Innovations In Government Contracting Using the Authority to Enter Into "Other Transactions" with Industry

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BEFORE THE HOUSE COMMITTEE ON SCIENCE

INNOVATIONS IN GOVERNMENT CONTRACTING USING THE AUTHORITY TO ENTER INTO "OTHER TRANSACTIONS" WITH INDUSTRY

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Several weeks ago the Advanced Research Projects Agency (ARPA) of the Department of Defense (DoD) entered into its 100th innovative agreement using the authority of U.S.C. 2371 to enter into 'other transactions", that is, contractual arrangements that are neither "procurement contracts", "grants", or 'cooperative agreements.' The inspiration for ARPA's statutory agreements authority was the provision found in section 203 (c)(5) of the National Aeronautics and Space Act authorizing NASA to enter into and perform 'other transactions" in carrying out its mission.

The vast majority of ARPA's "other transactions" have been multi- party agreements without traditional prime/sub-contractor relationships typically referred to as consortia or "partnership" agreements. They involve substantial industry cost sharing and usually involve dual-use technologies with both military and commercial applications.

The Cold War drove our Government to become heavily involved in supporting science and technology. Competition with the Soviet Union was played out in both the arenas of national security and national prestige. National security is self evident, national prestige primarily involved the space program and "big science." Government was viewed as the leader in advanced technology as exemplified by military and space systems. Government viewed itself as the market for advanced technology and thus felt it could set all the rules. An industrial base grew up in response to this view and though it still exists, military and space budget declines since the 1980's have resulted in severe retrenchment. The Cold War is over and new trends have emerged.

The commercial sector often develops technology more advanced than the military and space sectors. Government is clearly no longer the market for advanced technology and is often only a minor player in many market segments. Many high-tech companies refuse to do business under Government mandated rules.

Given the trends of the past ten years it seems obvious that Government should have radically reformed the way it develops R&D to respond to the new realities. Generally speaking, it has not done so. An exception is ARPA.Because the agreements authority ARPA uses to enter into innovative arrangements is based on the Space Act, ARPA's experience may be relevant to this Committee's consideration of NASA contracting practices. In the early 1980's the Administrator of NASA chartered a Space Commercialization Task Force which studied many of the same questions that are the subject of this hearing. I was the author of a minority report of that Task Force that recommended that NASA adopt innovative contracting methods using the authority of the Space Act. NASA recognizes that it has the requisite legal authority but has been reticent to exercise this authority both then and now.

Before going into this subject in detail, a brief word about ARPA (formerly DARPA) is in order. ARPA is the Defense Department's corporate research and development organization. It addresses issues that cut across Military Department responsibilities or that offer the possibility of revolutionary breakthroughs in military capabilities or affordability. ARPA was originally chartered as a space agency prior to the creation of NASA, but after NASA was created and worked up to operational speed ARPA evolved to the broader mission Just mentioned.

Beginning in the early 1960's ARPA began to support advances in computer technology on a broad front rather than focusing on military-specific or command, control and intelligence functions. This approach, which would today be called "dual-use", led to America's dominant global position in information processing systems for commercial and military uses ("America's computer strength came out of DARPA" John Deutch, 1989). There are many other examples. The military pioneered the use of semi-conductors but their cost dropped dramatically when they achieved widespread commercial applications. Advanced materials, advanced display technology and microelectro-mechanical devices are Just a few other examples.

ARPA's mission is such that 'gee whiz" technology alone is not of interest. Technology that actually gets into use to enhance national security is ARPA's aim. ARPA is not constrained in how this happens, thus dual-use strategies that field technology as commercial products which are available, or can be adapted, for military use re not only legitimate but often considered an optimum approach.

Modern Government contracting began at the start of the Cold War era with the enactment of the Armed Services Procurement Act (1947) and the Federal Property and Administrative Services Act {1949). By the early 1950's a separate and permanent defense and aerospace industry began to emerge. This was caused in part by the needs of a large peacetime military force, and technologies applicable only to military products, but in no small measure it resulted from government contracting rules (such as accounting and audit rules and mandated military specifications) that made a government contractor non-competitive outside the defense marketplace. See e.g., Integrating Civilian and Military- Technologies: An Industry Survey (Center for Strategic and International Studies, 1993). "Government contractor" is a better term than defense contractor since the available market includes NASA, FAA, NOAA and other government agencies. Contractors dependent on these agencies may likewise find that business practices mandated by government rules are not optimal for commercial business.

The constraints of the contracting statutes and their implementing regulations (originally DoD's Armed Services Procurement Regulation, later the Defense Acquisition Regulation and Federal Acquisition Regulation} led some agencies to issue "grants" to support university research. Grants were simple instruments not subject to procurement rules. Other agencies, viewing a grant to be a form of contract, believed that the procurement rules applied to grants. Yet other agencies viewed grants as gifts and doubted their authority to give gifts in the absence of express statutory authority. Congress remedied the confusion by enacting the Grant Statute in 1958. This authorized agencies to award grants to universities and non-profit research organizations to conduct basic and applied research. Under the authority of the Grant Statute or other statutory authority some agencies began to award "cooperative agreements" characterized by more active Government involvement than was traditional with grants.

The Federal Grant and Cooperative Agreement Act (1978) was enacted to remedy the substantial inconsistency being practiced by federal agencies in using the various award instruments. Unlike the Grant Statute, which it repealed, the new statute was not limited to research but could also apply to other activities. By repealing the Grant Statute, it repealed that statute's limitations on recipients (university and non-profits) and type of research (basic and applied).

The Office of Management and Budget (OMB), which oversees the Federal Grant and Cooperative Agreement Act, characterized the statute as establishing two categories of transactions

-- procurement and assistance, the former being the domain of procurement contracts and the latter authorizing the use of a grant or cooperative agreement. The distinction between a grant and a cooperative agreement is the level of anticipated government involvement. Procurement contracts are to be used when "the principal purpose of the instrument is to acquire ... property or services for the direct benefit or use of the United States Government .... " Assistance instruments are used when "the principal purpose of the relationship is to transfer a thing of value ... to carry out a public purpose of support or stimulation...."

In the research and development context this statutory policy has been implemented in the following language:

Contracts shall be used only when the principal purpose is the acquisition of supplies or services for the direct benefit of the Federal Government. Grants or cooperative agreements should be used when the principal purpose of the transaction is to stimulate or support research and development for another public purpose. Federal Acquisition Regulation (FAR) 35.003 (a).

Despite the repeal of the Grant Statute the Department of Defense, NASA and some other agencies, by policy, until very recently continued to limit grant recipients to universities and non-profit organizations performing basic research. Government wide regulations governed grants and agreements with universities and non-profits (OMB Circular A-110) but not profit-making companies. Some agencies, such as the Department of Energy, have awarded assistance instruments to profit-making companies, but by regulation applied key provisions of the procurement system such as procurement cost principles and auditing. NASA's notice of proposed rule making (June 27, 1995) concerning cooperative agreements with commercial firms also falls far short of adopting "commercial" practices.

There is a general misunderstanding that procurement and assistance (contracts, grants, and cooperative agreements) cover the field of all possible research and development contractual instruments. The following excerpt is from correspondence between OMB Director McIntyre and the Administrator of the National Aeronautics and Space Administration (NASA):

On the related question of transactions not covered by the Act, based on earlier comments of NASA and other agencies, a statement has been included in the OMB guidance that transactions such as patent licenses, out-bailments, etc. are not covered by the Act. It would help us in our study if your staff would provide a brief list and description of such transactions... (OMB letter, Oct. 11, 1978).

Over the years NASA has entered into a wide variety of contractual arrangements which it considers outside the procurement and assistance categories. See generally, Dunn, Contractual Mechanisms in Support of Commercial Space Activities(The Air and Space Lawyer, 1984). Among these these a "funded Space Act Agreement" under NASA'S authority "to enter into and perform such contracts, leases, cooperative agreements or other transactions as may be necessary in the conduct of its work..." under section 203 (c) (5) of the National Aeronautics and Space Act.

The Comptroller General has held that "authority 'to enter into contracts, grants or other arrangements'...particularly the language 'or other arrangements' is sufficiently broad to encompass transfer of Commission funds so long as the transfer is to an entity carrying out a function set forth" in the agency's statute (B-217093, January 1985).

In 1989 Congress enacted section 251 of public law 101-189 which was codified at 10 U.S.C. 2371. Section

(a) stated: The Secretary of Defense, in carrying out advanced research projects through the Defense Advanced Research Projects Agency, may enter into cooperative agreements and other transactions with any person, any agency or instrumentality of the United States, any unit of state or local government, any educational institution, and any other entity.

The statute provided for equal cost sharing "to the extent ... practicable .... " and avoidance of duplication of effort the maximum extent practicable ..." Advance payments could he made. Recoupment or other payments to the government were authorized. The authority was to be used only -when the use of standard contracts or grants is not feasible or appropriate .... In 1989 "standard" DoD grants were grants to universities and non-profit research organizations for the conduct of basic research. Standard contracts were described in Part 16 of the FAR and involved the principal purpose of acquiring goods or services for the direct benefit or use of the Federal Government. Much of ARPA'S work involves other activities such as advancing the state of the art, demonstrating technology, establishing industrial capabilities, and transitioning technology into actual use. Such activities can be distinguished from simply buying goods and services.

Another characteristic of "standard" DoD instruments in 1989 when the statute was originally enacted is that they were entered into with single parties. The trend toward research Joint ventures was in its infancy in the 1980's. The passage of the National Cooperative Research Act of 1984 accelerated the process.

ARPA has repeatedly reported to Congress on its use of "other transactions" authority. Congress has re-enacted the statute three times (1991, 1993 and 1994} making minor changes without changing the substance of the authority. In 1990 (section 244,Public Law 101-510} Congress authorized a $50 million appropriation for ARPA to fund consortia to support dual-use technologies utilizing the authority of 10 U.S.C. 2371. The following year $60 million was authorized. Each year ARPA used these funds to enter into several "other transactions" which were duly reported to Congress. In 1992 Congress appropriated nearly one-half billion dollars for a series of programs that specifically mentioned 10 U.S.C. 2371 "other transactions" as a funding option. By these actions of re-enacting 10 U.S.C. 2371 and appropriating millions of dollars year after year in the knowledge of ARPA'S use and interpretation of 10 U.S.C. 2371 Congress may be viewed as having ratified ARPA's interpretation of its authority. See, e.g., TVA v. Kinzer 142 F. 2d 833, 837 and U.S-v. Two Tracts of Land, 456 F. 2d 264,. 409 U.S. 887 (1972). In 1993 Congress authorized ARPA to use the authority of 10 U.S.C. 2371 on an experimental basis without cost sharing and whether or not a procurement contract would be otherwise appropriate for strictly military prototype projects (sec. 845, public Law 103-160).

IMPLICATIONS

ARPA has interpreted 10 U.S.C. 2371 to mean that "other transactions" are a class of transactions outside the procurement and assistance categories as they were implemented by DoD in 1989 at the time of the statute's original enactment. "Other transactions" are not subject to the Armed Services Procurement Act, Federal Acquisition Regulation, Defense Federal Acquisitions Regulation Supplement or other laws and regulations specific to the procurement system, including most of the statutes codified in title 41, U.S. Code. Likewise laws and regulations governing assistance relationships or specific to grants and cooperative agreements are not applicable. Statutes of general applicability such as title VI of the Civil Rights Act of 1964 are applicable. ARPA has entered into a number of "other transactions" with single commercial firms such as agreements with Gazelle Microcircuits, Cray Research and Intel Corporation. ARPA has entered into unfunded agreements with Rockwell Corporation, Boeing and Northrop. The majority of ARPA's one hundred other transactions have been multi-party agreements, most with multiple signatures and others with one company as an agent signing for all members of a consortium. The agreements are styled in various ways - Coordinated Research Agreement, Technology Development Agreement, or other appropriate designation. The legal authority for the agreement is always expressly stated. Agreements range in total funding from less than $1 million to $370 million. Government funding is almost always less than half and in some cases a small fraction of the total.

TYPES OF RELATIONSHIPS

In its initial report to congress ARPA described the first agreement executed under the authority of 10 U.S.C. 2371. This was an agreement with Gazelle Microcircuits, Inc., a small venture capital supported firm that had

never had a government procurement contract. The agreement would accelerate the development of a new class of high speed gallium arsenide communication components. ARPA had previously helped establish the U.S. manufacturing capability for digital gallium arsenide products. The purpose of ARPA's technical and funding support under the agreement was to establish a secure, low-cost, assured source of supply for a key advanced technology for defense needs.

That initial report also provided Congress examples of some of the other types of transactions ARPA expected to enter into:

"(i) Bailment. This would involve the lending or borrowing of equipment typically with a sharing of research or test results.

"(ii) Parallel or coordinated research. This would involve sponsoring a research project that is related to one or more research projects funded by others and involving an arrangement to share results or to coordinate the research so as to enhance the end result of each project.

"(iii) Consortia agreements. This would involve an agreement with multiple parties, when those parties have agreed to Join together to perform research as a consortium. The consortium may not be a legal entity with the power to contract. A contractor or grantee/sub-contractor relationship may not be appropriate.

"(iv) Joint funding. This would involve an arrangement with others to finance a third party to conduct research.

"(v) Reimbursable arrangements. This may involve ARPA providing services such as transportation services on an ARPA experimental space launch vehicle, experimental air vehicle, or experimental undersea vehicle. The user would typically provide one or more of its own experiments to be conducted during a test mission. The amount of reimbursement to ARPA could be fixed depending on the extent to which the user's experimental data is to be shared with ARPA and the extent to which it supports an ARPA program." To date ARPA's "other transactions" have involved one or more aspects from each example except that the reimbursable arrangement involved a satellite ground station rather than a vehicle. While "other transactions" can be defined in a negative sense - i.e., what they are not, to get a positive feel for other transactions some additional examples may help.

1. Ceramic fibers for gas turbine engines. ARPA (with some Air Force and NASA support) is co-funding with the seven gasturbine engine manufacturers work to develop a new class of high temperature ceramic fiber components for gas turbine engines. The actual research work is being done by universities and small R&D firms which are collaborating closely with materials manufacturers.

2. Interferometric SAR commercialization. ARPA contracted with the Environmental Research Institute of Michigan (ERIM) to develop a highly successful airborne Interferometric Synthetic Aperture Radar (IFSAR). The R&D and demonstration efforts are over and no government agency has stepped up to continue to fund the IFSAR operationally. ARPA has an agreement with ERIM to allow the IFSAR to be used in attempt to establish a commercial business distributing IFSAR imagery to commercial and government users. If conditions for a successful commercial transition are met ERIM will transfer the IFSAR to a commercial spin-off company.

3. Advanced composites for bridges. An ARPA sponsored consortium is cost-sharing the development of advanced composite components for bridge construction and repair. One subcontractor is developing production and application techniques to wrap bridge support columns for earthquake protection. Composite cladding will be cheaper than steel cladding now used and will drive down the cost of expensive composite materials for military applications.

EXECUTING "OTHER TRANSACTIONS"

A key distinction between the NASA approach to funded "Space Act Agreements" that I am familiar with and ARPA's approach to "other transactions" is that NASA considers these transactions to be outside its normal

contracting process and typically executes them at Headquarters through a program office rather than a contracting office. ARPA has fully integrated "other transactions" into its routine way of doing business through its Contract Management Office. A single competitive solicitation may result in multiple types of instruments being awarded, for example, a mixture of procurement contracts, grants, or "other transactions" depending on the proposals received. In other cases proposals are specifically sought that will result in "other transaction" agreements being awarded.

"Other transactions" are one more arrow in the quiver, so to speak. They are highly valued. They often fit ARPA's needs but they are not the sole way to do business.

Negotiating an "other transaction" requires a team effort of technical program managers and contracting officers with some legal support. A clear common understanding or "vision" of the project is essential and typically is negotiated first. With a clear vision and substantive pay-off for both the military and commercial interests, negotiation usually proceeds smoothly.

COMMERCIAL PRACTICE

Since "other transactions" are not subject to the rules applicable to government contracts and assistance relationships, ARPA is able to enter into agreements based on commercial practices. The essence of "commercial practice" is the ability to negotiate terms and conditions unconstrained by pre-ordained rules and forms. This has enabled ARPA to enter into agreements with companies who refuse or are unable to enter into government cost reimbursement research and development contracts. ARPA has been able to enter into agreements with small venture capital supported companies like Gazelle; the leading super-computer company, Cray Research, which has never had a government R&D procurement contract; and industry giants such as Hewlett Packard and Intel. ARPA has entered into agreements with divisions of IBM that do not typically do business with the government. Rather than imposing government cost accounting and auditing practices on these companies, ARPA makes payments based on achievement of technical milestones and accepts commercial audits based on generally accepted accounting principles. The dozens of clauses that are required in a government procurement contract as well as pages of representations and certifications are not found in "other transactions". ARPA's "reps and certs" take up one page. Rather than rules and regulations, ARPA's agreement negotiators have to rely on common sense and good Judgment to craft an agreement that achieves government objectives collaboratively with industry and maintains the public trust. ARPA often accedes to industry demands for provisions not usually found in government procurement contracts but only after due diligence; i.e., a full disclosure of relevant facts and a well developed rationale for industry's position.

INTELLECTUAL PROPERTY

The Bayh-Dole Act (1980) provided a uniform and enlightened policy on allocation of patent rights to universities and small businesses receiving government support to conduct research. In 1983 a Presidential Memorandum extended the policy of the Act to large businesses as well.

The Act allows performers to retain title to inventions conceived or first actually reduced to practice with government funding. The government retains a paid-up license to use the invention for government purposes which includes competitive procurement. The government also retains march-in rights, which allow it to license the invention for commercial purposes if the title-holder fails to take reasonable steps to achieve practical application or other specified conditions occur. There are various administrative requirements related to invention disclosure and election to retain title to the invention (i.e., file a patent application). The import of these administrative requirements is that the invention can be maintained as a trade secret for a relatively modest period before a patent application must be filed or title reverts to the government.

The scheme of the Act was both to promote commercial use of inventions made with government support and to give the government certain rights. The Act has been successful to a degree. However, it failed to accommodate a number of trends that emerged after 1980. These include R&D Joint ventures involving government contractors and commercial firms; commercially available technology advancing faster than government supported technology; the end of the Cold War, the shrinking defense market and the need of government-contractors to become more "commercial." In instances where the government wants to enter into

R&D relationships with commercial firms or where government contractors want to diversify into civilian product lines the Bayh-Dole allocation of patent rights is no longer adequate in all cases.

The Bayh-Dole Act comes into play when the research is conducted under a government "funding agreement," which is further defined in the statute to be a "contract, grant, or cooperative agreement .... " Congress has endorsed the view that ARPA's "other transactions" fall outside the scope of the Bayh-Dole Act. The conference report of the House and Senate Armed Services Committees on the National Defense Authorization Act for Fiscal Year 1992 stated:

The conferees also recognize that the regulations applicable to the allocation of patent and data rights under the procurement statutes may not be appropriate to partnership arrangements in certain cases. The conferees believe that the option to support "partnerships" pursuant to section 2371 of title 10, United States Code, provides adequate flexibility for the Defense Department and other partnership participants to agree to allocations of intellectual property rights in a manner that will meet the needs of all parties involved in a transaction. (Senate Report 102-311, p. 576)

In 1994 the House Armed Services Committee report on the National Defense Authorization bill noted that ARPA policy for "partnership" programs was "to negotiate intellectual property rights in "partnerships' so as to optimize the chances of successful commercialization." Further, ARPA "policy provides that the Federal Government should avoid acquiring rights if that will impede commercialization. Foreign access to technology is scrutinized and, if deemed necessary, restricted. Broad exposure of the technology among partnerships participants is encouraged." The Advanced Research Projects Agency (ARPA) can fully effectuate these policies because it has great flexibility to tailor patent and other intellectual property rights provisions under its "other transactions" authority. (House Report 103-499, p. 285) Seldom does ARPA abandon the general scheme of the Bayh-Dole Act. ARPA requires its industrial partners to make the case that the standard patent clause is inconsistent with the goal of a particular project. Typical ARPA concessions are to delay the effective date of the government purpose license for a period of years and to specifically define what are reasonable efforts toward practical application that will preclude exercise of the government's march-in rights. Through such measures ARPA can reduce the actual and perceived risk to the partnership during the initial phase of a project.

The allocation of intellectual property rights also involves a balancing of the relative needs and prior investments of the parties. If industry has advanced the state of the art through the expenditure of large sums of capital over many years with little or no government support, the government should be more open to industry's request to maintain a proprietary position especially if the Government's interests are primarily served by having a product available in the marketplace.

The goals of the particular project often define the optimum allocation of rights. For example, ARPA has entered into agreements where one result of the effort is for the partnership to develop a proprietary version of the first generation of a new product while also developing the industry standards or reference architecture for future generations. The standards are delivered with unlimited rights since their very purpose is to be publically available.

In the area of sensitive business and technical data, ARPA typically minimizes the actual delivery to the government. Data which becomes an "agency record" for purposes of the Freedom of Information Act runs the risk of being disclosed to a competitor or, at the minimum, requires a commercial firm to spend time and expense convincing the Government that the record should not be disclosed to a requestor. In lieu of delivery of sensitive data, alternative methods of keeping the ARPA program manager and agreement administrator informed are used such as meetings, briefings and delivery of summary reports.

OTHER OBSERVATIONS

Although most of ARPA's other transactions have been multiparty arrangements, this is clearly not the only, or in some cases even an optimum, way to do business. While consortia offer many advantages such as pooling talent, leveraging investments and developing strategic relationships, not every project or technology development can be accomplished collaboratively. ARPA's experience has been that working out the proper

roles and relationships among the industry partners is often more difficult and time consuming than working out the Government-industry relationship. Without the flexibility of "other transactions" it would probably be impossible to reach agreement in many cases. Foreign participation in ARPA sponsored efforts presents challenges and opportunities. The best technology is often not available domestically. Refusing to work with foreign companies would be a case of shooting one's own foot. On the other hand in this post-Cold War era domestic economic strength must be carefully considered in government mission-oriented research and development. ARPA has developed a "Foreign Access to Technology" clause which it includes in its agreements. Companies with plans for strictly domestic production generally have no problems with the clause. In the case of multi-national companies and partnerships involving foreign firms, the clause generates elucidating discussions which help ARPA to understand. where the economic benefit of the project is likely to go. ARPA tries to accommodate industry's needs so long as the end result is substantial benefit flowing to the U.S economy and the likelihood of assured access to the technology.

Cost-shared partnerships provide a real opportunity for developing new, less adversarial government-industry relationships. Each project is dual-use in nature and industry has a strong incentive to push the project to a successful conclusion. It is industry self-interest, rather than government oversight, that becomes the dominant feature in maintaining the public trust. Each participant has a strong interest in performing as effectively as possible. Additional pressure comes from the industry partners who are typically dependent on the success of every other participant. Use of fixed price payments triggered by the accomplishment of technical milestones reduces the need for extensive financial reporting and audit. This also avoids imposition of government cost principles and accounting systems which are anathema to many commercial firms.

Operating in a partnership environment is not natural for government or industry. Many traditional attitudes do not workwell. In fact the stock in trade of the legal profession focusing on avoiding failure and leaving nothing to trust - is particularly ill-suited to developing fruitful partnership relations. Few rules are applicable to "other transactions." This makes many people in both government and industry uncomfortable. For those willing to accept the challenge, however, working in such an environment is particularly rewarding.

At a time when government is trying to reinvent itself and Government's role in research and development is being re-examined in light of the end of the Cold War, the authority to enter into "other transactions" provides government agencies an unparalleled opportunity to experiment with new ways of doing business. "Other transactions" permit the deregulation of government supported research and development. Government is able to enter into "partnership" with industry and leverage not only the resources but also the genius and leadership of industry to the mutual advantage of both Government and industry. Government is no longer the for high technology. Government technology developments must not only meet mission needs but must do so affordably. The dual- use strategy is premised on the view that integration of the Government market into the broader commercial market place is an important facet in assuring the affordability of high technology products for the military. "Other transactions" that are extremely flexible and permit the adoption of commercial practices can be an important tool in reaching the goal of affordable military superiority for the United States. They should be able to help civilian technology agencies meet their goals as well.

END

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BEFORE THE HOUSE SCIENCE COMMITTEE

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Mr Chairman and members of the Subcommittee: I am pleased and honored to be able to present a statement on the development of the new Mission Control Center for Space Shuttle and Space Station at the Johnson Space Center.

The new Mission Control Center (MCC) at the Johnson Space Center is proof that NASA can execute projects of world class complexity on schedule and for significantly reduced costs. Delivered in eighteen months at a development cost reduced by tens of millions of dollars from the original estimate, the new MCC provides NASA the capability to control Space Shuttle, Space Station and other space projects with a common, modular, modern computer and communications architecture.

The new MCC will allow JSC's Mission Operations Directorate to operate both the control center operations for Space Shuttle and Space Station in 1998 for 2/3 of the yearly costs that it took to operate the old MCC for Space Shuttle alone in 1993. We will be able to provide MCC facilities for two programs at less than the cost of the original operating capability for one program. I believe that this is proof that by re-engineering NASA, we can take on new challenges for small increments of cost.

The new MCC was developed using an approach based on Commercial Off the Shelf (COTS) hardware and software. This meant that instead of developing custom equipment or heavily modifying computer equipment, we used computer equipment straight out of the box. This was a major step by NASA and a big piece of the development cost reduction.

In order for NASA to transition from a custom design approach to a COTS based approach, NASA demonstrated the capability of the technologies in small scale by projects with civil servants performing the "hands-on" work. This developed the skills and knowledge of the NASA civil servants so that they could be "smart buyers". Much of this small project work was funded by the advanced development and technology functions within NASA and was enthusiastically supported by JSC and Mission Operations Directorate management. As "smart buyers" we were able to specify procurements to allow the widest possible competition. This resulted in major cost reductions, essentially reducing the cost of the major computing components by 50%. The vendors were also required in these procurements to include extended maintenance of the computer equipment. This significantly reduced the yearly operations cost of the MCC because we did not have to develop the skills within NASA to maintain this commercial equipment. Being "smart buyers" also meant being sufficiently experienced in the hardware and software available in the marketplace to architect the new MCC so that it could take maximum advantage of commercially available software. Because we could rely on the private sector to maintain the commercial software, we were again able to significantly reduce the annual operating cost of the new MCC. We were able to reduce the code maintained by NASA from over 4 million lines of code to 2 million lines of code.

Building the new MCC based on commercial standards allows NASA to use new developments in the computer hardware and software industry as soon as they are available. As the vendors plan their upgrade paths for their commercial customers, they also provide an automatic upgrade path for NASA. We essentially allow NASA to utilize the entire commercial marketplace as the research and development environment for the computer components for the next generation of the MCC.

As we based our design for the new MCC on the modern computer and software industry, NASA was taking advantage of the NASA investment in these fields in the 1960's. As late as 1963, over 90% of all of the integrated circuits produced in the United States were bought by NASA and the United States Air Force for space and missile programs. Only these programs had requirements for small size, low power and lightweight electronics and could bear the high initial development costs for these components. This investment helped the fledgling industry reduce the costs to produce integrated circuits. It was not just a coincidence that the first modern electronic hand-held calculators came on the market just as the Apollo lunar landings were happening. The investment made by NASA and USAF in the 60's helped to bring about a technology that is in every

personal computer, cellular phone, fax machine, microwave oven and automobile engine. This investment not only enabled the development of the modern electronics hardware industry, but also a billion dollar/year software industry.

As we developed the new MCC using COTS hardware and software, we initially intended only to reduce NASA costs. We were reaping the harvest of seeds planted by NASA in the 60's. As the new MCC developed however, we began to realize that we were making an investment in a new technology, the technology of linking together hundreds of computers in a critical function. In doing so, we were planting seeds for industries of the next decade.

The new MCC is the largest Fiber Data Distributed Interface (FDDI) Local Area Network in the world linking over 200 computers from 10 different manufacturers on 150,000 feet of fiber optic cable. Although all of the components we bought were commercially available, they had never been put together on this scale before in a critical application. The new MCC also links video, audio, text, graphics and real time control and monitoring information. Integration of all of these types of data in a large scale critical application based on commercial equipment had never been attempted before.

This type of large distributed computer system in critical applications is the kind of computer system that will be dominant in industry and government in the next decade. But private industry could never afford a facility like this to test their products. The new MCC became a "final examination" for industry to find problems in applying their products to this type of problem. By partnering with industry, we were able to find and fix problems together, improving both the MCC and the industry's product lines. Problems in the fields of network management, computer security, software management and remote diagnostics and maintenance were solved and the solutions put into the marketplace by our vendors. An example can serve to explain the kind of technology we were developing with industry in the new MCC. The pre-release product testing of a commercial computer would not normally find a "bug" if it occurred very rarely. For example if such a "bug" required a unique set of circumstances that statistically might only occur once every 100,000 hours of operation, it would be very hard for a product manufacturer to find it prior to releasing a product. The manufacturer couldn't afford to test the product enough to see the bug once, much less the two or three times necessary to isolate and fix the problem. If a critical operation, such as controlling an industrial plant or a piece of medical equipment, only required one of these computers, a latent rare bug of this probability wouldn't be seen in 11 years of operation, probably longer than the lifetime of the computer. A computer with this type of rare bug, even if the bug had serious implications, would be considered very reliable for single computer applications.

However when you combine 200 of these computers, as we did in the new MCC, and use these computers 24 hours a day, as we do in controlling space shuttle and will do for the space station, a rare bug of this magnitude could be expected to surface once every 20 days. If this bug had serious implications for the system, such as causing the local area network to fail, a computer system containing such a rare bug would be unacceptable in the demanding environment of human space operations. Working with industry, we developed techniques in the new MCC to isolate and eliminate these types of rare bugs from their products. This resulted in an overall improvement in these product's ability to support the demands of the next decade in critical applications such as industrial process control, air traffic control, telecommunications, defense and medical industries.

It was an honor to be involved with the development of this new facility. I hope that it provides proof that NASA can work better, faster and cheaper and will give you confidence to invest in us to take on further challenges in the future. Thank you for the opportunity to speak to you today.

END

Transcript 953120347, 635 lines

PREPARED TESTIMONY OF

JOHN M. CASSANTO

INSTRUMENTATION TECHNOLOGY ASSOCIATES

PRESENTED BY DENNIS JAMES BUMETT

BEFORE THE HOUSE SCIENCE COMMITTEE

WEDNESDAY, NOVEMBER 8, 1995

Mr. Chairman and distinguished members of the Committee: Thank you for the opportunity to appear before the Committee and share our views about NASA contracting and procurement from commercial space enterprises. Although Chairman Walker and Mr. Hall are familiar with Instrumentation Technology Associates, Inc. ("ITA"), some Members of the Committee may not know who ITA is. Therefore, I will begin with a brief introduction of the company, a description of how ITA has developed and a summary of its relationship with NASA.

I. BACKGROUND

ITA was formed by John M. Cassanto in 1982 to develop commercial space hardware, in particular hardware for use in microgravity experimentation and commercial production and reentry capsules. Located in Exton, Pennsylvania, ITA was founded and has been sustained by commercial investors, commercial lenders, and the State of Pennsylvania which provided grants-all who had faith in the future of commercial space. John Gassanto, President and chief visionary, is an aerospace engineer who cut his teeth on the design and development of re-entry vehicles for strategic and tactical protection of the United States during the height of the cold war.

Space microgravity infrastructure is ITA's market niche. ITA manufactures standardized experiment modules that can be integrated easily into available transport such as the Space Shuttle middeck, sounding rockets, re-entry vehicles and research aircraft. ITA has an established expertise in low gravity research and the engineering services necessary for turn-key microgravity services. ITA has developed customers in the United States as well as international clientele in Canada, Europe, China and Japan. ITA also has formed strategic alliances with companies in Germany and Russia which broaden its product and service base as well as provide access to the global marketplace.

ITA was founded in large part due to U.S. government policies encouraging private/public sector cooperation in supporting the commercial development of space. With their focus on NASA's role as joint partner with the commercial space sector, these policies emphasized three fundamental themes:

The government would provide an environment conducive to private sector investment in space;

The government would purchase goods and services from the private sector involved in commercial space activity in order to stimulate the industry; and

The government should enter into cooperative/collaborative agreements for research, such as Joint Endeavor Agreements ("JEAs") for Shuttle flights for the private sector entity wishing to fly experiments or to have development flights of space hardware that would ultimately be used in commercial space ventures.One of ITA's first projects was the development, in 1983- 84, of an ITA Standardized Experiment Module ("ISEM") for users of NASA's Get Away Special Shuttle Program. Subsequently, ITA decided to pursue a JEA with NASA for a Shuttle bay carrier that would have been a significant upgrade of the ISEM. It took 18 months from the date of the formal submittal of the JEA proposal to negotiate and sign the Ilia Agreement. By way of comparison, it took NASA three months to negotiate and sign the first Space Station agreement with the Russian Space Agency. Unfortunately the ISEM JEA met an untimely demise when the Challenger went down on that tragic January morning in 1986.

ITA changed its direction after Challenger to pursue the development and manufacture of material processing space hardware that would be generic, multi-purpose, multi-user and provide a high density of data so that the cost per data point could be drastically reduced. The manufacture of the Materials Dispersion Apparatus ("MDA") was the result of ITA's reorientation. By 1988, the MDA had been developed and manufactured with private funds and ITA was ready to demonstrate the operation of the device. Further information about the MDA is provided in Appendix 1.

ITA approached NASA with a proposal to enter into a Space Service Development Agreement ("SSDA"), a type of agreement which had become the successor to the JEA. In 1988 NASA and ITA signed an MOU agreeing to enter into a SSDA that would allow ITA to fly the MDA in a Shuttle mid-deck locker. A formal proposal and draft SSDA was submitted to NASA in December of that year. What ITA didn't know and couldn't possibly have fathomed was that NASA would never come to terms on the SSDA and that ITA would nearly expire in the pursuit of the SSDA agreement.

Fortunately, ITA also decided to work with the Consortium for Material Development in Space (part of NASA's Centers for Commercial Development of Space (or "CCDS")) at the University of Alabama in Huntsville to fly the MDA on the Consort sounding rocket which was then being developed. The MDA first flew on Consort 1 in March of 1989 and proved to be a success. ITA continued to fly the MDA on Consort launches over the next several years.

In the meantime, there was no progress on the SSDA with NASA. In an effort to get the MDA qualified for the Shuttle, ITA joined another NASA CCDS ITA prepared and completed the extensive Shuttle documentation and testing to qualify as a CCDS sponsored payload on the Shuttle. ITA successfully flew four MDA's on Space Shuttle flight STS-37 in April of 1991. The Payload Specialist on that mission, Mr. Jay Apt, enthusiastically endorsed the concept of an automated mid-deck locker payload which allowed him to initiate hundreds of micro-gravity experiments in a mid-deck locker with a single command. The second flight was STS-43 in July of 1991. Even though ITA was flying its experiments without the SSDA, ITA could earn no revenue because there was no agreement which would allow ITA to sell space on its flights and no policy to allow commercial use of the mid-deck.By the third quarter of 1991, two and one half years of meetings and negotiations had resulted in ITA being down to its last reserves. John Cassanto didn't fade away but redoubled his efforts. In large part because of the support of the Chairman and others, in 1991, NASA finally agreed to fly the MDA hardware under an innovative type of barter agreement. In exchange for half of the payload capacity to be utilized by NASA and CCDS's for microgravity researchers, ITA could market the other half to commercial customers on a pay-to-fly basis. The program was known as the Commercial MDA ITA Experiments ("CMIX").

ITA developed a business plan for a five (5) flight research and demonstration CMIX program which concentrated on the first phase of two biomedical research programs for:

- Urokinase Breast Cancer; and Microencapsulation of Drugs (in cooperation with the Institute for Research, Houston, Texas) A description of the CMIX barter arrangement and the results that have been achieved are attached as Appendix 2.

Four CMIX missions were flown between 1992 and 1995 and one remains to be flown in November of this year. As a result of those missions, ITA developed a significant users base which includes domestic and international drug companies, research institutions, universities, cancer clinics, biotechnology companies and other companies undertaking proprietary microgravity research. This user base grows with each mission. Unfortunately, a substantial portion of the commercial and science data were lost on the CMIX-1 and CMIX-3 missions due to a combination of NASA hardware failures, in-flight crew errors and equipment malfunctions. Consequently, ITA requested that NASA refly those missions under the CMIX agreement-treatment which is not uncommon for experimental users of the Shuttle. NASA balked at the idea of reflights because of a provision in the agreement that specifically disavowed reflight guarantees but agreed informally, after numerous meetings, to provide additional flights to complete the commercial research that had been initiated.

However, when pressed on formalizing the agreement on the additional flights the NASA bureaucracy became evasive. In frustration, ITA sought the bipartisan support of this Committee and the NASA Administrator. Mr.

Golden heartily endorsed the CMIX agreements and the additional flights. But when ITA was contacted by NASA, the additional flights were not to be provided pursuant to an extended CMIX agreement but under a new scenario with additional strings attached. After further consultation between the Chairman and the Administrator, it was confirmed that NASA was "committed to five additional flights under the same conditions as the existing flight program [CMIX]."

Although the CMIX barter agreement has worked well for ITA and its customers, including NASA, NASA has recently proposed yet another type of agreement which it calls a"Product Development Agreement" to complete the biomedical research and honor the customer commitments made by ITA pursuant to the CMIX Agreement. ITA is working conscientiously with Code X officials to hammer out terms of the new agreement, although it is unclear whether such an agreement can be reached and whether NASA's internal clearing process can be completed in time to meet ITA's deadline of December 15, 1995; a deadline which has to be met to honor commitments to both investors and customers.

H. LESSONS

Given the twelve plus years of experience of IT& what has been learned from the experience? We believe the lessons can be summarized as follows:

1. Infrastructure Products can be Developed Cheaper and Faster by the Private Sector - ITA's experience with the ITA Standardized Equipment Module ("ISEM") and the Material Dispersion Apparatus ("MDA") demonstrates that commercial entrepreneurs can. develop market driven products faster and cheaper than similar type products can be developed through the normal NASA procurement process. Unfortunately, cheaper, faster, better and already developed doesn't necessarily translate into sales. We are aware of two examples we would like to recount.

ITA recently discovered that NASA is developing and ITA believes may already have fabricated a device which will replicate the functions and performance of the MDA. The device is known as DCAM (Dialysis Crystallization Apparatus for Microgravity). ITA has been crystallizing proteins in its MDA on Shuttle flights using dialysis techniques (one of five protein crystallization techniques available on MDA) since 1991. ITA does not know what the cost of the new NASA equipment is but we believe it to be more expensive than the MDA and know that the cost is unnecessary, Wyle Laboratories developed its Universal Small Experiment Container ("USEC") in ten months at a cost of about $550,000. Wylie estimates that it would take three to five years and $4-6 million to make the same development conventionally. In spite of the availability of the ECLIPSE-Hab rack or a modified rack, it appears to Wyle that NASA is preparing to develop and manufacture a similar containment device. Wyle's role in that project has not yet been determined. Wyle has not been successful in getting NASA' s attention as a vendor for providers of this technology. (See the letter from Wyle's Manager of Space Engineering attached as Appendix 3. See also the letter from Weaver Aerospace attached as Appendix 4 as further similar information.)

2. Policy to Support Commercial Space and Utilize Commercial Products and Services needs to be Strengthened - There is an inherent conflict in NASA, natural because of their procurement driven culture, between developing hardware internally or through contractors and utilizing off the-shelf commercial products. There is a conflict between those who want to develop equipment tailored to the exact requirements of the science community, regardless of cost, and those that are willing to adapt to what is available, are willing to modify the available hardware, and compromise if the trade-offs are acceptable. A policy must be clearly enunciated that NASA should first survey available commercial products and services and utilize such products and services before developing competing or similar products internally or through contractors. Commercial entrepreneurs want NASA as a client and are willing to modify their hardware to meet customer requirements. The policy should not merely be to utilize commercial products and services whenever possible but to actively seek means to leverage such products and services. This is not a new policy but is a policy that appears to be given only lip service.

3. Policy for Commercial Utilization of Shuttle and Space Station - Some of the difficulties ITA has encountered can be attributed to the lack of policy for the commercial use and pricing of the Shuttle mid-deck. This situation cannot be allowed to extend to the Space Station. Policies need to be put in place now which

define how commercial enterprises such as ITA can utilize the Space Station. If ITA develops a better mousetrap, how can ITA get it to the Space Station and utilize the Station infrastructure to (1) demonstrate its hardware, (2) perform product development, and (3) sell its services to others? A certain amount of Space Station resources must be made available to commercial developers to let the market laboratory as well as the science laboratory operate in microgravity. It is not enough to state the Space Station will be available for commercial users and ignore how commercial users are to obtain such access. It is ITA's opinion that one of the best means would be to keep the barter mechanism alive. The barter transaction provides NASA and experimenters with access to equipment to which they otherwise would not have access and provides the entrepreneur with a mechanism to demonstrate equipment and hopefully build a market. Product Development Agreements alone are not sufficient. As demonstrated in the attachments to this testimony, there is support for continuing the barter arrangements. Furthermore, commercial users of Station must have access through either the CCDS' or through NASA directly. A dual path is required because neither path alone meets the requirements of all users.

4. Policies Need Teeth - While strong policies are needed, the basic truth is that policies alone are worthless unless officials down the line of command are sufficiently motivated to carry them out. This is, without a doubt, the greatest weakness in the present system. No doubt the agency has been trying to implement various reforms to streamline the procurement process and can point to some success stories. But, can anyone dispute that there is something seriously wrong when industry must repeatedly seek the assistance of Congress and the intervention of the Administrator to enforce the policies that transcend administrations? ITA wants to make it clear that it is not questioning the commitment and intentions of NASA leadership. But when the agencies red and blue teams go away, often it is back to business-as-usual in the trenches.

The question is, of course, how to put teeth in any policy. We have two concrete suggestions: (a) There needs to be a troubleshooter with real power that can cut through competing interests, competing budgets and competing offices, and to whom industry can turn when things go wrong. Such a person must be someone who reports directly to the Administrator, has real commercial experience and real dedication to reforming the system to make it work; (b) NASA personnel must be incentivized to make the commercial policies work. What you have done for U.S. commercial development should be an important and substantial part of the annual review of each and every NASA employee with real rewards for performance. Congress should explore other means of providing real incentives for NASA employees to support commercial space.

III. CONCLUSION

Entrepreneurs need access to space. They need the support of Government not only to develop products and services but support to develop and demonstrate their hardware. They don't need money, although money would be nice. What they need is access to the government infrastructure such as the Shuffle or the Space Station. They need stable and predictable policies. And they need commitment from Government to carry out those policies and a commitment that government will not compete with industry. Commercial space is not just spin-offs of technology from government programs. Commercial space is about innovative, entrepreneurial hardware, products and services. What we need as a nation, is to find a way to enable and then incentivize NASA to foster commercial space and to leverage commercial space to achieve additional fiscal and scientific benefits. NASA's charter requires NASA to seek and encourage the commercial use of space, as well as to preserve the U.S. as a leader in space science and technology. There has to be room for both. If the U.S. does not implement such a policy for commercial uses of the Space Station, the nation will be wasting a precious asset and handicapping itself in the global space market of the next century. Whatever the market may be for microgravity in the next century, the market surely will develop and we believe it will be substantial. The U.S. Government can accelerate the growth of that market and enhance the benefits for the U.S. industry and economy. ITA wants the U.S. to aggressively lead so that a fair share of the benefits of commercial microgravity are reaped by the U.S. and not just by those who would sow the fields that we, the United States, have plowed.

Appendix 1
MDA MINILABITA's

Appendix 1

AUTOMATED SPACE PROCESSING LABORATORY - THE MDA MINILAB TYPICAL COMMERCIAL SPACE HARDWARE

ITA has been responsive to both the National Space Act as amended and to the various administrative policies on commercial space to encourage the private sector to invest in space activities. ITA has raised investment capital, obtained loans, and obtained grants from the Commonwealth of Pennsylvania to develop a spectrum of commercially developed space infrastructure hardware to participate in the commercial space market as a partner with NASA. An example of an ITA space processing hardware device developed solely by the private sector is our automated laboratory, the Materials Dispersion Apparatus (MDA Minilab), which has the capability to process 100 separate experiments. The device can be thought of as 100 tiny test tubes that mix sample fluids and/or solids at precisely determined time intervals.

For a typical Space Shuttle mission four of the MDA minilabs are integrated into a carrier and placed inside a thermally controlled environment in a standard Shuttle mid-deck locker. The integrated payload shown represents ITA's CMIX payload that flew on two Shuttle missions this year on STS-67 in March 1995 and on STS-69 in September 1995. This commercial payload provided some 400 data points in a single mid-deck locker. The commercial experiments consist of ITA biomedical projects such as the protein crystallization of urokinase to ultimately develop a drug to combat breast cancer metastasis; the Microencapsulation of Drugs, a drug delivery system for The Institute for Research, in Houston Texas; protein crystal growth for two pharmaceutical companies that wish to remain anonymous; various types of protein crystallization for five US and international organizations; collagen assembly for a German university; inorganic crystal growth for a US organization; seed germination for US elementary and high schools; cell growth experiments for the Consortium for Materials Development in Space at the University of Alabama in Huntsville; and many others.

NASA has flight hardware that can perform this same function but the government hardware is costly and does not have the multiple science discipline capability provided by the commercial hardware. It would take at least three NASA hardware devices to perform this same mission using three separate mid-deck lockers. The cost to develop the hardware (existing hardware and programs) and to support the mission would be at least a factor of 10 to 20 more than to use commercially available multi-technology multi-user hardware such as the MDA minilab.

A new generation MDA automated laboratory with more capability is being developed with private sector resources to fly in 1996. It will have the capability to obtain up to 1000 data points in a single Shuttle mid-deck locker with TV recording capability of selected experiments. ITA expects to fly this hardware on both the Shuttle and the Space Station as a commercial user.

Appendix 2
CMIX BARTER AGREEMENT

Appendix 2
CMIX BARTER AGREEMENT DESCRIPTION AND RESULTS

ITA is presently the only company in the United States to hold this unique type of Commercial Shuttle flight agreement (through the Consortium for Materials Development in Space at the University of Alabama in Huntsville, one of NASA's Centers for the Commercial Development of Space) which provides a very strong incentive for the private sector to invest in space activities. Although the agreement took three years to consummate with NASA, it is innovative and provides advantages both to ITA, NASA, and the nation. The barter agreement can be the model for other hardware developers and for the international Space Station, which would save NASA the time and money to develop space processing hardware through its normal procurement procedures. It has been conservatively estimated that commercially developed private sector space hardware can be developed at one tenth to one twentieth the cost of government developed space hardware. In fact, there are several commercial space hardware carriers and space processing devices that outperform and cost less that comparable government developed hardware. This information can be made available to interested parties.

The Barter agreement that ITA presently has is a "value exchange" whereby ITA allows the NASA CCDS community to utilize one half of its private sector developed generic space processing hardware (the MDA

Minilab) in exchange for allowing ITA to fly on the Shuttle. The remaining half of the MDA Minilab hardware is revised for ITA to either perform its own microgravity research, or to enter into joint business ventures or to sell the capacity to users. All of the products and technology developed from the space flight experiments remain the property of the experimenters and ITA. It is the commercial space where profit dollars are being generated. In fact, it is the only true commercial space operation presently flying on the Shuttle. It is a model worth emulating for other hardware providers and for use on the international Space Station. The present agreement is called CMIX which stands for .Commercial MDA ITA experiments.

At the present time after four flight (two of those flights were only partially successful due to NASA hardware malfunctions, one ITA hardware malfunction and the an on-orbit operation errors); However, in general the program has been a great success. ITA has four major thrusts:

Biomedical Experiments The major ITA biomedical research project involves a program to grow protein crystals of the enzyme urokinase. Urokinase is always present when the spread of cancer occurs, particularly breast, colon and other forms. The structure of urokinase is unknown. ITA has formed a consortium of cancer institutes, research institutes, private sector companies and universities to attack this problem. The company is trying to grow a large enough urokinase protein crystal using the microgravity environment of space so that the structure can be determined through x-ray diffraction analysis. The key players are set up to then design a pilot drug and conduct clinical trials. The end product would be a drug to combat cancer metastasis. This is a long term project which may take up to 10 years to get to the end product of a drug on the market, but we must start. The CMIX barter agreement with NASA is that start.

The microencapsulation of drugs is another project that is being conducted with the Institute for Research in Houston, Texas that utilizes ITA's commercial hardware and access to space to continue research. Ultimately, this will manifest itself into a drug delivery system for cancer therapy.

Several drug companies are flying using the CMIX flight agreement and the ITA space processing hardware to attempt to grow protein crystals, again to ultimately develop new drugs. These companies prefer to remain anonymous. Other US concerns are performing research in the area of inorganic crystals and proprietary microgravity research. ITA has interfaced with some 15 US companies, research organizations and universities. Some of these organizations are involved in joint ventures and some of these organizations are "pay to fly" customers.

International Users: ITA has several international marketing agreements and paying customers who perform research using ITA's automated laboratories and fly on ITA's CMIX flights. For the first time in a long time, funds are flowing across the Atlantic and Pacific Oceans in the right direction to the U.S. In addition, ITA has Canadian researchers who in addition to being paying customers are also involved in ITA's commercial biomedical research and perform analysis and tasks needed to keep the research on track and on schedule. In fact, U.S. users are now employing protein crystal growth techniques developed by Dr. Sygusch of the University of Montreal, Canada which he pioneered using the ITA commercial space processing hardware. This technique is being shared with U.S. investigators. Our European users are also going to fly on the international Space Station, and the research they perform is a precursor to station operations. We have a fair honest agreement which allows both companies and both the U.S. and Europe to benefit from commercial collaboration. Education Program: ITA established as a part of the CMIX barter program to donate a portion of each CMIX payload to "hands on" student space experiments. ITA donated the employee time and the hardware to work with students to conduct meaningful experiments. It is a most rewarding program that continues to pay dividends for both ITA, NASA, and the nation. This program is funded solely by ITA, and is our way of giving back something to the system. At the present time ITA has sponsored 12 schools in seven states and have involved some 400 students and 20 teachers. Probably the most rewarding feedback we have obtained is that some of the students have actually changed their curriculum from business to science and engineering as a direct result of the Shuttle experiment that they worked on. ITA has made a commitment to fly student experiments as long as the company flies experiments in space. To summarize, the CMIX program which is based on the barter agreement works. It works from a business point of view. It works from NASA's point of view because the agency didn't have to fund the development of generic space processing hardware for the CCDS community or for NASA. It is a win-win for all. We believe that this type of agreement should be used as a model for commercial users on Space Station with a direct agreement with NASA or through a

CCDS.

CMIX FOLLOW-ON PROGRAM FOR SPACE STATION

ITA's vision for Space Station is to provide more capability in the same volume (essentially a middeck locker) so that more experiments can be conducted thereby lowering the cost of doing commercial microgravity research, and in addition providing an enhanced probability of success. Figure 2 presents an overview of ITA vision for space station. As stated previously, the present hardware flying as the CMIX payload on the Space Shuttle has the capability for 400 samples or separate experiments in a single mid-deck locker. We have developed new hardware with private sector funds that has significantly larger volumes of fluids and samples. This hardware is called the Liquids Mixing Apparatus (LMA) and also currently flying on the Shuffle. The next generation MDA Minilab when housed in a middeck locker will have the capability to obtain some 1000 independent data points or experiments at the press of a button. This hardware will also have optical capability and be able to record TV images of the fluids mixing or crystals growing. The upgraded hardware is called the Double MDA with optics or DMDA-O.

Our concept is to have a Biotechnology Processing Facility (BPF) which is essentially a commercial rack. This commercial rack would have the capability to have three mid-deck locker configurations of DMDA-O automated laboratories at three different temperatures for the different types of experiments to be conducted, e.g., protein crystal growth, membrane casting, zeolite crystal growth, cell biology, collagen formation, seed germination, etc.. In addition, the Commercial BPF rack would also have an Electrophoresis space processing device constructed by the Center for Cell Research at Penn State University to separate commercial products. There would be a hardware device for the microencapsulation of drugs, and finally some type of cell culture or space biology hardware to continue that type of commercial research. Our vision is to have the BPF a "one stop" shopping biotechnology rack where commercial users can lease time on the various space processing hardware devices that satisfy their commercial research requirements. It would be a "pay to use" facility available to all users of the space station. In addition, a percent would be reserved for the continued ITA biomedical research and for our student space outreach experiment program. However, for our vision and our concept to work, the nation needs a good coherent policy for commercial users to use the international space station. The policy must allow US commercial users to have access to the station to conduct their own commercial research independent of NASA, to have joint ventures with other commercial entities, and to make a profit. It is obvious that the CMIX type barter agreement that is currently being used to fly ITA commercial payloads on the Shuttle could be used as a model for Space Station. In addition, an alternate approach would be to use the NASA CCDS mechanism to fly commercial payloads. The U.S. private sector, however, must be given the choice. The penalty for not allowing U.S. firms to fly on the space station to perform commercial research is that this nation will not be competitive in the global market in the next century. We will forfeit that market to the international community (Europe, Japan, Canada, and Russia) that is also flying on Space Station. Our international partners are aware of the products and technology that will come from microgravity research. We must insist that NASA pay more attention to commercial space activities and they must create an environment for U.S. private sector investment in space as the National Space Act mandates.

Appendix 3
LETTER FROM WYLE LABORATORIES November 1, 1995

Instrumentation Technology Associates, Inc.
35 East Uwchlan Avenue, Suite 300
Exton, Pennsylvania 19341
Attention: Mr. John M. Cassanto, President
Reference: ITA Memorandum No. 95-138

Barter Arrangement with NASA to Promote Commercial Space Activities for Shuttle Bights and for Space Station

My position on battering the use of hardware systems with NASA is exactly the same as yours. While space activities represent a very small part of Wyle Laboratories' work, it is an aspect of the American scientific and technical fabric that Wyle has supported since the company's beginning in 1949. In fact, Wyle has been

squarely in the middle of every major space and defense program that has come along. Since 1984, Wyle has been involved in meaningful Space Station research. In 1988, it was apparent that the Space Station work would be the domain of only gigantic aerospace companies and the little companies would have to find something else to do.

Wyle's niche in the space market was payloads, and we were encouraged by NASA to find a payload-related technology that we could pioneer and bring to the marketplace. It was to be an item of space hardware infrastructure that Wyle could develop with its own money and that NASA would not have to design and develop. It was to be leased to a customer or to NASA for a customer. We developed an amazingly versatile payload containment system that enabled a scientist to fly crude hardware at a fraction of the cost and schedule required to produce sophisticated hardware. It is called the Universal Small Experiment Container (USEC). Wyle demonstrated the value of USEC for housing a very complex furnace system for processing metal alloys in space. USEC flew an amazing three Space Shuffle missions in 18 months. The furnace system was developed from start to finish in 10 months as compared to a typical time of 5 to 10 years and at a cost of about 1/20 typical cost. The success of the USEC technology is an undeniable fact. USECs can be produced in a variety of sizes and shapes to accommodate any imaginable payload or experiment. USEC is one "wheel" that NASA does not need to reinvent. We have not been successful at getting NASA's attention as a vendor or provider of this simplifying technology. NASA prefers to develop its own versions of USEC.

Sincerely,
WYLE LABORATORIES
Dr. Ronald E. Giuntini, P.E., CR.E., C.P.L. Manager, Space Engineering

Appendix 4
LETTER FROM WEAVER AEROSPACE

6 March 1995
Instrumentation Technology Associates, Inc.
35 East Uwchlan Avenue, Suite 300
Exton, Pennsylvania 19341
Attention: Mr. John M. Cassanto, President Reference: ITA Memorandum No. 95-138
Subject: Barter Arrangement with NASA to Promote Commercial Space Activities aboard Space Station and/or the Space Shuttle.

Dear John:
I strongly agree with your efforts to promote the establishment of barter agreements with NASA, whereby those of us with commercial space services of value to NASA can exchange these services in return for space flight time. As long as the only access to the station is via the space shuttle, the station will remain unaffordable for most commercial enterprises. The barter concept is an effective and immediately available alternative. Of even more fundamental importance for a sustained manned presence in space, as we move into the Space Station era, is privatizing portions of on-orbit operations. We must begin moving from a government-operated manned space flight capability, wholly dependent upon tax revenue, to a privately-owned and commercially viable manned space flight industry that generates tax revenue. As you know, Weaver Aerospace is now its 17th year of operation in the commercial space industry. Our primary line of business is the development of Extra-vehicular Activity (EVA) solutions for manned operations in space. Our personnel have worked directly on all US manned space programs since Gemini, both for NASA and for industry. We contributed extensively to the development of the Hubble Telescope EVA maintenance concept and to the EVA assembly and servicing techniques for the space station. We operate several jet research aircraft providing commercial access to zero-g, lunar-g, and Mars-g environments. We utilize the McDonnell Douglas Underwater Test. Facility in Huntington Beach, CA, for underwater EVA tests, using our own test conductors and EVA-trained crewmembers.Since 1992 Weaver Aerospace has been attempting, thus far unsuccessfully, to sell parabolic research flight services to NASA. Based on the intent of HR2403 (privatizing parabolic microgravity and sounding rocket research) this market may now be mandated to the private sector. If this happens, it is our professional opinion that the market will be best served by separate procurements for astronaut training, and for research and development flights. Weaver Aerospace will bid on the research and development procurement.

Looking ahead to the space station era, EVA will be required to maintain and upgrade the station itself, and to support assembly and servicing of both attached and free-flying payloads. These tasks will olden be complex, and will be best accomplished by a highly proficient EVA crew whose full-time job is to conceptualize, develop, verify, and then actually perform these operations. Manned spaceflight is now maturing to the point that commercial astronauts arc a better solution for these applications than the long-duration science astronauts who will form the basic space station crew.

A primary corporate Weaver Aerospace business objective is to provide such specialized EVA services for commercial customers in earth orbit beginning early in the space station operational era. This service has the basic prc-requisite characteristics for a win-win barter arrangement with NASA, in which we would perform complex station-related EVA assembly, maintenance, and servicing activities, in return for flights to and from the station and for some additional on-orbit time which could then be sold to our commercial customers, or to NASA for selected complex non-station EVA tasks.

John, I applaud your tireless support of the commercial space industry, and I hope that these thoughts are of use to you.

Sincerely,

Lee Weaver President

END

Transcript 953120355, 277 lines

PREPARED STATEMENT OF

MS. DEIDRE A. LEE

ASSOCIATE ADMINISTRATOR FOR PROCUREMENT NATIONAL AERONAUTICS AND

SPACE ADMINISTRATION

BEFORE THE HOUSE SCIENCE COMMITTEE

WEDNESDAY, NOVEMBER 8, 1995

I appreciate the opportunity to appear before this Committee today to highlight the many changes and improvements NASA has planned and is implementing to improve our acquisitions.

OVERALL NASA CHANGES

First, I would like to set the stage for the overall changes at NASA. We know that the American taxpayers, the Congress and the Administration expect excellence from our Space and Aeronautics Programs. NASA intends to deliver.

We recognize that technical and business excellence must go hand-in-hand. For many years, NASA has been recognized for technical achievement. We want to expand that to include business excellence and we are aggressively pursuing changes to that end. My focus today is on the procurement challenges, yet to clearly address that specific area, I must highlight the importance of changing the way NASA looks at and defines requirements -- the very root of a "procurement." The front end of every acquisition, the requirements definition process is critical. A "perfect" contract document that does not meet mission needs is of no value, and is in fact, a failure.

NASA has undertaken the Zero Based Review, identifying core NASA mission and functions, their strategic alignment, and the Program and Center responsibilities. Accompanying that review was a thorough scrub of the support services NASA traditionally procured and their role in the overall NASA mission. Basic changes in how we structure business arrangements to accomplish our mission are emerging -- from cooperative agreements with for profit firms to outsourcing and Science Institutes. Overall, NASA will rely more not just on industry, but on the commercial industry as opposed to traditional Government contractor elements of industry. Yet, to fully invoke the talents of the commercial world, NASA has to continue implementing two fundamental changes.

These are:

1. Improving the definition of our needs ---in results oriented rather than process oriented terms.

2. Changing our NASA management and oversight structure to compliment the industry role.

We expect excellence from our industry partners. As we more clearly define the results needed we are focusing our metrics and management on these end outcomes. How we are going about these significant acquisition changes has been highlighted through other fora and Administrator Goldin has previously testified regarding NASA's program management changes.

Therefore, today, I will address that "middle" portion of our acquisition process, Procurement.

I am frequently asked "Why is Government procurement so difficult? Why don't you just operate like commercial firms?"

This is a valid question, and an intriguing one. As I have grappled with this question during my procurement career, I have developed a simple comparison to help clarify the difference in my mind. I'd like to use that analysis as a discussion point here.

FOUR TENETS OF GOVERNMENT PROCUREMENT

Although simplified for illustration purposes, I submit there are four basic tenets to Government procurement. These are different, although in varying degrees, from the way individuals and commercial firms spend money. None of these approaches can be classified as "Bad" or "Good" rather they are "Different" to suit the circumstances and needs.

The first tenet is that of Responsibility/Accountability. Each of us in our personal lives is responsible for our fiscal behavior. Yet if we don't make an ideal choice, only we bear the responsibility. In a Government environment, the taxpayer bears the cost, which may be substantial. This is and should be unacceptable, as we are the stewards of the taxpayers' dollars. If a mistake is made or judgments vary, a Government official finds herself sitting in this chair before you, or on the front page of the Washington Post. A career can be ruined, a job lost. This is and should be an awesome responsibility. In order to fulfill that responsibility and prevent mistakes people seek additional information and data, they set up structured systems and reviews. This response is not Good or Bad, but it is different and it is real.

The second tenet is that of Fairness and Openness. The 1984 Competition in Contracting Act requires that Government procurements be conducted using full and open competition. Because we are spending taxpayer funds, all interested companies must be afforded the opportunity to participate. They must compete and earn the contract but it is incumbent upon the Government to make every effort to fully and openly communicate that opportunity. We in our personal lives also use competition. We rely on the marketplace to develop products and to establish prices. We base our buying decisions on how well vendors communicate to us how they will fulfill our needs. We conduct "best value" analysis considering those factors that are clearly important to us, be they quality, delivery, price or other intrinsic values. The Government decisions are not unlike these. But, instead of relying on information readily available, full and open competition is described as placing a national notice, waiting a prescribed time for responses, evaluating all responses, and fully documenting all considerations and decisions.

This is different. It is important, but it also requires substantial commitment of time and money by all parties involved, including those parties that do not get the contract.

The third tenet is that of socio-economic provisions. The Government bears the responsibility for the good of all. We have chosen as a nation, to emphasize many important social and economic policies. These policies are effected and enforced wherever tax dollars are expended. Hence, they are key elements in Government Procurement. A typical Government solicitation contains an average of 15 certifications and representations, including among others Clean Air and Water Certification, Affirmative Action Compliance, Buy American, Rights in Computer Software, Contingent Fee Certification, Labor Wage Statements, Small Business Actions and Procurement Integrity. Special clauses require reporting, assurances, and special systems. In our personal and corporate lives, we rely on businesses to operate in a responsible law- abiding manner. We generally do not personally enforce these societal needs.

Numerous Congresses and Administrations have determined that these are valuable and necessary conditions of doing business with the Government but they do increase costs and make doing business with the Government different. It is incumbent upon our Government to do this. This action does not make the socioeconomic provisions good or bad... but it does make Government procurement different. The final tenet is that of Protests. When you or I make our purchasing choice, we enjoy the results of that product or service. We are not publicly accountable nor must we report and support our decisions to unsuccessful offerors. In Government, we have the unique process by which any interested party may demand a legal review of a selection decision. At that point, all progress usually halts. Generally, performance must be stayed until the protest is resolved. This is often difficult and costly for the Government, as schedules slip, concurrent actions must be delayed or adjusted and the program costs increase. Even more important however is the impact on the successful contractor, who "won" an award, is prepared to begin performance, often has a team of employees ready to work and now must pay to keep his workforce in readiness to perform the effort whenever the protest is resolved which may take months.

As a point of reference, during the past 5 years, NASA has had 204 protests before the GAO. Of those 2 were sustained. The GSBCA statistics are 44 protests since 1992 with 4 sustained. Government does make mistakes and there must be a method under which interested parties can seek correction of the mistake. This system however, is the most significant difference between Government and personal or industrial procurement. The litigious nature of the Protest procedure bring us full circle back to tenet one: Responsibility-Accountability. The anticipation and preparation for a protest often leads a responsible individual to cautious, risk-averse action that otherwise would not be in the Government's best interest.

Spending of taxpayer funds is no light responsibility and the importance of good, sound business decisions cannot be overemphasized. However, we have led ourselves to over regulation and a conservative, slow-moving process. There is much hope. The system based upon these tenets can be overhauled and the people are willing to step up to the challenge. Let me tell you about a few of the steps NASA has already taken.

COMMUNICATION

NASA has focused on more effective communications with industry. We are trying to form a more effective partnership - clearly defining each others' responsibilities and expectations. As part of this communication initiative we have embarked on numerous interrelated actions.

Better Statement of Work. As discussed in my introduction, NASA is focusing on better planning and communication of our requirements. This results in clearer understanding of our needs by potential bidders and better proposals by them which result in contracts that more effectively achieve the desired results.

Performance Based Requirements. Additionally, we are, whenever possible, defining our requirements to make them performance based. That is, we are making these requirements results oriented. In the past we in Government frequently laid out very precise detailed instructions on how to accomplish each task. Now we are focussing on telling industry what end product or result we need and giving them the freedom and responsibility to decide how to best meet that need.

Draft RFPs. To support early and interactive industry involvement, NASA is now issuing full draft versions of our solicitations and seeking industry comments for improvements and clarification. Our old practice was to issue limited information, usually describing only the most basic requirements. This did not give industry a complete picture of all the factors they would have to deal with and it certainly did not afford them the opportunity to comment, seek clarification or improve that approach.

Alternate Proposals. Traditionally, the procurement community has not made full use of a tool already available to us -allowing industry to submit alternate proposals. NASA is expanding use of this option.

Ombudsman. Industry representatives often told me that the NASA acquisition communication channels were not as open as they should be. Industry was hesitant to make comments on restrictive specifications or requests for proposals because of the reaction of the responsible program/procurement community. I believe we are solving that problem. Our people are more open and communicative with industry and more open to industry comments. To further help alleviate the industry concerns, we also implemented an Ombudsman program. At every Center as well as the Headquarters, we now have an individual who accepts and addresses on a non-attribution basis, if requested, any pre-award concerns. Ombudsman can also help firms, especially small business to resolve post award issues before they become major problems. To date we at Headquarters have received several specific queries. Industry had good points and we made changes. The program is working.

Meaningful and timely debriefings. Another industry concern often expressed was that our debriefings after source selection were so limited and restricted that companies protested just to find out why they did not win. After spending a great deal of time and money on preparing a proposal, industry needed and wanted more information on what was positive, what was negative, and particularly what could be improved for the next opportunity. We have revamped our debriefings to provide this kind of thorough, thoughtful, and timely information. I have personally received phone calls from unsuccessful offers, thanking me for the "new" NASA debriefings.

Selection Procedures. Selecting a contractor and awarding the contract were just taking too long,.were too cumbersome and too labor intensive for all parties. NASA has again taken numerous specific actions to improve this. Our actions break into two categories.

First, smaller dollar procurements. NASA recognized several years ago that "mid-range" procurements, or those over the small purchase threshold, but less than $500,000 (now $1 million) just took too long. Often they were as intensive as a multi-million dollar action. NASA developed and implemented the mid-range procurement procedures. They are simplified, basic procedures. The key elements are a small dedicated team of people to evaluate proposals (including someone who has to live with the results), shorter and smaller Requests for Offer, and concise contracts. A major element of this program, thanks to Congressional authorization, was authority in this pilot program to use the Internet versus the Commerce Business Daily for transactions. We are applying lessons learned here to larger procurements, and we are making great progress in our use of the Internet tools. Industry, particularly small business, has been complimentary of this streamlined process.

Next, we are focusing on our large dollar selection process. NASA is completely revising its source selection procedures. We are conducting NASA-wide training on these changes and implementing and improving as we go. Our source selection process incorporates comments from industry and the working level people who have to make the system work. Industry often told us, "If we don't have an opportunity to win, don't string us along. It costs time and money." We have changed that old way of doing business. We are making early and rigorous Competitive Range Determinations. We are using oral proposals where appropriate. In some selections, we clearly tell the offerors that our objective is to have a competitive range cut of no more than three offerors. This accomplishes several objectives -contractors understand the need to submit good proposals with their initial submittal, and they do; and NASA emphasizes cost realism, not merely a low "buy-in" cost. We are communicating with industry throughout this process. Cost control. Cost control is vital to NASA. We have given the contractors more responsibility for results. That includes cost control. We focus on cost realism in the source selection. We are structuring our new contracts to more effectively reward successful contractor efforts to control costs; those that aren't successful will lose fee dollars as a result. But that is not enough. We

have currently in the public comment process a new Cost Sharing clause, under which contractors who can find better ways to accomplish the desired objective and demonstrate cost savings to NASA sometimes in nontraditional ways can share in those savings. Industry is supportive of this bold step.

With the explosion in information technology, it is only a matter of time (a short time) before business is commonly transacted electronically, much of it on the Internet. NASA will be there. We are leading the government with our mid-range procurements. We are poised and ready to "go commercial" in our large as well as small dollar activities. As quickly as commercial software and process becomes available -- we don't intend to develop Government-unique systems.

These are but a few of our many initiatives. NASA wants a business approach that is innovative, yet sound. We are making great progress. We will make mistakes. We will learn from them and continue to improve. Our challenge is not to let those temporary setbacks lead us back to the risk-averse, regulatory bound procedures.

Thank you for this opportunity. I look forward to keeping you apprised of our progress.

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PREPARED STATEMENT OF

JAMES J. FRELK

VICE PRESIDENT, GOVERNMENT OPERATIONS EARTHWATCH, INC.

BEFORE THE HOUSE COMMITTEE ON SCIENCE

WEDNESDAY, NOVEMBER 8, 1995

On behalf of EarthWatch, Inc., I would like to express our appreciation to you, Mr. Chairman, for the vision and leadership you have shown in meeting the challenges associated with the establishment of a robust commercial space industry.

In the particular case of my industry, the commercial space imaging business, you and this Committee have provided the legislative support that has been critical to the emergence of EarthWatch, Inc., and other remote sensing ventures. We view today's hearing as the latest example of the Committee's ongoing efforts to highlight how the relationship between the private and public sectors can be significantly improved by streamlining the process by which the commercial space sector may provide government with low cost, innovative products and services; while the commercial sector benefits from leveraging access to federal customers and R&D.

I last testified before this Committee in my previous capacity as Director of the Commerce Department's Office of Space Commerce. Over the past several years, I have had the rather unique experience of seeing this industry from the vantage point of a government official, as well as an industry executive who struggles on a daily basis with the complex issues associated with building an international market base for our products. I speak with firsthand knowledge when I say that this Committee's bipartisan work on the landmark legislation, "1992 Land Remote Sensing Policy Act", provided the fundamental elements of a stable and predictable business planning environment for the fledging remote sensing industry. That legislation responded to the needs of the private sector by:

- Simplifying the licensing and regulatory process. Identifying in clear and explicit language which part of government had the lead responsibility for implementing the Act. Providing stability and predictability by ensuring that the government could not capriciously withdraw licenses issued to the private sector.Supporting

a market-based approach to defining commercially owned data -- a departure from the traditional government view that all imaging data should be made available on a non-discriminatory, marginal cost basis.

In addition, Mr. Chairman, your efforts to assist industry by discouraging direct or indirect government competition with the private sector has also been extremely important to assuring the investment and customer communities that the Congress is seriously committed to fostering U.S. leadership in the commercial space imaging business. Your continued vigilance and support for industry in these efforts is critical and greatly appreciated. The dramatic results of this Committee's efforts can be seen in the number of new ventures that have recently entered the space remote sensing marketplace: Lockheed-Martin Space Imaging Corporation, Orbview, Boeing's Resource 21, GDE Systems. EarthWatch itself is the product of a merger between the commercial remote sensing activities of Ball Aerospace and WorldView Imaging Corporation. A partial list of our strategic partnerships indicates the international nature of the imaging business -- CTA, Inc., Hitachi of Japan, Nuova Telespazion of Italy, Datron Systems, MacDonald, Dettwiller & Associates of Canada, Technology Venture Investors (TVI), Burr, Egan, Deleage & Co.

Our goal is to be the first to market as the premier global provider of commercial high resolution satellite imagery and related geographic information products. Although we are building and deploying low cost imaging satellites, we view ourselves as fundamentally in the information dissemination business. Thus, our main focus is on creating Digital Globe, an information database made up of a range of imagery and geographic information products, electronically delivered to the desktops of our customers. Being in the information services business means that the issue of intellectual property rights is of overriding concern to us in our dealings with the U.S. government.

I strongly believe that the emergence of this industry is in large part due to the themes of transparency, stability and predictability which the Congress has brought to the various enabling statutes affecting telecommunications and remote sensing industries. And I further believe, Mr. Chairman, that this Committee should apply these very same criteria when seeking reform in all public policy areas, such as procurement, that shape the relationship between the private and public sectors.To ensure effective procurement reform, it is necessary to place it in the context of the dynamic changes affecting our industry. As I stated earlier, it is important to understand that EarthWatch views itself as first and foremost as an information services company. As important as the satellite segment is to our business, we regard it as simply part of the infrastructure needed to meet the information needs of our international customer base. Accordingly, for us, issues related to intellectual property rights are paramount when considering entering into some form of procurement involving NASA -- such as our participation in the Clark satellite project.

Issues related to procurement reform must also be placed within the broader context of a major shift in the capabilities of the commercial space sector vis-a-vis NASA. In the past, the vast majority of NASA-industry relations could be accurately described as NASA being the dominant driving force (in terms of designing and managing the project, providing the resources, and dictating the terms and conditions of the relationship) with industry in a subordinate implementing role. As far as the emerging commercial space imaging marketplace is concerned, we are witnessing a significant reversal of that traditional agency-contractor relationship. In fact, we are not approaching government seeking public funds. In the case of EarthWatch, for example, we have the financial wherewithal, technology base and market expertise to approach the agency seeking an equal partnership arrangement based on mutual benefit.

There is no doubt that the concept of structuring contractual arrangements with industry on an equal footing might be difficult for the agency's procurement and legal cultures to accept (it is not easy to overcome nearly forty years of practice). On the other hand, creative approaches to structuring partnerships between industry and NASA offers major advantages to both sectors in these fiscally constrained times. To put it in concrete terms, our industry would certainly benefit from access to some of the innovative work NASA has performed in areas such as data compression techniques, miniaturization of satellite components, advances in signal processing -- to name just a few such examples. In turn, industry has the resources and capability to incorporate these technologies into their commercial space systems and thereby allow government to generate maximum benefits with minimal public investment. Such benefits include NASA having the opportunity to have technologies deployed in a space environment at major budget savings, with the commercial sector leveraging government technology and resources to generate new markets and jobs that, in turn, provide

NASA with a robust constituency base.

In this context, many of my colleagues in the commercial space imaging business believe that NASA's Mission to Planet Earth (MTPE) offers a range of "outsourcing" opportunities for the commercial remote sensing sector that would produce major long term savings to the taxpayer. In fact, the Committee might even wish to consider ways in which MTPE might be used as a test-bed for procurement reform to facilitate private sector involvement. In this regard, we are very much encouraged by the Committee's efforts to include funding in this year's authorization for evaluating and implementing mechanisms for innovative industry government partnerships regarding MTPE.

We believe that such study efforts will greatly assist NASA and the Congress in understanding the potential for significant savings from MTPE partnerships with industry. I would like the Committee to know that EarthWatch is a participant in an exciting program at Stennis Field Center -o the Earth Observation Commercial Applications Program (EOCAP). It has resulted in a very positive working relationship with the agency in terms of better defining the market potential for various satellite remote sensing technologies. We believe it is worth exploring as a potential benchmark when looking for creative ways to incorporate the private sector into the MTPE.

One of the major impediments to achieving innovative partnerships between NASA and industry pertains to the data rights issues that I alluded to above. The normal presumption under NASA contracts is to make all data generated under the contract available to all at the marginal cost of reproduction. This "open door" policy is anathema in the commercial world where the value of data is defined by the willingness of the marketplace to pay for it. As I stated above, our company is in the information business. Accordingly, our model for making data available is patterned after the long standing practice of the software industry to issue site licenses, as well as seek protection of distribution of data to third parties without the approval of the software owner. For example, when NASA buys a commercial software package it is precluded from making it available for free or at some arbitrarily defined marginal cost to the public-at-large.

There is absolutely no reason why the agency's procurement practices should not incorporate the same standards when entering into partnerships with the commercial space imaging industry. In fact, left unresolved, this whole data rights issue will continue to represent a fundamental impediment to the ability of our industry to provide NASA and other agencies with the cost-savings and innovation that will naturally come from a competitive commercial space imaging industry. In recognition that there are no "overnight" fixes, I would propose that NASA and industry focus on identifying pilot projects that could act as showcases for demonstrating how commercial practices might be introduced into various data fights arrangements with the agency.

In my view, the Global Positioning Satellite (GPS) program is an excellent model for how public-private sector partnerships, involving dual use technologies, can be successfully carried out. As you know, GPS was originally a Department of Defense (DOD) funded project intended to respond to primarily military requirements in the areas of navigation, tracking and location. When the U.S. government allowed the civil users access to GPS, the marketplace literally exploded. Today, the GPS is approximately $1.26 billion, of which DOD-related uses make up a comparatively modest market of $70 million. By the year 2000, it is anticipated that the total GPS market will represent $8.4 billion, of which the military market will represent $130 million. The product cycle time in the GPS industry is typically 12-18 months (less than 12 months for software). I need not remind this Committee that it is not unheard of for a government procurement process to take as long as 1-2 years. They key to the remarkable growth of this industry sector and its obvious benefits to its original government agency sponsor (greater product differentiation at significantly reduced costs) was what will be critical to the growth of my industry -- policy stability and predictability.

When considered as part of the remarkable rapid growth of the Geographic Information Service (GIS) marketplace (today's market is estimated at $5 billion and is projected to grow to $10 billion by 2002), the commercial space imaging business could well demonstrate a similar growth pattern -- with comparable benefits to NASA that the GPS industry is providing to the DOD world. To achieve that goal, however, will require constant vigilance and innovative thinking by all parties, including the Congress. For example, multi-year authorization/appropriations are crucial to providing the investment community a reasonable degree

of confidence that the government as customer for our imaging products will, in fact, be a reliable partner over the long term. In this regard, industry would not expect to be paid until satisfactory delivery of the data. In cases where contracts involve delivery of data over a multi-year period, it is critical to be assured that payment will, in fact, be made. Perhaps Congress might consider set-asides or some innovative mechanisms to assure that the funds will be available when we in industry have delivered the data product as agreed upon. Being able to assure one's investors and customer base that the funds will be available upon delivery of the product would make the government commitment "bankable" and assist in securing the private capital necessary to bridge the period covering the performance of the contract.Congress might also consider directing the agency to explore the use of "data vouchers" -- perhaps again on a pilot project basis - that would empower the research community to "shop around" for their spacecraft of choice. This is an example of how the agency benefits from working in partnership with industry to foster low cost commercial alternative access to deploying space payloads.

In addition, Congress might wish to explore the creation of some sort of ombudsman entity in NASA. I understand that the procurement office at NASA has created an ombudsman type function at Headquarters and the various Field Centers. I think that is a terrific step forward. However, one of the difficulties faced by commercial entities is that the agency is composed of diverse offices with sometimes competing cultures and agendas. Accordingly, it might be useful to have an office that reports directly to the NASA Administrator and is accountable to Congress and could assist the commercial space business in resolving issues in an expeditious manner. Such an ombudsman, with agency-wide purview, might be required to provide the Congress with an annual report identifying progress associated with NASA industry partnerships and outstanding issues that need resolution. Finally, this Committee would be well served by reviewing some of the innovative practices employed by other technology agencies and program offices, such as ARPA and BMDO, in their various joint ventures with the commercial sector.

I will conclude at this point by saying that these are extraordinarily exciting times for both the space imaging industry and our government partners. The potential for this industry, in terms of literally revolutionizing how spatial information is utilized at the consumer level, is boundless. Although there will be tough issues ahead as we in industry and government work to reshape and redefine four decades of old ways of doing business together, with this Committee's continued support, the end result will be a partnership that will ensure U.S. leadership in this new marketplace in the years to come.

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PREPARED OPENING STATEMENT OF

HON. RALPH M. HALL

BEFORE THE HOUSE SCIENCE COMMITTEE

WEDNESDAY, NOVEMBER 8, 1995

Good morning. I look forward to today's hearing as an opportunity to get an update on the progress of NASA's procurement reforms. It is a subject in which I have a keen interest, since we need to make sure that NASA is spending the American taxpayers' money efficiently as it carries out its missions. However, it's hard to talk about the taxpayers' money without tipping my hat to the NASA Administrator and those around him who have helped guide the space agency through cuts in its funding plans of more than thirty percent over the last three years. I think NASA has been a model for the rest of the Federal government in its willingness to step up to that challenge.

NASA's procurement system is where "the rubber meets the road" in obtaining the goods and services needed by the civil space program. It is the system that has to be working effectively if we are to avoid waste. And it

almost goes without saying that NASA's procurement system has to work hand-in-hand with the Administrator's efforts to manage NASA under the severe budgetary constraints that it is facing.

This Committee, and the Subcommittee on Space in particular, have held a number of hearings on NASA's procurement practices over the last several years. I think that NASA has made significant progress during that period, and I believe that the testimony of Ms. Deidre Lee, who is head of NASA's Associate Administrator for Procurement will reflect that.

Finally, I would like to welcome the other witnesses who will be offering testimony today. I think that the private sector can play an important role in realizing the practical benefits that space exploration offers to our citizens, and I look forward to their testimony.

Thank you.

END

PREPARED OPENING STATEMENT BY

HON. GEORGE E. BROWN

JR.

BEFORE THE HOUSE SCIENCE COMMITTEE

WEDNESDAY, NOVEMBER 8, 1995

Good morning. As many of my colleagues are aware, the Science Committee has long promoted the commercial use of space whenever possible and appropriate. In addition, for those activities that are carried out by government, this Committee has sought to ensure that NASA's procurement system is both efficient and fair. I hope that today's hearing will provide some additional insights on both of those topics.

I have been encouraged by the efforts made by NASA over the last several years to strengthen its procurement system. While discussions of procurement often are dry and colorless, procurement represents the indispensable step that transforms visions of future systems and capabilities into realities. It also is the step at which the taxpayers' dollars can be spent wisely and efficiently, or at times, unwisely and inefficiently. An important part of this Committee's oversight responsibility is to ensure that NASA remains an effective steward of the public's funds.

Commercial space activities, on the other hand, are those activities for which the private sector puts its own funds at risk. Government can play a constructive role in promoting space commercialization, and perhaps today's hearing will shed some additional light on which governmental approaches can help the process and which may hinder it.

Nonetheless, I believe that there will continue to be an important role for government to play in the exploration of space and the acquisition of new knowledge. Certainly it is important to leverage the contributions that can be made by the private sector in meeting common public-private goals. However, as testimony at last week's hearing on the Reusable Launch Vehicle program demonstrated, the private sector may be unable or unwilling to assume the entire task of pr>

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