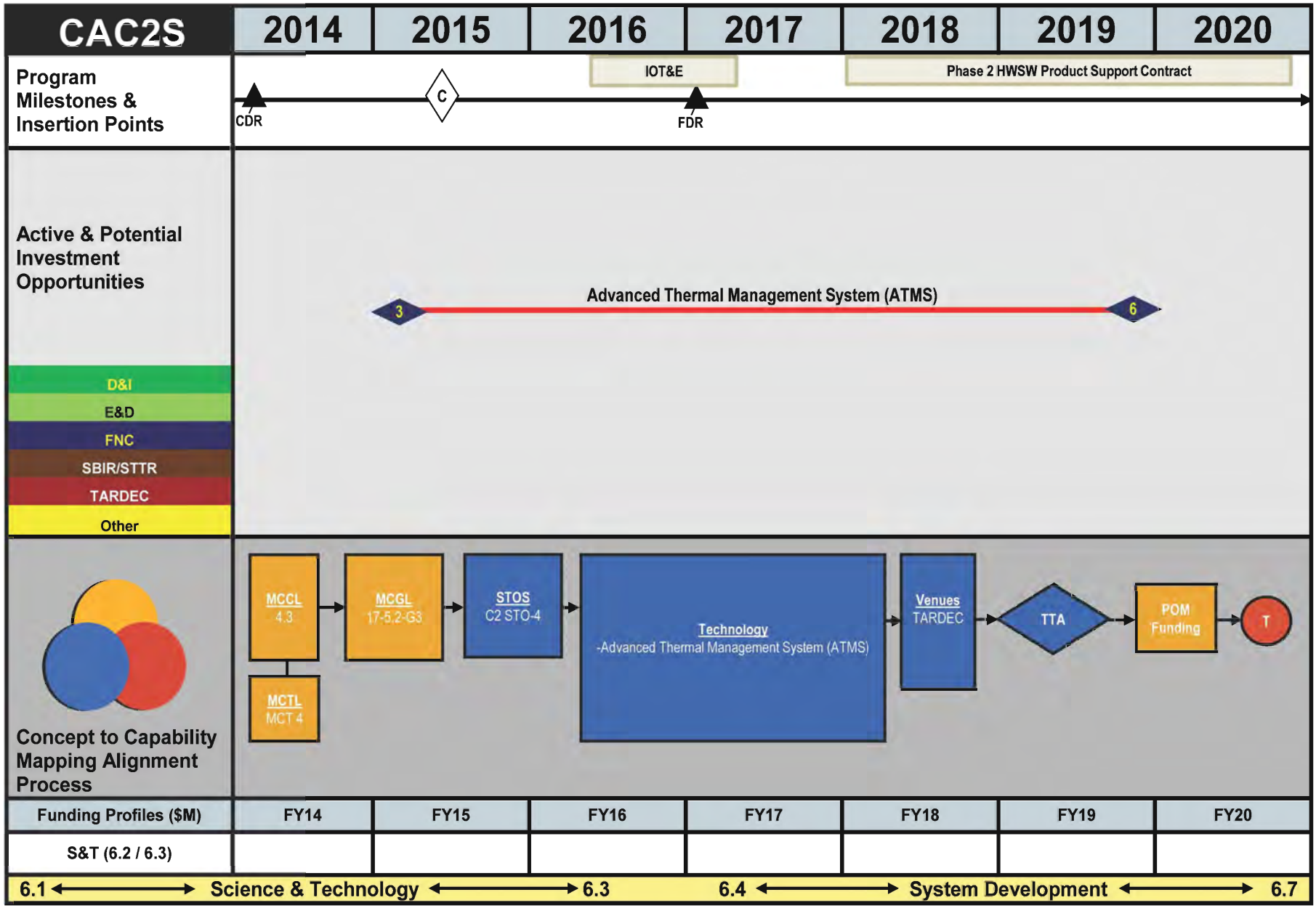
PROGRAM	FY14				FY15				FY16				FY17				FY18				FY19				FY20			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestones						MS C						FDR																
SETR Reviews	CDR		DT/OATRR							OTRR																		
Test Events	DT-B1		DT-B3			DT-C1			DT-C2											FOT&E								
		DT-B2		OA						IOT&E																		
Contract Events						Phase 2 LDU #1							Phase 2 LDU #2															
														Phase 2 FDU Production														

CAC2S Technical Issue #1 Voice Network

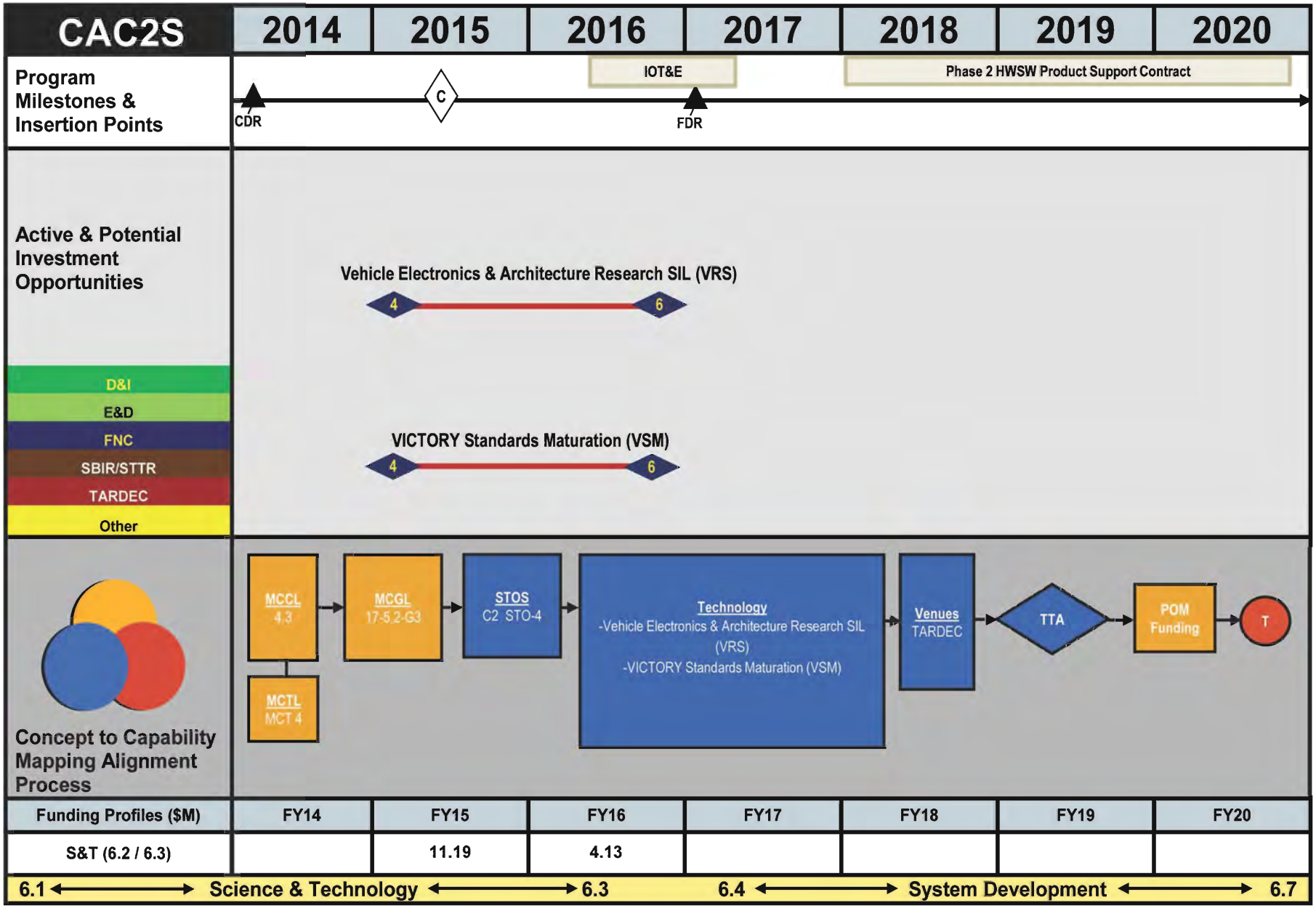
CAC2S	2014	2015	2016	2017	2018	2019	2020
Program Milestones & Insertion Points	CDR	C	IOT&E / FDR		Phase 2 HWSW Product Support Contract		
Active & Potential Investment Opportunities	No Current Investments						
D&I							
E&D							
FNC							
SBIR/STTR							
TARDEC							
Other							
Concept to Capability Mapping Alignment Process	MCCL 8.1 → MCGL 17-6.2-G3 17-6.1-G7 → STOS C2 STO-1 C2 STO-2 C2 STO-3 → Technology → Venues → TTA → POM Funding → T; MCTL MCT 5						
Funding Profiles ($M)	FY14	FY15	FY16	FY17	FY18	FY19	FY20
S&T (6.2 / 6.3)							

6.1 ← → Science & Technology ← → 6.3 6.4 ← → System Development ← → 6.7

CAC2S Technical Issue #2 Direct Air Cooling



CAC2S Technical Issue #3
Future Data Link Receiver and Processor



Funding Profiles ($M)	FY14	FY15	FY16	FY17	FY18	FY19	FY20
S&T (6.2 / 6.3)		11.19	4.13				

6.1 ← → Science & Technology ← → 6.3 6.4 ← → System Development ← → 6.7