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## The Process For Technology Transfer In Baltimore

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**Thomas S. Golden**

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National Aeronautics and  
Space Administration

**Goddard Space Flight Center**  
Greenbelt, Maryland 20771



**THE PROCESS FOR TECHNOLOGY  
TRANSFER IN BALTIMORE**

**Thomas S. Golden**

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# THE PROCESS FOR TECHNOLOGY TRANSFER IN BALTIMORE

## INTRODUCTION

Providing help with technology to a large American city is a very ramified process; no single paper can do justice to such a process. To the end of providing a broad, yet moderately detailed coverage of the subject, this is a companion paper to three other related papers.<sup>1</sup> Herein is a brief description of some events of the NASA/Baltimore Applications Project (BAP), an experimental program to provide technological assistance and advice to the City of Baltimore, as interpreted by the NASA<sup>2</sup> project director and technologist-in-residence.

Through a letter request to NASA for technological assistance, the experimental program known as the NASA/Baltimore Applications Project was instituted. As conceived, it was to be a two year experimental program in which a NASA technologist from Goddard Space Flight Center (GSFC) would serve full time in the Office of the Mayor of the City of Baltimore. The essence of the project agenda was to provide assistance to the City of Baltimore through the application of NASA and other Federally developed technology to the City's problems. Since the first two years, there have been two requests for one-year extensions of the BAP; the fourth year will be completed on May 6, 1978.

The companion papers will cover several BAP factors, scenes and regimes. It is the intent of this paper to cover the story of the interfaces within the City government in a general way and to delineate the salient characteristics of those interfaces.

What has happened in Baltimore is considered to be a beneficial event. Though there is little evidence thus far to substantiate it, it is the considered feeling of the writer that the events that happened in Baltimore are repeatable elsewhere. It is the purpose of these papers to describe those events in a way which will help to clarify what took place, or otherwise, will provoke additional attempts by others to provide technical assistance to other cities using these same principles that provided for "success" in Baltimore.

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<sup>1</sup>Bernie Berkowitz, The City and Its Need for Technology; H. J. Peake, The Human Element in Technology Transfer; H. J. Peake, The History & Nature of the Baltimore Applications Project.

<sup>2</sup>National Aeronautics and Space Administration.

## CHARACTERISTICS OF THE EXPERIMENT

The first obvious chronological event in the BAP was the letter from the City of Baltimore to NASA requesting assistance with technology. After almost four years of trying to provide technological help for the City it is obvious that there were several events which must have preceded the Baltimore to NASA letter. There are also a few intrinsic characteristics of the "personality" of the Baltimore City Government which were preliminary requirements for a project like the BAP to have occurred. These are basic to any successful city program to innovate with technology.

First, the city government must be aware of the need for help with technology. Often "keeping the operation going" tends to dim the vision of need for help. Sometimes there is a local pride in that operation which gets in the way. Most of the time the awareness of need for help takes a great deal of personal understanding and humility on the part of the city officials. Without awareness of that need for help there is little that the would-be "helper" can do.

Second, is a kind of corollary to the first; the local official must believe he can get help from some source. Again the burden of operations frequently limits the vision of "light at the end of the tunnel"; too frequently there don't seem to be any workable options. Faith that there are workable alternatives is necessary.

Third, asking for and getting technological help, while it requires a degree of humility as described above, also requires self confidence. Without a modicum of self confidence the local elected official or administrator is likely to be too threatened and defensive to allow outsiders to come in and perturb his operations by their experiment.

This brings up the fourth salient characteristic, recognition of the need to try new approaches; to innovate. Whatever is done should be recognized (if not referred to) as an experiment. This is particularly true when more sophisticated and complex technology is at issue; it is less important, perhaps, for the simpler and more routine considerations. Through the "experimental mode" objectivity is facilitated; the reversability option is better preserved. And negative findings are more acceptable. There must be adequate and full commitment to the "experiment," however.

### User Pull

The letter received by NASA constituted "user pull." It is the writer's opinion that this is the primary requirement for any attempts to utilize technological

assistance or to "transfer technology." Pull is a natural consequence of the first and second characteristics cited above. Without a sincere desire (pull) on the part of the smaller government body (local, county, state) the technologist must also become a salesman to sell innovation. While selling is one way innovation took place a generation ago, things are now too technically specialized and politically ramified for most technologists today to have to "sell" or "push" their technology.

The "pull" atmosphere allows several other things to obtain. There can be (and, given the conditions preliminary to the BAP, there is) the assumption that the City knows it has one or more problems; that's why they want help. The most difficult tasks for the technologist-in-residence are to fully explore and define the problem with the local people and not present "the" solution before the problem has been fully identified. This kind of behavior inevitably ends up in pushing "the" technology. The "sale" of a "product" has been one of the greatest barriers to successful technology transfer to cities.

### Steps in Problem Solving

The classic problem-solving regime should be followed. The first step in that regime is to discuss the problem with all its ramifications to enable a good focus on the definition of the problem. This must obviously be a mutual discussion between the technologist-in-residence and the responsible local government officials.

Once this has been accomplished the technologist is then able to take the second step, the search for one or more possible solutions to the problem. This search encompasses the literature, existing data bases (Scientific and Technical Aerospace Reports (STAR), National Technical Information Services (NTIS), etc.), discussions with recognized and knowledgeable people in NASA, other federal agencies and, at times, people in academia and industry. The idea is to get a number of approaches, suggestions and related experience applied to the search for potential solutions.

In the third step the technologist can return to the responsible local official to array the alternatives before him and together evaluate each one. In this activity the technologist should remember who's got the responsibility for the area in which a problem has been identified. It is relatively easy for a technologist to provide answers in the technological realm; often the technologist is lacking in knowledge of those non-technical realms so important to operating a government that is responsive to its constituents. This is the "politics" of the decision process. Together the responsible official and the technologist should evaluate each solution. It is the opinion of the writer that the decision

about any option (including "none of the above") must be made by the responsible local official; the technologist serves as the source of technical knowledge for this decision.

The last step is the implementation of the innovation. In this phase of problem solving through technology there are roles that the BAP technologist-in-residence can and should play. Though the BAP has been in operation almost four years there are only one or two experiences in implementation from which lessons can be drawn. These involvements are beyond the scope of this paper.

### Low Profile

While most elected officials want to get "political mileage" out of most everything they do, the BAP approach was to try to maintain a reasonably low profile for project activities. Some "exposure" is beneficial, even necessary. A low profile does two things for the technologist. First, it helps to keep local expectations at a reasonable level for the technologist's activity and, secondly, it enables a sufficiently thorough and deliberate approach so necessary for carrying out the classic problem solving regime described above.

### "You Gotta Be There"

It is necessary for the technologist to have a physical location in the city organization; he needs to be on site. In the BAP the choice was made to locate the project organizationally in the Office of the Mayor. This allowed an organizational purview of the city's many agencies from a place of perceived authority at least organizationally.\* It is imperative that the place of business of the technologist be located in the city he's trying to help. It may be possible to have "office days" but at the inception of a project the presence of the technologist in the place he's trying to help on a daily basis is highly desirable. A regular and consistent presence makes him more of a member of the team.

### Get Good Help

It is necessary for the technologist to understand that he is individually not expected to know answers to every question and to personally provide solutions to each area of expertise. However, the technologist should know where to go to provide the help needed or to get information on the problems that are discussed if he is to provide the best assistance to the city. He must have access to good

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\*The personality and mind-set of the technologist must not be discounted as a major factor in organizational interfaces. See Peake, H. J., "The Human Element in Technology Transfer."



information and to experts in the field of interest at the time. A suitable relationship with a nearby federal laboratory or university should be available to the technologist to get access to the best information. The technologist must be sufficiently skeptical to assure the motive and the quality of the sources of information he taps on behalf of the city. Through the personal knowledge he brings to the scene and this skepticism the technologist should be able to learn what he needs to know about his information sources and thus provide the city with good help.

## RELATING

The Mayor of the City of Baltimore has established two Cabinets—one for Human Resources, the other for Physical Development. Physical Development in the City is defined as those "physical" programs having to do with facilities, services requiring technology, construction, etc. It was the Mayor's Physical Development Coordinator, Mr. Bernie Berkowitz, who was selected by the City as the point for interface for BAP. This action was fortunate in a number of ways. The Coordinator had been the focal point for most City activity which related to technology in any way. The position was essentially administrative and non-political. In the incumbent, Berkowitz, there was a keen awareness both of what made good sense politically as well as a keen intuition regarding the feasibility and the broad relative merit of technical things (incinerators, pollution, etc.). For the BAP it was a very comfortable interface.

One further advantage of such an interface is that there is adequate "insulation" from the need for immediate politicization of technical issues. While the running of a city is and should remain "political" from a standpoint of local government's responsiveness to the people, there is a need for time to evaluate and deliberate about technical alternatives before bringing in a part of the general public to participate in the process of choice. There are numerous questions and some decisions about which the elected official should not have to be concerned once he's become assured of the intelligence, integrity and high motives of his advisers. In due time the Mayor was informed. Usually this information transfer was to the Mayor and the Physical Development Cabinet in one of their regular meetings. For the BAP operation the interface with the Physical Development Coordinator was an ideal one. It is strongly suggested that such interface arrangement be adopted in other projects which seek to provide technical assistance to local governments.

At the outset the BAP director was invited to attend the Mayor's Cabinet meetings regularly. Doing so offered a regular forum for meeting and establishing personal and sociable relationships with the Cabinet (Department Heads,

Bureau Chiefs, Office Directors, etc.). There was great opportunity to hear about problem areas in these weekly meetings.

It was obvious early in the project that there should be identification of the City Departments which were more intimately or intensively connected with technology in their operations. It was obvious for instance that the Law Department had little direct involvement with decisions regarding technology as compared with the Department of Public Works or the Fire Department. In short it was possible to separate the various departments into "intensive" and "less intensive" categories according to their individual daily activities. The separation led to the categories shown in Table 1; this strategy proved useful, generally correct for technology transfer activities, and increased the BAP productivity.

Getting to know the responsible officials largely through these cabinet meetings led to a social acquaintance and a personal mutual trust through which appointments with these officials and subsequent in-depth discussions about technology and the problems in their operations. Over time, through numerous personal encounters, the departments' operations, individual needs and priorities were discussed. In general the first step in activity was largely a problem identification process. A sort of "soft" priority was established through discussion with the department personnel and the physical development coordinator.

Table 1

Intensive	Less or Non-Intensive
Education Fire Health Hospitals Housing and Community Development Planning Police Public Works Recreation and Parks Transit and Traffic	Assessments Audits Comptroller Economic Development Finance Law Legislative Reference Postmortem Examiners Real Estate Social Services Treasurer

The next step was usually a search for possible ways of solving a given problem. A tentative state-of-the-art of the processes involved was determined through discussions with the proper knowledgeable expert in NASA, in other federal agencies or in academia. Occasionally the data bases available through the Goddard library were utilized. Through discussions and briefings a set of options for solution of the problem was derived.

The next step (which is likely to be overlooked or inadequately emphasized) is to discuss the various options with the person in the City who has the responsibility for the proper solution. Since he is the person responsible, it must be his decision. Usually this person is the one with whom problem discussions began. While the need to advocate a particular solution may be strong in the technologist, it is still his responsibility to present all the options. If the local official feels he needs guidance, he'll usually ask for it, if the background of trust and confidence in the technologist has been properly developed.

This could be the last action relating to the problem and its solution with which the technologist is involved. At this point the City officials should feel reasonably comfortable with the solution and might even choose to effect it themselves.

Alternatively the technologist may be asked for additional data, for advice on schedules, management, etc. or for guidance and help with the statement of work or the specifications for procurement. In some cases in the BAP, assistance with proposals for grants from the federal government was provided. In nearly every BAP case the role was dominantly that of advisor to the Department or group responsible for carrying out the solution chosen.

One of the difficulties of the technologist in this process lies in his natural pride and his desire to win. Sometimes a proposed solution, though to the technologist it is "clearly superior," may not be selected for other than technical reasons. The technologist should have provided the decision maker with good options and as much information about each option as needed so that the "best" decision can be made. It's difficult to learn that "you can't win 'em all!"

#### FINDINGS ABOUT THE PROCESS

The BAP was an event of fitting a NASA technologist into a public administrative structure in a large city. The BAP is basically an experiment in relationships. Both the technologist and the administrators had opportunity to learn what the other side was like and how they might get to know and understand it better. What follows is an attempt to summarize the things that were learned

by the technologist in this experience. Many of these points may be very obvious to the administrator and possibly even other technologists, but they are a part of what the writer "discovered" through his experience.

### An Operational Environment

A city's chief function is the provision of public facilities and services for its citizens. This gives the city a dynamic kind of appearance but it necessitates a continuous or operational character to the functions for which the city government is responsible. A city that has one or more individuals dedicated to "planning" is fortunate; it is rare that the planners can assume anything like the role of a technological research and development department. Most planning events are associated with "growth" or regional change and development; these are not intimately connected with technology in general or with specific know-how (e.g. energy recovery from solid waste) in particular. Most cities have not needed this kind of expertise in-house—the need for specific expertise along developmental lines is not a part of the continuing operations of the city. This is not to say the city doesn't need knowledgeable technical operators. It does say that most of the technical demand to date is operationally oriented. It may say that in-house technical expertise ("capacity") or a broad based technologist-in-residence would be a valuable adjunct to a city in planning its future. It is the general conclusion from the BAP activity that this project is of considerable value to the City of Baltimore and that continuing technological assistance of some form would be of benefit to the City in the foreseeable future.

### Levels of Technology

Another valuable observation of technology in the city drawn from the BAP experience is that there are varying degrees of complexity or sophistication of technology and that this "level" of sophistication has a direct bearing on how the technology and its implementation should be accommodated. As the complexity of the technology increases, usually,

- o the cost of the technology increases
- o the time to achieve reduction to practice is longer
- o the risk of probability of failure grows.

As the complexity of the technology lessens, usually

- o there is greater ease of implementation
- o the attention given to the technology grows.

One way of illustrating this variation is shown in Figure 1.

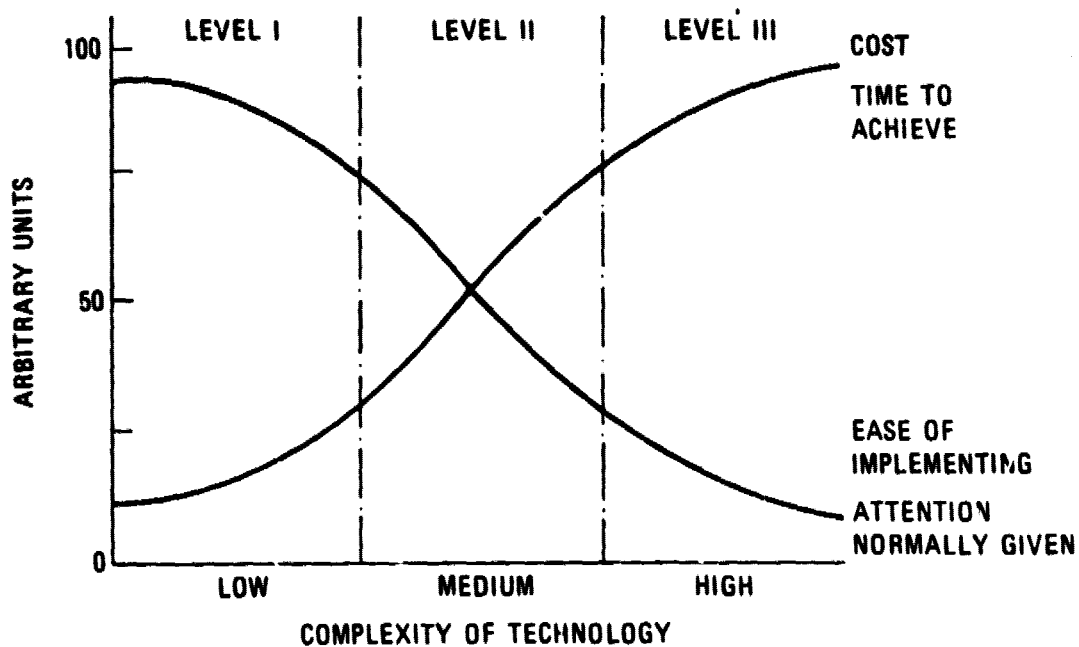


Figure 1. Factors and Levels vs. Complexity of Technology

In the early activities of BAP it has been useful to categorize tasks into low, moderate or high complexity. This has been helpful directly in setting priorities and indirectly in establishing schedules.

#### Roles Played by the Technologist-in-Residence

The chief characteristic of the roles of the technologist-in-residence is variety. The technologist has to be many "things" in carrying out the work. Among these, several seem to stand out. Because of the "pull" nature of the BAP, the earliest roles were problem seeker, problem identifier. Once contact with a local administrator was established interviews were conducted which probed into the problems which the administrator and the interviewer felt were more important. This involved the role of a technology assessor. Insight into where to go to get information on potential solutions was necessary so that the next role became one of information gatherer or agent. Some mixture of intelligence, skill and humility is needed because the technologist could not be expert in all the areas encountered in the BAP. He must be a technology broker who knows when to seek assistance, where to go for the best information, and how to present his findings to the person with the original problem. This latter requirement calls for a role as teacher.

There are other roles that are recognizable in the BAP experience; some of these fall into the adviser category. Others are akin to the role of an ombudsman. There were several occasions when the role of grantsman was played. Lastly, there are the roles of doer of the task or "doer-watcher," where an expert from another federal agency was called in to do a task and the technologist was there to introduce people and to watch. Midst all these various roles it is important for the technologist not to lose sight of the basic reason for being there, namely, to try to help the City solve some of its problems through technology.

#### FOR ANY CITY

The experience with the BAP in Baltimore has been beneficial, both for the City of Baltimore and for NASA. The question is now, "How does any city approach such a task?" The specific regime for implementing federal programs of this type on a broad scale is the subject of considerable (deserved) discussion and at this time is undecided. The question now is what has been learned in the BAP experience that would provide help and guidance to any city or other governmental jurisdiction wanting to employ the best technology in the most suitable way. There are several observations which can be made based directly on the experience with the BAP. There are others which intuitively follow from these experiences. These are factors which each jurisdiction must recognize about itself and about technology.

1. The city is basically people living in community.
2. The city has a basic requirement to provide services and facilities.
3. There are "people" problems and there are "technology" problems; the difference must be recognized.
4. There must be an awareness on the part of both the elected and administrative officials of a need for advice in re technology by the city. (The city, because of its operational nature, can't keep up with the state-of-the-art of all the technology with which it could be involved.)
5. The need is for advice not just dollars. While every city could do more and probably do it better with additional money, the basic need in the realm of technology is for good advice. (Money alone can buy advice, but it may not be "good" advice. A technologist-in-residence can help to assure the quality of the procured advice.)

6. The elected and administrative officials should have a good, honest and objective assessment of their city's intrinsic capability (capacity) for understanding and dealing with technology.
7. When a technologist-in-residence position in the city is opted for, he should have a connection with a nearby public (possibly private or academic) technology-based institution to serve as a resource for modern technical information and know-how.
8. The technologist should have his base of operations in the city he's trying to help. He must be available to the city officials.
9. For greatest success in the "delivery" or implementation of a technologist-in-residence program, the early stages of the enterprise should be recognized as an experiment. The nature of the experimental program provides for a) ability to cease activity at any time; b) a high degree of objectivity in establishing the schedule and in conducting the program, and c) reasonable expectations and results. It also helps the local government to avoid the opprobrium of failure.
10. There should be a recognition of the benefit according to the problem solving hierarchy and of adherence to it—a) define the problem, b) search for solutions, c) evaluate each solution as objectively as possible, d) select the "best" solution, e) plan and carry out the implementation.

## CONCLUSIONS

Based on almost four years of experience in the BAP a number of the elements of the process for the transfer of technology to the city have been identified. These elements represent most of the essential ingredients for a successful decision process relative to proper technological choices for a large city.

## BIBLIOGRAPHIC DATA SHEET

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