

APPENDIX III

30. CRITERIA FOR SELECTING CONFIGURATION ITEMS

30.1 Purpose. This appendix provides criteria for selecting Configuration Items. As used herein, CIs also encompass Computer Software CIs (CSCIs).

30.2 Scope. The criteria of this appendix shall be used in the CI selection process whenever it occurs during the life cycle.

30.3 Applicability. Each contractor shall be responsible for his compliance with this appendix as well as the compliance of his subcontractors, vendors, and suppliers in accordance with paragraph 1.3 of this standard.

30.4 General considerations.

30.4.1 Need for configuration item identification. Selection of CIs is based on the definition contained in FAA Order 1800.8 "an aggregation of hardware/software, or any of its discrete portions, which satisfies an end use function... CIs are those specification items whose functions and performance parameters must be defined and controlled to achieve the overall end use function and performance".

30.4.2 Level of government control. The CI must be a manageable level of assembly. The selection of CIs is normally a function of anticipated design and should be independent of the concept for future-reprocurement. The selection process, which separates the elements of a system into individually identified subsets for the purpose of managing their development, usually limits the designation of CIs to major subsystem levels of the Work Breakdown Structure, or to a critical item of a lower level, when so identified. CI selection reflects an optimum management level during acquisition. This level is one at which the procuring activity specifies, contracts for, and accepts individual elements of a system.

30.4.3 Logistics and life cycle considerations. The selection of items to be managed as CIs should be determined by the need to control an item's inherent characteristics or to control that item's interface with other items. The selection is a management decision normally accomplished through the system engineering process in conjunction with configuration management and with the participation of logistics. Selecting CIs should be with a full view of the life cycle cost and management impacts associated with such a designation. Choosing too many CIs increases the cost of control; choosing too few or the wrong elements as CIs, runs the risk of too little control through lack of management visibility. It must be determined what control is needed to be exercised in light of cost/benefit trade-offs. The CI selections are made accordingly.

30.4.4 Common subsystem considerations. On development programs for subsystems or support equipment that will be common to more than one system, the basic CI should be that assembly that is common to all applications. An assembly part that is required to meet interface or other requirements peculiar to one of the systems should be identified as a separate CI in that system.

30.4.5 Computer software considerations. Computer software should be designated as CIs in the same way as other elements of the subsystem. General selection of component CIs within a computer program designated as a CI is dependent upon the system breakdown structure. Any sub-program which is designated for use in more than one higher level computer program should be a separate CI. The firmware components required for a computer program must be designated as CIs and given a configuration identification.

30.4.6 Schedule considerations. The major elements comprising the system should be identified as CIs during the Demonstration and Validation Phase. Early selection of CIs is important since management emphasis becomes greater as development progresses. As development continues and logistic or technical considerations surface, additional items can be designated CIs. Usually, the CI selection process should be essentially complete by PDR for hardware CIs and SSR for CSCIs.

30.5 Specific considerations. The following paragraphs discuss some of the considerations upon which the CI selection decision shall be based.

30.5.1 System engineering guidance. Configuration items shall be selected in accordance with guidance provided by system engineering in the contract work statement.

30.5.2 Engineering release system. The CI must allow the contractor to release engineering changes at an assembly level which is reportable and which enables verification of change incorporation, i.e., does not preclude change incorporation verification in a lower level assembly.

30.5.3 Criticality. An item should be identified as a separate CI if failure of the item would adversely affect security, human safety, the accomplishment of a mission, or national defense, or would have a significant financial impact.

30.5.4 Existing or modified existing design items. Existing items that are not CIs developed at government expense should not generally be candidates for reidentification as new CIs on new programs. Existing/modified design and commercial off-the-shelf equipment/computer software should not necessarily be excluded from CI selection. The considerations identified in the remaining subparagraphs of paragraph 30.5 should be addressed prior to making a decision.

30.5.5 New or modified design. Careful consideration shall be given new or modified design items, wherein more than a modest degree of complexity, utilization of new materials, processes or technology is involved; and, where the government wants direct control over the performance requirements for that item, at a specific time, i.e., when the government is directly concerned with detailed development.

30.5.6 Interfaces. Interfaces among HWCI's and CSCIs should be simple. Functions which are highly data or control interdependent should be allocated to the same HWCI's or CSCIs. Functions which exhibit a high disparity between input and output data rates should be allocated to separate HWCI's or CSCIs.

30.5.7 Susceptibility to change. The higher the anticipated or estimated degree of change or modification which might be expected after the item is operational, the higher the likelihood for selection as a CI.

30.5.8 Maintenance. When different agencies have responsibility for maintaining parts of an element, consider breaking the element into separate CIs. An item which is clearly designated as "Repairable" is much more a CI candidate than one which is not repairable. Eventually logisticians must deal with the Line Replaceable Units (LRUs) which comprise the principal components of the subsystem. However, designating CIs at the LRU level at the onset of full scale development (FSD) would add significant cost to the development effort, especially in the area of change management. The LRU level is usually too low a level for effective configuration control during development.

30.5.9 Support equipment considerations. Without proper planning, minor items of support equipment could swell the list of CIs. Minor in this context refers to items such as individual hand tools. There will usually be little or no change activity on many of these minor items. It may be sufficient to list these items as "support equipment" in paragraph 3.24 of the CI Type B specification per FAA-STD-005 paragraph 20.3.2.4.c.

30.5.10 Subassembly characteristics. Subassemblies (within a CI) should have a common mission relationship; should have common installation and deployment requirements (ground and airborne segments would be separate CIs); should have a cycle of changes dependent on the CI; and should not be the subject of separate test or formal acceptance by the procuring activity (should be accomplished as part of a CI). If these conditions are not met, the subassembly should be either part of another CI or a separate CI.

30.5.11 Types. If there are different configurations due to different adaptation data for each operating location, the different configurations should be identified by types (FAA-STD-005 paragraph 4.1.2 and 4.3b) within a single CSCI.

30.5.12 Function. A given HWCI or CSCI should avoid mixing training, operation, test and maintenance, and support functions.

30.5.13 Supplier. Elements provided by different suppliers should be assigned to separate CIs.

30.5.14 Use. Elements which are general purpose in nature, require the capability to be operationally reprogrammed, or are intended to be reused in another system or are likely to be changed after initial deployment should be considered as separate CIs.

30.5.15 Location. The functions allocated to a HWCI or CSCI should not be partitioned among separate geographic areas. Functions allocated to physically distinct processors in a distributed environment should be considered as separate CIs.

30.5.16 Size. HWCI or CSCI selections which cannot be made on the basis of other criteria should be made to keep the HWCI or CSCI to manageable proportions.

30.5.17 Schedule/Phasing. Elements scheduled for development, testing, and delivery at different times should be assigned to separate HWCIs or CSCIs.

30.6 Effects of CI selection. CI selection affects cost, schedule and performance for the Government, prime contractors, subcontractors and suppliers. The effects of CI selection should not be permitted to occur automatically upon selection of an item as a CI. The effects which are unnecessary or premature can be tailored out for each CI by means of an appropriate contractually recognized vehicle, e.g., Program Plan, Statement of Work, CM Plan. Selection of an item as a CI for manageability may be based on its administrative complexity, technical (engineering) criticality or maintenance (logistics) criticality. The following is a listing of the usual effects of CI designation:

- a. Formal preparation of discrete configuration identification - most often in the form of a specification(s).
- b. A discrete development or requirements specification and a companion product specification.
- c. Government approval of changes over the configuration identification governing the item.
- d. Continuing an accurate recording of the exact configuration status of the CI, including providing field activities precise data dealing with impending or completed modification actions.

- e. Providing traceability of detailed design for follow-on activity, including historical data and individual status information for accident investigations, failure analysis, etc.
- f. Individual design review activity (PDR, CDR, FQR, etc.) during development.
- g. Individual qualification testing and reporting.
- h. Individual functional and physical audits (FCA and PCA) at the conclusion of development.
- i. Discrete and separate "related" ECP development preparation, review, approval and negotiation (for changes to CIs).
- j. Separate identification indexes and qualification records.
- k. Separate nameplates and discrete CI identifiers (i.e., CI number, type, model, series, etc.).
- l. Preparation of separate operating and user manuals.

30.7 Effects of selecting too many CIs. Too many CIs may result in the hampering of visibility and management rather than improving it. These effects include:

- a. Increased administrative burden in preparing, processing, and status reporting of engineering changes which tends to be multiplied by the number of CIs.
- b. Increased development time and cost as well as the possibility of creating an inefficient design.
- c. Possible increase in management effort, difficulties in maintaining coordination and unnecessary generation of paper work.

30.8 Effects of selecting too few CIs. Too few CIs may result in costly logistics and maintenance difficulties. The following may result:

- a. Loss of identity through separation of affected portions of a CI during field or depot maintenance of modification installation activity.
- b. Inability to control like individual remove/replace items when CI identification and control is at the "set" level, e.g., a storage battery set.

- c. Loss of operational use of one function because required maintenance on another function requires action against the CI level, e.g., a CI having separate VHF-UHF functions loses both when maintenance must be done on either function.

30.9 CI selection checklist. The following questions should be used in selecting CIs tailored to individual program/project requirements. If most of the questions can be answered NO, the item probably should not be a CI. If most of the questions can be answered YES, the item probably should be a CI. If the questions can be answered with approximately equal numbers of YESs and NOs, additional judgment is needed to determine if the item should be a CI. The selection of CIs is a management decision based on experience and good judgment. It should be kept in mind that some of the factors such as serialization and nameplates will be required, regardless of CI selection, e.g., part of a higher level assembly.

- a. Is it a critical high risk, and/or a safety item?
- b. Is it readily identifiable with respect to size, shape and weight (hardware)?
- c. Is it newly developed?
- d. Does it incorporate new technologies?
- e. Does it have an interface with hardware or software developed under another contract?
- f. With respect to form, fit or function, does it interface with other items whose configuration is controlled by other entities?
- g. Is there a requirement to know the exact configuration and status of changes to it during its life cycle?