COTS View

Case Study: Project Management Solutions Streamline Readiness Assessment for the Canadian Army

By using civilian project management software, the Canadian Army has found a way to hierarchically gauge its training needs while preparing mission-readiness profiles and thus shaving weeks off waiting for the good-to-go thumbs up sign.

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By now, COTS has pervaded most of the weapons, communications and military vehicles in the military and aerospace industries. Yet much of the logistics, material management and military personnel readiness infrastructure remains mired in inefficient human-intensive management systems that haven't changed in years. Sure, modern tools like PCs with network connectivity and PDA synchronization capabilities have improved some communications and efficiency, but these haven't necessarily changed the way decisions are made in planning for missions. But in at least one instance of change, the Canadian Army is applying consumer-based COTS project management software to aid mission readiness by assessing available personnel capabilities and training requirements.

Take Training, for Example

The ability to make careful projections and accurate assessments of military capability and readiness has become more important than ever in an era of shrinking budgets and new types of missions such as Operations Other Than War (OOW). To a large degree, preparing a military force to undertake a particular mission comes down to training. While businesses and other organizations can typically hire people with required training, a military organization must necessarily train its own people from recruitment through all levels of competence.

Determining the time and resource requirements of a real-world mission, such as sending a force to participate in a peacekeeping mission in the Balkans, is an enormously complicated task. The starting point is determining the number of people with each particular skill that is required. These people may or may not be immediately available. If they're not, they'll have to be trained for their roles.

Even if they're available, considering today's shrinking personnel levels, it's likely that they're already performing another important task and will have to be replaced. The result is an

Typical Training Assessment Approach	Drawback to the Approach
Review multiple data sources	• Besides the time required to search multiple sources, the data may be in multiple formats, requiring human assessment to transpose and interpret information. • The accuracy and validity of the data can't be audited, and the single point of failure remains the human.
Individual staff personnel construct spreadsheets showing available assets, talent pool and needs requirements	• This is a manual approach that consumes several weeks' worth of effort aggregating data (which may reside in computers, on paper or with other personnel). • Once aggregated, the data still remains disconnected in separate spreadsheets. This doesn't allow changing an entire mission profile for "what-if" scenarios. • No wide-area or upper echelon access to data is possible since it resides locally on PCs in spreadsheets.

Table 1

Using disjointed spreadsheets to assess mission-training requirements has a number of drawbacks that just can't be solved with "improved" spreadsheets.

Level	Primary BTS	Supporting BTS	Training Time/Type	Range/Training Area/Simulation	Vehicle Kilometers or Hours of Operation	Ammunition and Targets	Other Resources	Remarks and Assumptions
Sect/Tp/ Bty/Regt CP	N1002D– Established & Operate a CP	G3001 – Maintain Ops Sec	CPX: 1 day FTX (Dry): 2 day	Local Trg Area – 1 day, Dry Deployment Area – 2 days	50 km (CP parties)		Higher & Lower control	5 iterations
Bty/Regt	N1401– Employ AD Assets		CAX/CMX: 3 days	Local Trg Area – 1 day				3 iterations
Sect/Tp/ Bty	N1402 – Deploy AD Assets		CPX/TEWT: 1 day FTX: 2 day	Local Trg Area – 1 day, Dry Deployment Area – 2 days	130 kms		HICon Bty/Sect/Tp	
Sect/Tp/ Bty/Regt	N1403 – Coord AD Ops		CPX: 2 day	Local Trg Area – 1 day	50 km (CP parties)		ASOC HICon & LOCon	ASCC Ops
Bty/Regt	N1404 – Coord Airspace		CPX: 1 day	Local Trg Area – 1 day	15 km (CP parties)			
Sect/Tp/ Bty/Regt	N1405 – Apply Airspace Control Plan/Orders		CPX: 1 day (Sect/Tp/Bty/ex), FTX (Dry): 3 days	Local Trg Area – 1 day, Dry Deployment Area – 3 days	15 km (CP parties) 130 km (bty)		Air Support (Friendly & Enemy)	
Det	N2401 – Engage Tgts (Javelin)	N1402 – Deploy AD Assets N1405 – Apply Airspace Control Plan/Orders	FTX (Dry): 3 days FTX (Live): 3 days	Simulator – 33 days, Dry Deployment Area – 3 days Live Deployment Area - 3 days	325 km (bty)	??Javelin Missiles Targets (Drones, etc)	Defensive stores Air Su Hiconpport (friendly and enemy)	Note: All operators must be current prior to the ex)

Figure 1

This is an example of a spreadsheet showing training needs for air defense artillery assets with the Canadian Army. (For this particular mission, there are four more pages of listings not shown.) Note that each Level may also have its own spreadsheet as the specific training requirements are drilled down eventually to the individual personnel level.

enormous amount of training to accomplish the mission and regenerate the human resources that are needed to handle ongoing tasks. Moreover, it can be an even more complicated task to estimate the long-term impact of multiple missions on the readiness of the armed force to perform its other roles.

Today most military planners don't have the direct support of an information system (COTS or otherwise) for readiness evaluation, so they use an ad hoc approach to address these challenges. Typically, they start by using spreadsheets to compile the list of resources and skills that are required to accomplish a particular mission. Then they determine the skills that are already available and those that will have to be generated through training before the mission can be carried out. Finally, they attempt to consider the impact of the mission on the organization as a whole in order to determine which skills will have to be replaced to fulfill the force's other missions.

This approach is deficient for a number of significant reasons as shown in Table 1. It consumes a great deal of staff time in collecting and aggregating data to make the assessment. The data usually exist already in a variety of diverse and unconnected databases, and, therefore, they can't be exploited directly. The net result is merely a "shopping list" without a good estimate of the time required to actually fulfill it. The disconnected nature of the spreadsheets makes it very difficult to determine the collective impact of multiple missions on the whole force. The process can't be audited easily.

And, finally, this approach is deficient because the lack of consistency among the spreadsheets created by the various planners introduces a significant risk of errors. For example, imagine that three different planners are using three different complex spreadsheets to model the requirements of different aspects of a mission. And suppose that due to insufficient communications, more than one planner has included several aspects of the mission (such as the availability of dual-axle four-wheel drive vehicles to move supplies) while others have been overlooked entirely (such as the availability of number 2 diesel fuel for those vehicles). The net result of the spreadsheet approach leaves decision makers vulnerable to making unsupportable commitments of resources and infeasible readiness objectives.

Training for a Typical Mission

Three distinct types of training are normally required to prepare a force to undertake a particular mission and to sustain its effectiveness in theater. First, soldiers must be trained as individuals in basic skills required for participating in a team. Second, groups of soldiers need to be trained collectively as part of increasingly larger formations in projecting collective combat power. Finally, continuation training is required at both the group and individual levels in order to maintain the acquired skills.

As this list shows, not only is the training for each mission a function of the requirements of the mission itself, but the training for each asset is also specific to its individual role in the mis-

Level	Primary Battle Tank	Supporting Battle Tanks	Training Time/ Type	Range/ Training Area/ Simulation	Vehicle Kilometers or Hours of Operation	Ammunition and Targets	Other Resources	Remarks and Assumptions
All Pl/Coy	L1002 D/E– Establish and Operate a CP	3001 – Maintain Operational Security L4309 C/D – Occupy a New Location L431 6DF – Conduct Road Movement L4392B – Recce of a New Location Advance Party Activities	Theory – 1 day TEWT – 1/2 days CAX – 1 day FTX – 2 days	Garrison – Classroom x 1 day Simulation – JANUS/CST x 1 day Field – Local trg area, CATB x 2 1/2 days	30-40	Blanks/Pyrotechnics 0059,5.56 mm B C77 TrgPack x 30 per C7 0063, 5.56 mm Blk Clp C79A1 x 100 per C9 0130, 7.62 mm Blk C24 Lkd x 110 per C6 0080, 9 mm Blk C30 x 10 per pistol 1370, Flare Surface Trip M 49A1 x 10 1380, Thunderflash C1A1 x 20 1390, Sim Proj GB C1A1 x 20 1390, Signal Illum Flare (Comet) x 20	MSE Hire - FOA – 2 days Rations – 2 days POL – Targets – Nil Sanitary – Misc. –	This task can be pre-formed independently of other tasks however is best employed & evaluated as part of a field ex. The success of this task also reflects the standard of performance achieved in BTS L4309 B and BTS L4391 B
Coy	D1003 D – Provide the Alternate Bin HQ CP	L100 2 D/F – Establish and Operate a CP 1902 F – Site the Brigade Support Area 1903 F – Direct Rear Area Operations L200 1 C/D – Employ Indirect Fire Support 3001 – Maintain Operational Security	Theory – 1 day TEWT – Nil CAX – 1 day FTX – 2 days	Garrison – Classroom x 1 day Simulation – JANUS/CST x 1 day Field – Local trg area, CATB x 2 1/2 days	Nil	Blanks/Pyrotechnics 0059,5.56 mm B C77 TrgPack x 30 per C7 0063, 5.56 mm Blk Clp C79A1 x 100 per C9 0130, 7.62 mm Blk C24 Lkd x 110 per C6 0080, 9 mm Blk C30 x 10 per pistol 1370, Flare Surface Trip M 49A1 x 10 1380, Thunderflash C1A1 x 20 1390, Sim Proj GB C1A1 x 20 1390, Signal Illum Flare (Comet) x 20	MSE Hire - FOA – 2 days Rations – 2 days POL – Targets – Nil Sanitary – Misc. –	This task can be pre-formed independently of other tasks however is best employed & evaluated as part of a field ex. This task may be assigned to Maint or Admin Company for the purpose of familiarization.
Det	1901 B – Setup the Logistics Operations Center	3001 – Maintain Operational Security L430 9 C/D –Occupy a New Location L4 392B – Perform Advance Party Activities	Theory – 1/2 day TEWT – Nil CAX – Nil FTX - 1 day	Garrison – Classroom x 1/2 day Field – Local trg area, CATB x 1 days	10	Blanks/Pyrotechnics	MSE Hire - FOA – 1 day Rations – 1 day POL – Targets – Sanitary – Misc. –	This task is closely linked to BTS L4309 C/D and BTS L4392 B This task can be performed independently of other tasks however is best employed & evaluated as part of a field ex.
Bn	1902 E – Site the Brigade Support Area	1001 – Conduct Battle Procedure 1903 F – Direct Rear Area Operations L2001 C/D – Employ Indirect Fire Support 3001 – Maintain Operational Security L4101 C/D – Defend	Theory – 1 day TEWT – 1 day CAX – Nil FTX - 1 day	Garrison – Classroom x 1 day Field – Local trg area, CATB x 2 days	??	Blanks/Pyrotechnics	MSE Hire - FOA – 1 day Rations – 1 day POL – Sanitary – Misc. –	This task can be performed independently of other tasks however is best employed & evaluated as part of a field ex. All unit off should take part. Theory should include a map ex.

Figure 2

The training required for the artillery assets shown in Figure 1 may be part of a much larger service battalion as shown in this spreadsheet. In this case, there are 19 more pages not shown here. Positioning Figure 1 as one of many subsets and permutations of Figure 2 gives some idea of the complexity involved in assessing training requirements for an entire military mission. The need for COTS project management software is plainly evident.

sion. For example, a UN peacekeeping mission might require infantry soldiers to act as visible policemen to maintain calm within civilian communities, while a mechanized tank corps could be responsible for shoring up and providing force coverage of an airport that must remain open during the transfer of emergency supplies.

Within this example, both types of assets—soldiers and tankers—must work together to collectively achieve the mission's success. But, individually, each of these must know their own mission and be trained accordingly. In Canada, the Army's basic operations and mission profiles are governed by the Battle Task Standards. But this document doesn't provide sufficient detail down to the individual personnel level, nor can it dictate how assets are to perform in mission-specific scenarios.

In this UN peacekeeping example, what rules are the infantry soldiers to apply when on street patrol? That is, which persons are considered "friendlies," and which are considered hazardous? What is the rule of conduct for searching private dwellings for hazardous individuals? And, to maintain respect for the affected civilians who are being protected, what are the local customs concerning conversation with local officials?

Using this same peacekeeping example, consider a platoon conducting forward reconnaissance outside of a city into areas that might contain pockets of hazardous individuals. What are to be the clues pointing to the unfriendlies? How are people to be questioned in search of information and, in the event of conflict, what are the rules of engagement in order to stay within the boundaries of acceptable conduct in-country?

All these questions point to training requirements. Although the soldiers and tank commanders certainly are trained for their individual roles and what their country's expectations are of them as members of the military, individual missions require fine-tuning that's mission-specific. In this example, OOW peacekeeping missions by their very nature may be quite politically sensitive, and it's of the utmost importance for assets to operate within the guidelines of the individual mission.

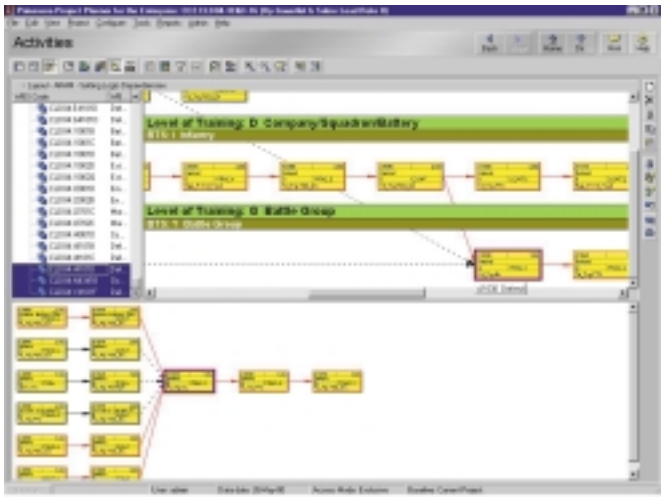

Figure 3

Contrasted with the spreadsheet approach in Figures 1 and 2, project management software from Primavera offers decision makers the ability to view training activities according to the type and level of training so that the timing and feasibility of readiness objectives can be assessed quickly. Here, the training required to defend a position for various army assets is shown.

Figure 4

Analyst decision makers can view resource allocation in a hierarchical roll-up over the planning horizon.

The only way to ensure an individual mission's success is to train for it prior to deployment and bring to bear the appropriate resources. Keep in mind that appropriate resources might include language translators or soldiers with specific knowledge of local geography; every situation's different.

The challenge for the mission planner then becomes: With the assets at my disposal, which are the best to deploy to the mission? Where are those assets currently? What mission-specific training will be required in order to achieve success?

Canadian Army Training Wish List

To bring the problem of training and today's antiquated spreadsheet approach into sharp focus, in 2000 Canada published the "Brahimi Report" whose conclusions are equally applicable to the U.S. and other NATO allies. In addition, the Canadian Minister of National Defense has recently stressed the importance of a timely response in order to better contain the escalation of hostilities in a peacekeeping or peace-enforcement situation. These both pointed toward the need for mission-specific responses in a timely fashion. Clearly, the old way of training for missions would have to go.

Applied to the Army, in order to realize a paradigm change in assessing training logistics there are three primary requirements:

- Quickly and accurately identify all the actual training activities required for any given scenario together with the actual resources (personnel, equipment and consumables) needed.
- Identify where in the Army the required resources are available and highlight any shortfalls so that either an acceptable work-around can be devised or the mission objectives that are impossible to achieve can be explicitly identified and the operations plan amended accordingly.
- Schedule all the required preparations in order to achieve deployment readiness in the shortest possible time.

Dr. Philip O'Neill, an operational research scientist at the Canadian Department of National Defense, proposed that the task of assessing readiness could be performed more accurately and quickly through the use of a comprehensive project management approach. Fortunately, COTS software was available for enterprise project management that was capable of tracking multiple hierarchical projects with multiple hierarchical resources.

The basic ideas are that military missions are typically made up of major tasks each consisting of many subtasks that can be arranged in a tree diagram in a hierarchical fashion. Tracking the resources required to complete the mission hierarchically saves a considerable amount of time because the planner can focus on the level of the hierarchy that relates to the current task without having to deal with all the associated details. The spreadsheet excerpts shown in Figures 1 and 2 give an idea of the massive amount of interrelated training data that must be tracked.

"While I was writing my report, I took a close look at the commercial software that was available and came to the conclusion that it was rapidly becoming very well suited to the task of military readiness assessment," O'Neill says. "It was clear that project management software could provide a much higher level of capability for estimating the time and overall impact of undertaking and sustaining military operations." Using such software enables the Army to leverage the innovation of industries with similar needs and established solutions while avoiding the high cost and risk of developing custom software for the military.

Subsequently, Major Nick Martyn of the Canadian Army became involved in the project and was able to advise O'Neill on detailed functional requirements for the conceptual readiness evaluation system. The two men began looking for software that

would provide the horsepower needed to eventually manage resources on an enterprise level for an organization the size of the 60,000-person Canadian forces or larger.

Some very specific requirements for project management software were created. Besides the ability to hierarchically track, allocate and display resources and their characteristics, the software needed to tie together reams of data already contained in existing Army databases and present them in useful graphical user interface (GUI) form. Moreover, the data should be presented at any level of depth required, from individual assets all the way up to the mission's top level.

Once they'd implemented a prototype and determined that it overcame the limitations they'd experienced previously, Martyn and O'Neill began to focus on training issues, which are at the heart of the resource allocation problem. With the help of the project management information systems integrator of The Project Management Centre, they developed a sophisticated coding structure that organized the skills required to perform virtually any type of mission using activity codes, custom data items and project codes.

The coding scheme makes it possible to roll up reporting through each hierarchical level of the structure. This makes it possible to determine instantly organization-wide resource availability and demand (Figure 3). Planners can quickly obtain key high-level performance parameters, identify areas of concern and immediately drill down to examine the details of the situation.

The commander himself can drill through the model to determine exactly what the readiness state is of any particular unit in a matter of minutes. In the past with spreadsheets, this type of evaluation would require that an officer be assigned to prepare a special report, which could often take weeks.

O'Neill and Martyn also used the project management system to create a library of planning templates containing the information and instructions that are frequently used in planning activities, such as doctrinal statements, procedures and manuals. The project software provides a framework under which these documents can regularly be updated and maintained while providing planners with the ability to reference them for a new plan in a few seconds.

The availability of reference activities, tasks and documents in an easy-to-use format facilitates traditional planning activities in a fraction of the time previously required. At the same time, since everyone is working from a common framework and information base, the accuracy and consistency of the resulting operational documents are greatly improved. Finally, the fact that each of the documents is maintained within a common structure offers the ability to determine easily the impact of a new mission on the overall readiness of the organization.

Not only does the project management software portray planned events, it can also track actual results in order to monitor the attainment of objectives (Figure 4). Ultimately, these tracking data can be used for performance measurement as well as for recording lessons learned. Planning templates can be annotated and amended with lessons learned in order to avoid re-learning them.

Actual COTS Solution

O'Neill began working to implement a project management approach using small-scale examples. After first trying Symantec's Timeline software, he ultimately selected software from Primavera Systems as the most potentially useful project management software to meet the Army's needs.

The Primavera Enterprise software chosen offers the ability to track the entire resource base of a large organization within a single database. "Primavera Enterprise supports us in developing training plans for individual missions within a hierarchical framework through which we can view the impact on the entire organization of each iteration of our plan," O'Neill says. "It electronically gathers diverse data from existing databases to be assimilated into a common operating picture that provides complete situational awareness of readiness and sustainability."

For the first time, the Army has a system that provides an enterprise-wide view of their resources and commitments. Says the Army's Martyn: "This business is by its very nature reactive to large-scale demands on tight timelines, and we can now understand the effect on the enterprise of those demands. The common framework and standardized planning tools drastically reduced the amount of time required to generate training plans." After demonstrating the proof of concept, the Army found themselves in a situation where senior officers recognized that they had a solution to a problem that has been taxing them for a long time.

As a result, the Army's recommending an implementation plan that will provide, in its first year, vertical integration in one division and, in the second year, a rollout to the entire Canadian Army involving 5,000 users of the software. Beyond that, the hope is that the Canadian Navy and Air Force will soon adopt the system. Clearly, the tools and disciplines of project management are being seen to support the immediate and future needs of military planning and readiness assessment.

Not only does the project management software portray planned events, but it can also track actual results in order to monitor the attainment of objectives (Figure 4). Ultimately, these tracking data can be used for performance measurement as well as for recording lessons learned. Planning templates can be annotated and amended with lessons learned in order to avoid re-learning them. The Primavera Enterprise database contains a rich source of information that can be exploited for risk assessment and risk management by the system's analytical tools. ■

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