CMMI Level 5 and the Team Software Process

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In July 2006, the 309th Software Maintenance Group (309th SMXG) at Hill Air Force Base, Utah was appraised at a Capability Maturity Model Integration (CMMI[SM]) Level 5. One focus project had been using the Team Software Process[SM] (TSP)[SM] since 2001. TSP is generally considered a Level 5 process; however, during the preparation for the assessment, it became obvious to the team that even the stringent process and data analysis requirements of the TSP did not completely address CMMI requirements for several process areas (PAs). The TSP team successfully addressed these issues by adapting their process scripts, measures, and forms in ways that may be applicable to other TSP teams.

In July 2006, the 309th SMXG was appraised at a CMMI Level 5. One of the 309th's focus projects, the Ground Theater Air Control System (GTACS) project, had been using the TSP since 2001. The team had achieved a four-fold increase in productivity during that time, had released zero defects since the TSP was adopted, and had been internally assessed at a high maturity by the group's quality assurance team. GTACS team members felt confident they could meet the rigors of a CMMI assessment and achieve their group's goal of Level 5.

Watts Humphrey, who is widely acknowledged as the founder of the Capability Maturity Model® (CMM®) approach to improvement and who later created the Personal Software Process (PSP)[SM] and TSP, has noted that one of the intents of PSP and TSP is to be an operational process enactment of CMM Level 5 processes at the personal and project levels respectively [1]. CMM and later the CMMI were always meant to provide a description of the contents of a mature process, leaving the implementer with the task of definition and enactment of these mature processes. Thus, CMM and CMMI are descriptive not prescriptive models. The TSP goal of being an operational Level 5 process implies that a team practicing TSP *out-of-the-box* should be very close to being Level 5.

The 309th is a large organization of nearly 800 employees, both civil service and contactors. The group level is comprised of five squadrons, each with a different focus or product line. 309th management and Software Engineering Process Group (SEPG) sets group policy and defines a group level process and metrics framework. Each squadron applies the group level process to its technical domain. So projects, like GTACS, must ensure their detailed project processes are consistent with their squadron's process and with group-level guidance. The GTACS project is also divided into several sub-teams, all managed as one project. The GTACS software team, which performs most of the GTACS assigned technical efforts, uses TSP to support its work. A separate Configuration Management (CM) team provides CM services. The project's customer, the GTACS Program Office, retains systems engineering responsibility and authority. This diverse organizational structure is important because several of the CMMI issues that need to be addressed are clearly the responsibility of these other entities and were not GTACS TSP team issues other than alignment and coordination.

Assessment Timeline

In order to prepare for the assessment, 309 SMXG conducted a series of Standard CMMI Appraisal Method for Process Improvement (SCAMPI[SM]) assessments which included the GTACS team. There are three kinds of SCAMPI assessments: A, B, and C. The SCAMPI A assessment is the final review during which a CMMI level can be determined. SCAMPI Bs and Cs are less rigorous and are intended to prepare the team for the full SCAMPI A. The 309th SMXG used SCAMPI Bs to ensure compliance to the model and value added to the enterprise. In general the SCAMPI B teams were told to aggressively identify risks to a successful SCAMPI A appraisal. When the SCAMPI B teams identified a process weakness, they assigned a high, medium, or low risk rating based on the seriousness of the noted weakness.

From the perspective of the TSP team there were four types of weaknesses: *non-team*, *process*, *artifact*, and *document*. The *non-team* weaknesses were those that were the responsibility of a team other than the TSP team, such as the group's SEPG or the GTACS CM team. Examples include policy changes or changes to the CM process. *Process* weaknesses indicate that the team had no process in place. An *artifact* weakness meant the assessment team found insufficient artifacts to pass the assessment. A *document* weakness meant the team's process documentation needed to be updated.

The initial SCAMPI B for the GTACS focus project was held about one year before the SCAMPI A final assessment and identified 86 weaknesses. A summary of the counts and types of these weaknesses is found in Table 1. Not all weaknesses were project focused. Some were organizational and some were squadron focused. Of the project-focused risks, many were the responsibility of one of the following: overarching project management (e.g., data manage-

Table 1: *SCAMPI B1 Noted Weaknesses*

Risk Level	Total Risks	Process Risks	Artifact Risks	Document Risks	Non-Team Risks
High	19	1	17	0	1
Medium	67	15	18	6	28
Low*	0	0	0	0	0
Total	86	16	35	6	29

* Low risks were not categorized in the first SCAMPI B

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ment and stakeholder involvement plans) or the CM group. The remaining issues were the responsibility of the TSP team. Most issues were focused within the Decision Analysis and Resolution (DAR) and Causal Analysis and Resolution (CAR) PAs. The specifics of each of these are discussed in the PA section below.

Based on the results of this initial SCAMPI B, the team continued its project work. The major focus was on executing the team's CAR process and addressing the documentation and process framework issues. Significantly, the team did not devote any special resources to the CMMI preparatory effort. After this finding, preparatory work was done by the team and led by the team's process manager (a standard TSP role) as part of normal work duties. About four months into this effort the 309th realized that DAR could not be solely addressed at the organizational level and a new process requirement for DAR implementation was pushed down to the project level. The team's TSP coach developed a draft process script and team training was conducted. No opportunity to execute the DAR process occurred before the second SCAMPI B.

The weaknesses and risks identified by the second SCAMPI B are identified in Table 2. It is important to note that the assessment team for the second SCAMPI B was different than the first and that this team chose to identify areas for improvement in the low-risk areas, whereas the first team did not. These new results gave the GTACS team a different and more thorough understanding of the remaining weaknesses.

Of the weaknesses noted there were three groupings: DAR (seven High Artifact, three Medium Artifact, and one Low Document); Organizational Process Performance (OPP) (13 High Non-Team, one Medium Non-Team, and one Low Non-Team); and Training (one High Artifact, two High Non-Team, 12 Medium Document, one Low Artifact, and one Low Non-Team). The other weaknesses noted were scattered throughout the model. Of these, the most significant for the purposes of this article were the seven Medium Process weaknesses. These reflected the fact that the team had a process gap. In these seven weaknesses there were three process gaps: 1) a lack of traceability matrices in the team's engineering work packages, 2) a missing checklist item in the team's high-level design inspection checklist, and 3) the team's implementation of statistical process control (SPC) to monitor *selected subprocesses*. Of these, only the SPC issue required a major change in the team's practices. It is discussed in detail below. The team's approach to requirements traceability had previously been to include traceability information in the textual requirements, design, and test descriptions and to validate traceability via an inspection checklist item. It was straightforward to modify the engineering work package template to include the traceability tables. The missing item in the team's high-level design inspection checklist was added, although it had not caused the team issues in the past.

Risk Level	Total Risks	Process Risks	Artifact Risks	Document Risks	Non-Team Risks
High	23	0	8	0	15
Medium	38	7	6	17	8
Low	22	0	1	11	10
Total	83	7	15	28	33

Table 2: *SCAMPI B2 Noted Weaknesses*

The Software Engineering Institute (SEI) has already performed a theoretical mapping of TSP to CMMI and determined that DAR is *partially addressed* by the TSP, OPP is *supported*, Quantitative Process Management (QPM) is 90 percent *directly addressed*, and CAR is 60 percent *directly addressed* [2]. As the GTACS team set about to shore up these weaknesses, they determined that these assessments were generally accurate; they also came up with creative ways to update the TSP to completely address all of these PAs.

The PAs

In addition to the weaknesses previously described, there were also minor weaknesses in requirements management, risk management, and two QPM issues. Since the initial preparation for DAR had been only at the group level, there was no DAR process or practice in place for the project. The team's previous process improvement discussions, during their TSP post-mortems, had not produced the artifacts necessary to meet CAR requirements. The TSP post-mortem process and PSP Process Improvement Proposal (PIP) process do not require the quantitative analysis that CAR and its link to QPM does. The team had not formalized its requirements management process and its documented risks management process was not consistent with the TSP risk management process. The QPM risks were labeled as medium risks and related to a lack of thresholds and control limits.

DAR

One of the innovations the team came up with was in their approach to the Level 3 requirement for decision analysis and resolution. Initially, GTACS addressed its DAR requirements by adopting the organization's DAR processes and forms. Organizational DAR training was held for the team. GTACS created a draft operational process in the form of a TSP script. The DAR script was then used by the team to analyze three different types of issues: product design, tool selection, and process. The final DAR process was then updated and included in the team's standard process (see Figure 1, next page).

The SEI's report on TSP and CMMI identified all six DAR-specific practices as partially implemented and identified various launch meetings as points where DAR activities are implemented. We believe this *partially implemented* term underestimates the risk and resulting effort that TSP teams will face to meet DAR CMMI requirements. A better characterization of TSP's implementation of DAR is that TSP is *consistent* with DAR philosophy but is nowhere near sufficient. DAR is, at its heart, a systems engineering sub-process for making and documenting formal decisions. In some ways it is as critical to the systems engineering culture as inspections are to software engineering or personal reviews are to the PSP/TSP approach. CMMI has elevated DAR from a practice to a full-fledged PA and although TSP is consistent with DAR, TSP is insufficient to pass a CMMI assessment. A procedure like that in Figure 1 is required to produce proper and meaningful DAR artifacts.

A TSP team must also be trained in the application of DAR. Based on the background of the team members, this training may involve getting software engineers to think like systems engineers. For the GTACS team, this was surprisingly difficult. While a DAR process, like that detailed in Figure 1, may appear straightforward and obvious, software engineers may question its applicability. For years we have observed good systems engineers following processes like this to make and document their systems designs and design tradeoffs. On the contrary, it has been significantly more difficult to get

DAR Process Script

Purpose	• To guide the team in making formal decisions.
Entry Criteria	Either • A critical measurement exceeds the thresholds defined in the GTACS DAR threshold matrix. • A critical decision needing a formal analysis is identified.
General	• Critical decisions are ones that have potential impact on the project or project team. Issues with multiple alternative approaches and multiple evaluation criteria are particularly well suited for formal analysis.
Tailoring	• This procedure may be used to make and document other decisions.

Step	Activities	Description
1	Planning	- A Point of Contact (POC) is assigned. • The POC may be self-assigned if the POC is responsible for the critical decision. • The team lead assigns the POC otherwise. - The team that will perform the DAR analysis and selection activities (the DAR team) is assigned. - The POC completes the Entry section of the MXDE Decision Analysis and Resolution Coversheet (section I). - A working directory is created to hold the DAR artifacts. - An action item is created in the Project Notebook to track the status of the DAR. - The approval signatures required for this DAR are determined. • For DARs initiated because a critical measurement exceeds the thresholds defined in the GTACS DAR threshold matrix the approval signatures are documented in the Stakeholder Involvement Plan (SIP). • For other DARs the GTACS Technical Program Manager is the approval authority.
2	Identify Stakeholders	- The POC identifies stakeholders for this DAR activity. These include the following: • Those who provide the alternatives, risks, and historical data. • The DAR team. • Those who will implement the decision the DAR results in.
3	Stakeholder Input	- The DAR team obtains input from the stakeholders. • Alternative approaches. There is no limit to the number of alternative approaches identified. • Evaluation Criteria and relative weighting. • Key risks.
4	Evaluation Criteria	- The DAR team determines the evaluation criteria and relative weighting after considering the input from all stakeholders. - The DAR team reviews the evaluation criteria with the stakeholders before finalizing the criteria.
5	Selection Method	- The DAR team determines the ranking and scoring method. • Suggested ranking and scoring methods are found in the DAR Tools document. • The DAR team must agree on a scoring method, the scoring range, and have a common understanding of what the scores represent. - The selected approach is documented on the MXDE Decision Analysis and Resolution Coversheet (section II).
6	Rank Each Approach	- For each alternative, the DAR team must assign a score to each decision criteria, employing the ranking and scoring method previously selected. - The total weighted score for each alternative is determined.
7	Make a Decision	- The DAR team makes a decision and reviews it with the stakeholders making changes if necessary. - The stakeholders review is captured on the MXDE Decision Analysis and Resolution Coversheet (section III). - The final decision is captured on the MXDE Decision Analysis and Resolution Coversheet (section IV).
8	Post-Mortem	- The effort expended on this DAR is captured on the MXDE Decision Analysis and Resolution Coversheet (section IV). - Approval signatures are obtained and recorded on the MXDE Decision Analysis and Resolution Coversheet (section IV). - DAR lessons learned are captured in the DAR notes. - All DAR documents are captured and archived per the GTACS Data Management Plan (DMP). • The completed MXDE Decision Analysis and Resolution Coversheet. • Scoring and analysis worksheets. • CM is notified that the DAR is complete and that the DAR artifacts can be archived to the GTACS data management repository.

Exit Criteria	- The MXDE Decision Analysis and Resolution cover sheet is completely filled out. - The artifacts produced during the DAR activities have been archived in accordance with the GTACS DMP.

Figure 1: *The GTACS Team's DAR Process Script*

purely software engineers to document their design reasoning with the same rigor. It is, however, a basic engineering practice that can be easily learned. Our experience with the GTACS team confirmed this observation that software engineers are unfamiliar with systems engineering techniques for formal decision making and documentation but can be easily trained to use these techniques.

QPM and OPP

One contentious area surrounding CMMI High Maturity appraisals and organizations is the definition and operationalization of Maturity Level 4: Quantitatively Managed. The formative book on CMMI: *Guidelines for Process Integration and Product Improvement* describes Maturity Level 4 as the following [3]:

> **Maturity Level 4: Quantitatively Managed.** At maturity level 4, the organization and projects establish quantitative objectives for quality and process performance and use them as criteria in managing processes. Quantitative objectives are based on the needs of the customer, end users, organization, and process implementers. Quality and process performance is understood in statistical terms and is managed throughout the life of the processes.
>
> For selected subprocesses, detailed measures of process performance are collected and statistically analyzed. Quality and process performance measures are incorporated into the organization's measurement repository to support fact-based decision making. Special causes of process variation are identified and, where appropriate, the sources of special causes are corrected to prevent future occurrences.
>
> A critical distinction between maturity levels 3 and 4 is the predictability of process performance.

> At maturity level 4, the performance of processes is controlled using statistical and other quantitative techniques, and is quantitatively predictable. At maturity level 3, processes are typically only qualitatively predictable.

Assuming an organization has achieved Maturity Level 3, the concepts for Level 4 are achieved by implementing the practices and satisfying the goals for OPP and QPM. The team weaknesses identified at Level 4 in QPM and OPP were due to the facts that GTACS data was not analyzed at the sub-process level and the data analyses did not address an understanding of process variability. To understand the root cause of these issues, one must understand how standard TSP projects use data to quantitatively manage themselves.

TSP uses data for three purposes: project planning, project monitoring and oversight, and process improvement. For project monitoring, TSP fundamentally considers the software development process as a single entity whose purpose is to help guide the production of products. Earned Value (EV), TSP's primary tool for analyzing schedule and cost, measures the whole process and not subprocesses. TSP's two primary tools for monitoring quality, Percent Defect Free (PDF) and Process Quality Index (PQI) also do not focus at the sub-process level. PDF considers the whole product and the whole process. PQI focuses on the evolving quality of product parts by analyzing the whole process used to produce them. Its usual use is to identify potentially troublesome parts for additional quality analysis. In addition, none of these measures consider variability from the statistical process control perspective. EV considers only how actual cost and schedule performance is varying from the planned performance. Both PDF and PQI consider how quality performance varies from TSP supplied benchmarks.

OPP looks at quantitative management from a top-down perspective. After the organization determines the critical processes (or subprocesses) and associated measures, analysis procedures, and performance models, a project can then use the practices of QPM to fulfill project OPP requirements. The organization's OPP requirements define the key organizational metrics as cost performance index, schedule performance index, yield, and rework. The team's base TSP practices are collecting all the measures needed to meet these requirements. Figure 2 is a portion of the squadron's historical data worksheet showing the key measures the project must collect and submit and the key metrics derived from those measures.

MXDE Historical Data Worksheet

Project Name:
Flight:
TPM:
Number of PEs:
Project Type:
Product Size: Sizing Units:
Completion Date: version 0.7

Process Performance Data

MXDE Standard Engineering Process Category	Estimated Effort at Kickoff	Final Negotiated Effort	Actual Effort at Completion	Estimated Schedule Duration at Kickoff	Final Negotiated Schedule Duration	Actual Schedule Duration	Defects Injected in Category	Defects Removed in Peer Review	Defects Removed in Test Event	Effort to Remove Defects	Externally Detected Defects	Category % of Total Effort
Planning												0.0%
Design												0.0%
Development												0.0%
Test												0.0%
Support												0.0%
Overall	0	0	0	0	0	0	0	0	0	0	0	0.0%

MXDE Process Performance Objectives

MXDE Standard Engineering Process Category	Cost: CEV% (KickOff)	Cost: CEV% (Negotiated)	Schedule: SEV% (Kickoff)	Schedule: SEV% (Negotiated)	Quality: DIR	Quality: DDR Peer Reviews	Quality: DDR Test Event	Quality: DDR Overall	Quality: DD	Quality: Rework% Actual	Productivity (Size/Hour)
Planning	0.0%	0.0%	0.0%	0.0%	0.00	0%			0.00	0%	0
Design	0.0%	0.0%	0.0%	0.0%	0.00	0%			0.00	0%	0
Development	0.0%	0.0%	0.0%	0.0%	0.00	0%			0.00	0%	0
Test	0.0%	0.0%	0.0%	0.0%	0.00	0%			0.00	0%	0
Support	0.0%	0.0%	0.0%	0.0%	0.00	0%			0.00	0%	0
Overall	0.0%	0.0%	0.0%	0.0%	0.00	0%	0%	0%	0.00	0%	0

Milestone Performance

Milestone (Specify)	Estimated Completion Date at Kickoff	Final Negotiated Completion Date	Actual Completion Date
Milestone A:			
Milestone B:			
Milestone C:			
Milestone D:			
Milestone E:			

Risks & Mitigations

Figure 2: *Portion of a Standard Process Data Worksheet for the GTACS Squadron*

As noted earlier, the SCAMPI B assessment team had identified the team's use of EV and PQI (the team was not using the TSP PDF metric because it did not add value for its work) as possibly not fulfilling the intent of the variability of subprocesses clauses of QPM. After discussion, the team decided to track rework and the forecast completion date of its various work products. These also supported the team's two highest priority project goals: finishing its work on time and having low rework. The key selection criteria for these two metrics were that they could be tracked during the project, that corrective action could be taken if they were trending beyond limits or goals, and that they were of relatively low cost to implement.

The team's EV tool computed the forecast completion date of the project and because of the way the project plan was set up, it could also compute the forecast completion date of each of the project subparts. The team reviewed these forecasts at the subpart level every week. Only once, when a team member had a medical condition that required unplanned long-term leave did a forecast fall past the project end date, causing the team to replan its approach for this particular subpart. This matches our prior TSP experience where the TSP EV project tracking process leads the team to meet its schedule commitments [4].

The team was easily able to use rework in a way that satisfied the CMMI assessor's need to see the team reviewing process variability. Rework time for this TSP team was defined as time recorded in the defect logs. Percentage rework was rework time divided by total task time. Good historical data existed from the team's prior projects. Rework percentage was computed weekly and reviewed during the team's weekly meeting for both the project's subparts and the project as a whole. Rework remained within control limits throughout the entire project for all project parts. Figure 3 (see page 20) is the project-level rework plot that was reviewed by the team during its weekly meeting. The rework percentage for each of the team's subparts and the project as a whole were each plotted. The plots each included the subpart or project under review, the organizational goal (10 percent), the Upper Control Limit (10.46 percent), and the normalized (to the project schedule) plots for previous projects.

The good news is that the data collection required by the TSP provides all and more of the data needed to perform such analyses. Using these data, the GTACS project was able to come up with QPM analyses that focused on variability for effort, schedule, and quality performance (such as rework) within predicted parameters. The team updated their weekly meeting process to address each of these measures, to see if they were in control, and to bring items that had gone astray back under control. GTACS also added items to the TSP post-mortem process to collect

project closeout data that could be used to determine process performance and variability overall and at the sub-process levels. These data were then standardized for sharing across the organization, supporting the requirements of OPP (Figure 3).

CAR

The TSP process as it currently stands calls for a detailed post-mortem analysis of project and process data, including identification of improvements. This provides a great deal of support for the Level 5 CAR requirement; however, the TSP does lack CAR formality and feedback to determine if implemented process improvements really worked. In order to shore up these issues, the GTACS team updated the post-mortem script to directly address CAR. They created a requirement for a *CAR report*, which formally douments the TSP post-mortem by capturing the data analyses performed, weaknesses identified, and the suggested process changes to address these weaknesses. The report also adds to the TSP post-mortem an analysis of the impact of previous process improvements.

Training

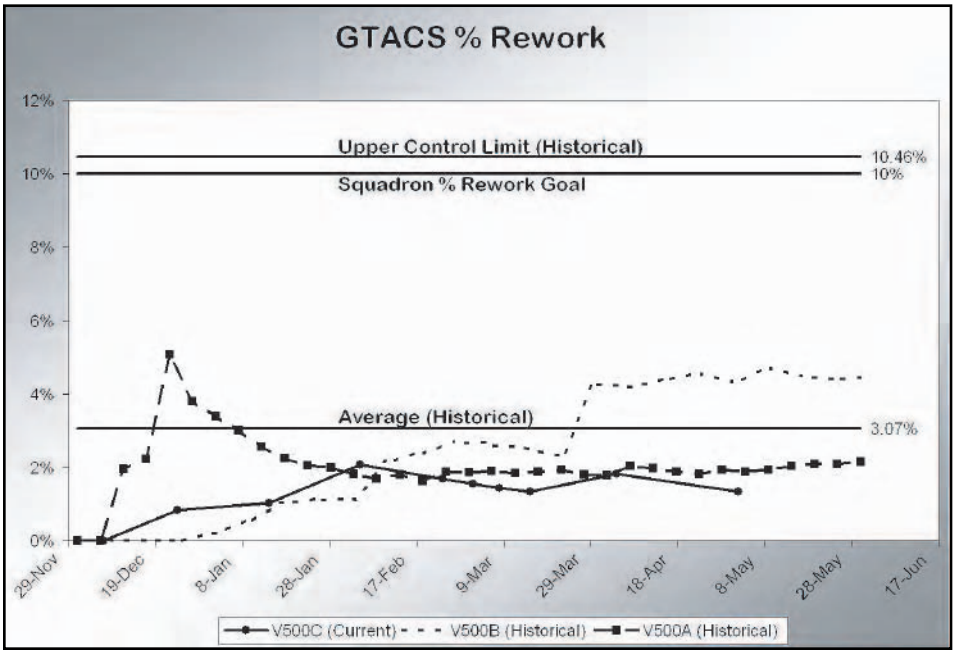
The TSP rollout strategy that the GTACS team used included PSP training for all engineers and managing TSP teams training for the team lead and the GTACS TPM. This approach provided the primary training for eight of the 21 PAs. Additional organizational specific training on policy was still required. The PAs addressed by PSP/TSP were project planning, project monitoring and control, integrated project management, integrated teaming, process and product quality assurance, measurement and analysis, and CAR. Verification was partially addressed. Training was required for the management PAs of risk management and quantitative project management, all the engineering PAs (Requirements Development, Requirements Management, Technical Solution, Product Integration, Validation, and Verification), the support PAs, configuration management, and DAR, and all the process management PAs (Organizational Process Focus, Organizational Process Definition, Organizational Process Performance, and Organizational Innovation and Deployment).

The team addressed the training issue by creating a team training plan that discussed how new team members acquired the skills needed to become full team members. This included an approach to obtaining GTACS domain knowledge, the tools and technologies used by the team, the processes used by the team, and the key organizational training needed to support the team. Most of the details of these training packages had been in existence for several years but were not structured and organized. In fact, the team had a longstanding improvement proposal to organize its training approach.

Summary

The GTACS team in 309th SMXG at Hill Air Force Base, Utah, successfully used the TSP in reaching their goal of CMMI Level 5. In order to do so, they adapted from and added to the TSP scripts, measures, and forms in ways that they believe can help other TSP teams also achieve this feat, as far as can be done by a single focus project.◆

Figure 3: *Variability in Rework as Tracked by the GTACS Team*



Related Literature

The topic of relating TSP practice to CMM-based assessments has been addressed in two thought papers and at least two case studies. The thought papers studied the problem in the abstract by comparing a theoretical TSP project against a model. Davis and McHale [5] first compared TSP against the CMM and concluded that *TSP implements a majority of the key practices of the SW-CMM*. McHale and Wall [2] later extended this study to the CMMI. They concluded, *that TSP can instantiate a majority of the project-oriented specific practices of CMMI*.

Naval Air Systems Command used TSP to advance their CMM efforts. Their experience report compared their approach of using TSP to implement CMM improvement versus non TSP based CMM improvement approaches. They reported that they halved the time needed to move from CMM level 1 to CMM level 4 by basing their process on TSP [6, 7]. Cedillo reported that *TSP actually accelerates CMM/CMMI implementation in a small setting* where the process improvement approach of a small startup company was based on TSP [8].

References

1. Carnegie Mellon University (CMU). TSP and CMMI: A Brief History. <www.sei.cmu.edu/tsp/history.html>.
2. McHale, James, and Daniel S. Wall. "Mapping TSP to CMMI." CMU/SEI-2004-TR-014. CMU, 2004.
3. Chrissis, Mary Beth, Mike Konrad, and Sandy Shrum. "CMMI®: Guidelines for Process Integration and Product Improvement." CMU, 2003.
4. Webb, David. "All the Right Behavior." CrossTalk Sept. 2002 <www.stsc.hill.af.mil/crosstalk/2002/09>.
5. Davis, Noopur, and Jim McHale. "Relating the Team Software Process℠ to the Capability Maturity Model® for Software." CMU/SEI-20020TR-008. CMU, 2002.
6. Pracchia, Lisa. "The AV-8B Team Learns Synergy of EVM and TSP Accelerates Software Process Improvement." CrossTalk Jan. 2004 <www.stsc.hill.af.mil/crosstalk/2004/01>.
7. Wall, Daniel S., James McHale, and Marsha Pomeroy-Huff. "Case Study: Accelerating Process Improvement by Integrating the TSP and CMMI." CMU/SEI-2005-SR-012. CMU, 2005.
8. Cedillo, Karina. "Accelerating CMMI Implementation With PSP and TSP in a Small Organization." SEPG, 2005.

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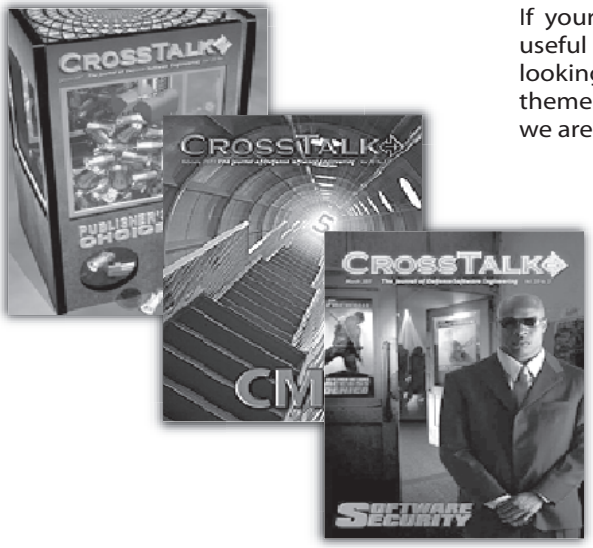

If your experience or research has produced information that could be useful to others, CROSSTALK can get the word out. We are specifically looking for articles on software-related topics to supplement upcoming theme issues. Below is the submittal schedule for three areas of emphasis we are looking for:

Systems Engineering
October 2007
Submission Deadline: May 18, 2007

Working As a Team
November 2007
Submission Deadline: June 15, 2007

Software Sustainment
December 2007
Submission Deadline: July 13, 2007

Please follow the Author Guidelines for CROSSTALK, available on the Internet at <www.stsc.hill.af.mil/crosstalk>. We accept article submissions on all software-related topics at any time, along with Letters to the Editor and BACKTALK. Also, we now provide a link to each monthly theme, giving greater detail on the types of articles we're looking for <www.stsc.hill.af.mil/crosstalk/theme.html>.