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12TH ICCRTS
"Adapting C2 to the 21st Century"

Title: Managing a Portfolio of C2 Programs

Track 1: C2 Concepts, Theory and Policy

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Abstract

This paper describes a management oversight methodology for Command and Control (C2) programs, and resulting execution outcomes; that serve the ASD(NII) C2 Programs Directorate's interests in fulfilling their obligations and responsibilities of effectively providing oversight management for the Departments' C2 programs. ASD(NII) C2 Responsibilities and Authority is detailed in DoD Directive DoDD 5144.1. Interpretation of these core directives helped define essential elements/requirements for developing the C2 Programs Directorate's management oversight methodology.

Our approach scopes the problem of managing a large number of C2 programs, by taking a "minimum essential" portfolio management perspective. This perspective examined programs based on priority, using only approved and existing C2 constructs. Prioritization was based on alignment to the four QDR challenges (i.e., traditional, disruptive, catastrophic, irregular warfare) as prescribed in the 2006 QDR and National Security Strategy. Programs were examined from functional, technical and programmatic perspectives hence scenario-independent, thus avoided exhaustive modeling and simulation. An abbreviated portfolio of six C2 programs was pre-selected for a proof-of-concept workshop to test the end-to-end utility for our C2 oversight management process. A compendium of formatted issue sheets recorded salient information for a particular issue, including detailed resource data addressing rationale. From these identified issues, we produced an abbreviated "Integrated C2 Plan" consisting of valid portfolio-level actionable recommendations across the six programs.

I. Background

ASD(NII) C2 Programs Directorate is responsible for the overall strategy and plan to support decisions relating to the development, integration, convergence and synchronization of Command and Control (C2) programs across the Services, Agencies and Combatant Commands.

In fiscal year 2005, MITRE developed a methodology to identify potential capability gaps and overlaps across C2 programs-of-record. We adapted a Matrix Mapping Tool (a.k.a. MMT) (used in MITRE's support of the Under Secretary of Defense for Acquisition, Technology, and Logistics) to determine its utility in comparing C2 program capabilities to fundamental C2 processes. Modification of the tool was necessary to allow mapping of the C2 and Net-Centric Environment Joint Functional Concepts (JFCs) to program capabilities embodied in their respective Capabilities Development Documents (CDD). The 2005 methodology operated under the hypothesis that C2 capabilities supporting the same functionality are potentially similar. This effort was a first step in developing a common and consistent basis for providing program oversight and guidance for C2 programs on an enterprise-wide basis in support of the C2 Programs Directorate mission. From this effort we found the process not scaleable to a large number of programs, so embarked on mapping C2 programs to Joint Capability Areas (JCA) instead, in the following year FY06.

In FY 2006 an abbreviated portfolio of six C2 programs was pre-selected for a proof-of-concept workshop to test the end-to-end utility for a C2 oversight management process, referred to collectively as the 'Integrated C2 Strategy'. A JCA mapping exercise was conducted to better understand its utility to our process; inspite of pre-selecting six C2 programs of high interest. A compilation of recommendations based on a collection of findings, or "issues", was captured in a compendium of 20 issue sheets. Formatted issue sheets recorded the salient information for a particular issue, replete with an appendix and attachments providing detailed source data addressing rationale for that particular issue. From the identified issues we produced an "Integrated C2 Plan" consisting of validated actionable portfolio-level recommendations. A secondary benefit supported the program Objective Memorandum (POM) process, at the discretion of the C2 Programs Directorate, as further proof that the recommendations posed had merit in support of the Directorate's responsibilities to provide meaningful and actionable oversight management.

II Overview of Approach

Components of the methodology are depicted in Figure 1. To prioritize the programs, program capabilities are mapped to JCAs which have been correlated by the Joint Staff J7 to the four QDR challenges. Through this mapping, we are able to determine how well programs support the QDR challenges from a capability standpoint, and have a basis to measure portfolio alignment before and after execution of any recommended changes. At a later date, C2 Joint Functional Capabilities (C2 JFCs) could be mapped to Tier II JCAs in order to further refine gap/overlap analyses across C2 programs, as well as reduce mapping bias by using C2 JFCs as a focused guideline.

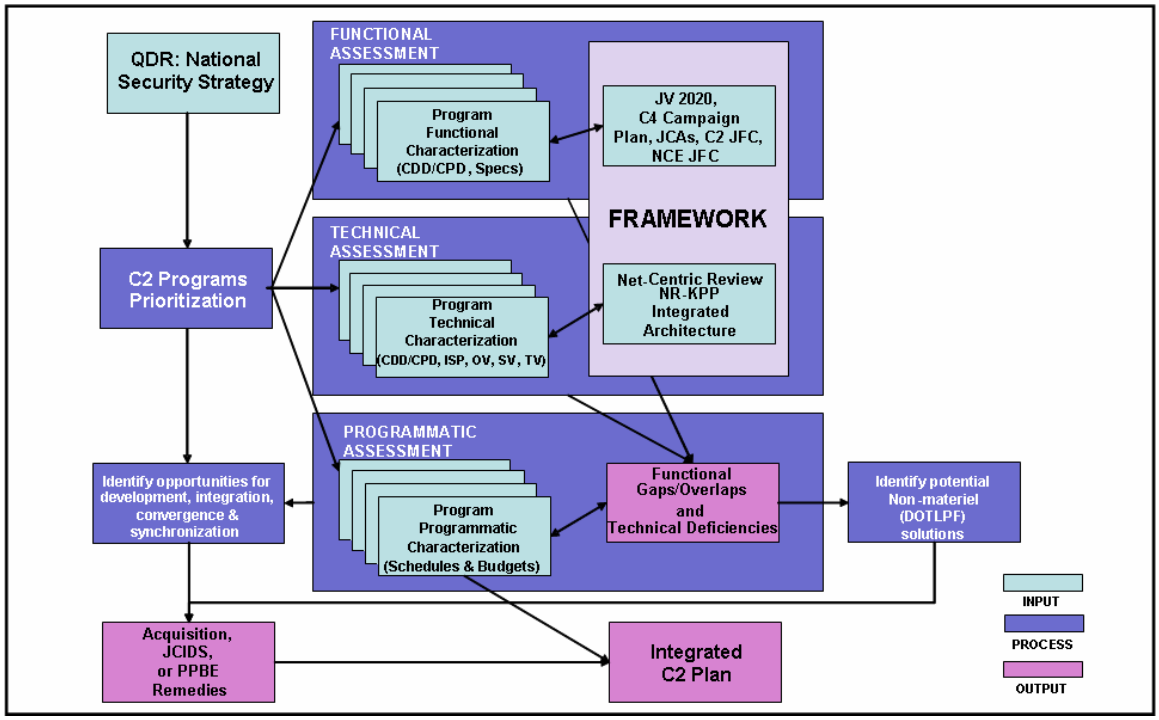


Figure 1 - Components of the Integrated C2 Strategy

The "framework" brings fundamental C2 functional and technical precepts into the analysis. It is the common yardstick by which we begin to evaluate programs within the portfolio. Program capabilities are mapped to the framework to identify potential gaps/overlaps and technical deficiencies in such a way that pair-wise comparison of program capabilities is

avoided to a large extent - an important aspect of the scalability of the process. The programs are then assessed from a programmatic standpoint to identify and formulate actions necessary to resolve the identified portfolio issues through the JCIDS, PPBE and acquisition processes.

A portfolio management perspective was adopted as a reasonable adjunct to support oversight across a number of C2 programs. Succinctly, portfolio management provides a closed-loop process to analyze, select, control and evaluate, and is consistent with the implementation of our "minimum essential" approach. Thus, relevant elements from the IT Portfolio Management DoD Directive were adapted to suit our needs.

In summary, our methodology links directly to the 2006 QDR and National Security Strategy to focus on strategic objectives, while analyzing program capabilities at a more detailed functional and technical basis. The foundation of recommendations lies in the "Integrated C2 Plan"; which provides source material for effecting Budget/Program Change Proposals within the PPBE yearly cycle, in addition to providing inputs to acquisition oversight and JCIDS processes. Thus, the methodology serves to strengthen program advocacy, and improve alignment to the four QDR challenges iteratively through execution of program guidelines, as recorded in the "Integrated C2 Plan".

III Proof-of-Concept Workshop

In Figure 2 many of the salient features of the methodology are shown. Starting at the left of the Figure, 'JCA Analysis' prioritizes C2 programs-of-record in accordance with their alignment to the four QDR challenges. Those programs in greater alignment are of higher priority. 'JCA Analysis' maps and quantifies each program's contribution toward fulfilling the Tier II JCAs. Those results are then aggregated to the Tier I level JCAs. Each program is therefore profiled across all 21 Tier I JCAs, thereby yielding a color-coded measure of support, 21-element vector. This is later discussed in detail.

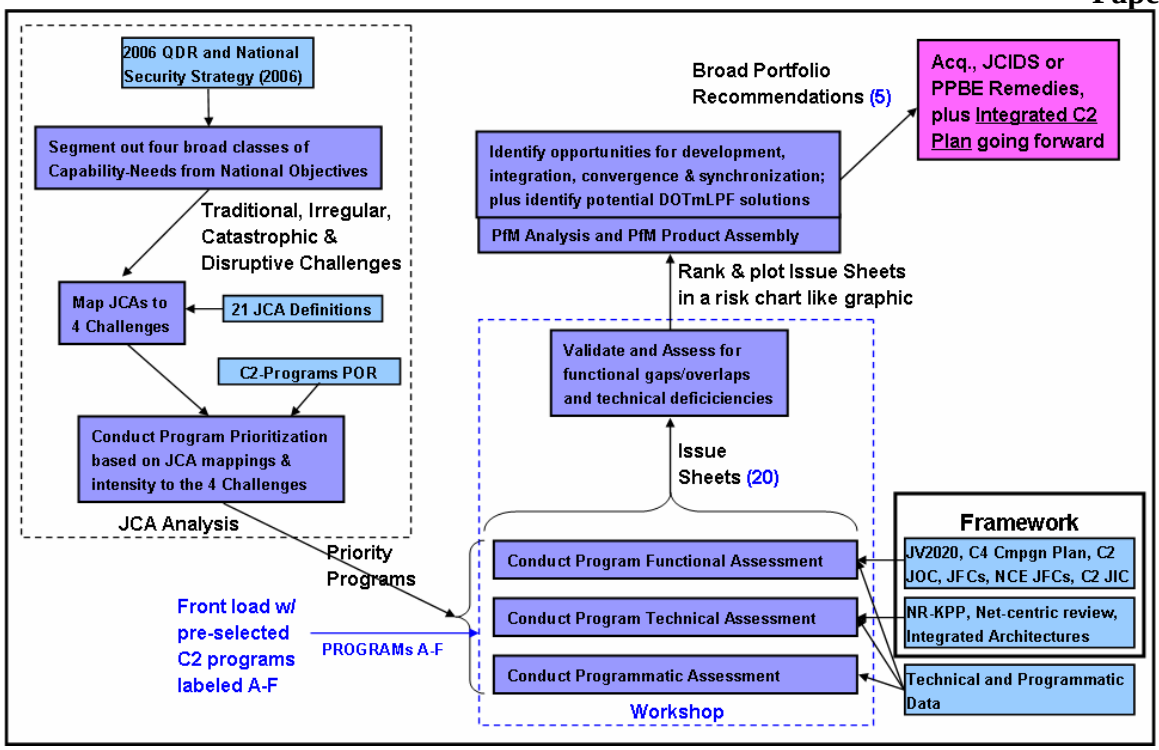


Figure 2 – Proof-of Concept Workshop Process Flow

The workshop exercised this element of the process, to gain understanding in the utility of mapping C2 programs to JCAs. The workshop operated on a pre-selection of C2 programs to minimize the time needed to produce end-to-end results in three months. Prior to the workshop, significant effort was required to assemble an information package for each selected program; on which to base functional, technical and programmatic assessments. All assessments were recorded into standardized issue sheets. The workshop then served to validate these issue sheets by subject matter experts (SMEs) invited to the workshop. After the workshop, issue sheets were further prioritized and mapped into a risk-like construct to depict relative impact to the portfolio. Issue sheets form the basis by which portfolio-level recommendations were ultimately identified, developed and incorporated into an "Integrated C2 Plan".

A. JCA Analysis

The JCA analysis is the first step employed in prioritizing programs, determining their alignment to the QDR challenges, and reconciling potential gaps/overlaps. The JCA analysis is by no means a cookie-cutter approach to automate oversight management and thus bypass core detailed analysis. The JCA analysis contributes as a tool to discover relationships, not apparent at the portfolio-level. The 21 JCAs map to the four QDR challenges defined in the Figure 3.

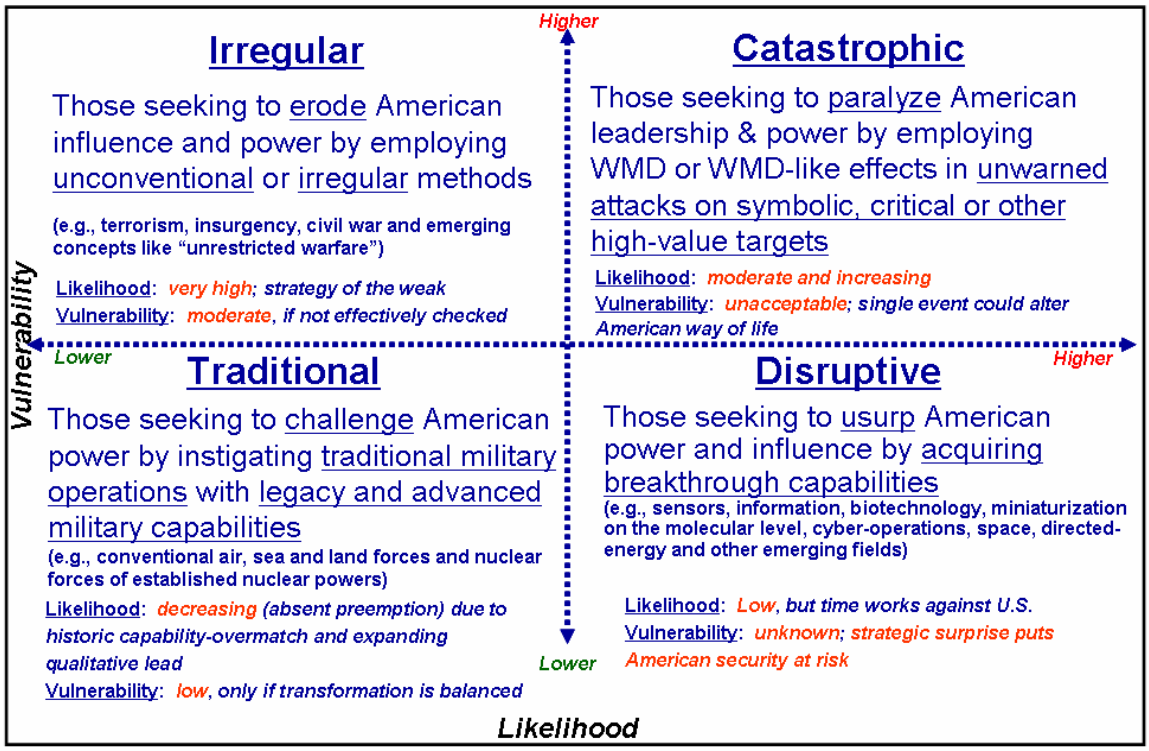


Figure 3 - Definitions for the four Strategic Challenges

The program mapping process was deemed best done by program SMEs. They were instructed to assess their ideally fielded program-capability against Tier II JCAs. If the program's capabilities were irrelevant or contributed negligibly to a Tier II JCA, the program was assigned a "zero". If the program capabilities supported the JCA, it was assigned a "one". If the program capabilities critically contributed to the JCA, such that without it the JCA could not be performed, it was assigned a "two". The average at the Tier II level was then computed to give an overall Tier I JCA score. As an aside, colors were also assigned, along with the numbers, to more visually depict clusters of similar program capabilities and potential gaps.

JCA mapping serves multiple primary purposes. First, when the entire portfolio of C2 programs is mapped, gaps may be readily uncovered. Second, clusters of programs having similar JCA-correlation profile indicate a potential for significant overlapping capabilities. Third, recommendations can be shown to improve the alignment to better satisfy the 4 QDR challenges; in a before and after comparison using the Joint Staff mapping of JCA to the QDR challenges shown below in figure 4.

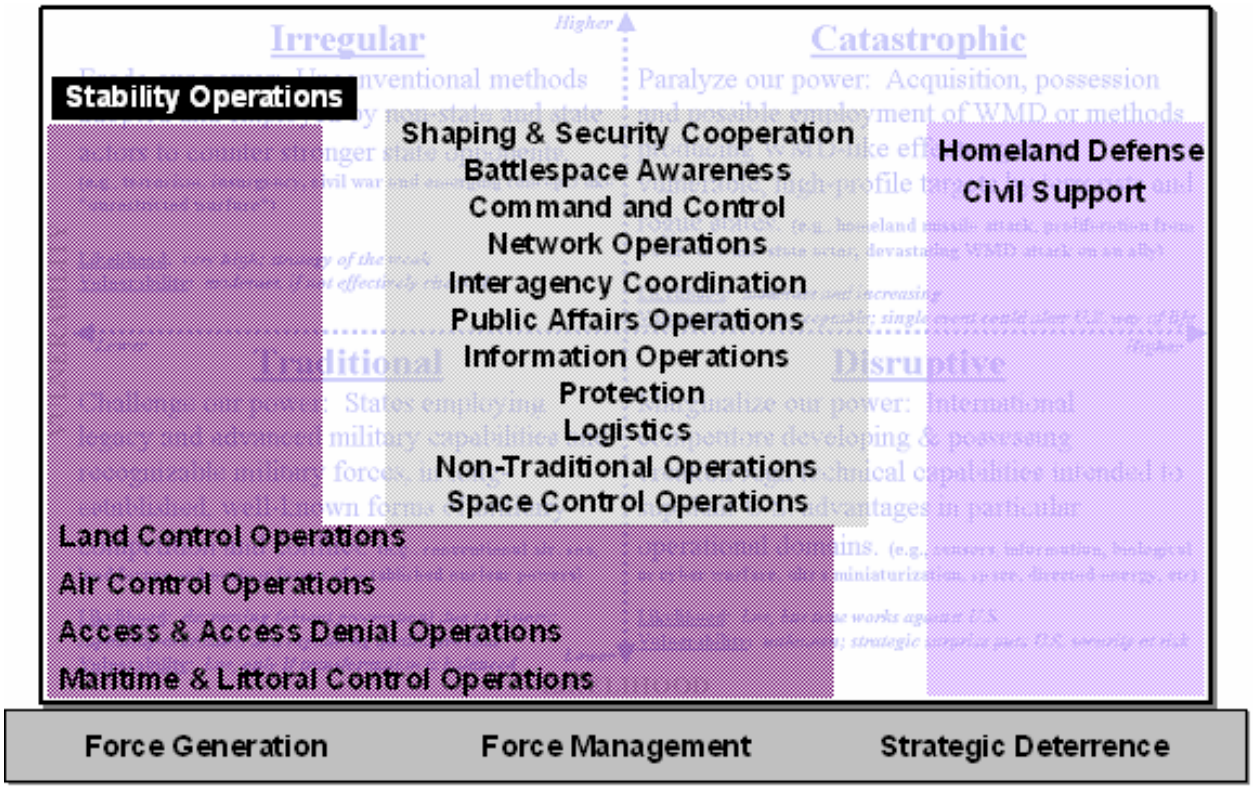


Figure 4 - JCA Mapping to 4 Strategic Challenges

B. Workshop Process

The actual workshop process is shown in figure 5. Originally the idea was to poll program SMEs to develop issues for input to the oversight management process. Quickly it became apparent that program SMEs are not best positioned to produce issues relating C2 portfolio concerns. Rather, their issues would tend to focus on their own internal concerns, though portfolio issues could still arise. To assuage this difficulty, issues were first developed

by those outside the program having strong and broad C2 understanding, with program SMEs simply commenting and validating issues presented to them. This greatly simplifies the onus placed on SMEs, exploits SME expertise more efficiently, and rapidly enhances learning at the C2 portfolio level by the C2 oversight management team. Learning is an important element of the process, because over time a deeper understanding across a broad set of C2 programs is gained; thereby simplifying and increasing future effectiveness of the overall process.

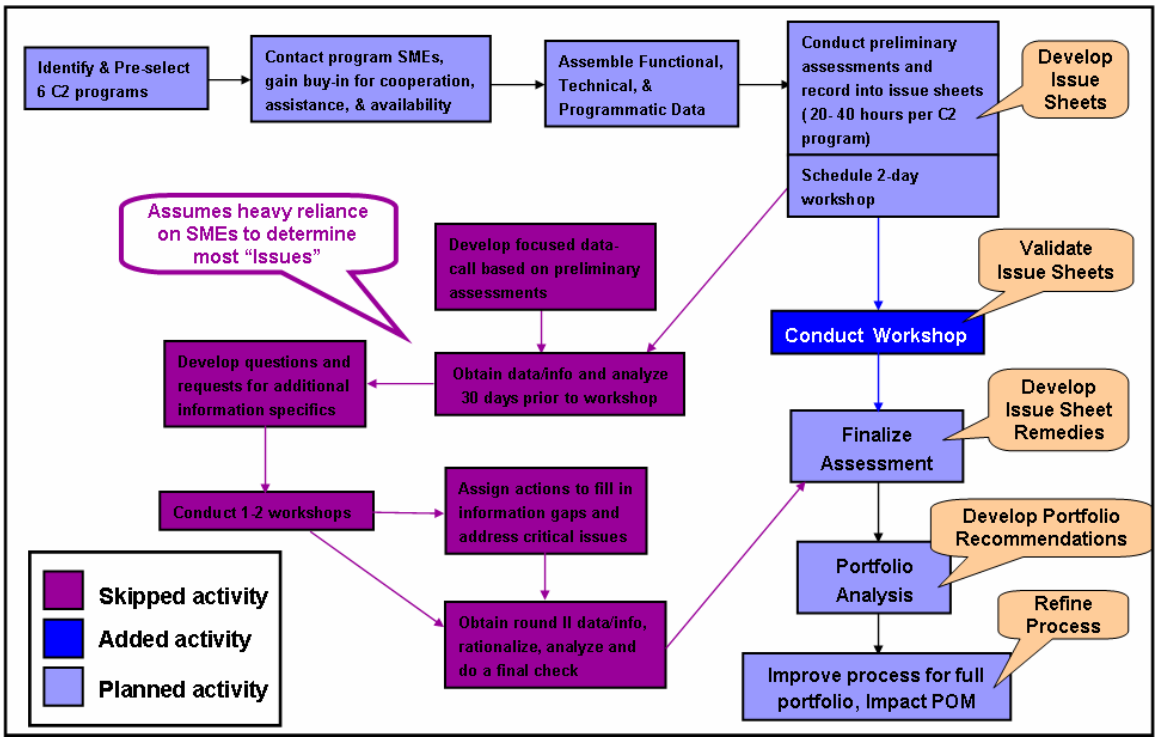


Figure 5 - Integrated C2 Strategy Workshop Process Flow

If history is an indicator, there remains much room for oversight process improvement when the portfolio is increased and new idiosyncrasies emerge. Also, there is no way to conduct effective oversight management without program-SME participation and an extensive C2 understanding by the oversight management team. SMEs are critical for validating the veracity of issues through their deep and detailed understanding of their program capabilities. Likewise, the C2 management oversight team must have strong C2 presence of mind to recognize broad issues across a number of C2 programs; not apparent at the individual program level. Thus, a rich interchange between the oversight management team and the program SMEs is vital for

eliciting high value information necessary to generate valid/actionable portfolio-level recommendations.

C. Issue Sheet Method

An issue sheet format was created to standardize the recording of issues. This hastened the pace of generating issues, by focusing the information gathering needs, while making it easy for program-SMEs to comprehend and assimilate a large number of issues. Issue sheets are self contained to reduce the amount of additional fact-finding imposed upon program-SMEs. "Issues" come in three varieties:

1) Problems – areas of concern either active, or soon to arrive with high certainty of occurrence

2) Risks – areas of concern with uncertainty can be positive (opportunities) or negative (problem areas)

3) Lack of Information – areas of concern requiring more information to reliably predict impact whether positive or negative

"Issues" can apply at both the C2 program level and the C2 portfolio level. The C2 portfolio level is our primary focus characterized by: 1) impacts to multiple C2 programs, 2) longer-term resolution, 3) direct strategic alignment and 4) a business process orientation. At the portfolio-level come: governance, new policy concerns, new capability development needs, and roadmaps with integrated planning. At the C2 program-level, issues can still have serious impact in achieving C2 portfolio objectives. A program-level issue may involve dependencies external to C2, such as other programs of emerging communication systems and networks. Issues at the individual program level tend to be resolvable in the shorter term, and covered by general oversight management.

III Workshop Products

The following paragraphs summarize the workshop products that were developed as part of the proof-of-concept workshop.

A. JCA Histograms

Figure 6 summarizes results of our JCA Analysis. The normalized mapping to the four challenges via JCAs shows C2 PROGRAM A dominating the Traditional, Irregular, and Disruptive challenges. C2 PROGRAM A was expected to dominate, given its broad reach of C2 capability. These results will become most meaningful when the entire portfolio is considered.

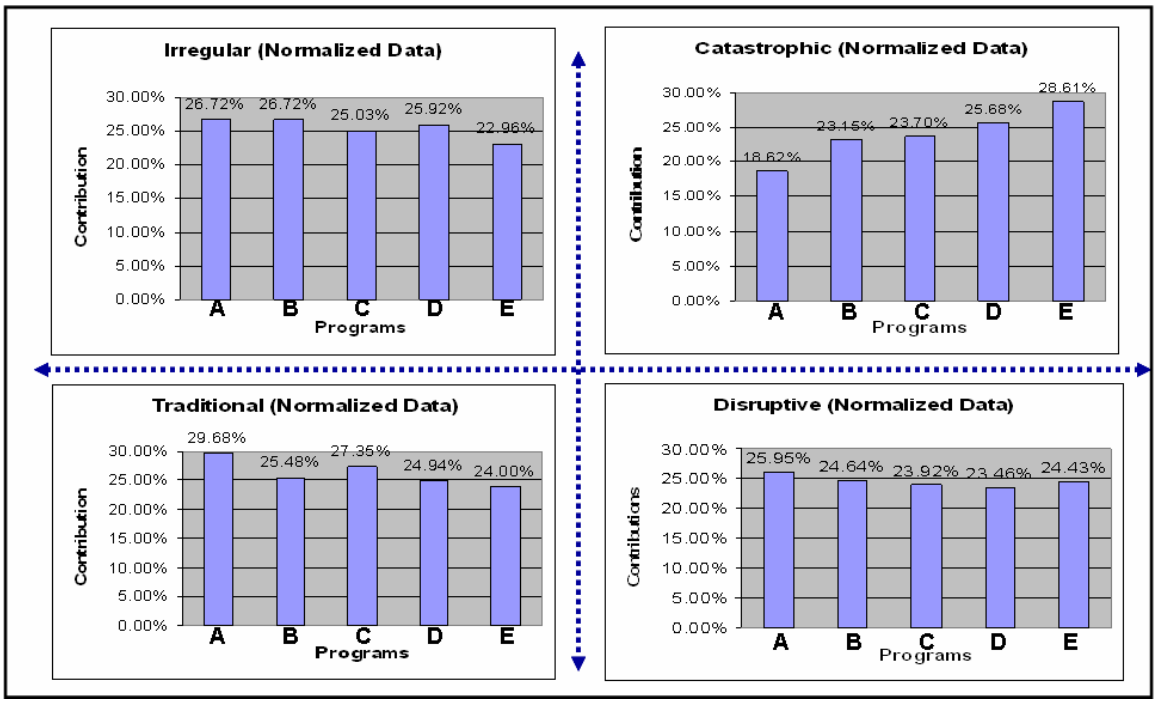


Figure 6 - C2 Program Ranking Over the Four Challenges

In the Figure 7, the program mapping results were aggregated to look at the intensity profile of program-support for all 21 Tier I JCAs. Again, results will grow more meaningful given the full C2 portfolio. Those JCAs scoring a level exceeding 20 reasonably indicates higher

intensity of support. Based on these results, there may be some JCAs that are less supported but not germane to C2. Future efforts will broaden this understanding by mapping C2 JFCs to Tier II JCAs to further determine if some JCAs rightfully or wrongfully require C2 functionality. This may also bring about weighting factors to further normalize the association of C2 programs to the 4 challenges. Lastly, we expect to map, in the same manner, a level of JCA-contribution to C2 programs to highlight capability interdependencies.

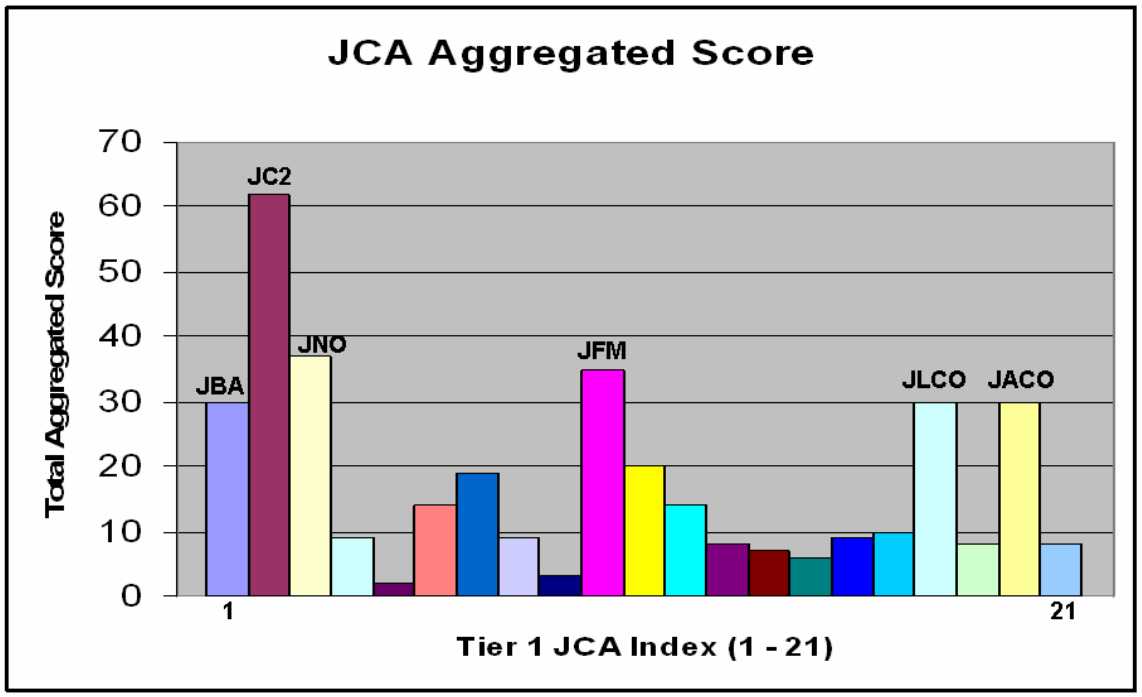


Figure 7 - Aggregated Program Support for Tier I JCAs

In Figure 8 below, three Tier II JCAs, within the JC2 JCA, are shown to have equal intensity over 5 programs. These potential areas of overlap were found to independently validate some, but not all, of the issue sheets generated. Thus the information learned by the mapping could assist in the generation of issue sheets pertaining to potential functional overlaps among programs. The value of mapping lies with the clustering of programs, in narrowing the analysis scope; thus avoids pair-wise comparison of every program with every other program.

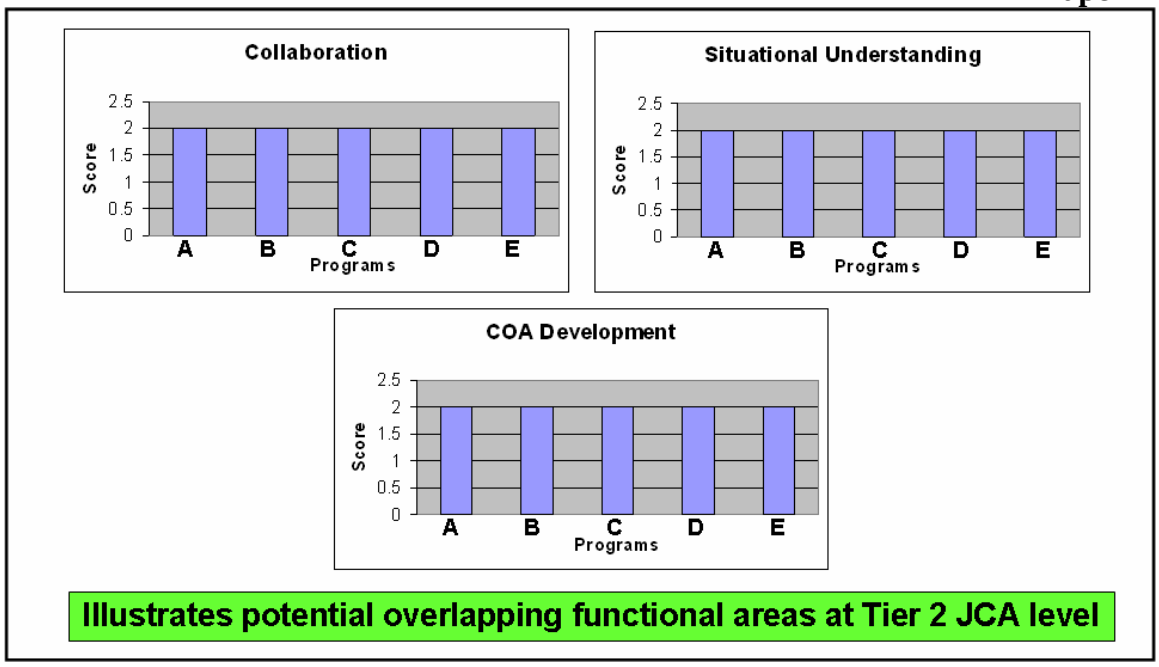


Figure 8 - Examples of Three Tier II JCAs within JC2 Tier I JCA

The JCA results were not instrumental in selecting C2 programs for the proof-of-concept workshop, but rather served to understand potential benefit in simplifying the analysis scope for a large number of programs, and exposing novel issues not readily apparent.

B. Issue Sheets

A compendium of 20 issue sheets was generated from our functional, technical and programmatic assessments. The naming convention "Topic_Assessment-type_Programs Affected_Date-of-Last-Revision" assured configuration control with "Date-of-Last-Revision". "Topic" provides a few words to cue the analyst; "_Assessment-type_" is designated by letters ('F' for functional, 'T' for technical, and 'P' for programmatic); "_Programs_" list programs affected denoted by their common abbreviation. Issue sheets are configured to be validated by SMEs with placeholders for SME comments/recommendations. We allowed comments to accumulate with no revisions to any earlier text, in order to preserve the full history of the issue.

Assigned tracking-numbers provide useful shorthand for citing issue sheets. This will be increasingly important as the number of issue sheets expands with a larger portfolio. The approach to documenting issues is designed to be succinct and self-contained so that SME participants are able to rapidly comprehend the nature of the issue, plus have available the source data justifying our detailed assessments.

IV Aggregation of Issues to Portfolio Level

This section discusses how issue sheets fulfill the role of generating actionable recommendations at the portfolio-level. In review, approved and unassailable information on C2 programs is collected. Independent analysis is next conducted by non-program personnel to provide objective inquiry in looking for high-potential relevant issues related to the C2 portfolio. Issue sheets generated are then validated by program SMEs; preferably multiple SMEs and by at least one representative for each program impacted. Articulating remedies that best resolve an issue are also part of the validation process. All "issues" should be viewed by the potential value produced upon their resolution.

A. Mapping Issue Sheets to Portfolio Impact

Issue sheets presuppose some significant concern regarding the C2 portfolio, otherwise they are dropped. Their priority is ranked and displayed by their potential portfolio impact and probability of occurrence. These priorities roll-up to a portfolio-level "exposure" discussed next in section V. Table 2 presents the issue sheet prioritization matrix which assists in focusing attention on those issues having highest impact and likelihood, and thus the first to be addressed. This practice should become more valuable as the number of issue sheets expands with increasing portfolio size. The point of ranking is to identify those issues which should be dealt with first, recognizing that all issues may not be resolvable, given current resource constraints.

Po	Impact Category				
	Negligible	*Minor*	*Moderate*	*Serious*	*Critical*
0-10%	Low	Low	Low	Medium	08 Medium
11-40%	Low	04 Low	19 Medium	Medium	01 09 10 High
41-60%	Low	Medium	03 Medium 12	02 06 11 Medium	High
61-90%	Medium	18 Medium	05 16 20 Medium	14 Medium 15	07 High
91-100%	Medium	13 High 17	High	High	High

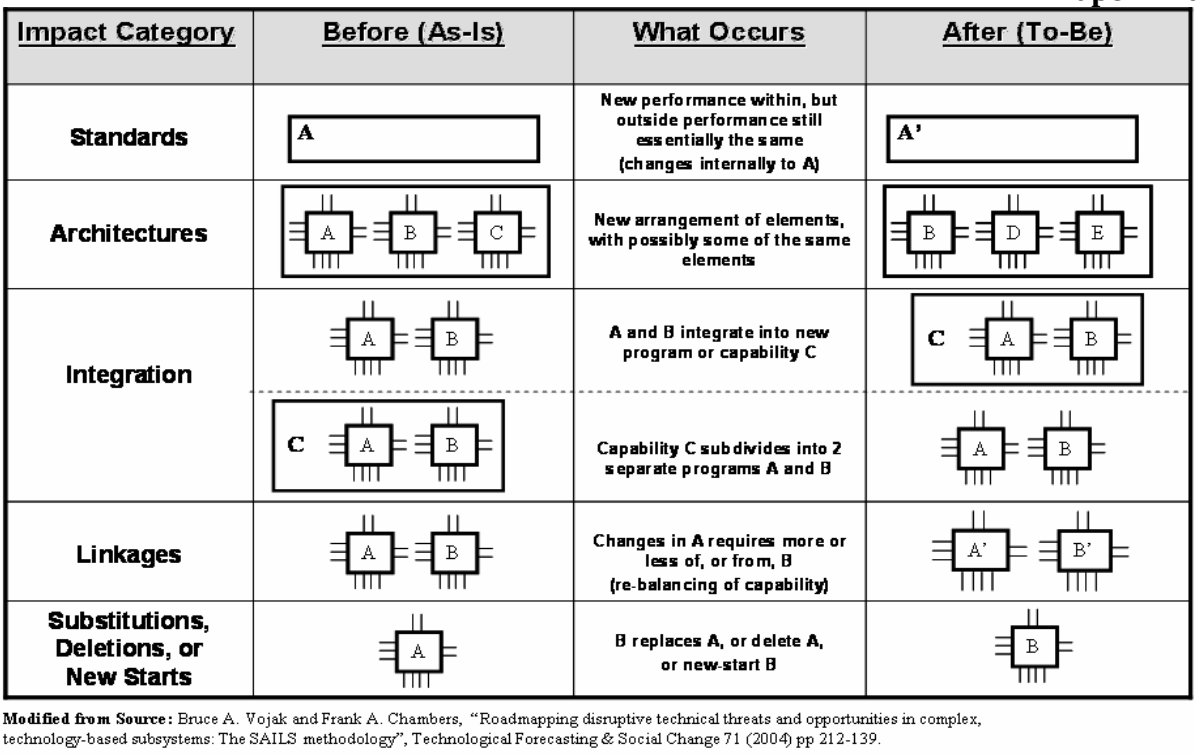
Modified from Source: Pamela A. Engert and Zachary F. Lansdowne, "Risk Matrix User's Guide Version 2.2", MITRE Document, Nov. 1999, Bedford MA.

Table 2 - Issue Sheet Prioritization for the 20 Issue Sheets

Summarizing the above table, there is one low-impact issue, thirteen medium-impact issues and six high-impact issues. Issues 03, 04, 08, and 20 are of the "more information needed" variety so their ranking is subject to change. For now, they are all medium. As new findings or information related to any particular issue comes to light, the rankings will vary.

B. Developing Portfolio-Level Recommendations

Once large numbers of issue sheets are validated and ranked, further consolidation packages them into broader portfolio recommendations. Recommendations at this level should have a tangible benefit and identify cost, schedule and performance impacts to the portfolio. Not all issues can nor should be resolved in a resource constrained environment. Figure 9 describes portfolio impact categories characterizing the kind of events that could occur alone or in combination at the portfolio level. These categories aid development and categorization of portfolio recommendations.



Modified from Source: Bruce A. Vojak and Frank A. Chambers, "Roadmapping disruptive technical threats and opportunities in complex, technology-based subsystems: The SAILS methodology", Technological Forecasting & Social Change 71 (2004) pp 212-139.

Figure 9 - Portfolio Impact Categories

At this point in the process, recommendations are those larger actions that are transposed to Budget-, or Program-, Change Proposals, having a business case built around them to justify their execution.

V Creating an Integrated C2 Plan and Portfolio Evaluation

A. Creating the Integrated C2 Plan

The recommendations become input to the Integrated C2 Plan, the construction of which is shown in Figure 10. The value provided by the Integrated C2 Plan ultimately improves alignment of the portfolio to the C2 strategy; given by the aforementioned increased alignment to the strategic QDR challenges.

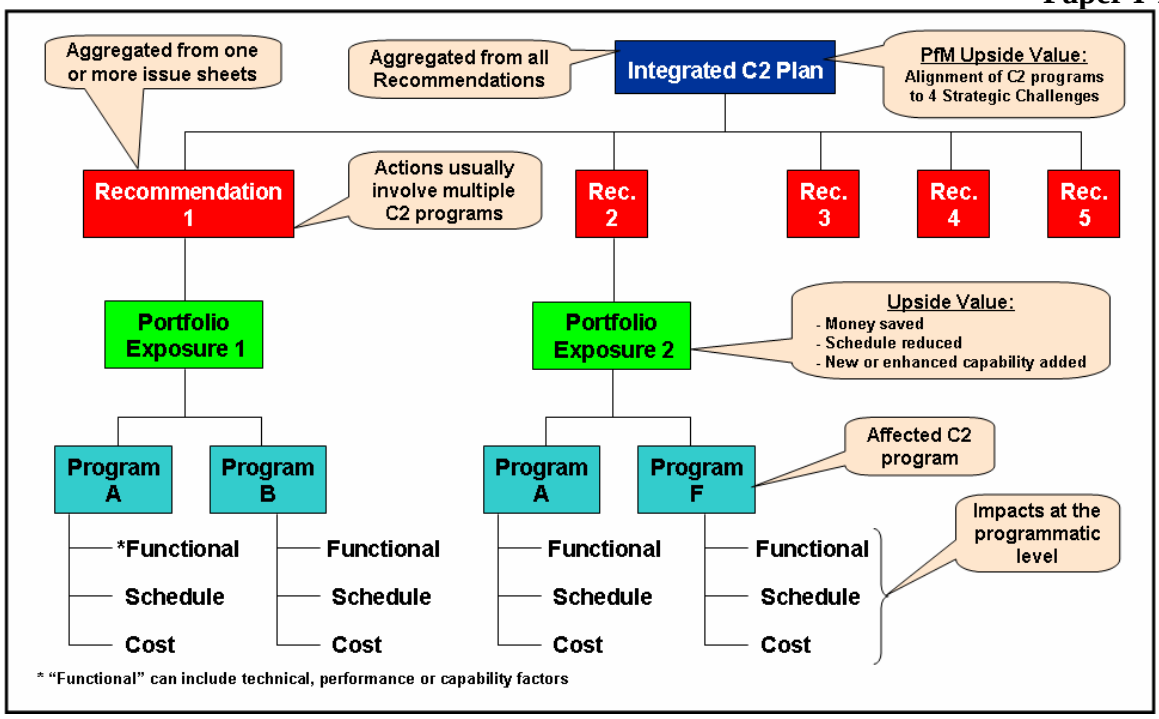


Figure 10 - Integrated C2 Plan Construction

Each recommendation comes with a benefit labeled "PfM Exposure". This quantifies the upside potential for a given recommendation upon timely and successful execution. The exposure is essentially a roll-up of all programmatic impacts associated with a recommendation. "PfM Exposure" provides a way to rank and prioritize recommendations according to an "upside value", thus allowing trades to be made in a limited resource environment. Lastly, "Portfolio Exposure" is complete when both positive and negative effects/impacts are recorded in accordance with the decision to either: 1) proceed forward with the final recommendation, or 2) not (status quo).This complete assessment reduces biasing the decision, while presenting a strong case for or against the recommendation.

The list of portfolio recommendation needs to be converted into individual program guidelines to focus execution at the programmatic level shown in figure 11. The Program Manager (PM) is responsible for implementing the guidelines. If the execution occurs successfully across all programs involved, then the overall portfolio benefit is assumed realized.

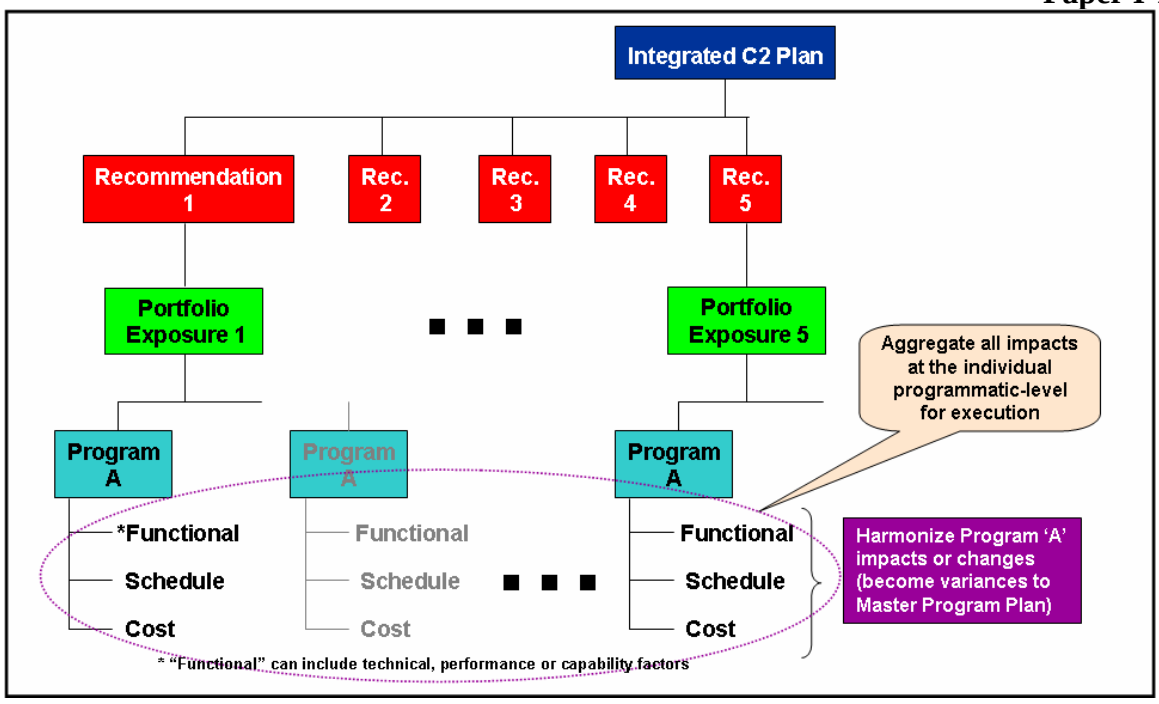


Figure 11 - Harmonization of Programmatic Impacts

Thus recommendations must be transposed and synchronized across individual program-level to execute so that changes lead to portfolio improvement. All program changes will be evaluated as part of the oversight management process for how well the portfolio is improving.

B. Portfolio Evaluation

Two ways of measuring a C2 portfolio are identified in figures 12 and 13. In figure 12, cost savings affords more capability across the 4 challenges, fielding capability sooner brings about alignment to the 4 challenges sooner, and resolving C2 capability gaps shifts the portfolio into the desired strategic direction. This claim is predicated in the veracity that recommendations are relevant to the challenges, beyond stating it so. The mechanics of measuring strategic alignment however is far from simple. The JCA mapping needs to take place consistently; before the recommendations and after implementing the recommendations. JCA mapping only postulates change in strategic alignment, subsumed from successfully executing the recommendations. To evaluate real-world alignment is even more difficult. Real-world

alignment must await execution of the recommendations, which will likely occur over multiple years, and then comparing that result to a forecasted-result of not executing the recommendations. This is an important point, since other recommendations and changes most likely take place concurrently, thereby clouding or eclipsing the evaluation process. If a yearly cycle of recommendation is occurring, then recommendations on top of recommendations will require that program change history be captured and understood. Moreover, recommendations will require reconciling with previous years' recommendations being, or soon to be, implemented at the individual C2 program level.

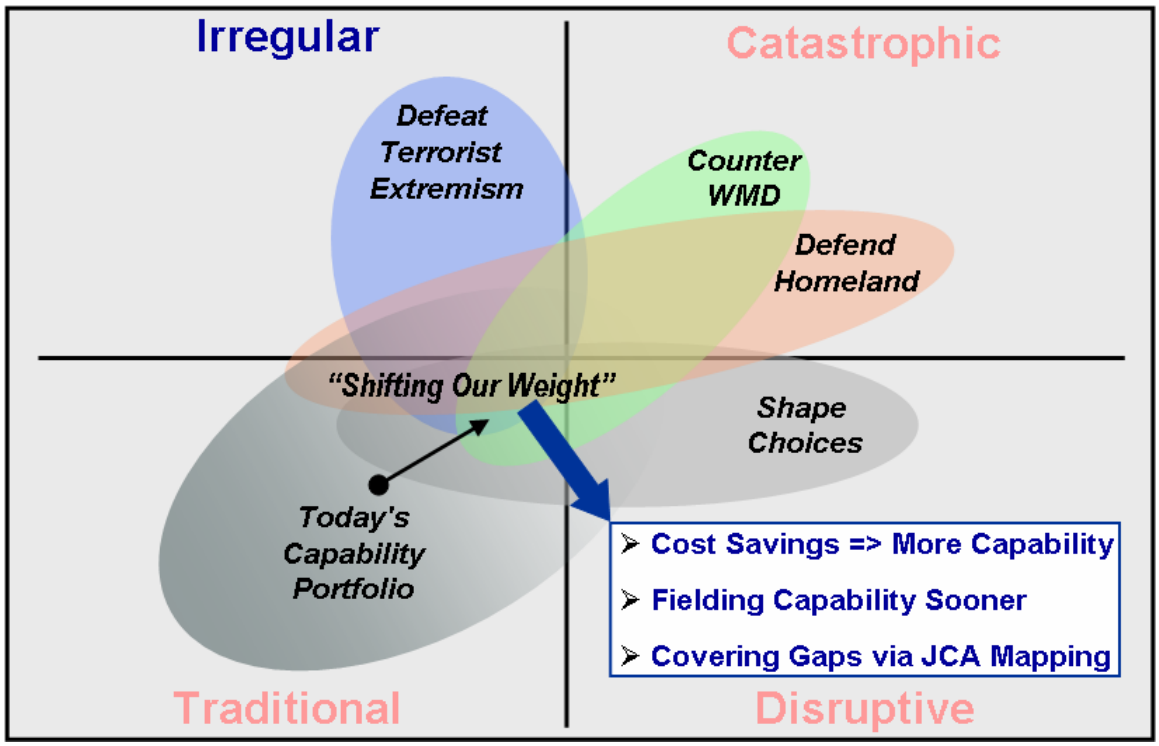


Figure 12 – Strategic Alignment

In Figure 13 below, recommendations executed reduce the known number of issues, thus purports to have an overall positive impact on the portfolio. This indirectly measures strategic alignment in monitoring execution progress (i.e. accurately following directions dictated by the program guidelines). This assumes the guidelines strategically align the portfolio as they should, and are well articulated in taking on a single clear interpretation. Thus, program managers (PMs), developers and stakeholders should affirm their understanding of what is being

recommended and participate in refining the guidelines handed to them by the oversight management team.

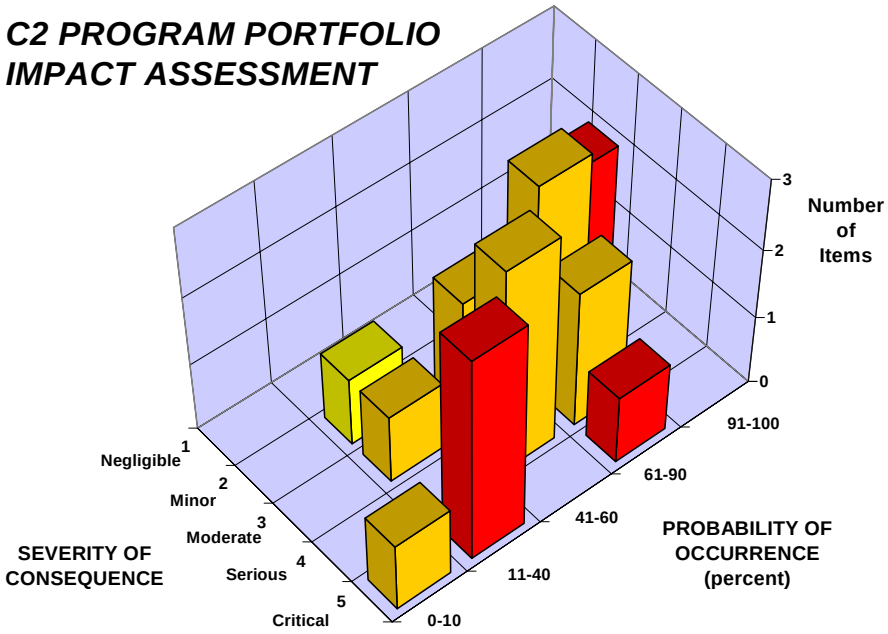


Figure 13 – Portfolio Impact Assessment

These two performance measures are a starting point for assessing the C2 portfolio, before and after recommendations are executed.

The practical application of portfolio management will likely continue to have open-loop aspects, outside of the ideal close-loop process. Incremental change in general, occurs on a continuous basis, and most recommendations will be executed across the POM cycle. Therefore evaluating a 'before' and 'after' condition of the portfolio must require thorough recording of the portfolio change history. In all likelihood, the portfolio will be evaluated in its current state then recommendations will occur on an on-going basis. Looking back 3 to 5 years time to evaluate the current portfolio will likely prove ineffable, especially if strategy has shifted over the years, in addition to the myriad of other on-going concurrent changes and recommendations.

VI Implementation of Portfolio-Level Recommendations

A list of five portfolio-level recommendations resulted from a June 2006 proof-of-concept workshop. The fifth recommendation, related to the PROGRAM D, was dropped much later upon face-to-face discussion with the executive program officers. This experience underscores the importance of deeper validation when considering portfolio recommendations, and expects to be part of the oversight management process. Annotated integrated schedules aided description of a recommendation usually composed of multiple programs. Annotations show proposed schedule impacts for a particular recommendation or information dependency. The general appearance should depict an explicit benefit of reducing schedule for achieving capability sooner, of properly synchronizing program dependencies, or recording planned program milestones.

VII Individual Program Execution Guidelines

Individual Program Execution Guidelines are developed for each individual C2 program, of sufficient detail, to be incorporated into their Master Schedule, Earned Value Management System, Budgeting Profile, Performance Specifications and Risk Management Plan, or whatever applies in the conduct of program execution. Individual program guidelines cross-cut among all recommendations derived from the June 2006 workshop. Each program execution guideline would be presented to the program-PM for additional vetting to refine the language and clarify assumptions.

Upon reviewing these guidelines much duplication in content occurs since recommendations tend to involve multiple programs. Recommendations are presented to each program along with the individual program guidelines. It is at the program-level where recommendations are ultimately executed to fulfillment. It may be necessary to also append an agreement vehicle to ensure execution of the guidelines.

APPENDIX I

DoD Directive 5144.1 - Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer (ASD(NII)/DoD CIO), 2 May 2005

DoDD 5144.1, as the baseline directive, "assigns responsibilities, functions, relationships, and authorities to the Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer (ASD (NII)/DoD CIO)". A key responsibility is DoD Command and Control (C2) management oversight elaborated in sections 3.6.1 through 3.6.6.

DoDD 5144.1 Responsibilities and Functions With regards to C2 Sections 3.6.1 – 3.6.6

Each section is stated below:

3.6.1 Develop and integrate the Department's overall C2 strategy, approach, structure, and policies and ensure the C2 structure and architecture are compliant with DoD network-centric precepts, information strategy, and joint needs.

3.6.2 Provide policies, program oversight, guidance, and strategic approaches for all C2 programs and initiatives on an enterprise-wide basis across the Department.

3.6.3 Identify the governance of the C2 structure that addresses the needs of the President and all levels of operational command within the Department.

3.6.4 Oversee and facilitate the integration of national, strategic, operational, and tactical C2 systems/programs, including support to the WHAMO, pursuant to Secretary of Defense guidance (ref (s)).

3.6.5 Oversee the development and integration of DoD-wide C2 capabilities, including the promotion of C2-related research, experimentation, metrics, and analysis techniques.

3.6.6 Direct the Heads of the DoD Components to plan, program, budget, and execute programs that will develop material solutions for JCIDS approved joint C2 capabilities

APPENDIX II

JV2020 Joint Command and Control

The primary thrust for JV2020 addresses U.S. Armed Forces joint operations "across the full range of military operations" (ROMO); where the "overarching focus" is "spectrum dominance – achieved through interdependent application of dominant maneuver, precision engagement, focused logistics and full dimensional protection". Also noted in JV2020, "2020" refers not to a deadline but rather a "general analytical focus". Below summarizes the key precepts given in the Joint Command and Control section of JV2020. Compliance to the precepts should be reflected in the PfM approach, insofar as insuring they could be followed without obstruction.

- Commanders need understanding of new operational capabilities and supporting tools for flexible, adaptive coordination and direction of both forces and sensors.
- Commander Staffs need to be organized and trained to take advantage of new capabilities, while capable of command and control in the face of technology failure.
- Commanders must be able to formulate and disseminate intent based upon up-to-date knowledge of the battlespace.
- JFHQ will be dispersed and survivable and capable of coordinating dispersed units and operations. Subordinate headquarters will be small, agile, mobile, dispersed, and networked.
- Faster operations tempos, increased choices among weapons and effects, and greater weapons ranges require continuous, simultaneous planning and execution
- Multinational and interagency partners require collaborative planning capabilities, technological compatibility/interoperability, and mechanisms for efficient information sharing.

In short the JV2020 provides a general guideline or "analytical focus" that is further amplified in the Capstone Concept for Joint Operations (CCJO) later discussed.

Joint C4 Campaign Plan (J-6)

The Joint C4 Campaign Plan recognizes the imperative of Network Centric Operations (NCO) and Net-Centric Warfare (NCW) enabled by the "dramatic increased reliance" on "Globally Connected Networks" related to the GIG and the "Power to the Edge Vision". When NCO is conducted in the context of warfare, it is referred to as NCW. Additionally, C2 operations in the future must also include Operations Other Than War (OOTW). OOTW consists of Stability Operations and humanitarian operations, both of which must be net-centric, conducted by the Armed Forces. Thus NCO is a critical C2 functional segment for warfare (ROMO) and OOTW.

The "Power to the Edge Vision" is stated as: "People throughout the trusted, defendable and ubiquitous network are empowered by their ability to access information and recognized for the inputs they provide". ASD (NII)/DOD CIO established three goals to realized this vision, they are: "1) Make information available on a network that people depend on and trust, 2) Populate the network with new, dynamic sources of information to defeat the enemy, and 3) Deny the enemy comparable advantages and exploit weaknesses to support NCO and the transformation of DOD business processes". These three goals may translate to both ROMO and OOTW.

Lastly, the Joint C4 Campaign Plan ties many of the transformational initiatives, defined in the Joint Transformational Roadmap dated 21JAN2004, as enabling technology to supporting C2.

Capstone Concept for Joint Operations (CCJO)

The CCJO governs the Family of Concepts shown in the layout below in Figure A, and offers future C2 guidance. The applicable Family-of-Concepts pertinent to C2 includes C2 JOC, C2 JFC, NCE JFC and the JC2 JIC. Other JOCs and JICs also apply. The JFC however are stable set used as a basis to guide functional assessments of C2 programs.

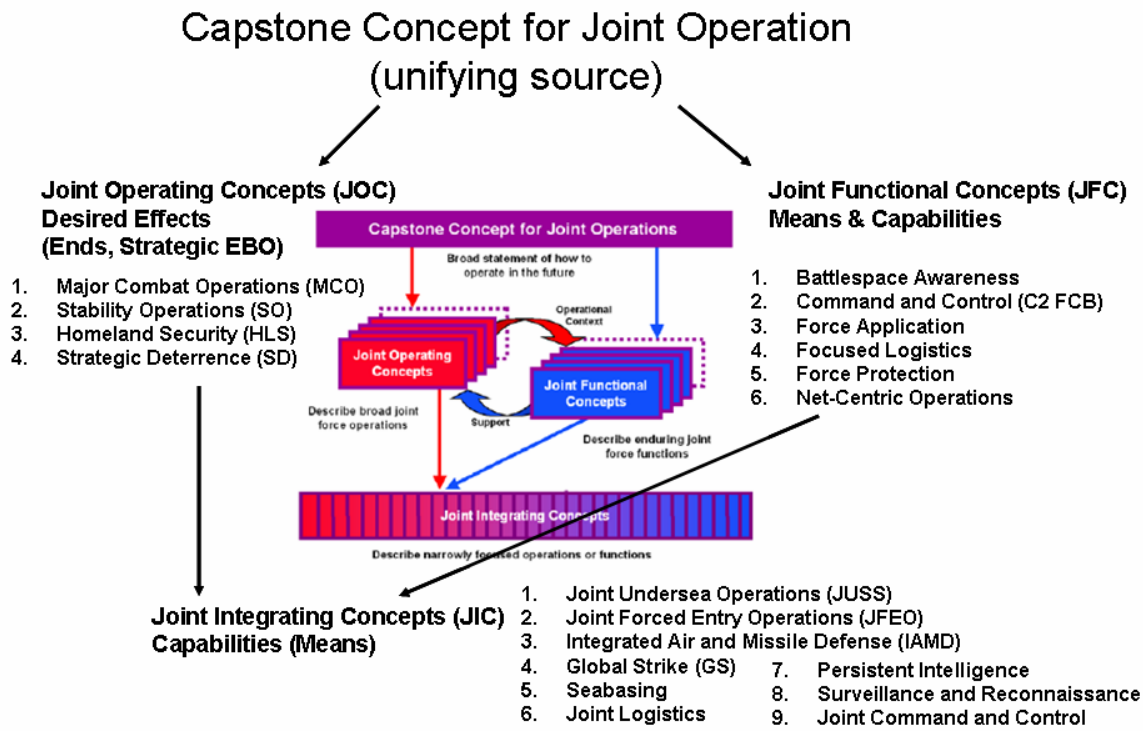


Figure A

a. Joint Operating Concepts (JOCs)

- JOCs integrate functional and enabling concepts to describe how a JFC will plan, prepare, deploy, employ and sustain a joint force given a specific operation or combination of operations.
- JOCs provide detailed conceptual perspective for joint experimentation and assessment activities, allowing decision makers to compare alternatives.
- The Joint Chiefs of Staff and Transformation Planning Guidance identified four broad initial joint operating concept categories: major combat operations, stability operations, homeland security, and strategic deterrence.

b. Joint Functional Concepts (JFC) and NCE JFC

- Command and Control (C2)
- Net-Centric Environment (NCE)

c. Command and Control Joint Integrating Concepts (JIC)

- Capabilities, Tasks, Attributes And Conditions

DoD Net-centric Precepts

- NR-KPP
- Net-centric Review
  - Internet Protocol (IP)
  - Secure and available communications
  - Only handle information once (OHIO)
  - Post in parallel
  - Smart pull (vice smart push)
  - Data centric
  - Application diversity
  - Assured Sharing
  - Quality of service

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