



Matrix Game Methodology

Support to V2010 Olympic Marine Security Planners

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Joint Task Force Pacific Operational Research Team

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Joint Task Force Pacific Operational Research Team
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Technical Report

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Abstract

The Matrix Game methodology is a structured Table-Top Exercise (TTX) method. It has been employed previously by the Defence Science and Technology Organisation (DSTO) in Australia for interagency harbour security and force protection exercises, and was seen to be particularly effective for handling problems in complex environments with diverse stakeholders. For this reason, it was decided to transfer the methodology to Canada for use in marine security planning for the Vancouver 2010 Winter Olympics and Paralympics (V2010).

Overall, the experience of organizing and running Matrix Games to support Olympic marine security planners proved to be very effective at helping the marine security agencies organize their planning, and uncover gaps and issues in their plans, and to gain mutual understanding of their respective capabilities and mandates. Over the course of the three Matrix Games, many refinements and adjustments were made to the methodology to adapt it to Canadian needs, to address specific planning goals, to adjust to evolving participation levels and complexity, to improve data capture and reporting, incorporate lessons learned, and improve overall effectiveness and efficiency.

The aim of this paper is to provide an overview of the Matrix Game methodology, including refinements, to discuss its strengths and weaknesses, and to provide recommendations for its effective use.

Résumé

La méthode des jeux matriciaux est un exercice de simulation sur table (TTX) structuré qui a déjà été utilisé par la Defence Science and Technology Organisation (DSTO) [Organisation de science et technologie pour la Défense] en Australie dans le cadre d'exercices interorganismes de protection de la sécurité portuaire et de la force, et qui a été jugé particulièrement efficace pour traiter des problèmes dans des environnements complexes avec divers intervenants. C'est pourquoi l'on a décidé d'appliquer cette méthode au Canada, plus précisément aux fins de planification de la sécurité maritime en vue des Jeux olympiques et paralympiques d'hiver de 2010 à Vancouver (V2010).

Somme toute, cette expérience d'organisation et d'exécution de jeux matriciaux en guise de soutien aux responsables de la planification de la sécurité maritime des Jeux olympiques a grandement aidé les organismes de sécurité maritime à organiser leurs plans et à en déceler les lacunes et les problèmes tout en favorisant la compréhension mutuelle des capacités et mandats respectifs des divers intervenants. Au cours des trois jeux matriciaux, de nombreuses modifications et améliorations ont été apportées à la méthode afin de l'adapter aux besoins du Canada pour répondre à des objectifs de planification précis, s'ajuster à la fluctuation du degré de participation et de la complexité de la situation, améliorer la saisie de données et la production de rapports, intégrer les leçons apprises et améliorer l'efficacité et l'efficience globales.

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Executive Summary

Matrix Game Methodology – Support to V2010 Olympic Marine Security Planners

Zegers, A.; DRDC CORA TR 2011-016; Defence R&D Canada – CORA; February 2011.

Through the course of security planning for V2010, a team of defence scientists from Defence Research and Development Canada (DRDC) Centre for Operational Research and Analysis (CORA) organized a series of table top exercises called Matrix Games for the Olympic Marine Operations Centre (OMOC) and members of the Federal Marine/Surface Technical Working Group (FMSTWG). The Matrix Games were held in October 2008, November 2008, and June 2009. These activities were funded by the DRDC Major Event Coordinated Security Solutions (MECSS) Project.

These games were the first time that the Matrix Game methodology, which was developed by the Australian Department of Defence, was employed in Canada. It is a non-adversarial structured Table-Top Exercise (TTX), in which injects are introduced and discussed by participants in a series of “turns” representing a discrete period of time (often one week). It is designed to stimulate an exchange of views and resolve any disputes through discussion, to test institutional relations within a multi-agency setting, and to identify critical issues.

Over the course of the three Matrix Games, many refinements and adjustments were made to the methodology to address specific planning goals, adjust to evolving participation levels and complexity, incorporate lessons learned, and improve overall effectiveness and efficiency of the method.

The first Matrix Game held, entitled Force Protection Matrix Game (FPMG) Marine One, was held over two days, 14-15 October 2008, and included 22 participants from eight different organizations. The structure of this game was closely modelled after the Australian experience, as this was the first time the Matrix Game methodology was employed in Canada. The objectives for the game were to prepare members of the OMOC for EX BRONZE (the first major V2010 security exercise); to increase the participants’ awareness of each other’s capabilities, resources, procedures, and mandates; and, to explore, within a gaming scenario, the security implications of boundaries between areas of responsibility. Results and conclusions from this exercise were communicated quickly back to the Integrated Security Unit (ISU) in an After-Action Report [1] that outlined findings grouped into three broad areas. The 50 “critical issues” identified in the Hot-Wash were in turn grouped into seven themes.

The second Matrix Game was called FPMG Marine Two, and was held 13-14 November 2008, coinciding with EX BRONZE. The ISU’s objective for the game was to enhance the training value of EX BRONZE activities by exercising issues and scenarios of specific concern to the OMOC, specifically focusing on boundaries and jurisdictional issues. Several changes were made to the methodology for this game, based on lessons learned from FPMG Marine One, as well as constraints resulting from the venue and concurrent activities from EX BRONZE, and the smaller scale of the exercise with only nine participants. Results were

communicated back to the client within one month in the form of a Letter Report [2] which presented findings and recommendations grouped into 10 areas.

The third and final Matrix Game held for the OMOC was called the Integrated Safety/Security Matrix Game – Marine III, and was held 16-17 June 2009. This was the most extensive and complex of the Matrix Games held, and included 56 participants from 27 different organizations. The specific objectives for this game, the participants chosen, and adjustments to the game structure flowed from findings of the first two games. For example, the gathering of participant inputs was computerised for this game, permitting more streamlined game flow and data gathering with the large number of participants. Specific groups, such as intelligence agencies, were added to address gaps identified in the previous exercises. A large number of issues and scenarios were explored in detail during this game, and results were communicated back to the client in a Letter Report [3] about a month after the activity. Another interesting outcome was that several of the participants also requested copies of data collected to form the basis for their development of operational procedures for scenarios explored. This final Matrix Game explored issues in great detail, and probably represented the limit of what can be achieved in a Table-Top format. Advancing to more fine-grained tracking of participant actions, exploring interactions between larger numbers of participants, and exploring subtle timing and coordination issues would require more realistic exercises, and thus it was recommended that further exercise activities progress to Command Post and Live Exercises.

Overall, the experience of organizing and running Matrix Games to support ISU marine security planners proved to be very effective at helping the OMOC organize their planning, and uncover gaps and issues in their plans. The structure provided a good framework for the participants to gain mutual understanding of their respective capabilities and mandates. Continued refinements to the methodology through the three games led to both smooth and relevant discussion, thorough data capture and recording of findings, a detailed examination of each issue, and efficient use of time with many scenarios investigated with moderate time investment by participants.

The participants reported that they accrued major benefits from this table-top methodology. It was seen as a critical springboard to progress them towards the more extensive exercises that followed, and final operational capability they deployed during the games.

Sommaire

Matrix Game Methodology – Support to V2010 Olympic Marine Security Planners

Zegers, A.; DRDC CORA TR 2011-016; R & D pour la défense Canada – CARO ; février 2011.

Au cours de la planification de la sécurité de V2010, une équipe de scientifiques de la Défense du Centre d'analyse et de recherche opérationnelle (CARO) de Recherche et développement pour la défense Canada (RDDC) a organisé une série d'exercices de simulation sur table appelés jeux matriciaux à l'intention du Centre des opérations maritimes des Jeux olympiques (COMJO) et des membres du Groupe de travail technique fédéral sur la sécurité terrestre et maritime (GTTTFSTM). Ces jeux matriciaux ont eu lieu en octobre 2008, en novembre 2008 et en juin 2009. Ils ont été financés sous le projet de solutions concertées pour la sécurité des grands événements (MECSS) de RDDC.

L'utilisation de la méthode des jeux matriciaux, qui a été conçue par le ministère de la Défense australien, était une première au Canada. Il s'agit d'un exercice de simulation sur table (TTX) structuré et sans adversaire où les intrants sont amenés par les participants, qui en discutent au fil de « tours » représentant une période de temps donnée (souvent une semaine). Le but est de susciter un échange de points de vue et de résoudre les différends qui pourraient survenir pendant la discussion afin de mettre à l'épreuve les relations institutionnelles dans un contexte réunissant plusieurs organismes et de repérer les problèmes critiques.

Au cours des trois jeux matriciaux, de nombreuses modifications et améliorations ont été apportées à la méthode pour répondre à des objectifs de planification précis, s'ajuster à la fluctuation du degré de participation et de la complexité de la situation, intégrer les leçons apprises et améliorer l'efficacité et l'efficience globales de la méthode.

Le premier exercice, intitulé Jeu matriciel de protection de la force (JMPF) – maritime I, a eu lieu sur une période de 2 jours, soit les 14 et 15 octobre 2008, et réunissait 22 participants de 8 organisations distinctes. Puisque la méthode des jeux matriciaux était utilisée pour la première fois au Canada, la structure était très fidèle au modèle australien. L'objectif du jeu était de préparer les membres du COMJO à l'exercice BRONZE (le premier exercice de sécurité majeur de V2010), de sensibiliser les participants aux capacités, aux ressources, aux procédures et aux mandats des autres participants et d'explorer, au moyen d'une simulation, l'effet sur la sécurité que produisent les limites des diverses zones de responsabilité. Les résultats et les conclusions de l'exercice ont été rapidement transmis au Groupe intégré de la sécurité (GIS) dans un compte rendu après action [1] mettant en relief des constatations divisées en trois vastes catégories. Les 50 « problèmes critiques » décelés au cours d'une séance de rétroaction immédiate ont ensuite été regroupés sous sept thèmes.

Le deuxième jeu matriciel, intitulé JMPF – maritime II, s'est déroulé les 13 et 14 novembre 2008, ce qui coïncidait avec l'exercice BRONZE. Pour ce jeu, le GIS visait à accroître la valeur instructive des activités de l'exercice BRONZE en soulevant des questions et scénarios qui préoccupaient particulièrement le COMJO, plus précisément en ce qui

concerne les frontières et les questions juridictionnelles. De nombreux changements ont été apportés à la méthode pour ce jeu à la lumière des leçons apprises de JMPF – maritime I, des contraintes de l'événement et des activités concurrentes de l'exercice BRONZE ainsi que de l'échelle réduite du jeu, qui comptait seulement neuf participants. Les résultats ont été transmis au client dans un délai d'un mois dans un rapport sous forme de lettre [2] qui présentait des constatations et recommandations divisées en 10 catégories.

Le troisième et dernier jeu organisé pour le COMJO a été nommé Jeu matriciel intégré de sécurité et de sûreté – maritime III. Ce jeu, qui s'est déroulé les 16 et 17 juin 2009, était le plus élaboré et le plus complexe des jeux matriciaux organisés à ce jour. En effet, il comptait 56 participants de 27 organisations distinctes. Les conclusions des deux premiers jeux ont dicté les principaux objectifs du jeu, la sélection des participants et la modification de la structure. Par exemple, la contribution des participants était informatisée, ce qui a favorisé le déroulement harmonieux du jeu et a facilité la collecte des données générées par les nombreux participants. Des groupes particuliers, comme des agences de renseignements, se sont ajoutés pour combler les lacunes décelées lors des exercices précédents. Un grand nombre de questions et de scénarios ont été explorés en détail au cours du jeu, et les résultats ont été communiqués au client dans un rapport sous forme de lettre [3] environ un mois plus tard. Il est intéressant de noter que plusieurs participants ont aussi demandé une copie des données recueillies afin de s'en inspirer dans l'élaboration de leurs procédures opérationnelles relatives aux scénarios explorés dans le cadre du jeu. Ce dernier jeu matriciel a permis d'examiner certaines questions en profondeur et a probablement atteint les limites de ce qu'un exercice de simulation sur table peut offrir. Pour passer à un suivi plus étroit de l'intervention des participants, explorer l'interaction d'un nombre accru de participants et approfondir les questions de délai et de coordination, il faudrait effectuer des exercices plus réalistes. Par conséquent, on a recommandé de passer à des exercices de poste de commandement et à des exercices réels pour les étapes subséquentes.

Somme toute, cette expérience d'organisation et d'exécution de jeux matriciaux en guise de soutien aux responsables de la planification de la sécurité maritime du GIS a aidé efficacement le COMJO à organiser ses plans et à en déceler les lacunes et les problèmes. De plus, la structure a fourni un cadre de travail favorisant la compréhension mutuelle des capacités et mandats respectifs des divers participants. Le perfectionnement de la méthode au fil des trois jeux a mené à une discussion à la fois harmonieuse et pertinente, à un processus consciencieux de saisie de données et d'enregistrement des constatations, à un examen approfondi de chaque problème et à une utilisation judicieuse du temps grâce à l'exploration de plusieurs scénarios moyennant un investissement de temps raisonnable de la part des participants.

Les participants ont affirmé avoir tiré des avantages majeurs de cette méthode d'exercice de simulation sur table. Ils ont perçu cette activité comme un outil non négligeable qui les a aidés à se préparer aux exercices plus complexes qui ont suivi et à déployer une meilleure capacité opérationnelle durant les Jeux olympiques.

Table of Contents

Abstract.....	i
Résumé	i
Executive Summary.....	iii
Sommaire.....	v
Table of Contents	vii
List of Figures.....	ix
Acknowledgements	xi
1. Introduction	1
1.1 Aims	2
1.2 Scope	2
1.3 Outline	2
2. Methodology.....	5
2.1 Background	5
2.2 Prior Work.....	6
2.3 Method to Run a Game.....	6
3. Canadian Matrix Game Experience.....	11
3.1 Force Protection Matrix Game Marine One	11
3.2 Force Protection Matrix Game Marine Two	12
3.3 Integrated Safety/Security Matrix Game – Marine III	14
4. Findings About the Method.....	17
4.1 Game Structure.....	17
4.2 Scenarios and Injects	18
4.3 Facilities and Technical Setup.....	18
4.4 Facilitation.....	19
4.5 Reporting	19

4.6	General Observations	20
5.	Conclusions	23
5.1	Research and Development Community Interest	23
	References	25
	Annex A – Matrix Game Preparation Checklist.....	27
	Annex B – Force Protection Matrix Game – Marine One Scenarios	39
	FPMG Marine One – Team Groupings	39
	FPMG Marine One – Scene Setting	40
	FPMG Marine One – Turn 1 – Ten days before Games.....	40
	FPMG Marine One – Turn 2 – Three days before Games	41
	FPMG Marine One – Turn 3 – First week of the Olympic Games	41
	FPMG Marine One – Turn 4 – Second week of the Olympic Games	42
	Annex C – Force Protection Matrix Game – Marine Two Scenarios.....	45
	FPMG Marine Two – Agencies Represented.....	45
	FPMG Marine Two – Turn 1 – Two weeks before Games	45
	FPMG Marine Two – Turn 2 – One week before Games	47
	FPMG Marine Two – Turn 3 – First week of Games.....	48
	FPMG Marine Two – Turn 4 – Second week of Games	50
	Annex D – Integrated Safety/Security Matrix Game – Marine III Scenarios.....	53
	ISSMG Marine III – Team Groupings	53
	ISSMG Marine III – Scene Setting.....	53
	ISSMG Marine III – Turn 1 – First week of the Games.....	54
	ISSMG Marine III – Turn 2 – First Half of Second Week of Games	57
	ISSMG Marine III – Turn 3 – Later half of the Second Week of Games	59
	List of Acronyms	63
	Distribution list.....	65

List of Figures

Figure 1. Typical turn structure for a Matrix Game	8
Figure 2. Example of a typical turn sheet as used in FPMG Marine One	9
Figure 3. Updated turn sheet used in FPMG Marine Two	13
Figure 4. Updated turn schedule used in FPMG Marine Two, and ISSMG Marine III, showing inject-by-inject discussion during plenary	14
Figure 5. Room Layout for ISSMG-III	15

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1. Introduction

The Matrix Game methodology presented here is a structured operational instantiation of a more generic Table-Top Exercise (TTX). It is an example of a “soft” Operational Research (OR) technique, as it does not apply quantitative methods, but rather provides a structured way of framing a complex problem and tapping into the knowledge of Subject Matter Experts (SMEs).

This methodology was initially developed and employed by the Defence Science and Technology Organisation (DSTO) in Australia for interagency harbour security and force protection exercises¹. During those exercises, it was seen to be particularly effective for handling problems in complex environments that involved diverse stakeholders. Defence Research and Development Canada (DRDC) became aware of the Matrix Game methodology through The Technical Cooperation Program Maritime Action Group 10 (TTCP MAR AG-10), and for this reason, DRDC proposed the use of the methodology to the Vancouver 2010 Winter Olympics and Paralympics (V2010) to the marine security planning team, who agreed to proceed with this proposal.

Through the course of security planning for V2010, defence scientists from DRDC Centre for Operational Research and Analysis (CORA) organized a series of Matrix Games for members of the Federal Marine/Surface Technical Working Group (FMSTWG). This work was done at the request of the Integrated Security Unit (ISU), the organization created to provide security for V2010. Three Matrix Games were held in October 2008, November 2008, and June 2009 [1-3], with scientist’s costs funded by DRDC Major Event Coordinated Security Solutions (MECSS) Project. The FMSTWG formed the basis for the Olympic Marine Operations Centre (OMOC), combining military security, and public safety agencies into a single integrated operations centre. The OMOC was a subordinate headquarters of the ISU with direct responsibility for security of marine areas and seaward approaches to venues. The ISU planners responsible for marine security went on the form the OMOC, and are referred to in this report as either OMOC planners or ISU marine security planners depending on whether or not the OMOC was in existence at that period in time.

These games were the first time that the Matrix Game methodology was applied outside the Australian Department of Defence. It is a non-adversarial structured Table-Top Exercise (TTX), in which “injects” are introduced and discussed by participants in a series of “turns” representing a discrete period of time (often one week). It is designed to stimulate an exchange of views and resolve any disputes through discussion, to test institutional relations within a multi-agency setting, and to identify important issues that need to be addressed. Over the course of the three Matrix Games, many refinements and adjustments were made to the methodology to address specific planning goals, adjust to evolving participation levels and complexity, incorporate lessons learned, and improve overall effectiveness of the method.

¹ DSTO provided several informal exchanges of information needed to implement Matrix Games, but no formal references from DSTO are available at this time. DSTO hopes to participate with DRDC in a joint report on the Matrix Game methodology in the future.

1.1 Aims

This report aims to:

- provide an overview of the current Matrix Game methodology, including refinements made to it,
- discuss strengths and weaknesses of the method,
- provide recommendations on its effective use, and;
- discuss results and findings for V2010 marine security planning.

The aim in documenting the operational use of Matrix Games, along with findings and observations made during these games, is to provide useful information and guidelines to others who may want to run similar exercises in future. It should also provide helpful information when deciding whether a Matrix Game or other exercise methodology may be of use in achieving planning objectives.

1.2 Scope

This work involved a research component, but was primarily focused on decision support to operations. Priority was placed on generating timely results and operationally relevant recommendations to the sponsor. This needs to be kept in mind when interpreting the findings presented here. When tradeoffs had to be made between collecting rigorous controlled scientific data, or intervening in the process to provide planning benefit to the sponsor, the default response was to provide maximum value to the sponsor. This being said, efforts were made to be as rigorous as possible given operational constraints, and overall the DRDC organizers felt that a good balance was achieved.

1.3 Outline

This Technical Report is divided into four major sections: Methodology, Canadian Matrix Game Experience, Findings, and Conclusions. The Methodology section includes background on the origins of the methodology, and complete description of the various components that constitute the Matrix Game methodology. The subsequent section recounts the experience of organizing and running three Matrix Games in support of V2010 Olympic Marine Security planning. Focus is given to modifications and enhancements made to the methodology over the course of these three events, both to tailor them to the specific goals and circumstances of each instance, and to provide general enhancements as lessons were learned along the way. The Findings section distils the experiences from the three Matrix Games into lessons learned about the strengths and weaknesses of the methodology, and pointers on how to employ it most effectively. Finally, macro level takeaways are presented in the Conclusion.

There are also four annexes that contain more detailed and specific information that may be of use to those with specific interests. Annex A includes a Game Preparation Checklist that should be helpful to those organizing their own Matrix Games. Annexes B through D contain details on the team groupings and scenario injects used for the three Matrix Games held in support of V2010 marine security planning.

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2. Methodology

The Matrix Game methodology is a specific instantiation of a TTX method with particular structure and organization. The general conduct of the Matrix Game consists of participants who are presented with scenarios that they must respond to. These scenarios are divided into discrete chunks called “injects” that are supplied to the participants at specified times. Participants then use their knowledge and expertise to provide their expected responses to these injects. Since it is a TTX, the participants are not immersed in a realistic simulation of events, but must use their imagination. The specific organisation and procedures for how this is conducted are what distinguish Matrix Games from other TTXs, and give it particular attributes. These characteristics of the Matrix Game methodology will be described in this section.

2.1 Background

The Matrix Game methodology evolved from a game originally created by Chris Engle in 1988, a multi-player game that used argument-based techniques [4]. The Matrix Game methodology was found to be useful by Maritime Operational Analysis Centre (MOAC) (an Australian inter-agency research centre), and then DSTO in Australia, who further developed and tailored the methodology to apply it to maritime force protection, and inter-agency scenarios, calling them Force Protection Matrix Games (FPMG)². The Matrix Game focus has shifted away from adversarial, argument-based approaches (though they can still be part of the games where desired), and more towards a structured framework to organize discussion and draw out participants’ expert knowledge, focusing on strategic planning issues, and inter-agency interaction and processes.

CORA became aware of the Matrix Game methodology through TTCP MAR AG-10. Although DSTO applied the methodology primarily to force protection issues at that time, it was felt that the methodology could potentially be a good fit to support Olympic marine security planners who were seeking assistance as they grappled with the early stages of very complex planning and organizational challenges. DRDC CORA scientists presented the Matrix Game methodology to the ISU planners who were conducting initial scoping and planning on how to handle marine security for V2010, culminating in development of the OMOC. These planners saw potential for Matrix Games to be helpful in their efforts, and directed the CORA scientists to proceed with the next step of preparing a more detailed evaluation and proposal.

In order to suitably assess the methodology, the author travelled to Australia to observe DSTO conduct a Matrix Game. The purpose of the trip was to assess the methodology, determine whether it would be suitable for the needs of ISU marine security planners, and if so provide recommendations on how best to implement it. This trip report [5] concluded that the Matrix Game methodology would be helpful to OMOC planners, and provided recommendations on

² Subsequent to Canada adopting the methodology, DSTO has ceased using the term “Matrix Game”, using instead “Force Protection Game”, as the current incarnations bear little resemblance to Engle’s original method.

how to implement it. This report included a recommendation to leverage Australian expertise by bringing an experienced practitioner to Canada to assist with the first Matrix Game, and several specific recommendations on how to develop the needed proficiency, the types of personnel needed, and how to organize and run the Matrix Games for maximum benefit to Olympic marine security planners. Based on the findings and recommendations contained in the trip report, V2010 marine security planners decided to proceed with a series of Matrix Games, and tasked DRDC scientists to organize and execute them.

Transfer of the methodology to Canada for use during V2010 resulted in further evolution and refinement of the methodology to tailor it to Canadian needs, and to make general enhancements and improvements. These changes will be described in more detail in the next section of this paper.

2.2 Prior Work

There are many exercise and gaming methodologies, but little in the way of authoritative publications or guidebooks on these methodologies and their respective characteristics, strengths and weaknesses. Generally speaking, the Matrix Game methodology is suited for complex situations involving disparate stakeholders each with their own interests; possibly overlapping or competing. The Matrix Game methodology provides a framework for exploring these scenarios, and facilitating the participants in achieving mutual understanding and genuine cooperation. Participants are typically familiar with both technical procedures as well as higher strategic considerations. When the methodology is used to assist planning, as in this case study, it is most beneficial if the participants involved are the actual planners or operators who will be expected to carry out the operation. Since they are, in effect, playing themselves, little to no read-in or immersive methods are needed to ensure realism.

Other methodologies are often focused either on specific tactical issues or on more intangible strategic levels. For example, traditional red-blue army simulations or the Disruptive Technology Assessment Game (DTAG), developed by researchers at the Netherlands Organisation for Applied Scientific Research (TNO), look in detail at well-defined situations with a single stakeholder, typically the military [6-8]. At the other end of the spectrum lie more strategic games, such as Rand Corporation's "Day After" method that focuses on speculative strategic possibilities that may or may not come to fruition [9-10]. Matrix Games lie between these extremes, exploring realistic complex issues, while reconciling the disparate interests of a spectrum of stakeholders.

2.3 Method to Run a Game

When running a Matrix Game, the overall sequence of events can be divided into four main phases: an introductory session, game play, a hot-wash, and feedback. Preparations must also be made prior to conducting the Matrix Game, so that the necessary materials and facilities will be ready. The primary items needed are a venue to hold the event and game materials such as injects. It is also advisable for facilitators to prepare a facilitation approach to maximize the success in achieving game objectives. A checklist of all tasks needed to prepare for a Matrix Game, based on the experience of running the Matrix Games described in this

report, is included in Annex A. The following sections describe each phase of Matrix Game execution in more detail.

2.3.1 Introductory Session

At the beginning of the Matrix Game, the facilitators orient participants to the process during an introductory session. This includes introductions of all participants and organizers, and presentation of the goal and purpose of the activity. A general scene-setting orients participants to the scenario being gamed is provided, as well as instruction on how to play the game. For first-time participants, this portion needs to be fairly detailed and extensive. For example, for the first Matrix Game run in support of V2010, the introductory session took about two hours. In further iterations of the Games, as participants become more familiar with the process, the introductory portion requires less time.

2.3.2 Game Play

Once the introduction is complete, participants should understand the game mechanics, be mentally oriented to the scenario and ready to begin game play (in this case, the major orientation was to enter the mindset that the Olympic Games were taking place). The participants in a Matrix Game are typically formed into teams each representing some organizational entity, or set of concerns. This makes the game more manageable with large numbers of participants, and helps organize discussion within teams, to explore areas of common concern, and later between teams to explore procedural seams and interfaces between different stakeholder groups. The choice of teams represented is very important, as this directly shapes the issues explored in the game. For example, if one of the game objectives is to explore issues around the dissemination and use of intelligence information, then it is important to have all of the relevant intelligence organizations participating in that Matrix Game.

The basic structure of gameplay in a Matrix Game is a series of “turns”, as illustrated in Figure 1. Each turn represents a discrete allotment of virtual time, typically one week each. Thus a game consisting of four turns covers a four week time period. This may seem like a large allotment of time, compared to other wargaming methodologies, however it is appropriate for the strategic level of the issues being considered. This time can be adjusted according to the level of detail of the issues being considered, conceptually, it could vary from hours or minutes, all the way up to years. In practice, experience has found that when considering strategic planning issues, a one week period works well. This was found to be the case both in the Australian force protection exercises, and the V2010 marine security exercises. It is also possible to vary the time associated with each turn, for example having each successive turn represent a smaller slice of time, as the focus shifts from higher level strategic issues to more detailed operational and tactical issues as the game progresses.

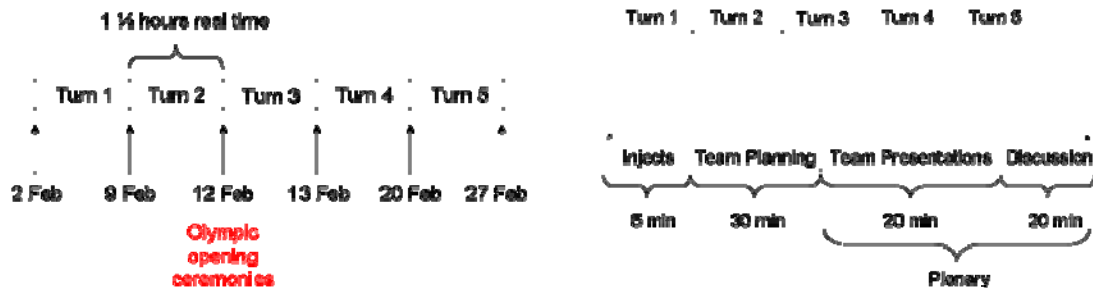


Figure 1. Typical turn structure for a Matrix Game

Within each turn, the activities are divided into distinct phases, as shown on the right side of Figure 1. At the beginning of each turn, all of the participants are assembled together, and the facilitator presents an update of the scenario along with injects. The teams then break out to discuss their response to these injects during the “Team Planning” session. At this time, the teams fill out their “Turn Sheets” which capture their understanding of the situation, their decisions and reasoning. This break-out portion usually lasts for about 15-20 minutes, and can vary, usually getting shorter as the game progresses. At the end of the team discussions, the facilitators make a copy of each team’s Turn Sheet, and the teams reassemble to present their turn sheets and for a plenary discussion.

The Turn Sheet is usually divided into categories to structure the information collected from participants. These categories are not prescribed by the methodology, but can be varied according to the goals of the particular game. A typical Turn Sheet is shown in Figure 2. The categories of data collected are usually designed to gather information on the actions of the participants, and how they interact with each other. In this example, the Turn Sheet contains four categories for the participants to fill out, plus an area for additional comments that the participants felt were pertinent, but not covered in the preceding sections. In the “Actions” section, teams record what they plan to do to respond to the inject, whether that is a direct action by their agency, or an indirect action such as requesting assistance or reporting information to another agency. The “Effects” section is where participants record the intended effect of their actions, in other words why they are taking the action entered above. In the next section, “Resources and Enablers”, participants enter any resources they intend to use in order to bring about their actions. The “Other Consequences of Actions” section is included to capture anticipated side-effects of actions. These secondary effects, whether they are positive, negative, or neutral, even if not important to the agency doing the action, may be very significant to other participants in the Matrix Game.

Capturing participant responses on the Turn Sheet obliges them to be explicit about their scenario responses. This can have the effect of exposing hidden assumptions or oversights. The various categories focus the players’ attention on the different aspects under consideration, leading toward discussion and examination by the group. Depending on the goals of the Matrix Game, the categories on the turn sheet can be adjusted to tailor the game to areas of interest.

Turn Sheet – Force Protection Matrix Game	
Team:	Turn 1
Actions – Including media strategy, security level changes, and communication with other agencies	
Effects – List the desired effects that the actions are intended to achieve	
Resources and Enablers	
Other Consequences of Actions – Positive or negative, intended or not	
Additional Comments	

Figure 2. Example of a typical turn sheet as used in FPMG Marine One
(Whitespace has been reduced for readability here)

During the plenary portion, teams present their decisions and actions to the rest of the group. At this point it is possible that teams will disagree about the effect of their actions, and these disputes are resolved using an argument-based system in which the facilitator assesses the strength of each team's arguments, assigns probabilities and chooses an outcome by rolling a dice. In practice, this method of conflict resolution was never used. The legal and media teams, if present, typically present their actions at the end so that they can address any concerns raised by the team actions presented. Once all the teams have gone around the table, discussions about interoperability issues normally ensues, along with considerations raised by the facilitators. The facilitators then present the outcome of the teams' actions from the turn (typically pre-determined to aid in ensuring scenarios unfold in a manner to achieve game objectives), and proceed with new events for the next turn. Each turn is designed to take about one hour.

The creation of injects and scenarios for the Matrix Game is very important and has a fundamental impact on the issues explored during the events, and what results stem from it. The scenarios and injects need to be crafted purposely to fulfill the game objectives set out by the sponsor. Typically, injects present increasingly acute scenarios as the game progresses, in order to assess capabilities and response capacities at various levels. Scenarios can be developed with input from a Red Team, to help devise novel and unexpected scenarios

focused on potential capability gaps and seams. It is also very important to have access to SMEs in the domains being investigated, to ensure that the scenarios are realistic and relevant.

There are some additional aspects to support the methodology, for example a “hidden issues box” can be used for teams to put slips of paper describing actions that they want to keep hidden from the other players. For example, if the police team decides to put undercover agents in a group of protesters, they could put this in the hidden issues box, so that the Red Cell remains unaware of that action. This could then become public in a future turn when intelligence from the protest group is needed. It is also a useful place for participants to place their comments or thoughts on the methodology to be considered after the game ends.

2.3.3 Hot Wash

At the end of the game, the facilitator holds a hot-wash session in which participants share the main issues and key take-aways from the game. The format for this portion is a round-table discussion in which each of the participants is given an opportunity to express their key findings. The team groupings are not used during the hot-wash, so that each participant, and also facilitators and organizers, can convey their opinion on the important lessons from the game. It is important to accurately capture the points raised during this session, as they tend to be some of the most important lessons and outputs from the Matrix Game.

A very effective way of documenting the hot-wash is to have a dedicated “scribe” to record all the points raised into a text document projected on a screen at the front of the room³. This allows everyone to see how the issue is being captured, and can alert the scribe to any nuances that are missed or to errors in order to ensure that the recorded data is accurate. Another very useful activity used during the Canadian Matrix Games was to have the participants fill in feedback sheets on the game format and execution, so that planners could make improvements for subsequent games.

2.3.4 After-Action report

Participants in a Matrix Game should all benefit from the experience, in the form of increased mutual understanding with other organizations, and greater appreciation of procedural gaps and issues arising from the game. But it is also important to provide some formalized feedback to the sponsor to capture the primary outcomes and results. The planning environment surrounding V2010 was very dynamic and fast-moving, so it was imperative to provide the feedback in a timely manner, to allow recommendations to be acted upon quickly while they were still relevant.

For the three Canadian Matrix Games, after-action reports were produced, typically in the form of a DRDC Letter Report, as quickly as possible following the event. These reports, that usually took less than one week to prepare, contained all of the major themes and issues that arose, as well as conclusions and recommendations that arose from them.

³ This is one of many ways of doing this; Novell’s Group Wise Decision Support System; a blog; Nova Mind (www.novamind.com), are examples of other possible methods.

3. Canadian Matrix Game Experience

CORA became aware of the Matrix Game methodology being employed in Australia through TTCP in late fall 2007. It was being used by DSTO in Australia, who were using it to run ongoing exercises for maritime force protection, and harbour security. Based on the information exchanged, it appeared that the methodology was well suited to inter-agency scenarios in complex environments, and might be well suited to the marine security problem for V2010.

DRDC sent the author to Australia to observe and report back on a Matrix Game that was held in Darwin Australia 24-25 June 2008. The trip report [5] resulting from this experience indicated that the method would be useful, and contained recommendations for its implementation in Canada. Based on these recommendations, Canada decided to conduct a series of Matrix Games to support V2010 marine security planning needs. These games were all conducted for the group of marine security entities that were to become the OMOC, and thus there was a continuity of a core group of participants, but there was also some personnel turnover, particularly in the organisations that were not core components of the OMOC.

3.1 Force Protection Matrix Game Marine One

The first Canadian Matrix Game, entitled FPMG Marine One, was held over two days, 14-15 October 2008, and included 22 participants from eight different organizations. The objectives for the game were to prepare members of the OMOC for the first major ISU exercise, called EX BRONZE⁴; to increase the participants' awareness of each other's capabilities, resources, Standard Operating Procedures (SOPs), and mandates; and, to explore, within a gaming scenario, the security implications of boundaries between areas of responsibility.

The structure of the first game was closely modelled after the Australian experience, as this was the first time the Matrix Game methodology was employed in Canada. The game venue was at HMCS Discovery, a naval reserve unit which had good facilities with a large wardroom for plenary sessions, and several smaller rooms nearby for breakout sessions. The participants were grouped into seven teams, listed in Annex B.

Many preparatory activities were undertaken prior to the event by the three-person team of game organizers. Structured participant interviews were conducted so that organizers could become familiar with the participating organizations and their various capabilities and resources. Organizers also made site visits to Olympic venues and surroundings, so that they would be familiar with the theatre of operations and the general lay of the land. Also critically important was ongoing consultation with the sponsor on the objectives, to ensure that the activity would fulfill their goals.

⁴ Exercise BRONZE was the first of three major ISU exercises comprising the 2010 Olympic Integrated Exercise Program. It was a very large table-top exercise involving all V2010 Security partners. The other two major exercises were called EX SILVER, and EX GOLD, respectively. OMOC was a subordinate headquarters of the ISU.

Game scenarios were developed using the expertise of a DRDC CORA strategic analyst, along with sponsor and SME validation. The number and complexity of injects had to be decided based upon the time available for the Matrix Game, and what organizers felt would be a reasonable level of detail for participants to handle. As it turned out, the organizers were somewhat over-ambitious, and the game had to be adjusted during execution, as the original schedule proved to be packed too tight, so the number of injects and turns had to be reduced. The final team groupings and injects used are included in Annex B.

During game execution, laptop computers were provided to the teams for them to complete their turn sheets electronically, which were then printed out and copied to a common computer using USB memory sticks. This method was not ideal, as the collection of memory sticks and printing took too much time, and became somewhat of a bottleneck in the process.

In spite of these hiccups, however, the activity proved to be of great value to the participants, and they expressed overwhelmingly positive support at the conclusion of the exercise, as captured in feedback forms they filled out. Results and conclusions from this exercise were promptly communicated back to the ISU in an After-Action Report [1]. The report documented 50 specific “critical issues” identified in the Hot-Wash. These were grouped into 7 themes to organize analysis and findings: intelligence, communications, resources, media, legal, protocols, and other.

As an example, one of the findings of the game was that there were many uncertainties around the issue of intelligence information sharing. Many of the participating organizations were unclear as to the planned flow of intelligence information for the Olympics. In particular, there was a lack of awareness of intelligence sharing procedures, and the relationships between the various intelligence organizations and operators. The Matrix Game helped to clarify that this gap existed, so that it could be addressed in follow-up activities. Specific features were included in the third Matrix Game to address this issue. In general, all issues identified through the series of Matrix Games were followed up and tracked in subsequent exercises.

3.2 Force Protection Matrix Game Marine Two

The second Matrix Game was called FPMG Marine Two, and was held 13-14 November 2008, coinciding with EX BRONZE. The ISU’s objective for the game was to enhance the training value of OMOC EX BRONZE activities, since EX BRONZE had few scenarios of relevance to OMOC members, by exercising issues and scenarios of specific concern to the OMOC (identified through their internal planning activities), specifically focusing on organizational boundaries and jurisdictional issues. Though they were run at the same time, FPMG Marine Two scenarios had no connection to EX BRONZE. The only interaction was occasional interruptions to the Matrix Game when OMOC members had to respond to an EX BRONZE event.

Several changes were made to the methodology for this game, based on lessons learned from FPMG Marine One, constraints resulting from the venue and concurrent activities from EX BRONZE, and the smaller scale of the exercise with only nine participants. The organizations represented are included in Annex C. With a more focused set of participants, they were not

grouped into teams, and breakout rooms were not used. Participants simply filled out their Turn Sheets, by hand, individually around the table.

Additional structure was added to the game, with a fixed number of four injects per turn. These injects are included in Annex C. This allowed Turn Sheets to be simplified by removing some redundant fields, and shrinking it to one sheet of paper per turn, as shown in Figure 3. The format of facilitation during the plenary discussion was also changed to focus the discussion on one inject at a time, led by relevant participants, as illustrated in Figure 4. This also created more structure, ensuring that the relevant issues were thoroughly covered.

FPMG – MARINE TWO – TURN SHEET				
TURN NUMBER:		AGENCY:	SECURITY LEVEL:	
INJECT	DECISIONS & ACTIONS (OR COMMENTS)	DESIRED EFFECTS	RESOURCES & ENABLERS	CONSEQUENCES Positive or Negative Intended or Not
1				
2				
3				
4				

Decisions & Actions – Can also include communications with other agencies.
Comments – Concerns can be noted, even if the inject does not directly affect your agency.

Figure 3. Updated turn sheet used in FPMG Marine Two

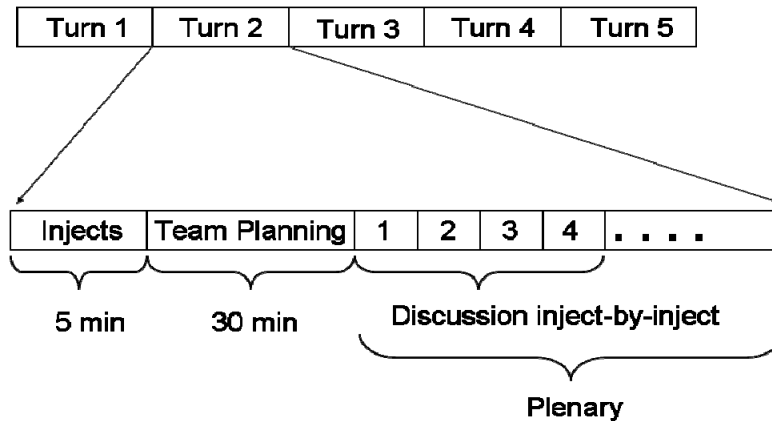


Figure 4. Updated turn schedule used in FPMG Marine Two, and ISSMG Marine III, showing inject-by-inject discussion during plenary

Results were communicated back to the client within one month in the form of a Letter Report [2] which presented findings and recommendations grouped into 10 areas: inter-agency awareness, Standard Operating Procedure (SOP) requirements, security levels, communications, intelligence, information sharing, accreditation, marine security barriers, accommodation vessels, and further exercises.

As an example of the results obtained, one of the scenarios in the game clarified the fact that some specific areas could not be protected against certain threats without the use of floating force-protection barriers. That resulted in a recommendation to employ the barriers, which was implemented for V2010.

3.3 Integrated Safety/Security Matrix Game – Marine III

The third and final Matrix Game held for the OMOC was called the Integrated Safety/Security Matrix Game – Marine III (ISSMG Marine III), and was held 16-17 June 2009. This was the most extensive and complex of the Matrix Games held, and included 56 participants from 27 different organizations (including six facilitators and six observers). The game was organised by a group of four analysts, with support from the sponsor in reviewing injects and game objectives prior to the event. Participants were grouped into nine teams representing areas of common concern: Police, Navy, Crossborder, Security, Safety, Integrated Intelligence, Military Intelligence, Legal, and Communications (Media). The specific objectives for this game, the participants chosen, and adjustments to the game structure flowed from findings of the first two games. Team groupings and injects used for this Matrix Game are included in Annex D.

A significant addition to this game was the creation of a computerised system to gather participant input during the exercise. Organisers provided each team with a laptop, and these laptops were networked together with a common shared folder on the game organizers' computer. Each team could see a folder on their desktop that contained templates for the Turn

Sheets that they could fill with the relevant information during each turn. Then as soon as they saved their Turn Sheet, it would become available on the organizers' computer. This setup streamlined game flow by allowing Turn Sheets to be quickly projected at the front of the room during plenary discussion, and, with the large number of participants, greatly simplified data gathering. This computerized setup allowed immediate collection of participant action electronically, which was far more efficient than previous methods.

The physical layout of the plenary room is shown in Figure 5. This layout, used in the third Matrix Game, was arrived at based on the experience of the preceding Games, and was found to be very functional. The overall layout was a U-shaped table arrangement with projection screens and visual aids (such as maps and charts) at the front. This setup enabled good interaction and discussion among game participants, while also allowing organizers to present information to the assembled group. The layout also allowed the facilitator to move around inside the U-shape to facilitate discussion. Several other elements of the methodology can be observed in Figure 5, the Matrix Games included six observers positioned around the room to record events as they unfolded, and a "scribe" for a more formal record of events. Each team had a team computer, which were all networked together and connected to a projector so that each team's input could be projected for all to see, at the facilitator's direction. There were also miscellaneous clerical necessities such as a printer, copier, and the comment box to collect participant feedback.

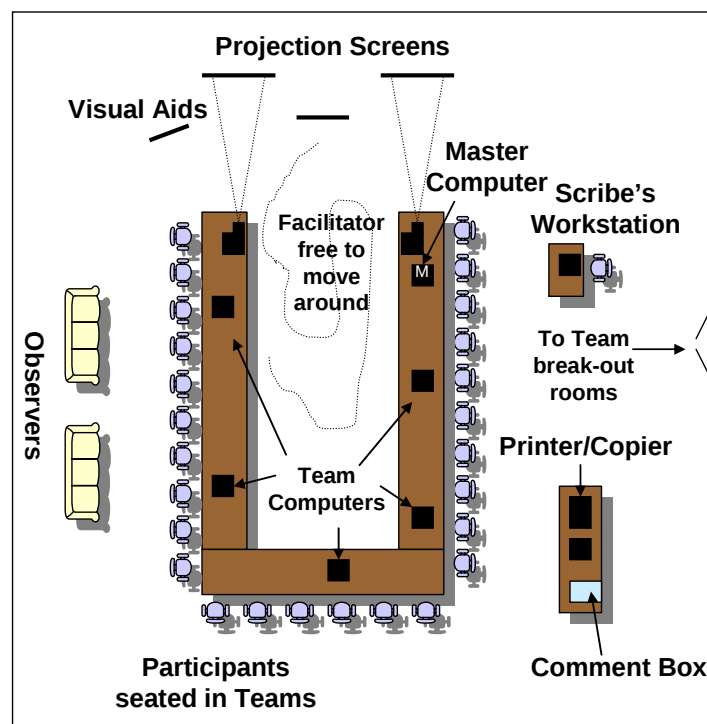


Figure 5. Room Layout for ISSMG-III

ISSMG Marine III retained many of the enhancements to the methodology that were added in FPMG Marine Two, such as the streamlined Turn Sheet (modified here to permit more injects), and the organization of plenary discussion by inject.

This Matrix Game included many more participants than the previous two, with several participants being invited because of the findings of previous games. For example, representatives from intelligence agencies were included based on gaps identified in the previous exercises. These additions proved to be very useful, allowing participants to build awareness of these important relationships, and to address any potential gaps.

A large number of issues and scenarios were explored in detail during this game, and results were communicated back to the client in a Letter Report shortly after the meeting [3]. Several of the participants requested copies of their Turn Sheet data to form the basis for their development of specific SOPs for the scenarios explored, and OMOC planners obtained the full set of Turn Sheets from all participants to form the potential basis for inter-agency SOPs. This final Matrix Game held for the OMOC explored many issues in detail, and the consensus of organizers and the sponsor was that it probably represented the limit of what can be achieved in a Table-Top format. To explore issues in more detail would require advancing to more fine-grained tracking of participant actions, exploring interactions between larger numbers of participants, and exploring subtle timing and coordination issues. In a Matrix Game, since it is a TTX, participants must use their judgement and imagination to come up with their predicted reaction to injects. To get more realistic data on operator actions requires more realistic exercises, and thus it was recommended that further exercise activities progress to Command Post and Live Exercises.

4. Findings About the Method

The experience of running a series of Matrix Games allowed the organizers to observe the effectiveness of many aspects of the methodology. Some of these observations resulted in changes to the methodology as the series of Matrix Games progressed, as discussed below. Other observations were of a more general nature on the methodology and its characteristics that may help in deciding under what circumstance Matrix Games can be most usefully employed. It was found that the methodology is particularly well suited to helping diverse groups of interacting organizations deal with a complex problem space. These findings are based on the experiences and judgments of the Matrix Game organizers, and are presented here in the hope that they may be of some use to potential future Matrix Game employers.

4.1 Game Structure

The Matrix Game methodology used a structured approach to help bring order to complex situations. This structure, however, is not rigid, and can be adapted to the sponsor's needs and goals, or to unique circumstances. Some of the aspects that can be adjusted as needed include the number and detail of the injects, the number and length of the turns, and the grouping of teams to focus on areas of concern or interest. For example, FPMG Marine One had 22 participants grouped into seven teams, FPMG Marine Two had no team groupings, but instead each of the nine participants represented their respective organization, and ISSMG Marine III had 44 participants grouped into nine teams (essentially the same as the first game, plus the addition of two intelligence-related teams).

Over the series of Matrix Games that were conducted, the structure of the game was examined and evaluated. Based on this experience, several refinements were made to the game structure, both to tailor the game to the specific objectives and circumstances of each iteration, as well as to make general enhancements where areas for potential improvement were noted.

One of the features initially noted about the methodology was it is very structured and organised. The DSTO team who run Force Protection Matrix Games, and the CORA team who ran the OMOC series of Matrix Games both had a broad exposure and experience with a wide variety of Table-Top Exercises, and found the Matrix Game methodology to be significantly more structured than a typical TTX. The sequence of scenario presentation, participant planning, gathering of participant inputs, and plenary discussion is divided into distinct and well-defined phases. This organised structure is one of the features that makes the Matrix Game methodology capable of dealing with complex situations among diverse participants. It is this structure that obliges game participants to be explicit about their reactions to the game scenarios, and thus expose any hidden assumptions, misunderstandings, and gaps in procedures between disparate participants.

Over the series of Matrix Games, additional granularity was added to the games to make them even more structured. In FPMG Marine Two, Turn Sheets were further structured by dividing them into sections for each turn, in addition to the sub-categories for the types of information collected for each turn. Also, for this Matrix Game, there was a constant number of four

injects per turn. This was done in order to streamline the conduct of this Matrix Game concurrently with EX BRONZE by making it easier to interrupt and resume game play. There were also hidden injects available to be secretly given to certain participants if deemed useful by facilitators during game execution, but they were not used for this game. The structure of the plenary portion of game play was also altered similarly to organize discussion inject by inject, with all participants being given the opportunity to fully discuss each inject before moving to the next one, rather than the original structure of combining the discussion together with each team going through their full actions in turn.

FPMG Marine Two is a good example of what flexibility is possible, with several modifications to the methodology to accommodate space, time and participant constraints. The number of injects was lower, the turns were shorter, the Turn Sheet was simplified, and plenary was made more structured and focused. This flexibility of the Matrix Game method allowed the OMOC planning team to leverage the opportunity provided by EX BRONZE (the fact that OMOC personnel were gathered together as a captive audience with free time during EX BRONZE), to conduct a focused marine security TTX.

4.2 Scenarios and Injects

Another element critical to success is developing good scenarios and injects to fulfill the goals of the exercise. The scenarios need to touch on areas of real concern that may not be obvious to the lay-person. They should push participant beyond their day-to-day operational experience, but not so far as to make it impossible for them to respond to the scenario. The scenarios must also be realistic for the game to remain credible, and participants to take it seriously, to keep them engaged, interested and “in the moment”. For these reasons, it is vital to secure the help of SMEs when preparing and running the game. The development of scenarios and Canadian Matrix Games used the expertise of strategic analysts from DRDC CORA, and Olympic marine security planners from the CF and the ISU, who were familiar with the marine domain and all of the organizations and issues surrounding marine security. Scenarios can also be made deliberately to test specific concerns, or to validate pre-existing hypotheses. The scenarios and injects used in the three Matrix Games are included in Annexes B through D.

4.3 Facilities and Technical Setup

An important and time-consuming element in Matrix Game execution was the arrangement of physical facilities and technical setup. Although perhaps somewhat mundane, these aspects are very important to success. Organizers of the Matrix Games were fortunate to have access to HMCS Discovery, a naval reserve facility near downtown Vancouver. Two of the three Matrix Games were held there (FPMG Marine two was held at the ISU headquarters in order to be co-located with EX BRONZE). This provided a suitable location convenient to participants, with comfortable plenary room and conveniently located breakout rooms, which facilitated smooth discussion for teams and the full plenary group. Arrangements were also made for hosting lunch and coffee, which minimised disruption during the course of the game.

It was found that technical and secretarial support was very useful. A naval reservist was provided by HMCS Discovery to assist with the physical setup (tables, chairs, projector, etc.),

and with many last-minute tasks such as photocopying, or putting up signs. Also, the FMSTWG provided a person to act as “scribe”, who helped to record discussion from plenary sessions.

The information technology setup developed by the organisers for the third game (networked laptops with pre-setup templates), was effective. This greatly improved game execution, lowering participant workload and easing data entry, reduced facilitator workload, and improved game effectiveness. Projecting data on a front screen helped to focus discussion, and data collection was greatly enhanced by making it completely digital, thereby easing the burden on organizers. This setup improved the visibility and value of the Turn Sheets. Several of the participants requested copies of their Turn Sheets to help with the development of their own procedures, and because they were already in digital form, this transfer was seamless.

4.4 Facilitation

The role of the facilitator is another important factor in how smoothly the Matrix Game will unfold. The actions of the facilitator can determine how open and forthcoming participants will be. This is vital, as the participants’ knowledge and input form the basis of game results, and a successful Matrix Game relies on their cooperation.

From the experience in this project, it was found that the facilitator should not be too forceful or directive, particularly for the early games. When leading the discussion, it is often good to allow gaps in the conversation, without the facilitator jumping in, because then participants will often jump in with comments. Facilitation is a skill that must be gained with experience, and should become more effective with subsequent game iterations.

It can be appropriate to modify the facilitation style according to the circumstances, for example, it was found beneficial to have a looser, less strict facilitation style for earlier games, to help the participants to feel at ease and more willing to open up and participate. In later game iterations, the facilitation style can become more structured to keep the game on track, to make sure that game objectives are met, and that all of the scenarios can be completed within allotted time constraints.

When deciding on a facilitation approach, it should be kept in mind that the overall purpose of Matrix Games is to tap into the knowledge and expertise of the participants, both between each other and to be captured by the organizers, and the purpose of the facilitation is to maximise this knowledge transfer.

4.5 Reporting

Since the primary purpose of the Matrix Games was to provide feedback to the sponsor, it was important that reporting of results be tailored to meet this objective. Quick-turnaround Letter Reports were found to be the most effective form of reporting. This can be vital, since in a fast-moving planning and operational environment, timeliness in this environment was far more important than excessive rigour and process. If results take too long to report to clients

(any more than a couple weeks), they will be overtaken by events, and lose much of their relevance.

In order to be able to organise feedback quickly, game organisers stayed on site immediately following the event to be able to compile results. Often the issues identified in the hot-wash session at the end of the game formed the basis of the themes to be reported. Once the themes were identified, additional detail of substantiation can be obtained by referring to specific participant actions and comments during the game. Essentially, these quick-turnaround Letter Reports consist primarily of a compilation of participant feedback from the Matrix Game, organized into a consistent package. In this way, the Matrix Games were a way of extracting and reporting participant knowledge and subject-matter expertise.

In the Matrix Games described in this report, After-Action Reports were delivered to the sponsor, who could then pass it along to all participants, and their discretion. In practice, it was found that some participants complained of long delays in receiving the game results. When they did see the After-Action Reports, they found that the information was very useful to them. It is important to ensure that all Matrix Game participants can get access to the results, as this will increase their buy-in and commitment. For the final Matrix Game, this issue was discussed with the sponsor to ensure that all participants would receive the After-Action Report. It is advisable to consult with the game sponsor before conducting a Matrix Game to ensure that a plan for distribution of results to participants is in place.

Further analysis and reporting is possible by conducting more detailed post analysis. This can be conducted afterwards for scientific interest, and higher level findings and takeaways.

Following on from the three Matrix Games, the author was asked by OMOC planners to provide observation and analysis of subsequent command post exercises, live exercises, and operational execution. This provided an opportunity to validate results by following up on the Matrix Games' findings and recommendations through these subsequent stages, recording whether or not they were implemented, and if so how they fared in practice. This was done through direct observation of subsequent exercises and execution [11-13]. These findings will be documented in a separate report covering the DRDC analysis support to the entire life-cycle of the OMOC, from inception through to operational execution.

Although reporting of results is of great value, it should be kept in mind that this official reporting of results was only a portion of the value gained by the participants. The mutual discovery and discussion during the exercises had significant value on its own, likely exceeding external findings and results that could be documented by the organizers.

4.6 General Observations

The ability to hold three related events with the same core group of participants also proved to be beneficial. As further iterations of the game were run, and participants became more comfortable, and interaction happened more naturally. The credibility and knowledge of facilitators, gained from earlier games, also helped them to pursue and leverage participant responses.

Probably the greatest benefit of the Matrix Game series, but also the most difficult to quantify, was the enhancement to the working relationships between the participating organizations. The Matrix Games pushed participants to tackle specific joint issues, through a structured framework that forced them to be explicit about their plans and expectations of each other. By making the scenarios specific and explicit, faulty assumptions were exposed. Also, through tackling common problems and challenges, participant perceptions were re-aligned from looking at each other as external entities with separate goals, towards a team focus of solving joint problems. This attitude carried through to the OMOC and was likely a key reason for its perceived success, as recognized by the selection of the OMOC as a successful case-study for the whole of government After Action Review report for Privy Council Office [14].

The participants have achieved good benefits from this table-top methodology, helping to move them from detached organizations, to a more cohesive and integrated group. It was a springboard to progress them towards the more extensive exercises that followed. The familiarity and trust developed during these activities led the author to become a trusted advisor to the OMOC planners, and they requested support for further analysis during subsequent ISU EX SILVER [11], Pegasus Guardian 3 [12], and EX GOLD [13]; as well as during V2010 itself.

A potential area for further enhancement to the Matrix Game methodology would be the inclusion of a more robust Red Team component. The methodology includes the capability to include an active Red Team, which DSTO employ in their Force Protection Games. During the Canadian Matrix Games, Red Team input was confined to aiding development of the scenarios, and some limited facilitator challenge to participants. The decision not to include an active Red Team was made for several reasons. For most of the participating organizations, Red Teaming was a foreign concept, and there was organizational resistance to the concept at the ISU level. There was concern that it could make participants uncomfortable, thus less willing to be open about their capabilities, limitations, and concerns. Also, there was a desire to explore many specific issues and scenarios, crafting these in advance ensured that all game objectives were covered. An active Red Team would be more unpredictable, thus not guaranteeing full coverage of the issues of interest. However, the unpredictable element of an active Red Team also adds the possibility of uncovering unexpected issues, and could be explored in future games.

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5. Conclusions

The experience of organizing and running Matrix Games to support ISU marine security planners proved to be effective at helping them organize their planning, and uncover gaps and issues in their plans. The structure provided a good framework for the participants to gain a mutual understanding of their own as well as each other's respective capabilities and mandates. Many specific findings and recommendations arose from the Matrix Games, which were subsequently implemented. The Matrix Game exercises proved to be an effective springboard to progress the marine security planners towards more extensive exercises that followed, and final operational capability.

Continued refinements to the methodology through the three games led to smooth and relevant discussion, thorough data capture and recording of findings, a thorough examination of each issue, and efficient use of time with many scenarios investigated with moderate time investment by participants.

During V2010 and after, the OMOC organization gained a reputation as one of the most organized, integrated and effective parts of the security apparatus, and was used as a case study in the final whole-of-government report to the government of how to do things right [14]. The OMOC became an example of a learning organization, with integrated groups sharing information and collaborating closely. In discussions with the Matrix Game organizers, the OMOC planners noted that the Matrix Games used in the planning and preparation stages contributed significantly to this. Overall, this project is an example of a successful application of a "soft" OR method to a complex combined military-security and public safety problem.

5.1 Research and Development Community Interest

Following the operational use of the Matrix Games, the methodology was presented and shared through various channels. In all cases, it was positively received:

- a. Findings on the methodology were presented to TTCP MAR AG-10 in April 2009 to provide feedback and findings based on the first two Matrix Games.
- b. Findings based on all three Matrix Games were presented at the 27th International Symposium on Military Operational Research (27 ISMOR) in September 2010. This presentation was well received, with several international colleagues expressing interest in further interaction and information sharing.
- c. The head of the Gaming Technologies & Engineering program at Johns Hopkins University (JHU) Applied Physics Laboratory (APL) has requested further interaction, and stated his intent to request a presentation of the Matrix Game methodology at the next Military Operations Research Society (MORS) conference track on wargaming methods.

- d. A researcher from the TNO in the Netherlands has also expressed interest in leveraging the method for use in an upcoming Concept Development and Experimentation (CD&E) workshop.
- e. Lastly, representatives from the MORS journal have also requested permission to publish the ISMOR paper in their journal.

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Annex A – Matrix Game Preparation Checklist

The Canadian experience in planning, executing and documenting a series of Matrix Games has provided many lessons learned. One of the more important ones was a realization of the number of things that need to be considered, developed, arranged, purchased, etc. by the planners and facilitators before a Game. The purpose of this Annex of the report is to go through the planning process based on the Canadian experiences and list/describe all of these planning activities. This will hopefully provide future Matrix Game planners with a good starting point should the methodology be employed again. Note that this section assumes that the reader is acquainted with the Matrix Game terminology.

The information in this Annex was created by Antony Zegers and Paul Saunders, based on their experience of organizing and facilitating the three Matrix Games covered in this report.

Table A1 lists all of the planning activities encountered during the Canadian experience. Not all would be necessary for all games and there are likely a number of others that would be unique to a particular game. The Table lists the activity, and the preferred lead time before the event. For planning an actual game, this Table can form the basis of a “Check-List”. In the case of a check list, the Table should also indicate the person who will take ownership of the item and another column to show when the item was addressed. A checklist such as this was used for the last two Games and proved invaluable in keeping track of everything.

Following the Table, a brief description or explanation will be provided for each item.

Table A1 – Generic Check List for a Matrix Game

Item	Lead Time
Meet with sponsor to establish goals and deliverables	3-4 months
Assemble team of organizers and facilitators	3-4 months
Decide date and book venue for game	2-3 months or more
Send invitations	1-2 months
Familiarization for Planners and Facilitators	1-2 months
Confirm attendees	1 month
Develop draft scenarios and injects	1 month
Decide on Teams	1 month
Decide on format for game	1 month
Decide on information capture and IT	1 month
Finalize scenarios and injects	2-3 weeks
Decide on format and produce Turn Sheets	2 weeks
Produce agenda	2 weeks
Acquire IT equipment	1-2 weeks or more
Acquire other equipment	1-2 weeks
Obtain services of a Scribe	1-2 weeks or more
Identify observers	1-2 weeks or more
Make hosting arrangements	1-2 weeks
Produce briefs	1-2 weeks
Read ahead package	1-2 weeks
Acquire/produce visual aids	1-2 weeks
Finalize facilitators' inject sheet and make copies	1 week
Name tags and signage	1 week
Set-up and test IT equipment	1 day
Set-up facility	1 day
Dry run	1 day
Handouts	1 day
Game day flexibility	During
Hot wash-up	During
Post Game analysis and 'quick-look' report	1-2 days after
Report	Weeks – months after

Note: In the case of a check list for an actual game, this Table should, have a column that indicates the person who will take ownership of the item and also a column to reflect when the item was addressed.

Decide date and book venue for game: Pick a date that allows sufficient time for preparation but also allows for maximum participation by key stakeholders. For example, avoid dates when organizations are committed to other activities. The Canadian experiences have shown that 1 or 1½ days are ideal for a Matrix Game. This is long enough that objectives can be achieved, and short enough to allow a sufficient number of participants to attend from the different organizations.

A suitable venue is required for the game. Ideally there should be conference type room able to accommodate all of the participants and supporting staff for the plenary sessions and a number of 'break-out' rooms to accommodate the various Teams. The plenary room should have at least one and ideally two projection systems for briefings. With two systems, scenarios, injects and/or supporting material such as maps can be displayed simultaneously when providing plenary briefs at the beginning of each 'Turn' and similarly, supporting material can be displayed while Teams brief their results at the end of each Turn. The break-out rooms require a working surface with sufficient seating for all Team members and access to computing facilities depending on how results are to be captured. If the Game is to be classified, this will limit the number of suitable venues and potentially add some complexity to the planning. If some of the Teams are represented by only one member, then break-out rooms are not required for these Teams. For one of the Canadian games, only one person attended from each of the participating organizations and the entire game was played in the plenary room.

The chosen venue should also be booked for the day preceding the Game to allow time to set up the facility and IT configuration. Planners and facilitators may also need somewhere nearby to conduct their post game analysis and write the 'quick look' report.

Send invitations: It's important that invitations go to potential participating organizations and individuals as early as possible so that the dates can be reserved and good representation can be achieved. It may be necessary to include with invitations, supporting information to encourage and justify participation in the Game. Three of the Canadian Games were concerned with preparations for marine security at the Vancouver Olympic Games and as such most of the marine security stakeholders were already meeting on a regular basis. Dates and invitations were taken care of by Olympic organizers to ensure good representation and attendance. In another case the Matrix Game involved Canadian Forces, Maritime Force Protection (MFP) stakeholders in the Halifax area and was conducted in support of a DRDC Technology Demonstration Project on MFP. It was necessary for the planners to 'sell' the Game to senior leadership in order to obtain the needed support and then actively approach both units and individuals to achieve good representation.

Familiarization for Planners and Facilitators: In order for game planners to develop scenarios and injects to meet the objectives of the game, they will need to have a good understanding of the 'event' to be examined, the key issues, and the responsibilities, capabilities and resources of the participating organizations. This includes knowledge of geography, environment and infrastructure in the area of the event. In order that facilitators can ask the right questions and lead the discussions in the right direction, they require similar background knowledge. Unless planners and facilitators already have this knowledge they will need to acquire it, well in advance of the game in order to have sufficient time for planning. This can be achieved through various means including background reading, internet searches, etc., however, interviews with experts from participating organizations are recommended as the best approach.

Confirm attendees: It is a good idea to confirm attendees as early as possible. This will aid in setting up Teams, acquiring the supporting material and processing any required security clearances.

Develop draft scenarios and injects: The preparation of scenarios and injects should be started as early as possible because these are the essence of the game and will likely need to be adjusted and refined numerous times as the game approaches. For the Canadian games, the

approach taken was to have all of the planners/facilitators produce a number of scenarios/injects individually at first and then meet (in person or via teleconference) to refine and decide on wording, when they would occur, numbers, etc. This process can take several weeks.

Decide on Teams: The number and composition of Teams is driven by a number of factors. Teams can be made up of individuals from the same organization or representatives from more than one. Ideally, there should be more than one person per Team to ensure good dialogue during break-out planning sessions. Having too many Teams makes it difficult to find a suitable venue and could extend the Game time requirements. Large multi-organization Teams can make Team planning sessions more challenging as the Team would have to deal with the interests and responsibilities of several organizations. Organizations in a Team should have related roles and responsibilities. For example, local and national police forces could be grouped together. Another consideration is the formation of 'special' Teams. For example, most of the Canadian Games had 'Media' and 'Legal' Teams. Both of these areas can figure prominently in planning for an event or dealing with a Force Protection type incident. These special Teams can be filled by public affairs and legal representatives from the participating organizations or experts can be brought in to play these roles.

Decide on format for game: The Game will normally consist of four main parts:

1. Introduction: This plenary session provides background briefs and introduce the game and how to play it. In addition, this is a good opportunity for all the participants to be introduced and to provide background information on the roles and responsibilities of their respective organizations.
2. Game Play: The game play would normally start with a scenario briefing to set the stage for the game and then the participants are provided with the injects for the first 'Turn'; a period of time over which the injects take place. It can be a long period, for example a week or more, or a shorter period. The Game is made up of a number of turns; usually some before an event and some during. An event could be a number of things, for example: an important meeting such as a G8; a foreign ship visit; or, a major sporting event like the Olympics. Turns and injects before an event allow for long and short term planning issues to be examined while injects during an event deal with response. Each Turn would normally consist of the following:
 - a. A plenary session to provide scenarios and injects for the turn;
 - b. Team planning where teams meet separately to discuss their responses to the injects and complete their Turn Sheets;
 - c. A plenary session where teams present their responses to all, led by a facilitator who asks questions to clarify responses and brings out key points for discussion. This session can proceed in two formats; first by inject where teams respond to each inject separately or secondly, all injects together where each team provides all of its responses for the turn at one time. The latter will normally take less time overall while the former provides a better opportunity to explore issues in each inject. For both formats, teams can be asked to present in different order each turn but normally 'Media' and 'Legal' teams are asked to present last so that they can comment on all of the responses. In addition, if there is a 'Red' Team, they would present after the other teams.

- d. An open discussion to provide participants with an opportunity to question the responses of other teams and discuss and resolve key issues. It is a good idea to have 'Comment Cards' available for all so that they can write down any thoughts that come to mind, especially if they don't have an opportunity to raise during the plenary.
3. Hot Wash: This consists of a plenary session led by a facilitator after the final turn for overall discussion on the game and the key findings. This should end with a 'round table' where everyone has an opportunity to raise what they believe to be the most important issues and lessons learned during the Game.
4. Feedback: It is informative for the planners to have a feedback session once the game is completed. This allows participants to voice their comments on the format and content of the game so that planners can make improvements for future games. Feedback sheets should also be completed by participants, particularly for those who may not want to air their comments in plenary.

The timing for each of these parts is dependent on a number of factors including the total length of time allocated for the game and the number of teams, participants and turns.

Suggested timings are provided below:

1. Introduction - One to two hours: If the participants are familiar with the Matrix Game methodology then less time is required for instructions. The time allocated for introductions and organizational backgrounds depends on the number of organizations represented and could be 3-5 minutes each.
2. Game Play – 1 to 1½ hours per turn: This would be broken down as follows:
 - a. Present scenario and injects – 5 minutes
 - b. Team planning – 30 to 45 minutes with perhaps more time for the first turn as players are becoming familiar with the methodology. This is driven by the number of injects the teams have to respond to. The Canadian experience has proven that 4 to 5 injects per turn is a good number. Not all teams will have to respond to all injects and teams familiar with the methodology won't take as long to complete their turn sheets.
 - c. Present Results - 30 to 45 minutes depending on the number of teams and injects to respond to.
3. Hot Wash-Up – 1 to 1½ hours: This depends on the number of participants as each should have a few minutes to raise their key issues.
4. Feedback - 30 minutes: Also provides time for participants to complete their feedback forms.
5. Total Time – Assuming four turns, one hour for lunch and 15 minute health breaks in morning and afternoon, a game can be played in 1 to 1½ days. In fact, one of the key selling points for the methodology is the fact that it requires such a small time commitment from the participants.

Decide on information capture and IT: Several options are available for recording and presenting Team responses and capturing plenary discussions. In the Canadian experiences, this has ranged from completing the Turn Sheets by hand and briefing team responses from

these sheets to using networked computers and a word processor to capture results. The former case is the easiest to arrange but means more work afterwards as Turn Sheets will likely have to be transcribed and team presentations are likely to be all verbal. The latter is ideal as Turn Sheets are all captured electronically and can also be projected for team plenary briefs, however, this would be more challenging to acquire and set up. The use of a Local Area Network (LAN), either cable or wireless, allows for more sophisticated game play such as communications between teams. An intermediate approach is providing computers for each team and having them complete Turn Sheets with a word processor and then either print copies or load them on a master computer so that team Turn Sheets can be projected during the plenary. One factor to consider in deciding on the approach, is the potential 'bottleneck' after team planning caused by several teams needing to print their Turn Sheets at one time.

Finalize scenarios and injects: When participants, teams and format are confirmed, the scenarios and injects should be finalized. These must be designed to meet the objectives of the Game and bring out the critical issues. It is a good idea to consult with some of the key stakeholders when making final decisions but injects should not be shared with any participants before the Game. Some injects may be 'one-offs' to explore a particular issue or add 'noise' or confusion (like real life). Others may be part of threads that progress throughout the Game. As an example, there could be an intelligence assessment that extremists are planning an attack in Turn 1, missing explosives in Turn 2, a stolen boat in Turn 3 and a Water Borne Improvised Explosive Device attack on waterside infrastructure in Turn 4. An example of a one-off would be a communication tower blowing down in a wind storm. Some injects may only be provided to some Teams in order to explore how they might communicate the information to others. Other injects may not be provided at the beginning of a Turn but sprung on all during the Plenary. For example, during the first Game run by Canada, one inject was a terrorist bomb taking out the Marine Operations Centre during the Olympics. This was injected during the Plenary of the final Turn causing the participants to consider backup facilities.

Decide on format and produce Turn Sheets: Depending on the Game format and IT option chosen, Turn sheets should be designed to capture Team planning outputs. Typical output headings for an inject are as follows: decisions and actions; desired effects; resources and enablers; and, potential consequences. These can be formatted such that all output headings and injects are captured on one form per team per turn or each inject could be handled separately to provide more space for Team responses. It may be that different sheets are required for the special teams. (e.g. media and legal teams). Whatever the format, it is recommended that the facilitators and planners try themselves to complete the Turn Sheet for some of the injects to ensure that the headings make sense. In addition, a completed Turn sheet example should be included in the instructions.

Produce agenda: Now that teams, format, scenarios and injects have been decided, an agenda should be produced. This may have to be adjusted as Game day approaches. See 'Decide on format for game' above for recommended timings.

Acquire IT equipment: Depending on the IT approach chosen, equipment may need to be acquired, borrowed or leased and this needs to be done well in advance of the Game so that testing can be done and software loaded, etc. It is also advisable to have an IT expert standing by to assist and even arrange to have them available during the Game. In addition, if files will need to be transferred between computers, a number of memory sticks should be

available, i.e. one per Team. A suitable printer will also be required with sufficient throughput to avoid printing bottlenecks.

Acquire other equipment: Other equipment that should be acquired, leased or borrowed includes:

- A photocopier
- Projectors
- Projector screens
- Extension cords
- Power bars
- Means of hanging/displaying visual aids

Obtain services of a Scribe: During Game play, facilitators and observers tend to be wrapped up in discussion and debate and are not always able to capture open discussion and key issues. It was found most useful in the Canadian experiences to have a ‘professional’ scribe or note taker. This ensures that nothing is missed. It may well be that one of the organizations participating in the Game has access to such an individual. To assist with the note taking, a template should be produced which lays out the turns and injects so that the scribe can then insert discussion at the appropriate spot.

Identify observers: Although not essential, it was found useful to have observers to accompany each Team for break-out sessions. These observers can capture important discussion that may not make it to the turn sheet. They can also help the Teams with the methodology and watch the time but should not participate in the discussion.

Make hosting arrangements: The exercise period tends to be very full with lots of potential for overrun on the times. It is therefore recommended to have lunch and health break snacks/drinks right at the facility to save time and provide a little slack in the schedule. This also encourages more interaction among participants. Depending on the venue, this food and drink may need to be catered and arrangements and funding made well in advance.

Produce Briefs: These could include some or all of the following:

- If preparing for an event (e.g. Olympics or G8 meeting), background information on location, security plans, venues, risks, etc.
- Introduction to Matrix Game methodology and purpose of Game
- How to play the game
- Scenario and injects for each turn

These briefs should be reviewed by all the planners and facilitators for content and consistency.

Read ahead package: A read ahead package can be sent out to the participants so they have familiarity with the Game methodology and scenario beforehand. The package can also include the agenda, directions, parking information, lunch/health break details and if available some information on the participating agencies.

Acquire/produce visual aids: It is very useful for both plenary briefings and discussions and team deliberations to have maps, satellite imagery, pictures, bathymetry charts, etc. available. Some of these should be hard copy while others can be electronic. For example, in introducing an inject, the facilitator may want to have a map to indicate the position of an incident or a picture to depict some form of infrastructure.

Finalize facilitators' inject sheet and make copies: The facilitators should have copies of the finalized inject sheets for each turn with questions and notes inserted to aid in their facilitation. It was found useful to meet just before the game to review the injects and discuss what issues should be highlighted for each inject. During the plenary session after team planning, the facilitators will direct the order that teams present. The order should vary from turn to turn and it is helpful for the facilitators to decide this order beforehand and include it on their notes. Some injects may not apply to all of the teams and this can also be noted.

Name tags and signage: To aid in facilitation and interagency discussion, it was found useful for all attendees to have name tags which also indicate the agency they represent. Name signs could also be placed on the table. In addition, teams should sit together in plenary with the team name sign clearly visible and team name should also be placed on the door of the team's breakout room.

Set-up and test IT equipment: It is a good idea to set up and test IT equipment ahead of the Game so that any bugs and other problems can be resolved. As part of this, each team's computer should be loaded with Turn Sheets for each turn. The recommended format is to have a folder for each turn with each folder containing the required number of Turn Sheets. These can all be pre-labelled as to team, turn number and inject number to avoid any potential mix ups afterwards.

Set-up facility: It may be necessary for the planning and facilitation team to organize and physically set up the facility. A 'U' shaped configuration with projection systems set up at the open end of the 'U' was found to be conducive to good inter-team discussion and visibility of the projection screens to all. Team name signs can be spaced around the 'U' based on team size. The facilitators will be free to manoeuvre within the 'U' to team seating areas. Maps and other visual aids will need to be arranged in the plenary room as well as Team break out rooms. A master computer connected to one of the projectors should be used to present team outputs from Turn Sheets as well as to store all of the material. A printer/copier may be required and should be positioned for easy access. A box should be provided for comment cards as some commenters may wish to remain anonymous. Figure A1 provides an illustration of a plenary room set-up similar to what was used for some of the Canadian games.

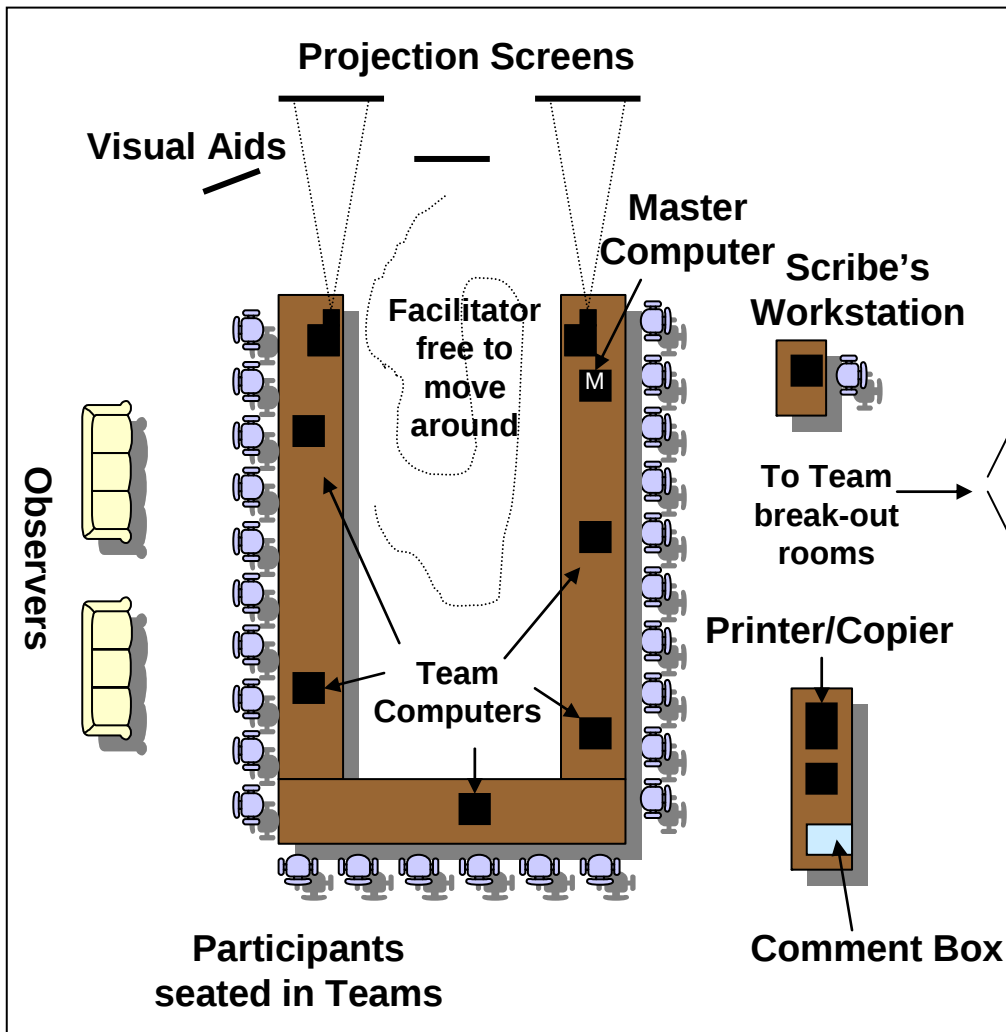


Figure A1: Illustration of a Matrix Game Plenary Room Set-up

Dry Run: Once all is set up, the briefs should be run through and a sample turn played out to ensure that timings are correct and procedures run smoothly. It may be necessary to make last minute adjustments to accommodate any problems that surface.

Handouts: The following items are recommended for handouts for all.

- Name tag
- Agenda
- Background scenario
- Summary of game instructions
- Sample Turn sheet

- Comment cards
- Feedback Form
- A pen and writing pad could also be included although most will come prepared.

Copies can be made and laid out for distribution during setup. In addition, copies of the injects for each Turn should be prepared in sufficient numbers so that each participant can have a copy at the beginning of a Turn. These should be placed in separate 'Turn' folders and only handed out after the injects have been introduced by the facilitators. A sign-in sheet should also be passed around.

Game day flexibility: Based on how the team planning and plenary discussions go, it may be necessary to make adjustments to the schedule and/or the scenario and injects. For example in Canada's first Matrix Game, the number of turns and injects had to be reduced after the first day. For a one-day event, this would have to be done 'on the fly'. It is a good idea to make advance preparations and contingencies, just in case. It may well be that more injects need to be added to a turn so additional injects should be set aside in advance.

Hot wash: As discussed previously, this plenary session at the end of the Game proved invaluable in identifying the key issues and lessons learned. This session can begin with a general discussion led by a facilitator and then each participant should be given a chance to raise their key issues. A good approach is to ask each participant to raise just one or two issues and then check back after all have contributed to ensure that nothing was missed. As a means of capturing these issues, they should be written to the master computer by the scribe or facilitator and projected for all to see. This ensures that the person who raised the issue and all of the other participants are satisfied with the wording and description. A template to record this information should be prepared in advance.

Post Game analysis and 'quick-look' report: For all of the Canadian Games, a day was set aside after the Game for the facilitators and planners to review the results and produce a 'quick-look' report while the event is fresh in their mind. A good approach was to take the list of issues raised in the hot wash-up and group them according to theme. These themes were found to reflect the key outputs of the Game. This report should be circulated to all participants as soon as possible. A typical format for the report follows:

- Introduction and game objectives
- Participating organizations and Team composition
- Summary of Game play
- Brief summary of key results (themes)
- Conclusions and recommendations
- Annexes
 - o List of participants
 - o Agenda
 - o Scenarios and injects
 - o List of issues from hot wash-up

Final Report: In the longer term a more comprehensive report can be prepared where the plenary discussion captured by the scribe and all the Turn sheets can be reviewed in more detail.

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Annex B – Force Protection Matrix Game – Marine One Scenarios

This Annex documents the team groupings and scenario injects used for the Force Protection Matrix Game – Marine One planning exercise, held 14-15 October 2008. These scenarios were created by Ben Lombardi, Paul Saunders and Antony Zegers. Results from this Matrix Game are documented in an After-Action Report [1].

FPMG Marine One – Team Groupings

Team One – OMOC COMMAND

- ISU/RCMP
- ISU/CF-Navy

Team Two – RCMP & VPD

- RCMP – West Coast Marine
- VPD Marine Unit

Team Three – CF-NAVY

Team Four – CBSA, TC - MARINE SECURITY, VFPA & RCMP-JFO

Team Five – COAST GUARD & TC – MARINE SAFETY

Team Six – LEGAL

- TC – Regulatory Affairs
- ISU/RCMP – Legal
- DND – JAG
- VFPA - Legal

Team Seven – MEDIA

- RCMP - Communications
- Coast Guard – Communications
- TC - Communications
- ISU – Communications

Team Eight – WHITE/RED/OBSERVERS

- RCMP
- DRDC-CORA
- JTFG

FPMG Marine One – Scene Setting

- **To be distributed day before Game actually commences**
- Prime Minister will arrive in Vancouver to attend the Opening Ceremony of the Olympics. He will arrive the day before the ceremony and will tour the Athletes Village at False Creek as well as host a VIP-attended dinner at the Convention Centre.
- Mehmet Fatih, the leader of a well-known jihadist organisation, issues a video: on it, he states that Vancouver and the Olympic Games are legitimate targets due to the presence there of so much hedonism and blasphemy. The story is reported in a national newspaper, *The Weekly Bugle*, from a leaked ITAC Report.
- A local police informer advises VPD that anti-globalisation activists intend to disrupt Opening Ceremonies by staging mass protests, focussing on maritime transport links.
- Police in Lethbridge, Alta, report that 2000 litres of ammonium nitrate are stolen from a local farm supplies store.

FPMG Marine One – Turn 1 – Ten days before Games

1. The manager of the Victoria Seaplane terminal reports to Victoria PD that suspicious individuals have made several inquiries about flight schedules and security.
2. Large amount of oil washing ashore at English Bay Beach is of unknown origin. Bad weather and high seas hamper clean-up.
3. US intelligence provided to CSIS indicates that a Pakistan-based terrorist group has been overheard discussing shipping an explosive device to North American port in a container on board a ship out of South Korea.
4. Two suspicious male passengers reported on ferry from Seattle to Victoria.
5. During locally-broadcast television interview, well-known advocate of the rights of the homeless, John Keinhaus, declares that the plight of the underprivileged in Vancouver needs to be brought to the attention of Canadian authorities by “deliberate and focussed action” during the Olympic Games.
6. A Bosnian-born immigrant is detained by Vancouver Police after being seen using a camcorder to film, at night, facilities around Ballantyne Pier. He is later released.
7. Three container ships from South Korea are in-bound – due to arrive in Vancouver during Olympic Games. 15 other freighters from other ports expected in first week: ten in second.
8. *The Daily Planet*, a local daily newspaper, reports that the manager of the Chevron refuelling station off Deadman’s Island states that, for security reasons, the facility will be closed during the Olympics.

FPMG Marine One – Turn 2 – Three days before Games

1. Large foreign-flagged freighter, S.S. *Sea Lotus*, gives 96 hour notice of arrival at Vancouver. Its required list of previous ports of call includes, most recently, Pusan, Shanghai, Jakarta, Singapore and Chennai (aka Madras).
2. VFPA offices are broken into after hours and are ransacked. It is not certain what perpetrators were looking for, but it appears that nothing was taken.
3. Vancouver police stop a vehicle with a trailer, holding one empty oil barrel, for improper signalling. Driver is abusive when asked to provide identification/registration. After he is stopped, a search of the driver yields a data stick with maps of several Olympic venues, including Burrard Inlet, the Olympic Village at False Creek and the Skating Oval. Suspect is subsequently identified as a known Toronto-based Islamic radical convert, not Middle Eastern in ethnicity.
4. The manager of a car rental agency at Victoria Airport reported to the Airport Security Office that two men, speaking what he described as “Arabic or Turkish, but not a European language”, and who had disembarked from a flight from Toronto, rented a full-size car and asked for a schedule for the Nanaimo to Vancouver ferry. Before leaving the parking lot with the rented car, he observed them talking with another man, after which they loaded a suitcase and two large duffle bags into the car. He thought it was odd that they only had the suitcase with them when they came to his kiosk to rent the vehicle.
5. Prime Minister arrives to attend Opening Ceremonies. In addition to planned visits to Olympic Village at False Creek, he decides to take a previously unscheduled waterside tour of Olympic-related venues in Burrard Inlet.
6. *Happy Tidings*, a US-registered 35 foot Catalina sailboat with four persons on board, en route from Sydney, B.C. to the Squamish area, issues a Mayday during the night, but the transmission ends before the boat’s position can be given. No EPIRB signal received.
7. Counterfeit VFPA identification seized during major RCMP drug bust in Montreal.
8. The sea is unusually rough: an unnamed US-registered private vessel has engine trouble at the mouth of the Strait of Juan de Fuca, in the vicinity of Swiftsure Bank, and calls for assistance.
9. CBSA loses contact with officers conducting routine inspection of freighter outside of controlled access zone beyond Lion's Gate Bridge.

FPMG Marine One – Turn 3 – First week of the Olympic Games

1. (Info only, situation resolved) *Happy Tidings* was located by Maritime Patrol Aircraft at first light and is now safely in Victoria harbour
2. A morning television news report indicates that the security fence around False Creek has been breached overnight when a kayaker infiltrated the Exclusion Zone. IOC and VANOC react sharply in a public statement, demanding better security measures.

3. VFPA reports that security cameras at CENTERM container terminal have detected trespassers after dark.
4. An article in *The Weekly Bugle* states that a journalist was able to purchase, only days before in Vancouver, what appears to be counterfeit VFPA identification.
5. Low-level radiation is detected by CBSA inspector on container unloaded at VANTERM.
6. During the early morning rush hour, large groups of anti-globalisation protesters break through the security cordon around Canada Place. The protest turns violent when police attempt to disperse the protesters. Reports indicate protesters and, possibly, police are in the water.
7. A large number of small pleasure craft from Port Moody try to undertake an on-water protest in Vancouver Harbour. Weather conditions make controlling boats very difficult, and loss of control is evident as some begin to drift, some capsize, and some run aground.
8. VFPA contracted patrol reports that, sometime during evening, no watch was observed on large freighter, S.S. *Warthog* (Liberian registry), anchored west of Second Narrows Bridge.
9. Mid-day power outage affects several city blocks around, and including, Canada Place and the Convention Centre. Media coverage of the Olympics is disrupted.

FPMG Marine One – Turn 4 – Second week of the Olympic Games

1. After picking up its pilot, S.S. *Sea Lotus* arrives at entrance to Vancouver port. CBSA boards the vessel and is subsequently concerned about irregularities in ship's manifest.
2. Several 9/11 callers report seeing a man throw a briefcase-sized object into the water near the Helijet terminal.
3. Caller to the VPD claims to have seen "a number of suspicious-looking Pakistani men" near Olympic skating oval.
4. Violent altercation on SeaBus midway during voyage to North Vancouver between group of US tourists and Canadians of South Asian origin. Vessel operator advises 911 operator of violence and adds that someone is attempting to open the passenger doors.
5. In the late evening, a small boat is reported to be on fire in Burrard Inlet, one kilometre from Ballantyne Pier, and it appears to be slowly moving toward the Accommodation Vessels.
6. Shortly after reports are received of the boat on fire in Burrard Inlet, a bomb planted in seawall during construction of bridge at Athletes Village at False Creek is detonated, and several athletes are killed, others wounded, and some are still missing.

**INSERT TO BE PROVIDED BY FACILITATOR MID-WAY THROUGH PLENARY
SESSION**

Minutes after the bomb at False Creek explodes, a US-registered yacht out of Portland Oregon, carrying several barrels containing a total of 2000 kilograms of ammonium nitrate mixed with fuel oil, leaves Coal Harbour Marina and moves toward HMCS *Discovery*, getting as close to shore as the boat's draft permits.

Taking advantage of high tide, it moves very close to the bank of Deadman's Island opposite the Chevron fuelling station. After running aground, the crew detonates the bomb, significantly damaging (possibly destroying) the OMOC command centre and igniting a secondary explosion at the fuel station. Windows of the Westin Bayshore and many private residences along shore-line are blown out.

Loss of life and physical damage at the OMOC and in the surrounding area are considerable.

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Annex C – Force Protection Matrix Game – Marine Two Scenarios

This Annex documents the scenario injects used for the Force Protection Matrix Game – Marine Two planning exercise, held 13-14 November 2008. There were no team groupings for this Matrix Game. This version of the injects was the facilitators version, which included suggested questions the facilitator could use to stimulate discussion, or probe more deeply into issues. Injects given to game participants did not include these additions. These scenarios were created by Ben Lombardi, Paul Saunders and Antony Zegers. Results from this Matrix Game are documented in a post-game Letter Report [2].

FPMG Marine Two – Agencies Represented

FPMG Marine Two had nine participants, on from each of the following agencies:

- a. Integrated Security Unit (ISU) – RCMP Rep,
- b. Integrated Security Unit (ISU) – DND Rep,
- c. Canadian Forces (Navy) Maritime Component Command (MCC),
- d. Canadian Border Services Agency (CBSA),
- e. Canadian Coast Guard (CCG),
- f. Transport Canada (TC) Marine Safety,
- g. Transport Canada (TC) Marine Security,
- h. RCMP West Coast Marine, and
- i. Vancouver Fraser Port Authority (VFPA).

FPMG Marine Two – Turn 1 – Two weeks before Games

1. The White House announces that the President of the United States (POTUS) will visit the Olympics during the second week. The US Secret Service approaches RCMP and asks for direct liaison with ISU to plan for security during visit. This story is leaked to the media and is picked up by a national television news network. US Coast Guard approaches MCC to assist directly in security of maritime approaches to Vancouver Olympic facilities. The Prime Minister announces that he will meet with POTUS in Vancouver and they will both attend the IOC-sponsored Olympic Gala at the Convention Centre.

- **Questions**

- **How is the request transmitted to OMOC?**
- **What is the likely media reaction?**
- **Are there any technical issues attached to US request?**
- **Are there any legal issues attached to the US request?**

2. US Homeland Security Department advises (who in Canada?) that it has lost track of a 38 foot, Meridian 381 Sedan yacht ("*Blackbeard's Ghost*") that departed Port Angeles in Washington State three days previous. An individual with suspected ties to both organised crime and Islamist extremists is believed to have been on board. The destination of the yacht is unknown.

- **Questions:**

- **How is the information transmitted to OMOC?**
- **What is the response to this information?**
- **Would any search be coordinated with Canadian authorities?**
- **Who, on the Canadian side, would take the lead?**
- **Security classification of info restricts distribution?**

3. MSOC JTFP reports that two in-bound freighters, currently beyond the 200 mile boundary, the SS *Osman's Dream* and the SS *Jolly Swagman*, were in the same location and stationary for 10 hours.

- **Questions:**

- **How will this information be processed?**
- **How will this event be interpreted?**
- **What actions will be taken and/or resources assigned?**

4. US provides highly classified intelligence of strong suspicion that jihadist attack is being contemplated for Olympic Games. Penetration of Islamist cell in Detroit indicates planning is advanced. Attack could be of a suicide nature, and attention of cell to maritime transport suggests it will be sea-based.

- **Questions:**

- **What agency would receive this information?**
- **What actions, if any, would be taken?**
- **Would this information get to the OMOC and be distributed to member-agencies?**
- **What are the implications, if any, for the MARSEC level?**

FPMG Marine Two – Turn 2 – One week before Games

1. The manager of the Port Moody Marina reports to local police that an individual has reserved six small boats for the week of 12 February and he has paid in advance with cash.

- **Questions:**

- **Is this information passed to the OMOC?**
- **How is this information processed?**

2. A mystery oil spill offshore of West Vancouver is reported by local yachtsmen who indicate that it could pose a maritime and environmental hazard. The spill is reported to local police after it begins to wash ashore, and local residents are concerned.

- **Questions:**

- **Is this information passed to the OMOC? If so, by who?**
- **What are the ramifications of this information?**
- **What is the procedure for addressing it?**
- **How rapid is the clean up?**
- **If this is assigned a priority, who makes the decision?**

3. Possible sighting of *Blackbeard's Ghost* by a CF Navy MCDV, but the speed of the former meant it could not get close enough for positive identification. The yacht was approximately half-way between Nanaimo and Vancouver, and was on a heading for Vancouver.

- **Questions:**

- **To what agencies would this information be passed?**
- **What actions will be taken?**

4. SS *Jolly Swagman* and SS *Osman's Dream* have arrived, one day apart, at Vancouver. *Jolly Swagman* is instructed to anchor in English bay. A hull attachment is spotted by a VFPA patrol on the SS *Osman's Dream* that is now anchored in Vancouver port.

- **Questions:**

- **What agencies would respond?**
- **What resources would be used?**
- **Would there be a call upon the divers? Given security concerns for games, what percentage of capacity would be committed?**

HIDDEN INJECTS – Turn Two

5. A local high-priced prostitute, who is a sometime informer for the VPD, reports that a recent “business acquaintance” bragged to her about how he was planning “something big” during Olympics. Her description is of a dark-skinned, foreign businessman, with a thick accent, possibly Slavic.

- **Questions:**

- **Does this information get reported?**
- **Reliability of information?**
- **Does the OMOC have any capacity to deal with information of this type?**

6. A plain-clothes Vancouver police officer is found dead in his seat on the SeaBus by another passenger. Tests reveal that he had been injected with Ricin, a highly toxic poison, most likely while he was either boarding the SeaBus or when he was seated. The officer was a member of a task force investigating possible links in the city’s drug trade between Chinese Triads and local Islamist sympathisers. The media only report that a police officer has been murdered.

- **Questions:**

- **How would this information be processed?**
- **Would the investigation of this sort of incident stay entirely within the local police, or would other agencies be affected?**
- **How would this affect security considerations for the Olympics?**

FPMG Marine Two – Turn 3 – First week of Games

1. On water security reports that some small boats seem to be probing exclusion zones in front of the Media Centre to elicit response from RCMP boat patrols. One of the vessels collides with an RCMP Cat: four men are reported to be in the water; two are missing.

- **Questions:**

- **Would the RCMP report this assumption (“probing”) to other agencies?**
- **What actions would be taken to counter this type of action?**
- **How would security measures respond to likely negative media reaction to maritime accident?**

2. VFPA reports that security cameras at VANTERM container terminal have detected trespassers after dark.

- **Questions:**

- **How would/could VFPA deal with the ramifications of this information?**
- **Who assesses the seriousness of this event?**
- **To whom does VFPA report this information?**
- **Would any actions be taken to ascertain the intentions of the trespassers?**

3. In response to the earlier marine advisory, reports indicate that a yacht fitting the description of the missing vessel from Port Angeles was spotted in Port McNeill and later by local ship captain. He notified the Coast Guard that the vessel is hugging coast and heading south.

- **Questions:**

- **What would the Coast Guard do with this information?**
- **Would MCC advise OMOC of this vessel's sighting?**
- **Would any action (i.e., commitment of resources) be taken to deal with this vessel?**
- **Given that the source of intelligence concerning this vessel is the US, would progress of vessel be passed to American maritime authorities?**

4. The manager at a local North Vancouver dive shop reports to local police that two suspicious individuals have rented some scuba gear for the week. His suspicions were raised when the two men, both of South Asian origin, were very evasive when he asked where they planned to dive.

- **Questions**

- **Would this info be of interest to the OMOC?**
- **How will information be passed from North Vancouver PD to Vancouver PD to other interested agencies?**
- **Would local police be aware of information provided by US? If so, how?**
- **How do the RCMP & CF dive units work with VPD Marine?**
- **What is likely response of dive units and/or police?**

INFO ONLY

- The protuberance on the hull of the foreign-flagged vessel, that was earlier addressed, was discovered to be a pod for transporting drugs. Arrests have been made and more are expected.

HIDDEN INJECT FOR TURN THREE

5. *The Daily Reporter*, a local newspaper, prints an article detailing the large build-up of personnel at HMCS *Discovery*, quoting an unnamed official as saying that the naval facility is playing a “key role” in Olympic security measures.

- **Questions:**

- Will there be a demand for counter-measures to be taken?
- What is likely broader media reaction?
- Does OMOC have a media strategy to deal with this issue?

FPMG Marine Two – Turn 4 – Second week of Games

INFO ONLY

- *Blackbeard’s Ghost* is located. Positive identification northwest of Anvil Island on course to Vancouver. A day later, it arrives in Vancouver and berths in Coal Harbour marina. Captain files appropriate documentation with Canadian authorities. Individual identified as terrorist associate by US government does not appear to have been on board when the vessel docked, and the crew denies any knowledge of the man.

1. POTUS and PM meet and proceed to the Convention Centre to attend the Olympic Gala. Anti-US protestors confront the president’s arrival at Convention Centre for Olympic Gala. During the Gala, a fast, covered boat speeds across the port, ignoring hails and warning buoys, toward the media centre at Canada Place and the Convention Centre. The occupants of the boat are trying to unfurl a banner protesting “US aggression”.

- **Questions:**

- **Would the security level be increased to this site for the visit? If so, who makes that decision? What agencies are informed and when?**
- **What kind of changes to area security measures would be made?**
- **Given the earlier incident, would the SOP have been amended to prevent maritime collisions and would that impact on security?**

2. Nearly 20 percent of RCMP officers onboard Accommodation Vessel are ill. Initial assessment by doctors is that this is a serious case of food poisoning – origin unknown.

- **Questions:**

- **What would impact of a manpower shortage be?**
- **How will RCMP compensate for reduction in available manpower resources? Does a surge capacity exist?**
- **Will other agencies be able (logistically & legally) to take over duties?**

3. At 0300, a security patrol spots two kayakers under Canada Place who appear to be stringing up an anti-globalisation banner on the pier. The next morning, a caller to 911 reports seeing a mysterious package fastened to pillar near an “Olympic venue”. The message is garbled and the caller hangs up before operator can determine where precisely the package was seen.

- **Questions:**

- **What type of response to a penetration of the Exclusive Access Zone might be expected?**
 - **What, if any, SOPs exist to address the information provided to 911?**
 - **Who would be notified of the penetration of the Exclusive Access Zone?**
4. On the second last day of the Games, a short, non-descript man wearing a long raincoat entered Granville Island Market during the noon-hour rush. Behaving suspiciously, a local police officer approached him leading the man to detonate the explosives that he had strapped around his body. Early estimates are that the number of fatalities is high. Two other incidents were obviously coordinated with this attack. The first involved a small boat laden with explosives that moved quickly down False Creek. After stopping opposite the Athletes Village, several (perhaps as many as four) heavily armed men moved onto the embankment and using machine-guns and grenades attacked anyone in their sight. Shortly afterward, the boat exploded causing serious concussion damage to the surrounding buildings. Simultaneously, two other boats raced across Burrard Inlet toward the Media Centre. The first, penetrated the Controlled Access Zone, and several armed men disembarked at the seaplane terminal. Discharging their weapons at all bystanders, they assaulted the Main Convention Centre. The second boat, essentially a floating bomb, exploded alongside the Media Centre, causing significant damage to the structure.

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Annex D – Integrated Safety/Security Matrix Game – Marine III Scenarios

This Annex documents the team groupings and scenario injects used for the Integrated Safety/Security Matrix Game – Marine II planning exercise, held 16-17 June 2009. This version of the injects was the facilitators version, which included guidance on which teams were expected to be closely involved in the given scenario, and suggested questions the facilitator could use to stimulate discussion, or probe more deeply into issues. Injects given to game participants did not include these additions. Scenarios were created by Paul Saunders, Antony Zegers, and Adriano Lozer. Results from this Matrix Game are documented in a post-game Letter Report [3].

ISSMG Marine III – Team Groupings

Team #1 – Police: OMOC Tac Watch Floor - RCMP, ISU Marine, JTFG Fwd (3)

Team #2 – Navy: OMOC Tac Watch Floor – Navy, PSU, Navy Divers, MCC plans, MCC Ops (5)

Team #3 – Cross-Border: OMOC Tac Watch Floor – IBET, USCG, RCMP E-Div (5)

Team #4 – Security: OMOC Watch Floor – TC Security Marine, CBSA, VFPA (4)

Team #5 – Safety: Marine and Surface – TC Safety Marine, CCG, VFPA, TC Safety Rail & Dangerous Goods, ISU Surface (6)

Team #6 – Integrated Intelligence: JIG, MSOC, CSIS, RCMP INSET, CBSA, CCG (11)

Team #7 – Military Intelligence: JTFP, JTFG, USCG D13 (4)

Team #8 – Legal: VFPA Legal, TC Legal (2)

Team #9 – Media: ISU, DND, VFPA (4)

Observers – (6)

Facilitators/Staff – (6)

Total Participants – 56

ISSMG Marine III – Scene Setting

Exercise Criminal Activist Threat-Carpe Diem:

a. This activist group has undergone a rapid transformation in the past two years. In October 2008 its members attempted to disrupt the “La Francophonie” Summit in Quebec City with little success. They were ill-prepared and the police easily neutralized their feeble attempts to halt the summit. After the summit their group was widely ridiculed in the press for their disjointed messages and poorly planned activities.

- b. Since that time the Carpe Diem has taken a low profile approach while it re-assessed its methodology. It quickly decided that rather than spread its efforts among numerous events, it would focus its protest activities on one major event every several years to maximize their effect. Since 2008, members of Carpe Diem have been focusing all of their efforts on preparing disruptive and possibly violent protests against the government of Canada during the Olympic 2010 timeframe.
- c. The Carpe Diem's main messages are:
- (1) immediate cancellation of Olympics and re-routing of funding into programs for the disadvantaged;
 - (2) an end to Canadian involvement in Afghanistan and the diversion of Defence spending to social programs; and
 - (3) revision of Canadian drug laws and the legalization and government provision of safe injection sites.
- d. Carpe Diem's plans include:
- (1) Staging or hijacking legal protests and turning them into violent confrontations; and
 - (2) A concentrated cyber program aimed at discrediting the federal government and transmitting the group's main messages.

Exercise Terrorist Threat-New World Struggle (NWS):

British officials have advised a US Intelligence Liaison Officer in London that NWS plans to further its global aims of establishing a new world order, that seeks an international system of more equitable wealth and power sharing, thru their activities in Vancouver during V2010. Their sources indicate that NWS aim to bring about an abrupt end to the Games in Vancouver as a means of drawing attention to their strength and potential to influence world-class events, and that their potential activities may involve a coordinated series of hostage-taking events during the games. There is further credible evidence of a planned catastrophic event at the Closing Ceremonies.

Weather:

Benign-Normal vis, temperature and precipitation for the time of year. Winds NMT 25kts anywhere over the water.

ISSMG Marine III – Turn 1 – First week of the Games

- 1.1 The CCG Regional Operations Centre receives a phone call from a resident from Gambier Island that several small vessels have been convening at anchor in Port Graves during the past couple of days. The resident reports nothing suspicious other than it's odd for the time of year to see so many vessels in the port.
- Primary Teams: Integrated-Intel, Military-Intel
 - Questions: Would information received on a routine basis of a rather benign nature at the CCG ROC be forwarded to the MSOC for greater appreciation and application to the overall domain awareness, even if this would not necessarily occur in an OPS NORMAL situation? If in receipt of the information, would the MSOC pass it to the

JIG for application to the greater overall V2010 intelligence picture? If the MSOC or JIG possessed this information, would they pass it to the OMOC for application to the marine surveillance picture in Howe Sound?

- 1.2 A diving goods store at Granville Island is broken into. The owner reports to Vancouver police investigators that several tanks and regulators, and three wetsuits, have been taken. In making his report, he observes that it is possible that the thieves may not be experienced divers as the stolen merchandise was not the most expensive in his store.
 - Primary Teams: Integrated-Intel, Military-Intel, Police
 - Questions: Would information be passed to the MSOC for greater appreciation and application to overall domain awareness, even if it would not necessarily occur in an OPS NORMAL situation? If information of an obvious marine affiliation reached the JIG, would it be passed to the MSOC and OMOC?
- 1.3 A man from Point Roberts, WA calls local police to inform them that his father, a local fisherman, had left the house the previous evening complaining of the Canadian government's restrictions on fishing by non-aboriginals. A subsequent inquiry at the local marina reveals that he had departed in his 30-foot boat the previous evening and that he had been observed leaving Boundary Bay and heading north. The man is not considered to be dangerous, but his son related to police his frequent public rants against what he considered to be preferential treatment of aboriginal fishers by both the Canadian and US governments.
 - Primary Teams: Navy, Cross-Border, Security
 - Questions: Would information related to the US 911 call concerning a suspect vessel with a person of interest heading north be passed to the MSOC, JIG, Border Integrity Patrol Ops Centre (BIP OC), or OMOC for application to the greater intelligence piece and the integrated marine surveillance effort? How would IBET, USCG and USCG D13 tactical surveillance assets be coordinated to look for the vessel?
- 1.4 The Horseshoe Bay BC Ferry terminal reports to the West Vancouver Police the occurrence of several unusual acts around the terminal in recent days including tampering with locks, the disappearance of hand held radios and uniforms, and a significant amount of anti-V2010 literature being found in multiple locations all around the terminal and on board ferries travelling out of Horseshoe Bay.
 - Primary Teams: Integrated-Intel, Military-Intel, Police, Security
 - Questions: Would the Police of Jurisdiction (POJ) reports about these unusual marine facility occurrences to the JIG, MSOC, or OMOC? Would they be received directly by security partners like TC Security or VFPA?
- 1.5 CSIS informs the JIG that a regional source reports CARPE DIEM intends to carry out disruption on a cruise ship in Vancouver Harbour. Possible activities:

Signs, banners, spray paint, cut lines, etc. This ties into a recent open source intelligence report stating CARPE DIEM intends to target and disrupt marine transportation in Vancouver harbour.

- Primary Teams: Integrated-Intel, Military-Intel, Police
- Questions: Would intelligence received by the JIG related to a potential criminal activist targeting and disruption of marine transportation in Vancouver harbour be passed to the OMOC and MSOC for application to the marine domain awareness and marine surveillance operations? Would tactical marine surveillance be enhanced and focused as a result of this information?

1.6 Police informer in Bremerton, Washington advises authorities that several tons of high-grade BC marijuana is due to arrive in the next five days or so. The “importers” are hoping to use the Olympics as a distraction. The “weed” is likely to be loaded onto a 38 foot Meridian cruiser somewhere near Quadra Island. Given the value of the shipment, the crew will be heavily armed.

- Primary Teams: Cross-Border, Integrated-Intel, Military-Intel
- Questions: Would this information be received by the MSOC and OMOC for application to marine domain awareness and marine surveillance operations?

1.7 Shortly after departing a refinery east of 2nd narrows, a barge containing marine diesel en route to refill the Chevron fuel dock in Coal Harbour is approached by two unknown vessels which in a very quick fashion come alongside the barge and drop off 4 individuals before quickly proceeding out of the port at speed. This activity is out of view of venue and AV security in Burrard Inlet.

- Primary Teams: Safety, Police, Security, Navy
- Questions: Would the OMOC be tracking the movement of dangerous goods in Vancouver harbour? Would marine surveillance increase as a result of this dangerous goods movement in the harbour? Is the baseline inner surveillance plan comprehensive enough to detect this activity outside of venue and AV vessel security assets?

1.8 ECOMM receives an anonymous 911 call that an underwater bomb has been planted on the hull of a cruise ship in harbour.

- Primary Teams: Police, Navy, Integrated-Intel, Military-Intel, Security
- Questions: Would this impact OMOC diving operations? Would a request for OMOC divers occur to investigate an underwater security threat in the urban domain?

1.9 In rough seas and heavy snow, a CP rail barge en route to Campbell River strikes a fishing vessel in Strait of Georgia, seventy-five miles out of Nanaimo harbour. A railway car carrying sulphuric acid for a local mining company’s smelting operations is severely damaged, leaking on to the vessel and into surrounding

- Primary Teams: Safety, Navy
- Questions: Would security assets be requested to assist in restricting access to the area affected by the spill and to assist in the search for the missing people from the fishing vessel? If requested would security assets involved in surveillance operations be retasked to support this effort by the OMOC? At what level does the decision to retask these vessels lie?

ISSMG Marine III – Turn 2 – First Half of Second Week of Games

For Info: RCMP intercepted and boarded barge with marine diesel and determined that people embarked were all crew.

The 911 call to ECOMM regarding underwater bomb was determined to be a hoax.

- 2.1 The MV CARE BEAR, an empty general cargo vessel bound for Vancouver fails to check in with Victoria traffic at Race Rocks or subsequently embark its pilot at buoy VH. The vessel is unresponsive to communication attempts made by traffic.

(To be passed in envelope to CBSA only: CBSA has information that there is a person of interest on board MV CARE BEAR known to have assisted CARPE DIEM in the past. CBSA to act as required with this information).

- Primary Teams: Integrated-Intel, Military-Intel, Navy, Security, Cross-Border
 - Questions: Would a vessel failing to report into Marine Communication Traffic System (MCTS) be reported to the MSOC and OMOC? Who would the Pilotage Authority report to in the event a vessel failed to embark a pilot? Would the information make it to the MSOC or OMOC for marine domain awareness and application to surveillance operations? If CBSA had information on a person of interest on board a vessel, would it be received by the MSOC prior to the event occurring? Will information related to persons of interest be shared with the JIG and MSOC when on board vessels bound for Vancouver for incorporation into the overall marine domain awareness and game intelligence picture? Would information of this occurrence initiate action in the OMOC wrt interdicting the vessel prior to arriving in Vancouver, given the enhanced presence in the Strait of Georgia? Given the cross-border area involved in this event, would USCG D13 be involved in the integrated resolution to this event?
- 2.2 At first light one day, two kayakers are spotted moving out from under Canada Place. Neither has any identification one is wearing a wetsuit, and both have only a halting command of English. They are, therefore, unable to provide a clear explanation for their transit into the Exclusion Zone. The kayakers are arrested by venue security forces.

- Primary Teams: Integrated-Intel, Military-Intel, Police, Navy, Security
 - Questions: Would this event impact/change venue diving operations? How would the kayakers be turned over to Police of Jurisdiction (POJ) for processing? Would details of the incident be passed to the JIG or MSOC? Given the venue marine security assets would be involved in interdicting and detaining the kayakers in the exclusion zone, would MCC assets surge to backfill them until the RCMP assets resolved the event?
- 2.3 The owner of a vessel normally berthed at Oak Bay marina calls the Oak Bay Police department to report that his vessel is missing, and that he last saw it two days prior. The vessel is a white 37'bayliner named "FLANDERS".
- Primary Teams: Integrated-Intel, Military-Intel, Police
 - Questions: Would information received by Police of Jurisdiction (POJ) of an obvious marine affiliation be passed to the MSOC for greater appreciation and application to overall domain awareness, even if it would not necessarily occur in an OPS NORMAL situation? If information of an obvious marine affiliation reached the JIG, would it be passed to the MSOC and OMOC?
- 2.4 JIG receives information from CSIS that a regional source reports CARPE DIEM has acquired specific resources to carry out a waterborne criminal protest at a cruise ship. Resources believed to be in their possession include small waterborne transport, diving gear, ascending gear, and other means to conduct criminal protest and mischief at a cruise ship. Some CARPE DIEM members believed to have marine experience and basic understanding of cruise ships.
- Primary Teams: Integrated-Intel, Military-Intel, Police, Security
 - Questions: Would intelligence received by the JIG related to someone having the intent, means and capability to carry out a criminal activist targeting and disruption of a specific type of marine transportation in Vancouver harbour be passed to the OMOC and MSOC for application to marine domain awareness and marine surveillance operations? Would OMOC led tactical marine surveillance and security posture be enhanced and focused as a result of this information anywhere? Would OMOC forces be requested by Police of Jurisdiction (POJ) or other security partners to assist in waterborne security of the specified targets in the marine urban domain?
- 2.5 During the afternoon peak ferry hour early in the week, the group of vessels anchored at Port Graves transits to Horseshoe Bay Ferry Terminal and converge with several other vessels out of local marinas to conduct a criminal protest and blockade of the ferry terminal. Masked CARPE DIEM members possessing signage containing anti-2010 messages are vandalizing ferries and jetties at the terminal. They are using rubber catapults to launch paint balloons at facility personnel and passengers. Some Carpe protestors are entering the waters in wet suits, affixing themselves to the ferry hulls, and swimming around the ferries with bright coloured hats. Highly organized, their vessels are rigged with obstructions to prevent easy embarkation by police. The Sea to Sky highway quickly becomes congested with vehicles unable to embark the ferries.
- Primary Teams: Police, Navy, Security, Safety

- Questions: Would there be a request for OMOC marine security assets to assist in the resolution of this event (boats, police, divers)? Would the CCG be able to assist in the extraction of protestors from the water without police support?
- 2.6 A charter vessel returning from a dinner cruise, proceeds into the False Creek east basin Controlled Access Zone, escorted by and with the permission of marine security forces at the Athletes Village venue. Heeding the direction of the security forces, the charter travels along the northernmost extent of the Basin. Having proceeded too close to shore, the vessel goes aground on a shallow patch west of the Plaza of Nations. Although the vessel is immediately able to manoeuvre off the shallow patch, a large oil slick begins to form.
- Primary Teams: Police, Safety
 - Questions: (Note to facilitator: skim this inject quickly) Would OMOC marine security assets conduct initial containment of a spill that occurs in a security zone, given exclusion of any other vessels? Will vessels associated with the clean up of the spill and the removal of the vessel involved be permitted to enter the security zone to conduct clean up operations? Would security presence increase as a result of any additional access to the zone and potential requirement to support the clean up and removal effort?
- 2.7 A small non-reporting vessel heading north to Boundry Pass and the Strait of Georgia from Friday Hbr WA, fails to respond to hails from the USCG and continues north into CAN waters.
- Primary Teams: Cross-Border, Navy
 - Questions: Would information about a vessel heading into CAN waters that is unresponsive to hails by the USCG be received by the Border Integrity Patrol Ops Centre (BIP OC), OMOC, or MSOC? Would information received in any of those places be passed to the JIG for the greater intelligence picture?

ISSMG Marine III – Turn 3 – Later half of the Second Week of Games

- 3.1 A coastal watch source from Campbell River reports two suspicious looking converted trawlers transiting southbound in Seymour Narrows during the most recent slack water.
- Primary Teams: Integrated-Intel, Military-Intel
 - Questions: Would coastal watch information received at the MSOC be passed to the OMOC for application to marine surveillance operations in the patrol area of interest? Would information from the coastal watch be passed to the JIG?
- 3.2 Accompanied by a large pleasure craft, several small boats leave a marina in West Vancouver and proceed toward the Controlled Access Zone in front of the Media Centre. A message broadcast from the larger vessel attacks Canadian involvement in “US Wars.” The small vessels unfurl a large banner calling for an end to the wars in Afghanistan and Iraq. The protest remains peaceful and outside the CAZ.

- Primary Teams: Safety, Police, Navy, Security
 - Questions: Is there anything that would preclude the permitted conduct of a peaceful marine protest in vicinity of but outside of a venue marine security zone? If so, is this the sole responsibility of Police of Jurisdiction (POJ) marine enforcement assets? If so, would the Police of Jurisdiction (POJ) have enough marine assets to respond to the marine protest or would they have to request the assistance of RCMP marine assets to assist in the resolution of the event?
- 3.3 An MCC vessel, while observing a 45' pleasure craft out of Nanaimo transiting the Strait of Georgia eastbound towards Vancouver, notices that the vessel has its name painted over. The vessel does not respond to a courtesy hail. The vessel is reported to the RCMP member on board the HMCS ALGONQUIN, currently on station in the northern Strait of Georgia
- Primary Teams: Navy, Police, Integrated-Intel, Military-Intel, Security
 - Questions: What is the integrated plan for investigating a suspect vessel bound for Vancouver that is identified thru marine surveillance operation? How is the MSOC involved?
- 3.4 A large dinner charter out in False Creek in vicinity of David Lamb park experiences an engine room problem the results in an explosion and subsequent fire on board. The 90+ people on the vessel are forced to immediately abandon it, crowding the upper decks of the vessel and proceeding directly into the waters of False Creek. This being a Legion dinner cruise, many of the people involved are elderly and in less than peak physical condition.
- Primary Teams: Police, Navy, Safety
 - Questions: Who would lead the response to a marine SAR outside but close to a marine venue security zone? Would security assets be requested to assist in this effort? Would security asset assistance result in a surge of MCC resources to the accident site allowing venue security assets to revert to their primary role?
- 3.5 The JIG receives information from CSIS that a regional source has indicated that the two CARPE DIEM intended criminal activist cruise ship targets are berthed at Ballantyne, and at Rogers Sugar. CARPE DIEM's intention is to conduct criminal protest against the cruise ships to draw attention to their cause. The waterborne criminal assets associated with this planned event are thought to be coming from somewhere in the Gulf Islands.
- Primary Teams: Integrated-Intel, Military-Intel, Police, Navy, Security
 - Questions: Would intelligence received by the JIG related to the disruption of specific marine transportation targets in Vancouver harbour, both in the urban and Olympic domains, be passed to the OMOC and MSOC for application to marine domain awareness and marine surveillance operations? Would Police of Jurisdiction (POJ) have enough resources to enhance waterborne security postures around a target in the urban domain while OMOC assets are focused on a target in the Olympic domain? If not, would a request to assist POJ go to the RCMP? Given the information indicates US origin, would this information be passed to USCG D13?

- 3.6 North Vancouver RCMP receives a call from a credible local source that works in a north shore marina. He indicates he had overheard that someone is planning to conduct a hostage taking at the Athlete's Village, and that they planned to execute the incursion for this hostage taking via water and that one of the vessels involved would be from the US and named FOX II, but that the vessel has been in CAN waters for days.
- Primary Teams: Integrated-Intel, Military-Intel, Police
 - Questions: Would information received by Police of Jurisdiction (POJ) about an inshore marine based threat to national security be passed to the JIG, OMOC and/or MSOC for inclusion in marine domain awareness, marine surveillance operations, and enhanced marine venue security postures?
- 3.7 RCMP IBET observe a large US flagged pleasure craft rounding East Point. Most recent routing of the vessel is unknown, as it is non-reporting. The name on the vessel is FOX II.
- Primary Teams: Cross-Border
 - Questions: If information is known about a non-reporting vessel within the marine surveillance piece, will it be cross-referenced with the overall marine surveillance piece and with marine domain awareness at the MSOC, OMOC, Border Integrity Patrol Ops Centre (BIP OC), and/or USCG D13?
- 3.8 Four days before the games are slated to end, an earthquake (4.5 on the Richter Scale) with its epicentre in the Strait of Georgia strikes the lower mainland of British Columbia at 9:46 a.m. The quake lasts slightly less than one minute, but causes significant and visible structural damage to a number of buildings in the downtown Vancouver area, including, HMCS Discovery, where OMOC loses IT, power and telephone service and must relocate. In addition, structural damage is suspected on the second narrows bridge, causing it to be shut down pending a thorough inspection.
- Primary Teams: Police, Navy, Security, Safety (focus on marine part)
 - Questions: Expect iterative discussion on immediate OMOC relocation required to perform interim critical OMOC directed and coordinated marine security operations, as well a follow-up permanent relocation for full-scale OMOC activities. Would OMOC resources be requested to cordon off marine areas to prevent potential danger to mariners related to critical infrastructure failure over water?

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List of Acronyms

APL	Applied Physics Laboratory
CBSA	Canada Border Services Agency
CCG	Canadian Coast Guard
CF	Canadian Forces
CORA	Centre for Operational Research and Analysis
CSIS	Canadian Security Intelligence Service
DND	Department of National Defence
DRDC	Defence Research and Development Canada
DSTO	Defence Science and Technology Organisation
DTAG	Disruptive Technology Assessment Game
FMSTWG	Federal Marine/Surface Technical Working Group
FPMG	Force Protection Matrix Game
HMCS	Her Majesty's Canadian Ship
ISSMG	Integrated Safety/Security Matrix Game
ISU	Integrated Security Unit
IT	Information Technology
JHU	Johns Hopkins University
LAN	Local Area Network
MCC	Maritime Component Commander
MECSS	Major Events Coordinated Security Solutions
MOAC	Maritime Operational Analysis Centre

MORS	Military Operations Research Society
MSOC	Maritime Security Operations Centre
OMOC	Olympic Marine Operations Centre
OR	Operational Research
RCMP	Royal Canadian Mounted Police
SME	Subject Matter Expert
SOP	Standard Operating Procedure
TC	Transport Canada
TNO	Netherlands Organisation for Applied Scientific Research
TTCP	The Technical Cooperation Program
TTX	Table-Top Exercise
V2010	Vancouver 2010 Winter Olympics and Paralympics
VFPA	Vancouver Fraser Port Authority
VPD	Vancouver Police Department

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The Matrix Game methodology is a structured Table-Top Exercise (TTX) method. It has been employed previously by the Defence Science and Technology Organisation (DSTO) in Australia for interagency harbour security and force protection exercises, and was seen to be particularly effective for handling problems in complex environments with diverse stakeholders. For this reason, it was decided to transfer the methodology to Canada for use in marine security planning for the Vancouver 2010 Winter Olympics and Paralympics (V2010).

Overall, the experience of organizing and running Matrix Games to support Olympic marine security planners proved to be very effective at helping the marine security agencies organize their planning, and uncover gaps and issues in their plans, and to gain mutual understanding of their respective capabilities and mandates. Over the course of the three Matrix Games, many refinements and adjustments were made to the methodology to adapt it to Canadian needs, to address specific planning goals, to adjust to evolving participation levels and complexity, to improve data capture and reporting, incorporate lessons learned, and improve overall effectiveness and efficiency.

The aim of this paper is to provide an overview of the Matrix Game methodology, including refinements, to discuss its strengths and weaknesses, and to provide recommendations for its effective use.

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Wargaming, Exercise, Marine Security, Matrix Game, V2010, MECSS.

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