

**Lessons Recorded from Applying the NATO Code of Best Practice (COBP) for C2
Assessment to Operations Other Than War (OOTW)**

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Abstract

Over a seven year period, culminating in 1999, several NATO panels developed a NATO Code of Best Practice (COBP) for C2 Assessment. That product was focused on the assessment of C2 issues in the context of conventional conflict. Subsequently, a follow on Study Group, Studies, Analysis, and Simulation (SAS) – 026, was formed to explore the application and extension of the COBP to C2 issues in the context of Operations Other Than War (OOTW).

In order to achieve that objective, SAS-026 convened two complementary workshops: a (relatively) well-defined assessment of alternative Civil–Military coordination (CIMIC) centers in the context of the on-going Stabilization Force (SFOR) in Bosnia and a broader assessment of the full set of C2 issues confronting SFOR.

The first of those workshops produced two classes of products. First, it generated strawman results for the assessment of the CIMIC alternatives. Second, the workshop led to a sequence of “lessons recorded” about the COBP that will be employed to guide the adaptation of the COBP to OOTW issues. The paper describes both of these classes of product. The workshop confirmed that assessments of this sort should not be approached as a linear, “cook book” process. They require the generation of a flexible plan of action that stimulates the creativity of the assessors while reinforcing needed RIGOR.

A. INTRODUCTION

Over a seven-year period, culminating in 1999, several NATO panels developed a NATO Code of Best Practice (COBP) for C2 Assessment (Reference 1). That product was focused on the assessment of C2 issues in the context of conventional conflict. Subsequently, a follow on Study Group, Studies, Analysis, and Simulation (SAS) – 026, was formed to explore the application and extension of the COBP to C2 issues in the context of Operations Other Than War (OOTW).

As an initial step, SAS-026 convened a workshop to perform a case study of a representative C2 OOTW issue. The workshop focused on an assessment of alternative Civil-Military Coordination (CIMIC) centers in the context of the on-going Stabilization Force (SFOR) in Bosnia. The case study team elected to decompose the workshop into the macro-categories of the COBP (i.e., Problem Formulation, Organization and Human Factors, Scenarios, Measures of Merit (MoMs), Data, Tools and Their Application, Risk and Sensitivity Analyses, Report). Members of the team prepared background briefings for each area and facilitated follow on discussion. The group collectively generated key products for each of the areas. A separate “White Team” was established to observe the deliberations and to derive insights into the process.

The workshop produced two classes of products. It generated strawman insights into the assessment of the CIMIC alternatives and “lessons recorded” about the COBP that will be employed to guide the adaptation of the COBP to OOTW issues. Both of these products are summarized below.

B. FINDINGS

1. Case Study Insights. During the course of the case study, the Study Team developed a refined formulation of the problem, an articulation of a baseline scenario and scenario vignettes, candidate MoMs, a proposed orchestration of relevant tools, a preliminary assessment of risk and sensitivity, and insights into the form of the final product.

Problem Formulation. The initial guidance to the study team was to formulate and assess variants of the CIMIC that has recently been implemented by SFOR. A description of the doctrine for a canonical NATO CIMIC is provided in Reference 2. The Study Team was directed to formulate a study plan that could be implemented in 3 months.

To assist in the formulation of the problem, the Study Team adopted a framework that identified the operational determinants of headquarters effectiveness (see Figure 1). Attention was focused on the four elements that drive the capability of the headquarters: people, linkages, procedures, and information processing. Consistent with those factors, several representative issues were identified:

- How is performance and effectiveness of the headquarters affected by new technology and new procedures/concepts of operations?
- If the information technology in the CIMIC is upgraded, what performance/effectiveness can be achieved with fewer staff? The same staffing levels?

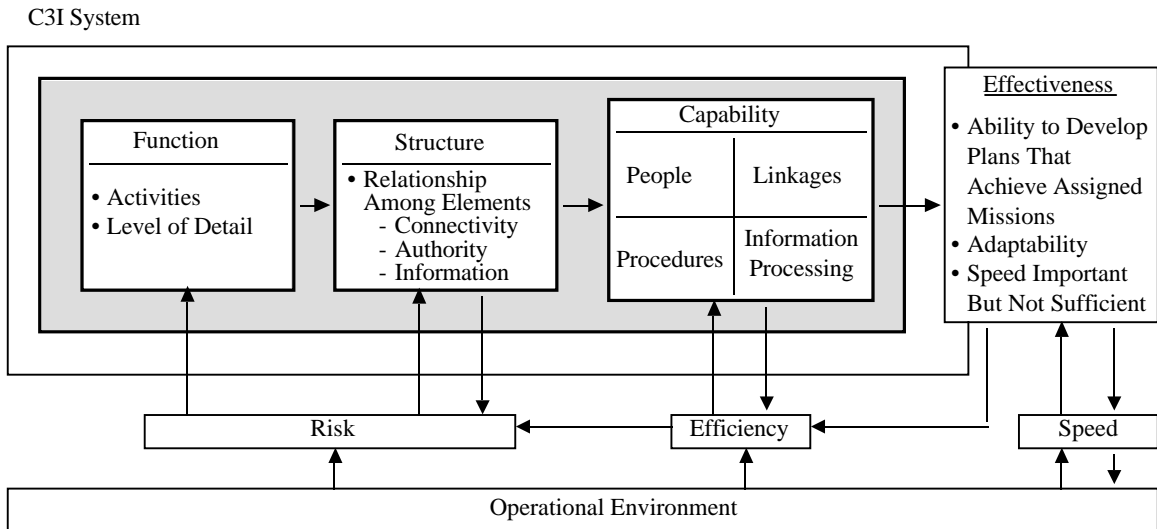


Figure 1. Organizational Determinants of Headquarters Effectiveness

To bound the technological options, alternatives were articulated in the areas of collaborative information technology, communications, and ADP support to personnel. As one extreme, an option was posed that selected the most austere technological choices (i.e., PC-modem access to the web, indigenous communications, no automated aids). At the other extreme, an option was posed that selected the most sophisticated technological choices (i.e., cutting edge collaboration technologies as instantiated in the “virtual building” paradigm; communications augmented by enhanced connectivity, capacity, and security; operational and training aids (e.g., language tutors, visualization tools)). In each case, it was recognized that appropriate doctrine, organization, training, personnel, and facilities would have to be selected consistent with the specific materiel option.

In order to evaluate and compare these options, several contextual issues were identified for further exploration. These included the following:

- **Information sharing.** It was recognized that the potential exists for mistrust among the heterogeneous participants in an OOTW. This suggests limitations on what information the CIMIC is willing to share, particularly in the areas of human intelligence (HUMINT) and proprietary data.
 - **Cultural differences.** The various participants in an OOTW are likely to be characterized by very different decisionmaking styles. For example, the military gravitates towards top down planning and written orders. Conversely, many non-governmental organizations (NGOs) seek consensus and are often comfortable with creative ambiguity.
 - **Roles and Relationships.** The military agenda focuses on the bounded task of establishing a secure environment within which ancillary organizations can help the failed state recover. Conversely, it must be recognized that many of these ancillary organizations (e.g., NGOs, International Organizations (IOs)) are not unified colleagues, but competitors who frequently vie for resources and credit.
 - **CIMIC Location.** The actual siting of the CIMIC frequently poses problems. If it is “inside the barbed wire” it challenges the NGOs who often fear being too closely associated with the military. Conversely, if it is located outside of military compounds it poses force protection issues.
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- **Scenarios.** The Study Team employed the scenario template that was identified in the NATO COBP. This involves characterizing the national security context for the assessment, the attributes and capabilities of the participants, and the environment in which the assessment is set. In particular, it was recognized that OOTW are often described by an initial ramp up (as the military intercedes in a failed state), a steady state phase (as the military seeks to establish a stable environment in which societal institutions can be reestablished), and a ramp down phase (in which the military disengages from the theater).

It was decided to focus on the initial stage of ramp down in which the military system is stressed by a variety of hypothetical vignettes (see Table 1).

Vignette	Potential Issues
<ul style="list-style-type: none"> Organized thuggery gives rise to substantial numbers of refugees 	<ul style="list-style-type: none"> What is the ability to provide <ul style="list-style-type: none"> - Security - Shelter - Food/Water?
<ul style="list-style-type: none"> Miscreants, convinced that one or more NGOs are biased, take hostages The remaining NGOs/IOs panic and go to the press 	<ul style="list-style-type: none"> How does the CIMIC respond?
<ul style="list-style-type: none"> A massive snow/ice storm strikes, interrupting the actions of <ul style="list-style-type: none"> Military operations Humanitarian assistance NGOs 	<ul style="list-style-type: none"> How does the CIMIC respond? How can the CIMIC surge capacity?

Table 1. Strawman Vignettes

• **Measures of Merit (MoMs).** Consistent with the NATO COBP, a hierarchy of MoMs was formulated that subsumed dimensional parameters, measures of performance, measures of C2 effectiveness, measures of force effectiveness, and measures of policy effectiveness. A representative set of these MoMs is depicted in Table 2.

Measures of Policy Effectiveness	<ul style="list-style-type: none"> Progress in transitioning from a failed to a stable state; e.g., <ul style="list-style-type: none"> - Successful democratization (e.g., ability to conduct a fair election) - Dealing with displaced persons (e.g., ability to relocate displaced families)
Measures of Force Effectiveness	<ul style="list-style-type: none"> Ability of military to create and sustain a secure environment
Measures of C2 Effectiveness	<ul style="list-style-type: none"> Quality of <ul style="list-style-type: none"> - Situational awareness - Synchronization of effort
Measures of C2 Performance	<ul style="list-style-type: none"> Ability to perform CIMIC tasks, functions, (e.g., time to complete a task)
Dimensional Parameters	<ul style="list-style-type: none"> Communications (e.g., bandwidth, connectivity) ADP support to personnel (e.g., quality, flexibility) Collaboration tools (e.g., scalability, latency, security)

Table 2. Strawman MoMs

• **Tools and Their Application.** The three month constraint on the Study Team severely drove the tool set that could be brought to bear on the problem. It led the team to orchestrate the tools identified in Figure 2. To initiate the study, a three week historical analysis was prescribed to clarify the nature of the problem. In fact, the workshop began with a briefing that characterized the past thousand years for the Balkans to sensitize the study participants to the critical initial conditions.

Month 1	Expert elicitation 1			
	Historical analysis			Begin systems dynamics model
Month 2	Complete and exercise systems dynamics model	Expert elicitation 2	Prepare for experiment	Conduct experiment
Month 3	Conduct experiment	Experimental analysis	Synthesis session with decision-maker (e.g. AHP)	Prepare annotated briefing
		Refine systems dynamics model		
	Week 1	Week 2	Week 3	Week 4

Figure 2. Mix of Tools

Shortly after the beginning of the study, an expert elicitation phase was envisioned to help identify the key dependent and independent variables of interest and their relationships. It was posited that it would be most efficient to employ tools such as group systems to facilitate the capture of ideas. Drawing on those results, it was concluded that a relatively simple model should be developed to capture the group’s understanding of the relationships among the variables of interest. One simple means of doing so would be take advantage of COTS products to develop a systems dynamics model. Some preliminary insights could be derived on the options of interest using bounding probability distribution functions to drive the model. Once these initial results were available, a second round of expert elicitation could be undertaken to refine the understanding of the problem and to prepare for a simple experiment of alternative CIMIC options. Using surrogate decision aids and communications, a sparse fractional factorial experimental matrix could be run to evaluate and compare the CIMIC options. These results would also be employed to refine the systems dynamics model. This approach reflected the application of the model-experiment-model paradigm. Subsequently, the refined model might be used to extend the results of the experiments to conditions/scenarios that had not been run originally. Since the evaluation would inevitably involve multiple MoMs, it would be useful to conduct a session with the decisionmaker to help him in the weighting and synthesis of these results. One candidate tool to support this process would be the analytical hierarchy procedure (Reference 3). In this truncated process, the final week would be devoted to documenting the findings and recommendations in the form of an annotated briefing.

- **Output.** During the course of the case study, the Study Team identified a variety of ways in which risk and sensitivity could be explored. One vehicle was to generate an experimental design matrix, keyed to variations in assumptions that had been made in the initial assessment. By implementing a relatively sparse fractional factorial experimental design, it provided an opportunity to assess the sensitivity of the findings to variations in these assumptions. By presenting these findings to the decisionmaker, it serves to illuminate the uncertainty in the results rather than suppress it. It was further concluded that annotated briefings should be employed in lieu of formal written reports, including (as a minimum) an abstract with highlights, an articulation of the problem, a characterization of what the data says, relevant examples, and implications.

In this case study, the White Team played the role of Peer Reviewers. Their involvement began early in the assessment and their assistance was invoked periodically throughout the assessment process.

2. “Lessons Recorded”. During the course of the case study, a variety of lessons about the assessment process were identified and noted. Some of the more significant “lessons recorded” include the following:

- **Problem Formulation.** Problem formulation is the most difficult and important step in the assessment process. It is recognized that there is no universally acceptable approach to problem formulation and that adequate time must be set aside to do it right.

In general, OOTW problems are difficult to define sharply. Scoping the assessment is an art form. As an initial step, the assessment must be scoped to be consistent with the sponsor’s resource constraints. However, to avoid the trap of overly constrained specification, keep the boundaries porous. Understand the significance of each “fuzzy” boundary before making assumptions about it. Consider whether the analysis requires a baseline.

Particularly for OOTW assessments, it is vital to identify all of the players (including stakeholders) early in the process. This can subsume host nation organizations, coalition partners, IOs, and NGOs. For each of these entities, it is important to understand their goals, objectives, and perspectives. In addition, it is vital to understand the context for the operation. This includes a deep appreciation of the relevant culture and history. It must be recognized that many present-day perceptions and prejudices have their roots in the past.

A key step in the problem formulation stage is the identification of key relationships that are central to an effective assessment. These include, *inter alia*, the sponsor and the Study Team, the Study Team and other stakeholders, the Study Team and Peer Reviewers, and Intra-Study Team relationships. In each case, it is important to identify what relationships are desired and how they should be initiated and sustained. As an example, consider the relationship with the study sponsor. As a minimum, there must be extensive sponsor – Study Team dialogue throughout the problem formulation phase. In this dialogue the Study Team must manifest a clear understanding of the problem if it is to be viewed as

credible by the sponsor. Ultimately, the Study Team must ensure that the sponsor concurs with the formulation of the problem.

At the outset of the Problem Formulation stage, it is important to select a strategy for this task. In developing this strategy, the Study Team must understand the key constraints and assumptions of the study (e.g., available resources, schedule), understand the nature of the problem (e.g., learn the context, including relevant cultural, historical, and political factors; identify and mine relevant prior work); and identify key issues that the Study Team should address). With those as inputs, it is appropriate to formulate and evaluate alternative “Courses of Action” (COAs) for performing the assessment. The COAs can be developed by systematically addressing the following questions, *inter alia*:

- In progressing through the phases of the COBP, what sequence should you pursue; e.g., Linear? Web-like? Hybrid (e.g., sub-cycles)? [note: examples of the linear and web-like sequence are depicted in Figure 3]

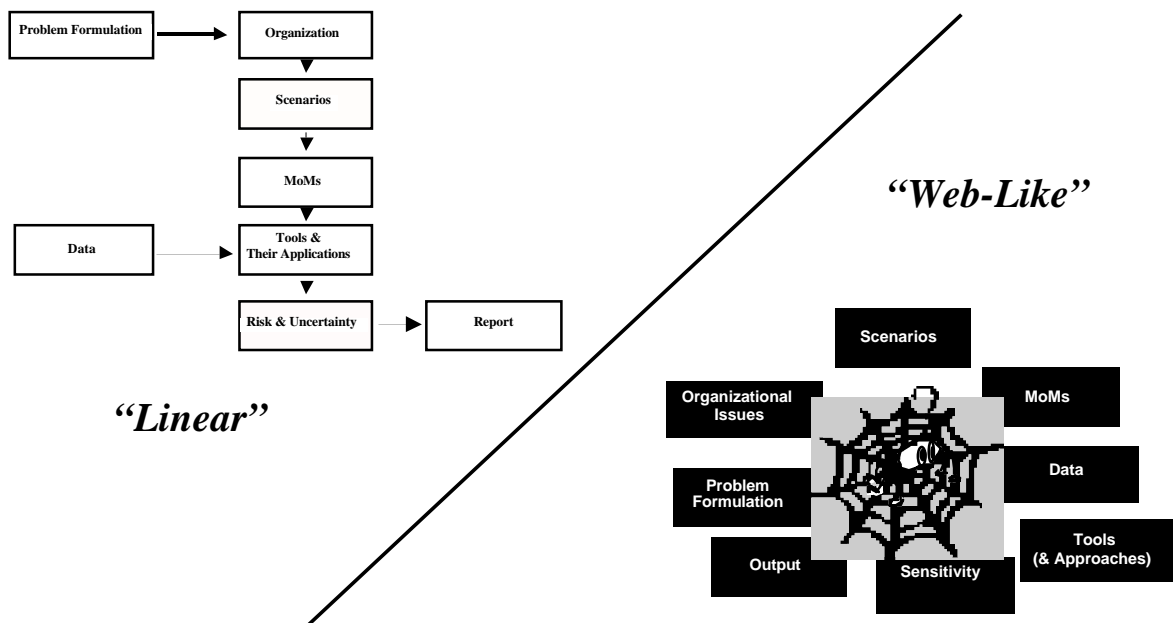


Figure 3. Sequencing Extremes

- What is the basic philosophy of the approach (e.g., cost-benefit, risk centric)?
- What are the options of interest? [note: don't restrict the options to materiel alternatives -- anticipate *co-evolution* and the need to identify the associated Doctrine, Organization, Training, Materiel, Leadership – Personnel, Facilities (DOTML-PF) associated with each option]
- What tools, data are needed to evaluate the options?
- How do you plan to address the “curse of dimensionality”?

- What are your fallback options if problems arise (e.g., non-availability of data)?

During the course of evaluating the resulting COAs, consideration should be given to factors such as skill mix implications, feasibility, and risk. If necessary, decision theoretic tools (e.g., Reference 3) can be used to help rank order the COAs.

It has been found useful to identify, develop (if necessary), and apply simple tools to support the implementation phase of the Problem Formulation. Representative tools of interest can subsume the following: whiteboards, techniques for supporting expert elicitation (e.g., group systems), spreadsheets, influence diagrams, systems dynamics models, agent-based distillations (Reference 4), and management tools (e.g., PERT, Gantt charts).

Using the selected COA and available tools, iterate the COBP process at the appropriate level and sequencing. This implementation process should include the following actions. Articulate the assumptions needed to simplify the analysis, testing them where possible in the sensitivity phase. Quickly cover the whole problem and produce an initial formulation. The initial formulation should address briefly all of the major activities cited in the COBP at an appropriate level. This should include broadly exploring scenario space to identify “interesting” regions; limiting MoMs to high level values; and employing highly flexible, easily applied tools. Eventually, this implementation phase should be iterated, progressing from broad, shallow analyses to narrower, deeper analyses.

During the course of this implementation phase, parallel activities should be performed for long lead items that will ultimately prove to be pacing items during the analysis. These activities can be keyed to the key phases identified in the COBP. A partial listing of these activities would include the following. In the area of data, create a data dictionary at the outset of the study, formulate thoughts on data management, and identify sources of needed data. In the area of tools, evaluate the suitability of available tools and generate a plan of action to tailor existing tools (if needed), create new tools (if necessary), and orchestrate the tools selected. In the area of sensitivity, identify the number and type of explorations that will be conducted to assess the sensitivity of preliminary findings to factors such as scenario variants. Finally, in the area of study output, decide how you plan to display the results to the decisionmaker.

Once the Problem Formulation phase has reached a tentative conclusion, document what you have learned, preferably as an annotated briefing. This product should identify what you plan to do (e.g., which issues you will address; key areas of emphasis; associated options to assess), how you plan to do it (e.g., the COA that was selected for the assessment; associated resources and schedule), what you plan to produce, and any relevant material (e.g., frameworks, metamodels, key sources). It is vital to discuss and iterate this product with the sponsor, other stakeholders, and peer reviewers.

The Problem Formulation process concludes when you have “buy in” from the key participants. In reality, it is desirable to refine the Problem Formulation throughout the life of the analysis.

• **Organizational Dimensions.** A multidisciplinary approach to OOTW assessment is vital drawing on a broad set of social science disciplines and tools (e.g., political science, anthropology, demography). The effect of human and group behavior on the operation must be addressed explicitly. It must be recognized that there are several key dimensions of human interactions. Substantively, this includes intra-military interactions (e.g., among coalition allies) and between the military and non-military (e.g., NGO, IO) participants.

• **Scenarios.** The set of scenarios employed establishes the study context. Thus, it is vital to consider scenarios early during the problem formulation stage, in concert with the decision-maker. No single scenario is adequate. It is important to take a holistic perspective of scenario space and to use screening techniques to identify the most “interesting” segments of scenario space, consistent with the issues of interest. Vignettes can provide a useful vehicle for illuminating key options under selected conditions of stress. The following guidelines may prove useful in selecting scenarios/vignettes.

- Conduct a dialogue with the sponsor (at the appropriate level and fidelity).
- Start from the identification of variables of interest and important issues.
- Seek scenario variables that significantly change the context of stressors on each issue.
- Cover all relevant epochs of the military intervention in the OOTW.
- Limit attention to those conditions that contribute directly to analysis of pertinent issues (e.g., “interesting segments of scenario space”).
- Employ a checklist of scenario selection factors (drawing on the scenario “fine structure” identified in the COBP).
- Consider the influence of the media.

• **Measures of Merit (MoMs).** A rich, nested set of MoMs is needed ranging from Dimensional Parameters to Measures of Policy Effectiveness. In general, the higher the level in the hierarchy, the more subjective the measures. It is important that the MoMs that are selected illuminate the decisionmaker’s issues at hand, not merely “goodness”. Ultimately, it is important to develop and record relationships among levels of the MOM hierarchy and use this information as the basis for selecting the methods to be used for evaluating the MoMs. Pragmatically, consider developing “trees” of MoMs, pruning/expanding them to reflect available resources, issues of interest, and the ability to evaluate them.

• **Data.** Data are frequently the “long poles in the tent” which drive the time and quality of the assessment process. This is particularly important in OOTW where critical data are often controlled by others (e.g., coalition partners, host country organizations, IOs, NGOs, commercial firms (e.g., insurance companies)). In addition, in C2 OOTW studies,

the significance of “soft” data (e.g., sociological, psychological, cultural, ethnic) is much higher, and possibly dominant. To facilitate the assembly and management of these data, there is a need for a data dictionary/glossary at the outset of an assessment.

- **Tools and Their Application.** No one tool is sufficient to address an OOTW problem. Consequently, a carefully orchestrated, spectrum of tools is needed to support these assessments. These tools can subsume broad, eclectic elements (e.g., Geographic Information Systems; regulations), as well as more classical operations analysis tools (e.g., M&S). There is a need to look at these tools as a complementary composite, rather than as separate fragments. In fact, the use of tools which overlap in their area of coverage can provide a valuable cross validation mechanism. For the test case considered, the model-experiment-model paradigm appeared to be attractive. Any application of these tools must be consistent with the requirement for *Repeatability*, *Independence*, *Grounding in reality*, *Objectivity of process*, and *Robustness of results (RIGOR)*.

- **Sensitivity/Risk.** Consider employing a risk based (vice a cost benefit) approach focusing on understanding the exposure to uncertainty and the value of insuring against it. Since the phrase “risk” has multiple subjective meanings, it is important to be explicit about its meaning. For example, it may prove useful to interpret risk as “the exposure of value to uncertainty, for gain”. One role of the Study Team is to manage risk. This implies the need to illuminate risk, rather than eliminate it. In particular, in OOTW assessments it is often necessary to go beyond quantitative statistical treatments in sensitivity analyses. Consideration should be given to complementary qualitative approaches and the use of categorical variations in assumptions or input data.

- **Output.** It is important to avoid surprising the recipient(s) of the assessment; thus, manage expectations! This can best be achieved by establishing and sustaining appropriate Study Team – decisionmaker relationships, characterized by trust and integrity, a common understanding of assumptions, and periodic interactions. At the outset, it is important to get decisionmaker “buy in” on the cost of a *RIGORous* assessment.

In addition, peer review is essential. It is important to initiate the process early in the assessment and to invoke it periodically throughout the assessment.

- **Overall.** The assessment process is inherently an iterative one. One reason for iteration arises from the fact that change is generally an integral part of a C2 assessment. Change can emerge from a variety of factors (e.g., change in understanding the nature of the problem; affects of technological change; ramifications of co-evolution). Thus, it would be prudent to anticipate change and to plan to deal with it.

C. CONCLUSIONS.

The SAS-026 workshop on performing C2 assessments in an OOTW context provided interesting insights into the substance of the problem (e.g., formulation and analysis of alternative CIMICs) as well as the C2 assessment process itself. The workshop confirmed that assessments of this sort should not be approached as a linear, “cook book” process. They require the generation of a flexible plan of action that stimulates the creativity of the assessors while reinforcing needed RIGOR.

It is concluded that the evolving NATO COBP for C2 Assessment appears to offer useful principles to guide future multidisciplinary assessment teams. However, there is a residual, four-fold challenge. First, steps must be taken to expose the analysis community to the NATO COBP. This presentation is one small step towards addressing that challenge. Subsequently, it will be important for the analysis community to apply the NATO COBP to a broad spectrum of complex, poorly defined C2 assessments. Once those assessments have been performed, it is vital that the products of those assessments be disseminated throughout the community and subjected to rigorous peer review. Ultimately, it is important to continue to refine the NATO COBP to reflect the lessons recorded (and hopefully learned) from those applications and reviews.

D. REFERENCES

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