FEDERAL RADAR CORPORATION*

On the morning of November 14, 1988, John Taylor, Space Warning Network (SPAWN) Program Manager, was getting ready for a private meeting with Paul Shaifer, President of the Federal Radar Corporation (FedRad). Mr. Shaifer had scheduled the meeting to discuss the problems that had plagued the company's important SPAWN Program during its first year and a half. These problems, which included unauthorized design changes and Taylor's inability to control the Program's cost, schedule, and technical performance, had contributed to a cost overrun and schedule delay, estimated at 30% and four months respectively, and a general loss of customer confidence.

The November 14 meeting was specifically precipitated by a series of delays in the scheduled date of the first prototype acceptance tests and by strong evidence of customer concern and loss of confidence in FedRad's management. By November, Taylor was still unable to set a firm date for the tests that had been originally scheduled for August. The test slippage, supplemented by cost overruns and technical problems, had caused Colonel Grace, the Air Force's System Program Office (SPO) Director for SPAWN, to write a highly critical letter to a FedRad manager.

Shaifer, deciding that some definite action was required to put the SPAWN Program on the right track, asked Taylor to prepare a list of possible steps to solve SPAWN's problems. He had prepared a similar list of his own. The two men were meeting to pool their ideas and prepare a plan of action.

The Federal Radar Corporation

Since its founding in 1940, FedRad had been pre-eminent in the radar field. FedRad's scientists and engineers had been prominent figures in the initial development of radar and, through the years, the name "FedRad" had been synonymous with technical excellence in building radar equipment. Financial success had rewarded the company's technical skills in the production of surface, navigational, and fire control radar equipment for the military services and large prime contractors. In recent years, however, sales, employment, and profits had declined appreciably as heavy competition reduced FedRad's contract capture rate.

Over the years, FedRad's largest customer by a substantial margin was the United States Navy. U.S. Air Force (USAF) business was growing rapidly, however, and FedRad thought it might eventually equal the Navy's volume. The SPAWN Program accounted for most of the company's Air Force business and was the largest single program in-house during 1988.

The Space Warning Network (SPAWN)

FedRad won the SPAWN prime contract in mid-1987. SPAWN was an advanced warning system to detect, track, and report weapons fired at the United States from space. It was to consist of four major subsystems: (1) radar installations to detect the threat; (2) computer systems to translate and analyze the signals from the radar in order to identify the objects, determine their position and velocity, and calculate their course and probable target; (3) communication equipment to relay the information to NORAD [North American Aerospace Defense Command] headquarters and the various command and control sites; and (4) display equipment to be used by the operators.

SPAWN was the logical follow-on to the Aircraft Warning System and the Ballistic Missile Early Warning System. It was designed to extend USAF's detection and response capability to the potential threat of armed satellites and spacecraft.

The SPAWN radar subsystem required several advances over earlier radar systems because of unique scanning and tracking problems. The other major

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* The issues presented in this case are based on actual experience; however, names, circumstances, program customer, and dates have been disguised. Prepared by L. Wallace Clausen and Alfred G. Zappala under the direction of Dr. Sterling Livingston, the case is intended to provide a basis for seminar discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

subsystems were similar to those of existing manned aircraft and missile warning systems, but the performance and reliability requirements for the system as a whole were considerably more stringent because successful reaction to a space attack required an extremely fast and accurate response.

FedRad's Program Management History

Although FedRad had always made significant contributions to radar's state-of-the art, most of the radar equipment it had developed prior to the SPAWN Program was based on the same fundamental principles. In addition, the major portion of its contracts had required only the redesign and improvement of existing components to meet new specifications. Consequently, the company was able to follow a management approach characterized by functional groups performing traditional tasks. Although program coordination existed, there was very little centralized control over a total program.

FedRad first departed from its traditional approach to organization in 1987, when the company won the SPAWN contract. To win the competition, FedRad had established and described in its management proposal both a SPAWN Program Office and a Programs Department. There were two reasons for this departure from tradition: first, the recent loss of a key Navy contract, primarily because of an unsatisfactory management proposal, and second, the Air Force's current attitude toward contractors' management organizations and procedures.

The SPAWN competition took place shortly after FedRad's 1986 loss of a competition for the Navy's Shish Kebab, another advanced system. Had it won the Shish Kebab contract, FedRad would have been placed in a favorable position to win several hundred million dollars in direct follow-on and related development during the next decade. The loss was thus a severe blow, and FedRad's management was determined to make any changes necessary to assure winning other key contracts.

The first step taken was an effort to identify and correct any management deficiencies which might have contributed to the Shish Kebab loss. At the Navy's debriefing, Paul Shaifer had learned that his company placed second in the competition. The company had lost the award primarily because its management proposal failed to demonstrate FedRad's ability to manage and control an advanced development program.

The October 3, 1986 Management Meeting

At an October 3, 1986 meeting held at the company's California headquarters, Shaifer conveyed the debriefing information to FedRad's top management (see Exhibit 1, company organization chart).

"From Navy's comments," Shaifer added, "I inferred that FedRad's management structure is considered obsolete and probably would not win any significant future Navy contracts unless it 'shaped-up.'"

Mr. Hereford, Vice-President, Marketing, agreed. "All the [military] services seem to be taking a stronger and more specific look at the relative merits of contractor management approaches. The Air Force is strongly oriented toward program management and is currently our main potential source of business."

"Important programs of the type we need to maintain our operations are scarce," Hereford continued. "We have only one in the fire now, the Air Force SPAWN proposal, which we've been working on for several months. We expect the RFP[1] in late 1986 and the award in mid-1987."

Mr. Hereford next amplified his comment on current attitudes toward contractor management. "An Air Force SPO is a powerful organization headed by a single officer. Air Force officials increasingly want contractors to provide an equally authoritative single point of contact for each program. My staff is preparing the SPAWN management proposal now, and it looks like a loser at this point. The closest we come to centralized responsibility is the Program Coordinator in the Engineering Department. This person, however, has no broad program responsibility and authority. Unless we can develop and present a modern, centralized type of organization, I don't think we'll win the SPAWN award or any other major contract."

James Hereford's comments touched off a lengthy discussion. Charles Greggson, Vice-President, Engineering, favored FedRad's present organization, noting the company's reputation for excellent

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1 Request For Proposal, soliciting bids from potential contractors.

technical work, the close relationship between the Engineering and Manufacturing Departments, and the long and close association between his staff and many customer technical personnel. He concluded, "I'm inclined to discount all this supposed customer pressure for a new kind of organization. I think the men who talked to Paul and James were probably administrative types attempting to persuade us to adopt some 'ideal' organization structure. I'll bet a customer technical man wouldn't want us to change. These new organizational ideas would remove control from our integrated Engineering team and hand it to administration types who don't have adequate insight into our technical problems. A move in that direction would interfere with our methods which, after all, have made us 'number one' in the radar business. I'm convinced that political considerations lost us the Shish Kebab contract - nothing more."

Carson Phillips, Vice-President, Manufacturing, agreed with Greggson, adding, "I'd be the first to go along with a change if I felt it was necessary. I do resist any changes that would risk our present very successful setup unless somebody can show me how they will improve our management capability."

After further similar discussion, Paul Shaifer declared, "Gentlemen, I've not been completely open with you. I made some decisions on this matter before the meeting but I wanted to hear you express your own opinions before I announced them."

"I believe we must meet the new emphasis on program-oriented management if we are to be successful in the future. We need to establish and present to our prospective customers some coordinating organization which can monitor our programs as they pass through the marketing, engineering, and manufacturing phases. We all agree that our present management organization and techniques are sound, but I think we'll also agree that superimposing a coordinating group can't do any harm, might help us manage large programs, and most certainly will appeal to our friends in the military.

"With this introduction, I'd like to announce the formation of a Programs Department and the promotion of Victor Towell to the office of Vice-President, Programs. Vic's performance as Financial Manager has been exceptional and I believe his demonstrated grasp of the intricacies and interdependencies of our financial structure proves his ability to watch over our program efforts. He'll direct the overall program effort by guiding the activities of program offices, each consisting of a program manager and a small staff. In the future, a program office will be established for each major program. Within the next week, Vic and I will choose, with your concurrence, a Program Manager for the SPAWN proposal.

"I also plan to create and fill another new position in the near future -- that of Special Assistant to the President for Management. This man will act as a proposal consultant, trouble-shooter, and management specialist, keeping an eye on the effectiveness of our organization and management of defense programs. He'll be an outsider and, hopefully, will be familiar with government and military management techniques."

Establishing Program Management for the SPAWN Proposal

On October 18, in a memorandum to all FedRad personnel, Paul Shaifer announced the appointment of Colonel Brian Emery (USAF, Retired), formerly Assistant Deputy Commander for Systems and Logistics, Air Force Systems Command, to the newly created position of Special Assistant to the President for Management. His appointment was to be effective November 15.

At the same time, John Taylor, formerly Ordnance Fabrication Shop Supervisor, was appointed to assist in the preparation of the SPAWN management proposal and to take over as Program Manager if FedRad won the award.

Victor Towell, the new Vice-President, Programs, was 55 and had been with FedRad for 25 years, After ten years in engineering and manufacturing positions, he was appointed Chief Financial Officer. In that position, he reported to the Vice-President, Finance and Control, and was responsibility for the corporation's financial management. He also assisted the Marketing Department in its efforts to identify and capture new business.

Brian Emery, 48, was a veteran Air Force procurement officer. He had participated in procurements ranging from "nuts-and-bolts" items to billion dollar weapon systems and had a unique insight into the key elements of military management. Emery had directed two substantial Air Force development programs and, during the preceding two

years, had helped formulate the latest USAF systems management techniques. Shaifer had selected Emery because of his demonstrated competence and forceful personal impression.

Shaifer and Towell chose John Taylor to head the SPAWN Program because they considered him well qualified, with wide experience in military and contractor organizations. After receiving his electrical engineering degree in 1966, Taylor had served four years in the Army Corps of Engineers. From 1970 to 1977, he was employed by the Worldwide Electronics Corporation; from 1977 to 1981, by Uniradar Systems, Inc. He had served in positions which included contracting officer, administrative manager, and shop supervisor. In 1982, Taylor joined FedRad. During his years with the company he had served in various supervisory and administrative positions in both the engineering and manufacturing departments.

After his appointment, the Marketing Department gave Taylor the task of completing the management proposal. Work had progressed further on the technical and cost sections of the proposal, and Taylor did not work on those sections.

By mid-November, 1986, Taylor had consulted with his associates in other departments and had set up a proposed program management organization. It was strictly an information-collecting and liaison organization and included, in addition to Taylor, a manager for the administrative systems required by the RFP and engineering, manufacturing and quality control liaison representatives. In the meantime, Colonel Emery had joined FedRad. Since his first assignment was to assume responsibility for preparing the SPAWN management proposal, it was to Emery that Taylor submitted his proposed organization.

When Emery inspected Taylor's five-man program office he was shocked. "Why, the 'staff-coordinator' approach to managing a large development program was abandoned two or three years ago! A weak program orientation," he told Taylor, "caused several programs to go completely out of control technically, financially, schedule-wise, or all three. In each case, the Air Force SPO manager had tc ride it out at great expense to his budget and reputation or, through drastic application of SPO personnel and techniques, actually had to take over the management of the contractor's effort. Most Air Force procurement officers are aware of this and consequently view this approach with dismay. This type of organization will never work with an advanced, complex program like SPAWN."

Bolstered by the Colonel's knowledge and persuasion, Taylor joined Emery in another attempt to structure a strong program management organization. Emery suggested that they approach the job from the standpoint of an Air Force evaluator's preference. According to the Colonel, this would be a program office which possessed the capability, responsibility, and authority to plan and direct the essential elements of the SPAWN Program. Furthermore, it should be the only Air Force contact at FedRad for information and action.

Noting that nearly half the SPAWN Program would be subcontracted, Emery added subcontract management to the Program Office's list of responsibilities. He asserted, moreover, that the organization and management techniques described in the proposal should correspond to the Air Force's SPO management system. Each member of the SPO should be able to perceive who would be responsible for his particular area and to be confident that both the defined position and the person filling it would meet his requirements.

By late December 1986, Emery and Taylor had a long and complete description of the SPAWN Program Office (See Exhibit 2 for the organizational structure).

Selling the SPAWN Program Office

Emery and Taylor presented the new organization to key Engineering, Manufacturing, Purchasing, and Marketing Departments personnel. Their attempt to solicit support for the new SPAWN Program Office was a complete failure. Most engineering managers vigorously resisted the concept that a centralized program organization should have overall responsibility for a program's technical, cost, and schedule elements.

"Technical integration has always been performed by the Engineering Department," declared Charles Greggson, "and, as far as I am concerned, always will. I plan to appoint a Program Engineer, the staff administrator we traditionally use to monitor program activities. He'll handle the Program Office's contacts with Engineering and I'll conduct my own Engineering budgeting and scheduling. I think your proposed provision that all customer contact be

conducted through the Program Office is unnecessary and unworkable."

The Purchasing Department resented the appointment of a subcontracts manager and felt that anything he would do directly with the subcontractors was a violation of their prerogatives. The Marketing Department opposed the idea that Taylor should play a major role in the marketing effort and should become acquainted with both the Air Force SPO Director and higher-level military and Department of Defense officials. Otherwise, they favored a strong Program Office because they felt the Air Force desired it.

Emery and Taylor presented and discussed the new organization on many occasions during the next three weeks. Each presentation led to lengthy arguments and terminated in disagreement. By the third week in January, it was apparent to both men that there was no time for additional persuasion. The proposal's deadline was February 1, 1987 and a prompt decision had to be made regarding the SPAWN management proposal. After due consideration, Emery, Taylor, and Marketing Department personnel agreed that FedRad would not win the award if the proposal lacked a strong Program Office. The only realistic approach was to propose a "paper organization" that had not been approved.

In a memorandum dated January 18, Emery requested Shaifer's permission to propose a SPAWN management organization that did not exist. Emery stated that he was convinced that this organization was needed not only to win the contract but also to manage the program and recommended that it be included in the proposal. He also recommended that strong steps be taken to implement this description if FedRad won the contract, informing Shaifer that he and Taylor had been unable to convince others in the company of its desirability.

Shaifer replied two days later that, while he had not gone over the proposed description in detail, he would go along with Emery's opinion that it was required to win. The management proposal was written accordingly and the SPAWN proposal was submitted to the Air Force on February 1, 1987.

The SPAWN Award

On May 13, 1987, the Air Force announced that FedRad had won the SPAWN contract award. FedRad's management breathed a sigh of relief as the anxiety generated by a steadily decreasing work was lifted. After the initial ebullience had subsided, however, a few FedRad managers felt mixed emotions. Emery and Taylor knew that their real work was just beginning. They again attempted to convince engineering and other FedRad management personnel that the proposed organization had contributed significantly to winning the award. The other managers, however, claimed that the award could be attributed to the company's superior technical design and sound engineering reputation.

At this point, Emery was assigned to another task. Consequently, establishing an operational SPAWN Program Office was left entirely to Taylor. By June 1, when the actual engineering work was to begin, Taylor had been able to secure for his Program Office only five men from the Engineering Department. These men were responsible for technical management and program control. Greggson refused to give Taylor additional engineers. Taylor was able to obtain from other departments one man to perform manufacturing liaison work and another to act as Subcontracts Manager.

Taylor felt insecure about his organizational support as SPAWN moved into high gear in June 1987. His feeling was borne out during the next six months. By January 1988, the SPAWN Program was two months behind schedule and a cost overrun of from 10-25% was projected. The problems leading to the January situation are described below.

Technical Management Problems

The Program Office's technical management team consisted of George McTavish, Technical Manager, Philip Sosland, Assistant Technical Manager, and Peter Kolman, System Integration Coordinator. All three men remained on the Engineering Department payroll. McTavish was assigned 80% to the Program Office. Sosland was assigned 100% to the Program Office and reported directly to McTavish. Kolman worked with the Program Office as necessary but continued to report to his Engineering Department superior. McTavish and Sosland had backgrounds in manufacturing, engineering, and project engineering. Kolman was the only one with recent experience in systems design work. As stated in the management proposal, these three men were to define the system, subsystem, and end-item design objectives; to prepare data for the work breakdown structure; to design

performance tests; to control the technical interfaces between the various FedRad, Air Force, and subcontractor design groups; and to evaluate the effect of technical deficiencies and proposed changes on system objectives.

By July 1987, it was apparent that the Program Office was technical manager in name only. The Engineering Department's technical integration section continued to perform the same functions it traditionally had performed for programs managed within the Department. Engineering personnel contacted Air Force representatives without going through the Program Office, explaining, when questioned by Taylor, that channeling technical communications through a third organization only confused matters. In two instances, Taylor learned about unauthorized design changes after the redesign work was almost completed. While both changes would result in improved technical performance, Taylor doubted that the improvements would justify the schedule delay and cost increase. He learned that FedRad engineers had obtained informal approval for the changes from lower-level Air Force engineers, but he was not certain that the SPO Director would approve funding for the changes.

Program Control Problems

Taylor's program control team consisted of Barton Brody, Program Control Manager, and Louis Stapleton, PERT Supervisor[2]. Both were assigned full time to the Program Office. Although they had experience in program planning and cost analysis, neither had prior experience with PERT networking. The description of the work breakdown structure and the PERT network, both of which were included in the SPAWN proposal, had been prepared by Anatole Kalmis, a Project Administrator in the Engineering Department. Kalmis had worked with Taylor and the Marketing Department during proposal preparation, but was recalled to handle detailed networking and changes full time for the Engineering Department after the program began.

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2 PERT stands for Program Evaluation Research Task, a method that breaks down and organizes all the tasks necessary for the completion of a project into a "PERT network" that permits optimal sequencing and scheduling of activities for planning and control of complex projects.

As defined in the SPAWN management proposal, Brody and Stapleton were responsible for PERT, which included maintaining the work breakdown structure and master plans; revising and updating the PERT networks; preparing system output reports, such as Management Summary Reports; and recommending corrective action for problems revealed by the reports.

During the first months of the program, their roles were reduced to monitoring the actual planning and control work conducted within the Engineering Department and trying to integrate this information into the total program plan. These plans encompassed the other FedRad departments, contractors of major subsystems, and CFE.

Several incidents occurring between June and January had created problems for the Program Office. In one case, Stapleton was not informed of a network revision made by the Engineering Department to reflect a schedule slippage caused by a shortage of engineers. This revision was discovered only shortly before a set of drawings was scheduled to go to the computer subcontractor. As a result, the subcontractor's schedule also was delayed and several engineers were placed on idle time.

On another occasion, FedRad engineers had provided Air Force representatives with work breakdown charts detailed below the level furnished the Program Office. The SPO Engineering Deputy had a question regarding the charts and called Taylor to inquire about it. He ascertained in short order that Taylor was both unaware of the charts in question and uninformed about the overall status of the engineering effort. Following this incident, the SPO officer developed the habit of contacting FedRad engineers directly to obtain information.

Subcontractor Management Problems

FedRad had three SPAWN subcontractors for the major computer and communications subsystems and the smaller display subsystem. The subcontracted portion represented about 45% of total contract dollars. All three subsystems were closely interdependent and were expected to meet stringent quality and reliability requirements. Of the three, FedRad previously had worked with only the computer subcontractor.

Ken Hollis, assigned 50% as Program Office Subsystem Manager, was responsible for monitoring and analyzing subcontractor performance. The Purchasing Department was responsible for all contractual, price, and delivery matters. George Dierden, Purchasing Department Manager, had made it clear during the proposal effort that his organization was fully competent to negotiate with vendors, and had promised to object if any unnecessary duplication or interference by the Program office came to his attention. In fact, Towell and Greggson had to intervene while the proposal was being prepared to settle a conflict between the Program Office and the Purchasing Department regarding Taylor's right to monitor and approve work statements the Engineering Department prepared for subcontractors.

Taylor had several problems involving subcontractor management during the June-January period. The most significant of these was a series of revised proposals submitted by the communications subcontractor during negotiations with Purchasing. As of January 1988, requirements changes had escalated contract costs by 15% and the contract still had not been finalized. An additional group of 25 Engineering Change Proposals was awaiting approval by the FedRad Engineering Department, following which they would be negotiated by Purchasing.

Another difficulty involved the display subcontractor. The terms of that subcontract had not defined a specific set of management and control procedures, and the subcontractor's procedures were very difficult to translate accurately into categories useful to FedRad. As a result, Ken Hollis was unable to monitor the display program's status, or even to identify the single person in the subcontractor's organization who could talk knowledgeably with him. George Dierden refused to help Hollis, stating that since the contracts people had affirmed to him the subcontractor's intention and ability to meet requirements, he saw no need for additional information.

The Program Office Staff Increase

By January 1988, John Taylor felt that he had lost control of the SPAWN Program. Because of his limited authority and staff, he was able to determine program status only after a one- to two-month lag. His inability to provide prompt answers to the customer had caused SPO personnel to contact FedRad and subcontractor personnel directly. Many decisions which Taylor believed he should make were presented to him as accomplished facts. Also, he felt that technical decisions were being made without due consideration of their cost and schedule impact. Consequently, he described his problem to Paul Shaifer and asked Shaifer to take some action which would increase his effectiveness as Program Manager.

Shaifer responded by securing the release of several additional men to the Program Office. Two of these men were appointed to the previously vacant positions of Logistics and Field Support Manager and Quality Assurance Manager. Others provided additional support to the Program Control and Technical Managers. With his staff increased to 13 men, Taylor felt better prepared to face his responsibilities, which were now focused on the Air Force acceptance testing of the first prototype unit, scheduled for August 1988.

By early March, Taylor was able to report that expanded staff had given him substantially greater control over the program. This improved control, however, was largely brought about by better liaison and information gathering capability. The actual role of the Program Office remained the same, since the functional managers still were reluctant to yield those responsibilities which, through years of experience, they were confident they could discharge effectively.

The Translator Module Design Change

Taylor's new feeling of control soon vanished. Early in April, he saw a FedRad memorandum referring to a significant design change in the Translator Module, a highly sophisticated component linking the radar sensing unit with the computer subsystem. The change surprised him because he had thought the Translator design was finalized at the beginning of the program. Any change in the Translator concerned him because it constituted the interface between the radar and computer subsystems. In addition to the expense of the change itself, any change might have significant impact on those subsystems.

Taylor began investigating to determine why the change was deemed necessary, what it could cost, and what effect it would have on the program requirements. It took him two weeks to gather the full story. He learned that a senior systems engineer who had joined the SPAWN Program two months earlier had developed a new approach to the

Translator design. After obtaining the Chief Engineer's permission, he conducted a parallel design study which demonstrated that his design would substantially improve translation speed. The Chief Engineer then tabled the original Translator design and instructed his engineers to work out the new design and to make any necessary changes in the radar unit. He ordered the computer interface to be redefined and communicated to the computer subcontractor after several technical problems had been solved. When questioned, the Chief Engineer apologized to Taylor for not first checking with him, but explained that Taylor had been out of town when the new approach originally came up.

Further checking revealed that, as a result of forced delays in other parts of the computer design, the computer subcontractor had accelerated the design of certain components which were highly interdependent with the Translator. Consequently, a redefinition of the translator-computer interface would generate considerable added costs and schedule delays. Some radar redesign would also be required.

When Taylor reviewed the data he had collected, he determined that the new design meant a clear improvement in Translator speed, increasing it 20%. A reliability problem was still unsolved, however, as well as possible problems in the redesign necessary to take advantage of the increased speed. Taylor estimated the $70,000 had been spent on the change so far and predicted an additional $100,000 and one-month schedule slippage to complete the change. On the other hand, it would entail a $25,000 expense and a one-week schedule slippage to go back to the old Translator design. At this point, Taylor called Colonel Grace to report the situation and to get a decision on whether or not to proceed with the design change.

Colonel Grace was displeased by Taylor's news. "You know as well as I do that we are already exceeding our cost and time schedules," he told Taylor. "The old design met requirements and we bought it. Let's go back to it. You can charge your little experiment to company-funded research. Furthermore, I advise you to find out how many more unreported changes you've piled up. At this point, I really wonder who runs the show at FedRad."

The Test Date Slippage and Colonel Grace's Concern

By Spring, 1988, it was apparent that FedRad would be unable to meet the deadline for the Air Force acceptance tests of the first prototype unit, originally scheduled for August. During the summer, the anticipated test date was projected successively to September, November, and December. Taylor declared that the inaccurate projections were due to the fact that delays in end-item completion were reported to him at the last minute. The slippage was accompanied by a projected cost overrun of 30% which, Taylor assured the customer, could be reduced to about 5% by anticipated shortcuts in the development of the second prototype unit. Colonel Grace was pessimistic about this, however, and it was clear that he had lost confidence in FedRad's management capability.

In October 1988, Colonel Grace wrote to Colonel Emery, and old Air Force friend. Among other things, Grace wrote, "I'm worried by the persistent slippage in the test date and I'm under pressure from my superiors. My position is very sensitive because it's more and more apparent that I should have stepped in and put tighter controls on FedRad several months ago. I'd appreciate anything you can do to explain good program management to FedRad's executives."

After receiving Grace's letter, Emery obtained permission from Paul Shaifer to make a study of the SPAWN Program's problems. Emery was appalled by what he found, and wrote a confidential memorandum to Shaifer which included the following comments:

> "John Taylor's efforts to direct and control the SPAWN Program are being frustrated by the functional managers. With such a limited Program Office, successful direction depends on the managers' support and cooperation. Without their help, we risk fumbling the program. There are two major problems, as I see it.
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> "First, the acceptance test date has already slipped four months and we are unable even now to set a definite date for these tests. A survey of the considerable correspondence between the Program Office, the Engineering and Purchasing Departments,

and subcontractors during the past several months reveals two difficulties. Number one, no single department is coordinating the effort of all the organizations involved in the tests. Engineering's radar design and systems design test sections have a general plan on paper. This plan is being monitored by the Program Office. The detailed test plan, however, is known only to Engineering's test personnel and has not been communicated adequately to the other parties involved. The second point that emerges is that the tests are vitally important to the customer. They are the SPO's first chance to demonstrate the success of the program.

"Second, a serious threat to our reputation currently exists. Colonel Grace is thoroughly disgusted with our disorganization and mismanagement. In addition, continued poor performance may bring visits from higher-level Air Force officials. I can assure you that, whatever the technical merits of FedRad's management approach, our program management concept as it has been implemented on the SPAWN Program will be sharply criticized.

"In conclusion, I believe we will be in serious trouble as long as we retain our present approach to program management. I urge you to expand Taylor's group and to strengthen and clarify his relationship to the functional managers."

Shaifer's Meeting with Taylor

Colonel Emery succeeded in arousing Shaifer's concern. Shaifer contacted Taylor and arranged a meeting for the morning of November 14. He suggested that Taylor prepare a list of the changes he wanted in staff, organization, procedures and any other areas he believed necessary to making SPAWN's program management a success. Shaifer said he would do the same and ended the conversation with the comment, "Maybe between two of us we can come up with a plan of action that will really work!"

EXHIBIT 1. FEDERAL RADAR ORGANIZATION CHART

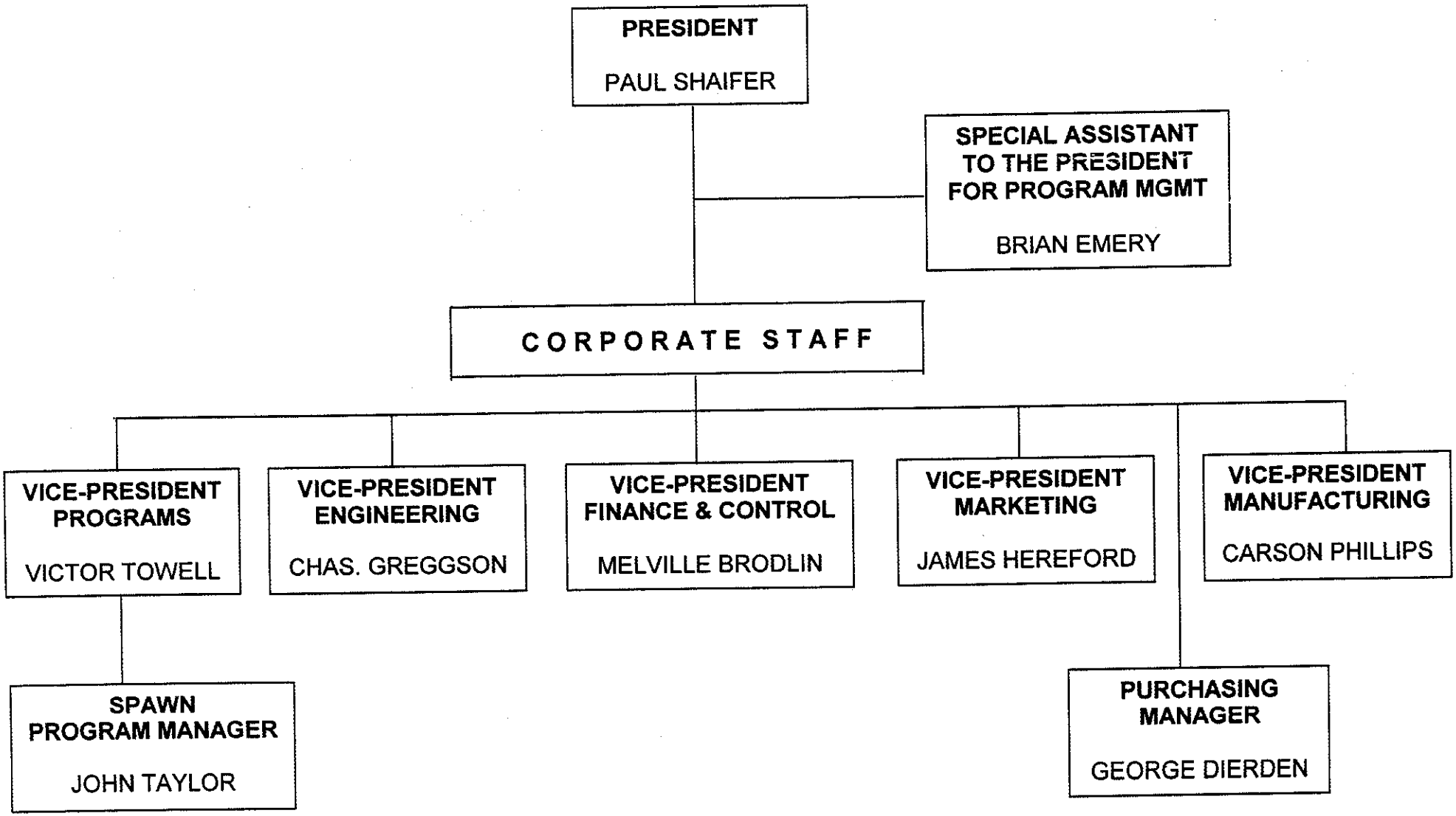

EXHIBIT 2. SPAWN PROGRAM OFFICE