Terms of Reference for Technical Panel 6
Effects-Based Analysis of Systems

1. Field: Concepts, tools and methodologies for the effects-based analysis of primarily adversary socio-technical systems of systems.

2. Authority: The Technical Panel is established and will operate as a component of the JSA Group of The Technical Cooperation Program (TTCP) of Australia, Canada, New Zealand, the United Kingdom, and the United States under authority of the Subcommittee on Non-Atomic Military Research and Development (NAMRAD) of the Combined Policy Committee.

3. Background: Modern conflict management across the spectrum of conflict by coalition partners will demand an analytic foundation for the generation of effects based options for operations. Those options must be cognitively connected to the effects desired by the national decision making authorities, be efficient and effective, and accrue minimum collateral damage with clear effectiveness indicators. To achieve this, sound and validated analytical approaches based on a common understanding among the traditional allies are required. Allies need not have common options derived from the analysis but should understand the rationale by which each is generating their options for operations. JSA Action Group 10 conducted collaboration in effects-based analysis for four years; this technical panel will continue and expand these efforts.

4. Scope: JSA-TP-6 Effects-Based Analysis of Systems will conduct information exchange and shared exploration and exploitation on the concepts, approaches and issues for effects-based analysis. The modeling and analysis domains of virtual network and physical networks characterize the primary focus of the panel. The panel will advance:

   a. the capability to perform integrated effects-based analysis of virtual and physical networks

   b. key enablers to effects-based analysis including visualization and information extraction.

It is recognized that the panel will need to take account of other styles of analysis such as operations and engineering modelling in order to provide a comprehensive capability.

There are also a number of key enabling technologies that need to be addressed that are critical to the practical implementation of concepts, tools and techniques associated with each of the modeling and analysis domains. These enabling technologies include integration, visualization and information extraction.

The following is the TP definition of each of the domains and enabling technologies:

Virtual Networks are largely human-centric and concern relationships, dependencies and influences, behavior, and belief. Such networks are characterized by nodes and links but having non-material flow. Networks of political (power), military, social, informational and economic (financial) factors, situations and relationships are included. Models of these networks aid in the understanding of criticalities, network interdependencies and constraints and also map critical vulnerabilities to centers of gravity.

Physical Networks are characterized by nodes and links with sources and sinks plus material stocks and flows. Modeling of these networks includes representation of the dynamics of a network, its adaptation, criticalities and interdependencies with other networks.

Integration of the modeling domains is vital for a thorough understanding of the capability and intent of one's adversaries and other actors within threat environments, an effects-based analysis of candidate influences and actions (driven by national and military objectives and effects) against such adversaries, and the assessment of achieved effects. This requires an ability to loosely or tightly couple a range of disparate models.

Visualization tools and techniques aid analysis, interpretation, understanding, and decision-making; they complement intuition and facilitate complex problem conceptualization and resolution; they include data mining.

Information Extraction encompasses technologies that aid in the automated generation and management of domain representations. Development of virtual and physical networks is data hungry.

5. Strategy: Subject to the availability and deployability of national resources, the panel will address the analysis and modeling domains identified above through a process of:

a. Collaborative peer reviews and studies;
b. Identification of international subject matter experts (SMEs);
c. Sharing experience with the operationalization of analytical tools, methodologies and techniques;
d. Engagement with the effects-based concept development and experimentation (CD&E) community;
e. Evaluation of commercial developments;
f. Workshops;
g. Sharing best practices;
h. Extending membership to other agencies, both national and non-governmental;
i. Extending links with national intelligence organizations and their customers; and
j. Establishing regular interactions with other technical panels and groups.

6. Responsibilities: In its field the Technical Panel is responsible for meeting the following objectives:

a. improve the co-ordination and utilization of the collective resources and capacities of the member countries, broaden the base of scientific and technical knowledge, avoid unwarranted duplication, and take advantage of particular national capabilities;
b. maintain a continuous overview of the various programs and review the state-of-the-art to identify gaps in knowledge, limit technical problems, and exploit opportunities for collective action;
c. identify, promote and implement co-operative activities, projects and programs of high potential mutual benefit, subject to subsequent endorsement by the Principals;
d. ensure that the program of work is directed toward improved system performance and increased military capabilities and that these benefits are highly relevant to the needs of the military community;
e. consider the need for reducing life cycle cost and achieving affordability; and look for opportunities to reduce costs in deciding on the Technical Panel's program of work;
f. effect an interchange of information, personnel and materiel as needed to accomplish the Technical Panel's program of work and as approved by national authorities;
g. promote common approaches to design criteria and test and evaluation procedures to facilitate interoperability of systems and the common use of test results;

7. Direction: The Technical Panel will operate under the direction the JSA Group and the NAMRAD Principals within the provisions of the TTCP MOU and as amplified by the supporting document "Policies, Organization and Procedures in Non-Atomic Military Research and Development" (POPNAMRAD). National security regulations and procedures shall be followed. Information received through TTCP shall be safeguarded as set out in the MOU and POPNAMRAD. Difficult cases in the release of information will be referred to the JSA Group. The JSA Group will appoint a Chair of the Technical Panel from one of the participating nations. The Chair and a National Leader from each participating nation will manage the agreed program and ensure its timely execution.

8. Formal Group Reviews: The Technical Panel will provide a written annual report on its activities, accomplishments, and plans to the Executive Chair for JSA Group each year by 30 June; and the Technical Panel will brief this information to the JSA Group at its Annual Meeting. The JSA Group will assess the accomplishments, potential for high mutual benefit, direction and focus of the Technical Panel, and will endorse or redirect the planned work program.

9. Term: The lifetime of the Technical Panel is not predetermined but depends on the assessment of the JSA Group regarding the Technical Panel's continuing value and potential to contribute.