**CEG 4981: Team Projects II**

**EE 4920: Senior Design II**

**Guidelines for Critical Design Review**

The CDR is a detailed technical review presented to the class to ensure that the system under review can proceed into system fabrication, demonstration, and test; and can meet the stated performance requirements The CDR presentations must accomplish the following:

* Provide a brief restatement of the problem to orient the audience
* Provide a description of work to date
* Explicit description of requirements, constraints, and design standards
* Provide detail design, along with analysis and explanation
* Notional outline of a test plan so that each requirement is demonstrably verified
* Explicitly state – in detail – two milestones that will demonstrate progress

**Procedures**

* Briefings are limited to 20 minutes (in absence of questions).
* Briefing materials are to be provided to instructors prior to class.
* All members of the team are expected to take an active role in the briefing.
* Questions concerning any particular aspect of the design may be directed to any member of the team, i.e., every member of the team must be able to answer any question about any aspect of the design.
* Briefings should be professionally presented and well-rehearsed.
* The CDR will be peer and instructor reviewed.

**CDR Briefing Outline**

1. Brief review of project objectives and purpose
2. Outline of the approach:
   1. Provide a system block diagram with a functional description of parts and interfaces
   2. Discuss key technologies that will be required to implement subsystems.
3. Implementation of the System
   1. Provide specifications and detailed design of each subassembly
   2. Description of software processes with their inputs and outputs
   3. Describe any test results or simulations of the completed parts of the system
4. Schedule:
   1. Updated detailed schedule with planned deliverables for Milestone 1, Milestone 2, and the final demonstration.
   2. Be specific on what you will demonstrate for these milestones.
   3. Describe or list the current status of items/subsystems: Which items have been completed?
5. Significant challenges of this project
   1. Identify issues found to be particularly challenging.
   2. Describe your solution to these issues.
6. All required parts identified and costed (domestic vendors identified with current inventory)
7. The test plan should be notionally-complete (as much as possible) and map to requirements

### *For your reference:*

### DEFENSE ACQUISITION GUIDEBOOK Chapter 4 -- Systems Engineering

**(from** <https://acc.dau.mil/CommunityBrowser.aspx?id=638320> **edited)**

[**4.2.13. Critical Design Review**](https://acc.dau.mil/dag4.2.13#4.2.13)

The Critical Design Review (CDR) confirms the system design is stable and is expected to meet system performance requirements, confirms the system is on track to achieve affordability and should cost goals as evidenced by the detailed design documentation, and establishes the system’s initial product baseline. The system CDR occurs during the Engineering and Manufacturing Development (EMD) phase and typically marks the end of the integrated system design efforts and readiness to continue with system capability and manufacturing process demonstration activities.

The CDR provides the acquisition community with evidence that the system, down to the lowest system element level, has a reasonable expectation of satisfying the requirements of the system performance specification within current cost and schedule constraints.

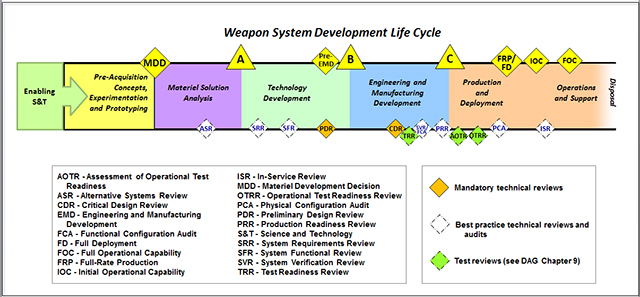
The CDR establishes the initial product baseline for the system and its constituent system elements. It also establishes requirements and system interfaces for enabling system elements such as support equipment, training system, maintenance, and data systems. At this point the system has reached the necessary level of maturity to start fabricating, integrating, and testing pre-production articles with acceptable risk.

The product baseline describes the detailed design for production, fielding/deployment, and operations and support. The product baseline prescribes all necessary physical (form, fit, and function) characteristics and selected functional characteristics designated for production acceptance testing and production test requirements.

**Inputs and Review Criteria**

Figure 4.2.13.F1 provides the end-to-end perspective and the integration of SE technical reviews and audits across the acquisition life cycle.

**Figure 4.2.13.F1. Weapon System Development Life Cycle**

[](https://acc.dau.mil/docs2/dagfigures/chapter4/4.2.13.f1.pptx)

The [March 2012 Government Accountability Office (GAO) report, “Assessments of Selected Weapon Programs,”](http://www.gao.gov/products/GAO-12-400SP) suggests a best practice is to achieve design stability at the system-level CDR. A general rule is that 75 to 90 percent of (manufacturing quality) product drawings, software design specification(s), and associated instructions (100 percent for all Critical Safety Items (CSIs) and Critical Application Items (CAIs)) should be complete in order to provide tangible evidence of a stable product design. A prototype demonstration shows that the design is capable of meeting performance requirements.

The CDR review criteria are developed to best support the program’s technical scope and risk and are documented in the program’s SEP no later than Milestone B. Table 4.2.13.T1 defines the products and associated review criteria. The system-level CDR review should not begin until these criteria are considered met and any prior technical review is complete and its action items closed. A readiness assessment tool for CDR preparation is the [DoD CDR Checklist.](http://www.acq.osd.mil/se/pg/guidance.html) The CDR is a mandatory technical review.

**Table 4.2.13.T1. CDR Products and Criteria**

|  |  |
| --- | --- |
| **Product** | **CDR Criteria** |
| **Cost Estimate** | * Updated Cost Analysis Requirements Description (CARD) is consistent with the approved initial product baseline * System production cost model has been updated, allocated to subsystem level, and tracked against targets |
| **System Baseline Documentation (Functional and/or Allocated and/or Product)** | * Detailed design (hardware and software), including interface descriptions are complete and satisfy all requirements in the system functional baseline * Requirements trace among functional, allocated, and initial product baselines are complete and consistent |
| **System Baseline Documentation (Product)** | * Key product characteristics having the most impact on system performance, assembly, cost, reliability, and sustainment or ESOH have been identified to support production decisions * Initial product baseline documentation is sufficiently complete and correct to enable hardware fabrication and software coding to proceed with proper configuration management * Assessment of the technical effort and design indicates potential for operational test and evaluation success (operationally effective and suitable) (see [DAG Chapter 9 Test and Evaluation](https://acc.dau.mil/dag9)) * 100% of Critical Safety Items and Critical Application Items have completed drawings, specifications and instructions * Failure mode, effects, and criticality analysis (FMECA) is complete * Estimate of system reliability and maintainability based on engineering analyses, initial test results or other sources of demonstrated reliability and maintainability * Detailed design satisfies sustainment and Human Systems Integration (HSI) requirements (see [DAG Chapter 6 Human Systems Integration](https://acc.dau.mil/dag6)) * Software functionality in the approved initial product baseline is consistent with the updated software metrics and resource-loaded schedule * Software and interface documents are sufficiently complete to support the review * Detailed design is producible and assessed to be within the production budget * Process control plans have been developed for critical manufacturing processes * Critical manufacturing processes that affect the key product characteristics have been identified, and the capability to meet design tolerances has been determined * Verification (developmental test and evaluation (DT&E)) assessment to date is consistent with the product baseline and indicates the potential for test and evaluation success (see Test and Evaluation Master Plan (TEMP) and Chief Developmental Tester in [DAG Chapter 9 Test and Evaluation](https://acc.dau.mil/dag9)) |
| **Risk Assessment** | * All risk assessments and risk mitigation plans have been updated, documented, formally addressed, and implemented * Test and evaluation strategy defined in the TEMP accounts for risks with a mitigation plan; necessary integration and test resources are documented in the TEMP and current availabilities align with the Program’s IMS (Systems Engineer coordinates with Chief Developmental Tester in this area; see [DAG Chapter 9 Test and Evaluation](https://acc.dau.mil/dag9)) * ESOH risks are known and being mitigated |
| **Technical Plans** | * PDR is successfully completed; all PDR actions are closed * Integrating activities of any lower-level CDRs have occurred; identified issues are documented in action plans * All entry criteria stated in the contract (e.g., SOW, SEP, approved SEMP, and system specification) have been satisfied * Adequate processes and metrics are in place for the program to succeed * Program schedule as depicted in the updated IMS (see DAG section 4.3.2.2. Integrated Master Plan/Integrated Master Schedule) is executable (within acceptable technical/cost risks) * Program is properly staffed * Program is executable with the existing budget and the approved initial product baseline * Detailed trade studies and system producibility assessments are under way * Materials and tooling are available to meet the pilot line schedule * Logistics (sustainment) and training systems planning and documentation are sufficiently complete to support the review * Life-Cycle Sustainment Plan (LCSP), including updates on program sustainment development efforts and schedules based on current budgets, test and evaluation results, and firm supportability design features, is approved * Long-lead procurement plans are in place; supply chain assessments are complete |

**Outputs and Products**

Completion of the CDR should provide the following:

* An established system initial product baseline
* Updated CARD (or CARD-like document) based on the system Initial product baseline
* Updated program development schedule including fabrication, test and evaluation, software coding, and critical path drivers

Note that baselines for some supporting items might not be at the detailed level and may lag the system-level CDR. Enabling systems may be on different life-cycle timelines. The CDR agenda should include a review of all this information, but any statement that all detailed design activity on these systems is complete may lead to misunderstandings. As an example, development of simulators and other training systems tends to lag weapon system development.