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# DEFENSE SYSTEMS MANAGEMENT COLLEGE

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## PROGRAM MANAGEMENT COURSE
## INDIVIDUAL STUDY PROGRAM

SMALL TECHNOLOGIES MANAGEMENT

STUDY PROJECT REPORT
PMC 77-1

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# SMALL TECHNOLOGIES MANAGEMENT

Individual Study Program

Study Project Report

Prepared as a Journal Article

Defense Systems Management College

Program Management Course

Class 77-1



by

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May 1977

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This study project report represents the views, conclusions and recommendations of the author and does not necessiarily reflect the official opinion of the Defense Systems Management College or the Department of Defense

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE: SMALL TECHNOLOGIES MANAGEMENT

STUDY PROJECT GOALS:

To define lucidly specific steps in an attitudinal philosophy that has been employed by the author to accelerate technology transfer and to reorient R&D explorations towards current and future systems needs.


STUDY REPORT ABSTRACT:

This paper is concerned with technology development within the Department of Defense. This multibillion dollar industry is constantly beleaguered with the proposition that the results of the myriad investigations are not being reduced to practice rapidly enough. This may, indeed, be true.

If it is, it's because the technology community and the systems development community can view themselves as disparate entities. If this is so, it is so only in the areas of technological advances that can be "done without" in the short term. Every major system development will push the technology frontiers in certain areas but cannot use an "across the board" advancement of technology due to the risk involved in such an approach. Is this really so? Are there not built in attitudes which guarantee that this attitude must exist in todays DoD?

An hypothesis is presented that the major shortfall in technology transfer is directly attributable to the attitudes and practices of technology managers, and secondarily attributable to the program managers, as well. An attitudinal approach which will accelerate technology transfer is presented herein for use by technology managers. An ancillary attitude, to be emulated by program managers is also elucidated.


SUBJECT DESCRIPTORS:

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## EXECUTIVE SUMMARY

Technology development is a large segment of activity within the DoD. In general terms this base of work is maintained to enhance our capability to field systems adequate to meet future sophisticated threats. It follows that technology transition is vital. Within the spectrum of R&D programs conducted by the DoD there are "sets" of research which might properly be classified as large technologies and small technologies. Possibly the distinction originates in how urgently the technology is needed for current development programs. In any case, the large technologies are invariably linked to major programs and, per se, need no driving force to sustain or justify the major research work. There is no question of technology transfer here, since utilization is demonstratable in major systems.

At the fringes of the large technology programs, and in broad areas where major thrusts do not currently exist there are hundreds of small programs underway in all of the services that exist under the aegis that they will be required in the future. These are defined as Small Technolgies. In point of fact, all of these technologies are useful, all are interesting, all do possess potential, but are probably not being applied efficiently.

The blight on technology transfer is primarily a two fault syndrome. Program managers view small technologies at face value and see a welter of conflicting data, theories, pheonomenlogical explanations. The program office, consequently, discards small technologies as unusuable. Managers of small technologies allow this to happen. Herein lies the cause of the demise of technology transfer.

Small Technology Management, as set forth in this paper, is a personal management attitude (philosophy) that can circumvent this turn of events.

This attitude embraces a "will do" concept toward the responsibilties associated with making technology acceptable for use in Department of Defense systems acquisition programs. The system acquisition manager must match this attitude just as responsibly, and accept technolgies which are ready for use although still "immature" in the sense of systems applications.

By successfully integrating this theme of attitudes, the Small Technology Manager can bring focus to his technology area. He can define the area usages of his Small Technology, can determine and direct development work that the user community needs, can orient his research toward future applications. In short, he can provide the vision to consolidate developments into useful application (transfer technology now) and can create research goals more clearly directed to future needs (future technology transfer).

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## SECTION I

## INTRODUCTION

### Formalized Technology Transfer

Federally funded research and development has, during the second half of the 20th Century, become a significant industry unto itself. Funds slated for expenditure in 1978 are approximately $11.904 billion dollars of budgeted Department of Defense funds plus an estimated additional expenditure of 5% of contractor sales to the federal government for Independent Research and Development and Product Improvement. In recent years private industry, as well as the Department of Defense, have drifted towards the connotation that research and development must be so structured that no significant failures occur during program execution. High emphasis is placed on "successful" R&D to the extent that there is an unreasonably low tolerance level for failures and little management initiative to budget realistically for false starts or learning curve advancement in a technology sense. The Department of Defense - in its ever increasing tendency to disallow the risk connotation to the phrase "research and development" is met at the government industry interface by a similar industry attitude. The pressure within industry to maintain its return on investment levels with previous years is creating two new corporate attitudes. (1) Industry has little acceptance, in the current state of technology, of governments position that it should share the risk of technology innovation and/or invention for products in the government arena. This shifts the financial responsibility almost totally onto the government for bearing the risk associated with advanced technology required for weapon systems which must (always) meet out-year threats embodying sophisticated technological advances. (2) Industry is moving towards a "DoD attitude" with regard to its own commercially oriented technology. That is, it is imposing more pressure in its own exploratory development programs to eliminate the risk from research and development. The impact here is that the broad base of technology is being curtailed in favor of a narrower range of funded programs that will pay-off with the least risk, and quickly.

There is a growing concern within the Department of Defense relative to technology transfer. More particularly: towards showing appropriate levels of transfer - [illegible] of expended dollars in terms of improved capability military sy[illegible] Congress, on the other hand, constantly exerts pressure on the federal R&D community (primarily DoD, ERDA, NASA) to show civil benefits from such expenditures. The reaction, among the federal agencies, is to show relevancy of funded research to major acquisition programs and to minimize comments and visibility of R&D enterprises that are false-starts, have no immediate application, or which require massive overhaul to obtain salient results. Little effective resistance has been mounted to halt the increasing curtailment of "non-relevant" R&D.

The process is a vicious circle: Congress authorizes and appropriates monies and exerts pressure to justify expenditures. Agencies, in todays environment, satisfactorily justify only expenditures which have "immediate" payoff. On a yearly basis more and more R&D, that which cannot be umbrellaed by the assertion of future threat sophistication or greater future societal need satisfaction, is postponed or written off the books. The impact of this trend will not be felt now. In fact, it will not be felt while the current elected are in power. The effects of risk avoidance in R&D will materialize in a decade, or in two decades. Acquisition of technical knowledge, accumulated to underwrite future systems developments, is being eroded.

Technology application is the driving function for research and development. Technology innovation plays a significant role in technology application. Technology diffusion - the time consuming process of dissemination of concentrations of technical knowledge - is a significant factor underlying the process of technology innovation. If there are no new concentrations of knowledge to be diffused within our science and engineering communities, there will be little new application potential after a time.

Devising a method to promote the flow of R&D results into application is extremely difficult - probably impossible, except in isolated highly focused instances. None the less, numerous models have been devised, numerous investigations have been executed to develop and substantiate methods of accelerating the flow of technology from the research community into the application community. Most models for technology transfer present structured information systems to aid the flow of ideas into arenas where they can be applied. These models reveal the unquantifiable (and mysterious) element of human endeavor. These models reveal, almost by surprise, that entrepreneurship, ingenuousness and inventiveness - human elements - underwrite most innovations. The bulk of this article, which is about technology transfer, will deal with the human element side of the transfer issue.

## SECTION II

## EXPOSITION

### What Is a "Small Technology"?

This paper deals with a facet of management required in the research and development field within the Department of Defense. This paper deals with the small dollar programs which comprise approximately 80% of the "roadmapped" R&D programs in the military laboratory community. Each of these programs (frequently comprising 3 or 4 contracts or a comparable amount of inhouse work), is small in dollar magnitude, paced over a 3 to 5 year period of time, and may compliment other such programs but can probably stand alone as a "defendable" program. This paper does not deal with programs (small or large) which are in the limelight by virtue of external agency interest or current need. This paper develops management tenets for those first level managers of small technology programs as well as first level system managers who have a need for technological improvements and cites attitudinal attributes which technology program managers should cultivate or possess to a high degree.

A Small Technology (ST) is defined here as a collection of interrelated small dollar R&D programs. Characteristics of small technologies are: (1) clearly defined research objectives - probably for some future application, (2) a continuity of need - past, present, future - which provides program continuity, (3) distinct emphasis on the exploratory nature of the program, (4) a considerable degree of empiricism at the forefront of the technology associated with emerging quantification in the older portions of the overall program (5) a modest private sector involvement in terms of interested (capable) contractors, and (6) modest research funding. Additionally, and most critically, a small technology has no immediate outlet as relates to direct system application, i.e., no system in the acquisition process has accepted this technology for use in its current state of advancement.

It is contended that small technologies, as defined, are prey to several influences which can stifle a primary objective of Department of Defense sponsored R&D, namely: transition to application. One recognizes that within broad constraints the technology base must be protected from the ever present question of "where are you going to use that?" This is utterly essential to the well being of the nation's defense posture - particularly in the future. However, the persistence with which the R&D community is assaulted by the above question gives a clue that some perceive a deficiency in the function of transition of R&D to application. Small technologies <u>can</u> become institutionalized, <u>can</u> run on year after year generating empirical data which literally litters the investigative field, <u>are</u> nonstructured in their explorative nature, <u>are</u> incomprehensible to any outside the technology. Small technologies <u>can</u> become introspective - generating research issues and answers of relatively little interest vis a vis application. Small technolgies <u>can</u> get well out of touch with comparable work occurring in industry or in sister services.

It is contended that a primary management role in the conduct of small research and development programs is the internal application of the question "where are we going to use this?" It is asserted that the proper local application of this question and appropriate activities to develop the answer to this question - and action in accordance with the answer developed -

will strengthen the umbrella over R&D which protects it from being arbitrarily redirected or terminated. It is asserted that application rate can be improved and that healthier R&D (for long term objectives) can result. This paper will set forth a "small technologies management" approach (attitude) as a fundamental management precept (the Small Technology Manager (STM) approach) for Department of Defense sponsored R&D.

## Who Is the Small Technology Manager?

The vertical orientation of management and functional definition which exists in agencies patterned after Webers' Bureaucratic model, provides a key element to the emergence of the Small Technology Management concept. At the first level of supervision we find, in most government laboratories, and in many corporate agencies involved in technology development, a pivotal interface, a "dual-manning" area. In these organizations there are essentially two career progression avenues: science and engineering development or technical management. The talented personnel in the working ranks exhibit proclivities towards technology or management. As senior personnel move up, the young engineers with a management orientation move into first level supervisory oppotunities. They are conversant with the technology of the groups they supervise (having just come from them), they have no time to practice technology, but have time to stay abreast of it. They respond, by job charter, to traditional bureaucratic demands on management. Their scientifically oriented counterparts, in the meantime, ascend to leadership roles in steering technology areas. They become technical area managers. They do not provide the supervisory/administrative function to people, but do provide this function to their technical areas. They are occupied by duties which require reporting and planning and remaining leaders in their technology areas. They work for their counterparts - the first level supervisors. The significant point here is the "duality" of the interface in terms of general knowledge of the technology.

Consider such a "pair" - a first level supervisor and his technical area manager. One of these two people will be saturated with duties. Generally it is the technical area manager. He must stay technically proficient, he must plan, program, budget for his continuing research, he must (almost continually) defend, explain, bargain with the upper agency management to keep his technology area funded. On the other hand, the first level supervisor does not have as intense a burden. He does, however, possess a working knowledge of the technical area and he has management ability (business sense and people sense). He is the prime candidate to assume the Small Technology Manager (STM) role.

## The STM Attitude

What does this candidate do when it finally dawns on him that the technology his work force is developing may never, or at least not very rapidly, be promulgated into useful applications? What is the consequence of waiting until a potential user comes knocking on his door? In fact, how long is he likely to wait for such a knock? Will his management put pressure on him to apply his technology? For the moment let us discuss the attitude that ought to exist in the STM, the attitude, and the reason that the attitude can survive and grow.

Stated simply, the attitude is "you don't need permission to transfer your technology". So, don't wait to be told to apply it. Don't ask permission to sell it. Don't give up on upper level management interest in applying a technology - simply, don't wait for an outside assertion to apply technology. The simplest, most direct approach to doing something useful is to go do it, ask permission later ... or not at all. If you define technology transition as one of the roles in your functional province, you need neither permission nor overt management concern that you seek application outlets. Diligently pursued, technology outlets will accrue (by definition DoD sponsored R&D has useful system application - some place(s)). With success in applying new technology to a system the will to make technology more broadly serviceable will also grow. The "do", rather than the "think-about" attitude of technology transfer will be secured.

## What Does the STM Do?

Certain steps are essential to the successful entrepreneurship of a small technology. The focus is on the manager as an individual - not as a part of an agency - and the dominent attitude is personal accomplishment of the steps (or stages) cited. The manager must prepare himself, must emerge from organization attitudes, must live the attitude that he is best suited (and situated) to deliver technology to application, that it is his responsibility to do this.

### Global Perception of the ST

Due to the proliferation of technology sponsored throughout the DoD laboratory structure, there is almost no possibility that the research central to a given ST is practiced only by the would be entrepreneur's group. As the initial step in assuming the role of transition practitioner, the STM must become familiar with the extent and content of the technology as pursued within other government laboratories. Almost without question this will require a definite ability to establish rapport with coworkers in the same field. A hallmark of bureaucratically oriented government laboratories is the innate proclivity towards noncommunication with technically qualified "other" agency personnel. Probably the root cause of this is professional pride linked with new ideas in research which are frequently difficult to originate and harder yet to sell to management. One will not talk freely on such topics if he feels he is likely to see these ideas emerging in another agency's research program a year later. Yet it is absolutely imperative that a working knowledge of the research objectives (and methods), as practiced by other governmental agencies, be obtained.

The search for these areas of similar research should extend into organizations chartered to basic research (6.1), exploratory development (6.2) and, quite likely advanced development (6.3). The search should extend at least across all military services. By acquiring an insight into what the DoD is really doing in a given research area, other necessary information will accumulate: the private sector involvement, the scope of resources being applied to the field, the uniformity (or in many cases, the duplication) of effort being applied to the various aspects of the technology. Additionally, knowledge of people will result: the government and private sector practitioners of the research, the government people attempting to utilize the technology being developed ... and these people will attain a knowledge of the STM. Finally, insight will be accrued: areas where the technology can (or should) be applied, perceived deficiencies of the technology as viewed by would be users, the extent and content of research performed. The STM's own perception of technology deficiencies relative to suitability for application will emerge in this process.

System Needs for Small Technology Application

Establishing, at least in the STM's mind, what systems could benefit from application of a new technology is the acid test for justification of government expenditure in the technology area. It is inconceivable that, in the steps taken to understand the breadth and scope of the technology investigations underway in the government and private sectors, a range of applications not be discovered. This range will include hazily defined long term objectives, shorter range firm application targets, and probably some application of previous developments (within the same technology) which could be improved upon. A given technology generally presents a continuum of achievements which range from older work which resulted in uses and application of the technology (past transferred technology) to current work which may be ready for application.

The emphasis of the STM should be in providing outlets for the emerging technology across a greater spectrum of applications and into system applications which are new for the ST. Innovation and tailoring of the technology must ultimately be accomplished to acquire suitability for application in new systems developments. There are generally many market places which have historically resisted utilization of the ST. The reasons are predictable: "work not fully developed", "costs too much to be utilized", "looks good, but still too immature to risk during system development", "we have too many major risk areas to worry about another". These are standard refrains that technology managers receive from system program managers. A major reason for these responses is that the ST is not proposed in acceptable fashion to the systems managers. And this is the technology manager's fault.

Understand the system. A general notion of how the ST can be applied is simply not good enough. The STM must have a detailed understanding of the system he wants to impact. He must know the mission of the system, the mission profiles, the environment the system operates in, the acquisition phase the system is in, the schedule of events that the system is constrained by, the fiscal constraints imposed on the system development. If the ST is hardware oriented, it is essential to understand the production, maintenance, and reliability plans of the system to be impacted. In short, the STM must understand the system well enough so that he can evaluate the ST from the same point of view as the system manager. The STM must wear a "systems hat" when he considers whether the ST is applicable to a system.

There are numerous information sources available to provide insight into a major system program. An essential first (and continuing) source of information is people. People in the system program office(s). Get to know the people in the program(s) since these are the ones who will open or close the door to utilization of the ST. Through knowledge of the people, knowledge of the program details can be obtained. Program requirements, schedules, test plans, specifications all can be acquired by asking. More important, the STM can evaluate the people. He can determine the special emphasis they place on the ST as they perceive it, how they evaluate its shortcomings, and what the attitude is concerning costs and schedules. The STM can, finally, educate the program development people relative to the ST - as he is educating himself relative to the program he wishes to impact.

Small Technology Needs for System Application

It is almost axiomatic that, for multi-agency pursued technologies, the body of research and experimental knowledge is not adequately collected, integrated and/or uniformly understood. This is especially likely in emergent technologies that are spearheaded by empirical research and which possess, at best, emerging analytical and phenomenological descriptions of aspects of the technology. The STM, in obtaining a global perception of the ST, must be aware of numerous "indicators" of the maturity and cogency of it. For instance, he will be aware of the different broad disciplines practiced within the technology - disciplines required to analyze performance capability in diverse operational environments. He will be aware of conflicting emerging theories relative to performance. At the forefront of a technology this degree of "theory confusion" is normal and is reconciled only over long periods of time because budgets are normally small.

The STM will be aware of diverse test methods in use, of data bases related to these test methods, and of (often) uncorrelatable results between the different test methods. He will be aware of data base "sets" used by different government laboratory agencies - these sets, while not mutually exclusive, do not include uniformly, the major advances made in all laboratories. The STM will also be aware of test methods which are affordable, but which do not duplicate the system use environment. Most tests are this way. This, in conjunction with a host of extrapolative techniques by which test results are extended to encompass real environments provides weakly supported performance data.

Just as he will perceive the above mentioned indicators of newness and growth within his technology, the STM will also grasp the established elements of the ST, the new proven concepts, the documented improvements over previous years, the proven analytical methods and phenomenological theses. He will know where the technology has been applied and will know what new advances have not been applied.

The STM, as he compares what he knows about the state of his technology with what he perceives as likely systems developments that could (should) apply his technology, is in a position to analyze why the technology is not being employed. If the STM does his job properly at this point, he can hasten transition by years. His role is one of assessing the ST for true usefulness to defense systems under development. He must look inward at the technical community and its results and ask whether the work he fronts for is ready for engineering development. More importantly, he must determine whether or not it appears viable. In essense, the STM must be somewhat eclectic in his approach, he must act as a buffer between the technology community and the user community. He must prevent the extreme forefront of his technology (where the confusion exists) from being presented as useful to the systems developer. It is not, by virtue of the unresolved nature of it. He must focus the new and substantiated results for the system developers' consideration. He must present these results in a frame of reference that the user community can grasp, that is, he must use their language, their constraints, their environment.

In the performance of this role, the STM should become adept at wearing "two hats". He must be able to wear a "system hat" when viewing the ST for possible application, and he must wear his customary "technology hat" at other times. It is entirely possible that his assessment of the ST, when he views it as a potential user, is that there are gaps in the technology, untested or unexplored regions that must be resolved to strengthen the appeal of the technology to the user. In truth, this is a point of view, an insight, most often lacking in the technical community. There is generally no perception of how inadequate the technology appears (or is, actually) to the would be user.

## The STM Charter

The STM can provide two invaluable (and rarely performed) services to the technical community he represents. He has learned what potential users exist in the systems acquisition community as well as their needs, their constraints, their views and requirements. Secondly, he has evaluated the ST from a user orientation and can perceive technology gaps that must be filled or overcome - he has the user view of why the technology cannot be applied. Almost by accident he has gained a viewpoint that most government researchers do not possess. And the impact this viewpoint can have on the ST is immense. Now it is possible to define explicitly the reason for existence of the ST. Such requirements as specific systems applications, specific needs, specific time frames for application, broader user base, now become part of the ammunition used by the technical community to protect and extend their technology budget and charter within their own management channels.

More importantly, however, this user oriented viewpoint provides improved direction for current and future work. Fresh, vital information is available to direct research into channels that will result in consolidation of the technology, of the data, of the theories, of the phenomenological explanations. Consolidation of the state-of-the technology at the level that is most appealing to the user. This is never the forefront of the ST. This is the work that is from two to four years old, the work that is tending to stabilize. By directing research to fill the gaps and overcome specific deficiencies the user may cite, the STM can cause the ST to be more immediately useful and desirable to the system developer. This effort is invaluable to the ST internally, for consolidation of results will ultimately provide better knowledge with which to direct the empirical leading edge research in the technology.

## What Does the Systems Developer Do?

Acquisition management within the DoD is a compendium of conflicting pressures. Systems in development are envisioned as being capable of countering future threats, threats which are intrinsically more sophisticated than those in the field today. Such threats pose the imperative that systems currently in development must, themselves, be highly sophisticated. Sophistication costs time and money. The greater the length of time in development is, the less sophisticated (relatively) the system will be when finally deployed, and the more the acquisition life cycle will have cost. A high degree of sophistication equates to an increased degree of risk during the development phase of a program. High technical risk increases cost, increases testing requirements (and difficulties) and underwrites the probability of test failures. DoD and congressional pressure today is pro testing and con failure ... but pro sophistication. The program manager, in this scenario, instinctively tends to minimize his technical risk by avoiding new technology where possible, but must of necessity employ new technology if he is to field a system sophisticated enough to counter the future threat. Laboratories offer sophisticated technology which, from their point of view, is ready for application. It never is, from the program managers point of view, since it hasn't been demonstrated and hasn't been fitted to his constraints and unique requirements. It is easy to conceive of mediocrity as the result of such pressures.

Historically, program offices have exuded the attitude that "its our wheel, and we'll invent it as we see fit." It isn't hard to envision where this attitude comes from. If you are confronted with "half-baked" technology solutions from the scientific community on the one hand and the siren song of the prime contractor on the other hand, it takes little or no time for communications channels between the program office and the technical community to atrophy. No amount of insistence from OSD will facilitate the transfer of small technologies into a major program once the communications are gone. When an SPO assumes the appearance, to the technology community, of an unassailable fort then the potential for technology infusion into the SPO is no longer orchestratable by bureaucratic department heads in Washington, D.C.

The program office staff can help themselves in the technology transfer area. Personal involvement is the most certain method of obtaining insight into systems technology needs and solutions. Presupposing the existence of technology managers who wish to help, the program office personnel have a role to play which they must individually accept. It is the nature of individual attitudes and actions of program office personnel that is to be addressed in the ensuing paragraphs.

The program manager must communicate to the STM the true nature of his technology needs. He must assist the STM in understanding the development program problems and constraints. This requires that the STM be educated in the language and the scenario of the program. The STM must be informed of the system peculiarities and requirements. He must understand the constraints of the program, the criteria that technology must meet to be useful. He must understand the program well enough to be able to view his technology from the program managers point of view. Program documentation, technical explanations, threat discussions, requirements in terms of maintainability, reliability, and integration into the total system <u>must be learned, understood</u>.

Of singular importance is the information the program manager can provide as to why a given technology is viewed as inadequate to meet the system's needs. Quantification of the perceived inadequacies of the ST will lead to areas where the system manager can be educated out of misconceptions, and areas where the STM can only acknowledge the inadequacies of the ST. If the STM is perceptive, if the program manger can properly express the inadequacies of the ST, then research can be applied to alleviate the shortcomings.

The program manager must be candid concerning the potential of the ST to impact his program. He must indicate the degree of likelihood that his program has time or need for the ST. He must reveal his skepticism that the ST can enhance the attainment of his program goals. He must, after such revelations, acknowledge the rebuttal offered by the STM. He should be willing to assess the position of the STM, and, especially, should encourage the STM to perform consolidation of his technology to meet program objectives if time constraints permit.

The central theme that should be retained by the program manager and the STM throughout the exercise of the above ideas is: the program manager is not committed to utilization of the ST. He views it as inadequate in its current state, but possessing potential to impact the performance capability of his system. He expresses his skepticism concerning the ST, but is willing (capable) to be educated concerning the true state of the ST. It is the STM's responsibility to consolidate his research and present it in a manner that is compatible with the program requirements. If the STM can do this, then the program manager must show a degree of commitment.

The activities beyond this point of agreement are the activities associated with active technology transfer. There are pitfalls and growing pains to be lived through. There is a transfer of funding responsibilities to the system program office and a period during which the ST community must work closely with the program office, providing, for a time, engineering support to the program. Finally, the responsibility for the ST is assumed by the development program and the ST community performs only an advisory role. Throughout this transition period (which could take two to three years) it is a mandate that both parties to the technology accept the premise that the technology is immature. The immaturity is unavoidable and can only be retired through application experience in systems.

## SECTION III

## CONCLUSION

Technology development is a large segment of activity within the DoD. In general terms this base of work is maintained to enhance our capability to field systems adequate to meet future sophisticated threats. Within the spectrum of R&D programs conducted by the DoD there are sets of research which might properly be classified as large technologies and small technologies. Possibly the distinction originates in how urgently the technology is needed for current development programs. In any case the large technologies are invariably linked to major programs and, per se, need no driving force to sustain or justify the major research work. There is no question of technology transition here, since utilization is demonstratable in major systems.

At the fringes of the large technology programs, and in broad areas where major thrusts do not currently exist there are hundreds of small programs underway in all of the services that operate under the aegis that they will be required in the future. In point of fact, many of these programs address technology areas that could be handled better. In point of fact, <u>all</u> of these technologies are useful, <u>are</u> interesting, <u>do</u> possess potential, but not all are being applied. They do possess areas of advancement that have not been utilized, they do press the frontiers of technology and, at the forefront, are in a state which is not usable. However, many of the advances that have been made have not been transferred.

The blight on technology transfer is primarily a two fault syndrome. Program managers view ST's at face value and see a welter of conflicting data, theories, phenomenological explanations. This "moving target" of information cannot be dealt with in a program office because of lack of intense knowledge of the area, and lack of time to gain the knowledge. So, the program offices discard ST's as unusuable. Small technology managers allow this to happen. Herein lies the reason for the demise of technology transfer. The technology community does not prepare itself to present useful information to potential users. It girds itself in an array of conflicting theories, conflicting data bases and fuzzy five year objectives and emanates the "theory confusion" of its forefront technology investigations.

Small technology management is a personal attitude that can circumvent this turn of events. The STM attitude encompasses the following:
(1) I understand my technology - across my service component - across the other service components - within the private sector. (2) I understand the potential for use of my ST within DoD programs under development. I understand my verifiable technology advances - I understand the chaos at my technology forefront. (3) I am trying to understand program needs and my ST deficiencies relative to these needs. (4) I am a buffer, an eclectic device - I will show you what I can prove.

The SPO must match this personal attitude with an attudinal change on its part. The program management attitude must be (1) This is my problem... (2) These are your deficiencies as I perceive them... (3) Convince me of your capability and I will use it.

By successfully integrating this theme of attitudes, the STM can bring focus to his ST, can define the area usages of his ST, can consolidate his research, can present his abilities in a fashion that the user community can accept. In short, he can provide the force to consolidate research developments into useful application, can reorient research into useful paths (through this consolidation process), and can transfer technology into the application world.

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