

## MISSILE PRODUCTS CORPORATION (B)

Early in the spring, Sam Roberts called the first management meeting of all the lead engineers on the SURTAC guidance project for a status report. Present at the meeting were the nine lead engineers and two of the department managers. A number of problems surfaced at this meeting.

Bob Taylor, lead engineer for the ECM and mode selection subsystem, was not sure that there was enough data to corroborate the validity of the basic integrated system design. He felt that systems engineering should be doing extensive trade-off analyses and he should monitor all the SURTAC guidance design efforts and should redirect subsystem design according to these analyses. Roberts reminded Taylor that they had a contract to build hardware and test feasibility.

The next comment came from Ed Smith, the technical staff consultant who was the lead engineer for the sensor antenna. "I've got absolutely no control over the people who are going to work on the sensor antenna," he complained. "I mean, since I've been back, I've observed some pretty medieval concepts of design and fabrication around here. I tried to get some sharp young fellows who've written theses on target acquisition theory. All but one of them are on special assignments to the marketing manager. They're out jawboning while I've got an antenna to build!"

At this point, the department manager for systems engineering wanted to discuss another topic. His department's contribution to the intercept computer subsystem had been drastically slashed from what had been originally planned. Herb Olson, the lead engineer for the intercept computer subsystem and a section manager in the digital department, had originally planned to allocate work and funds on the computer as follows:

Digital Department	40%
Systems Engineering Department	30%
Mechanical Department	20%
Electronic Development Department	10%

This allocation was based on the assumption that MPC would be funded for full-scale engineering development. When MPC was funded only to perform specific hardware subsystem feasibility demonstrations, funds for the intercept computer were halved. Olson recast the allocated work and funds as follows:

Digital Department	70%
Systems Engineering Department	5%
Mechanical Department	10%
Electronic Development Department	15%

Naturally, this did not sit well at all, particularly with the manager of the systems engineering department who argued that 50% of his workload forecast and manloading projection for the next six months was SURTAC work.

"In effect," he concluded, "this redirection is going to make six of my systems engineers available for six months. Furthermore, Herb just arbitrarily reduced our 30% share of the computer work to 5% so he could take care of his own people. He has the lion's share now and he's assuming the major part of the systems engineering tasks which by rights belong to us."

What followed was a heated argument between Herb Olson and the manager of systems engineering

Sam Roberts was forced to close the meeting at this point because he was due in Washington for a week's visit to the Office of the Secretary of Defense (OSD). He decided

that another progress meeting should be scheduled within the month.

One month later, several new problems came to the surface. These were revealed at the next meeting of the group. Roberts had asked each lead engineer to make a presentation on the progress of the subsystems during the past month. Gene Mack, LE for the shipboard signal receiving subsystem, made the first presentation. He stated that although the shipboard signal receiver was on schedule and within cost, the breadboard, which was ready for program management office signoff, had not been approved by Pete Johnson, chief engineer on the SURTAC guidance project, because he was at Dahlgren discussing a navy-recommended change in the signal band width. Gene knew about the recommendation and had discussed it with his engineers. Fortunately, only the long-lead items had been ordered and Gene was not concerned over the impact of the change on either his schedule or his budget.

The reports from the missile guidance subsystems lead engineers were not as encouraging. All the missile guidance subsystems were behind schedule and the sensor antenna was below nominal specification and overrun in cost. Ed Smith, LE in charge of the sensor antenna, was not overly concerned about the antenna because he felt it was too early to achieve nominal spec performance.

After three hours of discussion of the problems, Roberts sketched out a tentative action plan for the future. The engineering department managers were called in and briefed, and their concurrence with the reviewed priorities required by the plan was obtained. Before closing the meeting, Roberts announced that the MPC general manager, Dick Nolan, had asked him for a progress report on the use of the lead engineer concept in the SURTAC guidance project. Specifically, Nolan wanted to know what kind of management styles were adopted in order to get things done. Roberts then set the date for another meeting within the week to

discuss this topic.

At the next meeting, the nine lead engineers were asked to describe their management techniques to the group. Gene Mack was first to present. "I planned to have three of my section managers as lead engineers for portions of the signal receiver. We got together to think the work through in great detail and plan our course of action. As far as relations with my lead engineers, they are informal. This way we have pretty good communications. I'm rarely in the dark and because they keep me informed, I can monitor progress continuously and we have a perpetual replanning effort.

"I've got a planning syndrome I'm really preoccupied with. At the outset, we define the work in detail and then little deviations from that plan can easily be identified and coped with. I've found that by thinking the job through at the beginning, the implementation usually works and reflects our trade-off analyses, although sometimes the trade-offs are intuitive."

Wiley, Haskins and Jenkins were nodding in agreement. Jenkins stated, "The successful manager has to be able to view the project as a whole. He has to see how the different organizations depend on each other and how changes by one affect the others. The success of a decision depends on the manager's ability to sell its' across-the-board impact.

"I never tolerate an impasse," he continued. "When I see a problem on the horizon, I pull out all the communication stops and broadcast the circumstances to the project engineer, the department manager, and anyone else who'd be an interface if that problem materialized."

"In my opinion," offered Carl Wiley, "a manager of a technical performing organization should personally be proficient in the specific disciplines of his charter. Success requires being in charge from the first gun and getting your people with you from that first minute. You have to know all the contract provisions. You have to define and authorize all

task assignments; conduct all design reviews, beginning with the initial subsystem block diagram; and endorse all action item directives. The thing to avoid is being exposed to just half the problem. That's tantamount to knowing just enough to be dangerous."

John Haskins had a somewhat different outlook: "When problems occur within my area of responsibility, it's my job to resolve them with whatever resources I can beg, borrow or steal. Going topside for help is an admission that I can't cut the mustard and this isn't going to get me bigger and better future assignments. It's difficult enough to insulate myself from the SURTAC project office when everything's going right. If I go back to them or my boss in the department for help, it certainly won't improve the interference problem. The project office just won't let go if they know you've got a problem."

Roberts then called on Herb Olson to discuss his management style. Herb stated that he was discouraged. It seemed to him that the lead engineer just couldn't win: if he was a dictator he got nowhere and if he tried to use a cooperative leadership approach, the work still didn't get done. Herb felt that a lead engineer was asked to perform and then was given as much control over the departments or engineers as he had over the tides.

Roberts asked Herb to be more specific. Herb stated that the basic problem was that two-thirds of the work on the intercept computer was performed outside his section. As section manager, he had control over the tasks performed within his section, but work in other sections and departments had been falling behind schedule. Herb first became alarmed about a month after work had started. As part of his informal control procedures, he had been chatting with an engineer performing a subtask which involved designing a component of the intercept computer. This work was being done in another section and Herb found out that the man was really devoting most of his time to a different project.

Herb was surprised. "How come?" he asked.

"I had to finish up another job that was already overdue," the engineer explained. "This intercept computer subtask was just starting and I knew I could make up a delay on it in a week or two. Besides, I'm already putting in a 54-hour week and no overtime."

Herb decided to mention the situation to the engineer's section manager, Joe Ellis, to make sure that there had not been confusion over manloading and scheduling. When asked, Joe was rather abrupt in responding to Herb and asked him how he expected his workers to perform if they were continually bothered. Herb agreed to talk directly with Ellis and left believing that the schedule had been agreed to.

Herb stated that two other serious problems had come up that prevented him from performing his role as lead engineer. Don Muller, one of the staff scientists reporting directly to the general manager of MPC, called Herb and stated that the design approach for the intercept computer was, in his opinion, inferior. Prior to the start of work, the design as presented in the proposal had been reviewed by Herb, the engineers who would be building and testing the computer, and Joe Ellis, manager of the section making a principal component.

Other approaches considered at that time would have required additional systems engineering with regard to interfaces and would have jeopardized both dollars and schedule for the program. Therefore, Herb, along with Ellis and the engineers, had decided to proceed with the original concept.

Herb called an informal design review with Muller, Ellis, the engineers, and Dick Muller, the project engineer. By the end of the meeting, they agreed that the spec could be met with the original concept although the growth potential of the principal component would be limited. Muller had found in Dick Miller a sympathetic ear to his alternative approach, which

was, in fact, superior. Herb stood firm on the decision but he was generally unhappy with the results of the meeting. Although Dick Miller had not said so directly, he was clearly questioning Herb's capability as lead engineer, and both Ellis and his engineer left feeling that their technical competence had been challenged.

The second problem concerned a change of design on a module that eliminated some extra margin that he had worked hard to maintain. When he investigated, he was told that the signoff box for release of shop drawings contained a space for the draftsman's signature, his section manager's signature, and a program office signature – but not the lead engineer's. The drafting section manager had noticed the extra margin and had talked it over with Dick Miller. After agreeing that it was not necessary, he had modified the drawing to eliminate the margin and then released the drawings to the model shop. Herb was able to redline the shop fabrication drawings but time was lost and additional material had to be used.

At this point, Roberts decided to call a halt to Herb's presentation and to open the problem for discussion by the group.

#### QUESTIONS

1. Why don't the shipboard equipment (signal receiving) projects have the same problems as the sensor antenna projects?
2. What role should the project engineer play in this case?
3. If you were Herb Olson, what style would you adopt to get the job done?
4. Discuss an alternative overall plan for the SURTAC guidance project, involving the program office, lead engineers, project engineer, and the departments.