An evaluation of a control system in a large apartment complex in New York City (Manhattan Plaza) is currently underway. J&C Lamb Corp., a small Long Island City company specializing in the monitoring of energy use in buildings, is assisting BNL with installation of instrumentation and daily processing of data at their offices using a Dataphone link.

9. Medical Technology

The Medical Department, in conjunction with the Department of Applied Science, developed a series of isotopes that are currently in general use:

- a Tc-99m kit for labeling red blood cells for vascular imaging in human beings
- the use of thallium-201 used for myocardial imaging
- developed I-123 labeled indocyanine green (cardio green) for imaging the hepato-biliary system
- developed carbon-11 labeled octylamine for pulmonary imaging and evaluation of nonrespiratory functions of the lung.

Other developments by members of the Medical Department in public use are:

- a plutonium-beryllium neutron source for the in-vivo whole-body neutron activation analysis of human beings - specifically for the analysis of calcium, sodium, and phosphorus
- the extracorporeal irradiation of circulating blood for studying lymphocyte kinetics as well as adjunct therapy for leukemia and certain autoimmune diseases
- L-Dopa as a treatment of Perkinsonism
- the effect of decreasing salt (NaCl) intake in the treatment of hypertension
- the first synthesis of a human protein, insulin, was completed at BNL

- the method for introducing tritium into thymidine to obtain data on the fate and function of biological cells and deoxyribonucleic acid, (DNA).

10. Power Transmission

The BNL Power Transmission Project proved the suitability of using oil-injected screw compressors in cryogenic helium systems. Subsequent to this work, there was a dramatic switch to screw compressors from the reciprocating compression machines previously used for this service. Since 1974, screw compressors have been specified for most helium refrigerator/liquefiers in sizes greater than 100W.

IN SUMMARY, we've tried to illustrate a few examples of technology transfer at Brookhaven National Laboratory. While we are not intimately familiar with technology transfer at all the other DOE multi-program laboratories, we think that the story will be much the same but, of course, with changes in subject matter.

The Laboratory system is a resource that can be utilized by the business community. It can't guarantee profit margins but it can deliver a great deal of insight, fresh thinking, and ideas on modern technology.

In closing, we thought you might wish to refresh yourself on how long it takes to develop new ideas. The following viewgraph on approximate innovation incubation intervals should be helpful. As you can see, periods like 15 to 30 years are the rule. Consider that process research takes longer than product research and that multidisciplinary process research requires sustained funding for long periods of time and necessitates large capital expenditures. Even very large companies, with large cash flows have difficulty

digesting these expenditures. A new cooperative regional approach where the Federal laboratories and the universities work in partnership with industry may be the answer.

Thank you.

INNOVATION INCUBATION INTERVALS
(Approximate)

INNOVATION	CONCEPTION	REALIZATION	INCUBATION INTERVAL (YEARS)
ANTIBIOTICS	1910	1940	30
AUTOMATIC TRANSMISSION	1930	1946	16
BALL-POINT PEN	1938	1945	7
CELLOPHANE	1900	1912	12
COTTON PICKER	1924	1941	17
CREASE-RESISTANT FABRIC	1918	1932	14
DRY SOUP MIXES	1943	1962	19
FILTER CIGARETTES	1953	1955	2
FLUORESCENT LIGHTING	1901	1934	33
FROZEN FOODS	1908	1923	15
GYROCOMPASS	1852	1908	56
HEART PACEMAKER	1928	1960	32
HELICOPTER	1904	1941	37
HYBRID CORN	1908	1933	25
INSTANT CAMERA	1945	1947	2
INSTANT COFFEE	1934	1956	22
LIQUID SHAMPOO	1950	1958	8
LONG PLAYING RECORDS	1945	1948	3
MAGNETIC RECORDINGS	1900	1937	37
MINUTE RICE	1938	1949	18
NUCLEAR ENERGY	1919	1965	46
NYLON	1927	1939	12
PENICILLIN	1928	1943	15
PHOTOGRAPHY	1782	1838	56
RADAR	1904	1939	35
RADIO	1890	1914	24
ROLL-ON DEODORANT	1948	1955	7
SAFETY RAZOR	1895	1906	11
SELF-WINDING WATCH	1923	1939	16
SILICONE	1904	1942	38
STAINLESS STEEL	1904	1920	16
TELEGRAPH	1820	1837	17
TELEVISION	1884	1947	63
TRANSISTOR	1940	1956	16
VIDEO TAPE RECORDER	1950	1956	6
XEROX COPYING	1935	1950	15
ZIPPER	1883	1913	30

Mr. LLOYD. Thank you very much, Mr. O'Hare. Go ahead Mr. Whisker.

STATEMENT OF ROBERT WHISKER, BROOKHAVEN NATIONAL LABORATORY

Mr. WHISKER. Thank you, Mr. Chairman. I, too, have a prepared statement which I'd like to enter into the record.

Mr. LLOYD. Without objection, we accept it for the record and if you wish to paraphrase, that's also fine.

Mr. WHISKER. What I would like to talk about now is the patent policy of Brookhaven and by extension, the other DOE national laboratories and how it can help and hinder transfer of technology out of the laboratory.

To start with the bad news, how patent policy can hinder. As we've indicated, we feel that one of the best ways that we can move technology out is to get involved in cooperative efforts with industry. Either we have somebody posted at the Laboratory for a period of time or we develop a joint research effort with industry. But there are problems protecting the intellectual property that a company, or a man, may bring with them to the Laboratory when they start to work there. This property could take the form of either trade secrets or patents.

Considering trade secrets, we do have procedures to protect them. When people come in to use facilities such as the national syncrotron light source or the high flux beam reactor on a full cost recovery, time available basis, the policy is that they do not have to divulge any information other than that necessary for the safe operation of the equipment.

But DOE procurement regulations do have some fairly stringent requirements that require the acquisition of background data necessary to practice the results of research done at its laboratories or under its contracts. This is something that we would have to sit down with the people when they came in and anticipate, work out the agreement in advance, to avoid the problem. If the intellectual property that people brought with them had the form of patents, you might think that you would be perfectly safe. In general, that's true, but there are a couple of little snags.

These flow from the language used in DOE contracts, which requires the Department at the Laboratory for the Department to acquire title to inventions that are conceived or first actually reduced to practice. Conceived is a technical term in patent law and it means a bit more than you might think. It means the complete idea of what you want to do and how to do it and it's conceivable to me, at least, that a person could come to the Laboratory with what he thought was an invention with just a few minor things to work out, work them out while he was there and find the Department taking the position that conception took place under an agreement, under an agreement covered.

The first actual reduction to practice means just what it says, the first time you build it and use it. You may have your invention. You may have filed an application or even received a patent, but never

actually have built and used your invention; come and build it for the first time at the Laboratory. Again, you could find the Department taking the position that it was first actually reduced to practice under the contract and they were entitled to title.

Again, this is something that if you anticipate it, you can avoid it, but we have to work with the people before they come in.

All right, that's the problems part. Now, the question is and this is what you were asking about, inventions made at the Laboratory and patented, how can people work those inventions, use those patents.

Well, there are two basic approaches. If the Government retains title, there is in the 1974 ERDA Act, which has been carried over into the DOE legislation and is the policy we operate under, provision for licensing of Government patents. Licenses can be either non-exclusive, which are fairly easy to get and mean only that the Government will not sue you for infringement; which is something I know the Government doesn't do anyway, or exclusive, which does give you exclusive rights, subject to some minor—well, not so minor exceptions. These are: The right for the Government to use it royalty free and certain march-in rights. Application for an exclusive license requires notice in the Federal Register, and opportunity for intervenors to come in and request a hearing. This can get to be, I should think, fairly expensive and might be a little bit intimidating to the small company thinking of applying for an exclusive license.

It is my understanding that at the moment, there are only about four exclusive licenses out and maybe another dozen applications in the mill.

For the contractor, for the person who is actually under contract to the Department, there are provisions for waiver of the Government's right to title. In other words, title remains with the contractor and does not go to the Government. This waiver can be either advance, which simply means that it is worked out before the contract and covers any invention made under the contract, or it can be a waiver of an identified invention made during the contract. Brookhaven does not have the right, does not have an advance waiver in its contract. We do have the right to request waivers to inventions made under the contract and have, in fact, done so. If we were working with a company, we could probably structure such an agreement to be a subcontract and request an advance waiver to any inventions made under the contract.

A few suggestions for improvements we might make that would make things a little bit easier for us to work with other people without actually going so far as to try and rewrite the whole ERDA Act. When we do bring a person to the Laboratory, an industry person, he is required to sign a patent agreement that is essentially the same as the one we require of our employees and this is so even if we know perfectly well he's coming in to do purely theoretical work and there is no real patent problem existing.

Occasionally, it does get to be a hassle, working out something between DOE and the industry, that's acceptable to both. We've always been able to do it, but I think it creates a slight barrier that could possibly be ameliorated.

The licensing provisions I mentioned for exclusive licensing. I think the hearing part, as I indicated before, is an obstacle. I think it would frighten away the small company who hears about these enormous fees that patent attorneys charge. I think that could possibly be changed. The facilities, such as the Light Source I mentioned a minute ago. The current policy under development is that even if a person comes in on a full-cost basis, the agreement is considered a research contract and the Government is entitled to take title to inventions conceived or first actually reduced to practice.

I should add that they're developing a policy where these inventions would be automatically waived back to the user, but they would still retain march-in rights, certain claims of the Government and I think this could be, again, a slight disincentive.

And the final one, I think, which is very much in line with what everybody else has said so far and that is waiver requests, and exclusive license requests are now taking about a year to process. If this could be speeded up, it's got to help.

[The prepared statement of Mr. Whisker follows:]

STATEMENT BY ROBERT H. WHISKER, ESQ.
PATENT ATTORNEY, BROOKHAVEN NATIONAL LABORATORY
BEFORE THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
OF THE HOUSE SCIENCE AND TECHNOLOGY COMMITTEE

JANUARY 28, 1980

What I would like to talk about now is the Intellectual Property Policy at Brookhaven, that is, the policy with respect to patents and trade secrets, and the problems and opportunities that it presents in transferring technology out from the Lab.

As we have indicated, probably the best way to move technology out to industry is by cooperative efforts (e.g. joint research projects, posting of industrial employees to the Lab) between the Laboratory and industry. Unfortunately, this is where Intellectual Property problems will crop up. People who come from industry to work at the Laboratory may bring with them Intellectual Property of considerable value. The question then is, how do we protect this property?

If we consider the question of trade secrets first, we do have procedures for protecting trade secrets. Further, full cost recovery users of certain facilities, such as the High Flux Beam Reactor and The National Synchrotron Light Source, are not required to disclose the results of their work, or any information other than that necessary for safe operation of the facility. But, DOE does have a fairly stringent policy requiring the acquisition of background information required to use the results of DOE-supported research. In order not to put a company's trade secrets at risk care is required in negotiating the agreements for joint efforts.

With respect to Intellectual Property that is protected by patents or patent applications, you might think that there would be no

problem. In general that is true, but there are a couple of little snares. Both the Laboratory's prime contract and the patent agreement the guests and employees sign refer to the Government's taking title to inventions "conceived, or first actually reduced to practice under or during the course of the contract". That language should be examined.

"Conceived" has a technical meaning. It means roughly the complete idea of what you want to do and how to do it. While "conception" does not require a full set of engineering drawings, it does mean that there must be no hazy areas, no matter how confident the inventor is that they can be worked out in time. A person could come to the Laboratory thinking that he had already conceived his invention and only a few minor details remained to be worked out. If he worked out those minor details at the Lab, he might find DOE taking the position that it had been "conceived" under the contract.

"First actually reduced to practice" means just what it says, the first physical making and using of the invention. The language was deliberately chosen so that DOE could claim title to inventions, even though a patent application had been filed, or for that matter, even though a patent had issued, if the "first actual reduction to practice" was done under the contract.

There is also a question "Background Patent Rights". These are simply clauses that are included in research contracts which enable the Government to take certain rights in existing patents held by the contractor and which are necessary to practice the results of the contract.

The provisions are fairly moderate in defining "necessary" and may not present too much of a problem.

Those are the problems with our patent policy. The policy flows directly from the 1974 ERDA Act, which sets forth the policy for DOE and its contractors. However, they are the sort of problems that can be anticipated and avoided or minimized.

Turning then to the second question, if we can work out an arrangement where a company can work with the Laboratory and not lose what it already has, what can we offer them in the way of an inducement? In other words, can the company get a proprietary position in the results of the work done in cooperation with Brookhaven?

If a private company is to get some kind of proprietary position in the results of joint research it will have to be through a patent, and there are two ways this can happen, waivers, of the Government's rights to take title, and licenses under Government held patents, particularly exclusive licenses.

Taking licenses first, again there are two kinds, exclusive and nonexclusive. Nonexclusive licenses are easy to get, cheap, and do not really get you very much. All a nonexclusive license does is keep the Government from suing you for infringement, but the Government never sues for infringement. Further, the Government can take away your nonexclusive license if they can show that an exclusive license to somebody else is necessary to commercialize the invention. The only real advantage to a nonexclusive license is that the licensee gets the right to a hearing

before the Government can take it away.

Exclusive licenses are hard to get, but have some value. The trouble with exclusive licenses is that notice of the intent to grant one must be published in the Federal Register and intervening third parties have a right to a hearing. Clearly, this could become expensive for a company seeking a license.

This now brings us to waivers. There are three kinds of waivers, advance waivers, waivers of identified inventions, and mini waivers.

Taking the last first, mini waivers are available to the contractor and relate to foreign rights in countries where the Government elects not to file, and to nonexclusive licenses in the U.S. Again, they are fairly easy to get and not that valuable unless a company is already sophisticated about foreign marketing.

The other two kinds of waivers differ from licenses in:

1. Only the contractor is eligible.
2. There is no notice requirement.
3. If granted, the recipient writes the patent application.

Advance waivers are simply waivers to any and all inventions made under a particular contract and are granted in advance of the work to be done. Brookhaven does not have an advance waiver to inventions made under its prime contract, but we do have the right to ask for waivers of identified inventions. Further, if we were in a situation where we were collaborating with a private company we might structure that

collaboration as a subcontract for which an advance waiver could be requested.

Even if a waiver is granted, the Government still retains a license for Government use, which may be important for certain kinds of inventions where the Government is really the only market. The Government also retains certain "march-in rights" to revoke the waiver in the event the invention is not being commercialized. The last time I heard, DOE had never exercised "march-in rights", so that point is probably not a difficulty.

What can be done then to improve the Intellectual Property Policy that the Laboratory operates under? Short of a major revision of the 1974 ERDA Act to provide a special patent policy for the Laboratories, there are some changes that could be made:

1. When a person is posted by industry to the Laboratory, the person is required to sign the same patent agreement that Laboratory employees are required to sign, even though working in a purely theoretical area where there is no possibility of an invention being made. We could use some flexibility in this area.

2. The licensing provisions of the ERDA Act as they now stand are cumbersome. If these procedures were simplified they might be a more useful way to encourage industry to commercialize Government inventions.

3. We have certain facilities, such as The National Synchrotron Light Source, which may be made available to industry for proprietary research on a time-available, full-cost recovery basis. DOE

considers agreements for such use to be research contracts, and we are required to obtain for DOE title to inventions conceived or first actually reduced to practice by persons using these facilities even on a full-cost recovery basis. However, we understand that the DOE is developing a policy whereby a blanket waiver may be granted for such facilities, which would return title to the full-cost-recovery user. But, the Government will retain the "march-in rights" discussed above. In some cases that may discourage the use of the facilities. Recognition that this type of use of Government facilities is not a research contract within the meaning of the Act, and that users should retain all rights to inventions made during their use of these facilities, would encourage industry to make use of these facilities.

4. It now takes about a year to process a request for a waiver or an exclusive license. It would obviously be helpful if this time could be reduced.

Mr. LLOYD. Thank you very much, Mr. Whisker. I will take this opportunity to introduce our colleague and the senior minority member of the Committee on Science and Technology of the House of Representatives, Mr. Jack Wydler. Thank you for joining us today.

Mr. WYDLER. My pleasure.

Mr. LLOYD. Mr. Ambro, do you have any questions at this time?

Mr. AMBRO. Well, I think I consumed, Mr. Chairman, my 5 minutes under the 5-minute rule in my little monolog earlier, so I'll defer. Thank you.

Mr. LLOYD. Mr. Wydler.

Mr. WYDLER. Well, Mr. Chairman, I have to say that I'm most grateful to you for bringing this group to Long Island. I think the fact that we hold congressional hearings in the Long Island area is a good thing, both from the morale of the area, particularly since you're from California where most of the business is, but——

Mr. LLOYD. We like to share, Mr. Wydler. We like to share.

Mr. WYDLER [continuing]. And my colleague from New Mexico has the other part of it, so between you, you might give us a little bit in the future. We hope you'll be more kind and generous, but we are glad you're here and we thank you for coming and I think the topic that you've chosen is a most significant one. Congressmen Ambro and Carney are from Suffolk. They share with Nassau County a history of an area that used to do it on its own, practically independently. We've built here on Long Island one of the great bases for high technology in the country and we're willing and ready and able to compete on an equal basis with any other part of the country, but sometimes we find it very difficult to compete at the Federal level for the Government money and contracts and that's something that those of us who are from Long Island are working hard to cure. Congressmen Ambro and Carney and myself are members of the Long Island Congressional Caucus which has as one of its main purposes, doing just that.

Now, to get specific about your hearing here today, I'm delighted to see the people from Brookhaven here. My travels around the world have indicated to me that the United States is in deep trouble in competing economically in the world. A great many of the problems unfortunately are brought upon by ourselves. We set up one barrier or another to American businessmen doing business overseas, through our tax laws, so-called antibribery laws. One rule or restriction after another that has, in many cases, made it practically impossible for American firms to compete successfully in the international market.

Another result is, for example, in Saudi Arabia where construction is going on at a multibillion-dollar rate, a country where we had 80 percent of the construction business just a few years ago, we have managed through the passage of a few laws to bring that number down to about 30 percent now and it's going down at a steady rate. An incredible thing for us to behold when we face a tremendous deficit of balance of trade and since Saudi Arabia has so many of our dollars, we are throwing away a chance to get a great many of them back.

These are the kinds of things that the Government is doing to our businessmen in their attempts to compete overseas and I think that it's going to be not long before the American Congress and Government,

in general, is going to realize the need to reverse that trend and start to encourage, rather than discourage our foreign businessmen.

The only reason we even have anything left, practically speaking, as overseas efforts outside of our agricultural products, is our advantage in technology and if we lose that, we're really out of the ballgame. So these hearings have a tremendous importance to the future economic development of our Nation and that high technology comes, in most cases, we find from the small firms that do the original work and get the original inspiration and ideas which are translated very often by bigger firms into reality, but I think the ideas begin at the small firm level.

All of which brings me, Mr. Whisker, to my question to you and it's the only question I have for this panel. I'm sorry I was late, but I just could not get here earlier, which is of all the things that you've suggested, because I do really want to see this transference and cooperation between the Government institutions and the small technology firms, the private firms, and do anything I can to help it. What is the most important thing, in your judgment, that we can do? And I'll ask the other members of the panel, certainly, you, George, and Tom, to comment on it—the most important thing we can do to encourage and help the small high technology firm to make it both financially and practically speaking, in a manner that will be beneficial to our economy. I'm asking you to pick one, because I know there are many—we can put up a laundry list, but I'd like to hear what you think is the most important.

Mr. WHISKER. Well, at the risk of seeming a little bit evasive, I think the common note of all the things I mentioned was that when people want to work at Brookhaven, which is largely involved in basic research, and is not producing things that are going to be marketed next week, the basic thing to do with patents is to keep them from getting in the way. Do not obstruct the man who wants to come to work at Brookhaven by throwing this rather freightening patent agreement at him. The man who wants to come to use the Light Source, paying his own way, when time is available, don't start making claims on inventions that may come out of the use of that facility. Don't let the patent policy get in the way. I think that's more important than licensing waivers of inventions just to keep it from becoming an obstacle.

Mr. WYDLER. Any other comment, George?

Dr. VINEYARD. No; I agree with that very much, Jack.

Mr. WYDLER. And Tom?

Mr. O'HARE. I have a comment that goes back to Dave Ladd when he was Patent Commissioner and then Ed Brenner when he was Patent Commissioner and Don Banner when he was just Patent Commissioner. The patent department has needed revitalization for 30 years. They are unable to get the budgets. They are unable to get the money. They are unable to get the people. They are unable to get the ear of Congress to get that money. Simplifying the patent procedure, amplifying the ability to search the patent documents, finding methods and ways and means so that the inventors can be served better would certainly help technology exports in the United States.

Mr. WHISKER. I concur with that wholeheartedly. My answer was directed strictly to working at Brookhaven.

Mr. WYDLER. Thank you. Thank you, Mr. Chairman.

Mr. LLOYD. Anyone else? Mr. Carney?

Mr. CARNEY. I would just like to say that we all know, actually I'm sure that every member of this panel has taken the time to go to Brookhaven Laboratory not only once, but several times and we all know the work that they're doing, but it is important that that work is known to the people who can most utilize that facility and we would encourage you to do everything you possibly can to allow people in our segment of the economy to know what you're doing and know how they can prosper from that. It is a shame to know and it was only 3 weeks ago, I spent the entire day at Brookhaven National Laboratory and it was a shame to know that there are so many people from foreign countries who take advantage of these fine facilities and we should do everything we can to encourage others from America to take that same advantage and in closing, I would like to go back to the polymer concrete that, the work that we've done out there and I would just like to take 2 seconds to tell you the first time I ran across that product. It was in Mr. Ambro's office when he offered me a cup of coffee and a bagel, and the bagel was made of polymer concrete. Thank you.

Mr. LLOYD. Does he still have it?

Mr. CARNEY. Yes; he does. Be careful, Mr. Chairman.

Mr. LLOYD. Thank you very much gentlemen. There will be written questions which will be submitted to you. We appreciate your presence here today and again, we apologize for the shortness of the time, but we do appreciate your presentation.

The next panel will please come up.

While they are coming up, I'll introduce them. Mr. Westermann who is chairman of the board of the Hazeltine Corp., Mr. Gold who is with Polytechnic Institute of New York and Mr. Schiffer who is with the Action Committee of Long Island and while we're getting your names up there, we'll go ahead and start with Mr. Westermann.

STATEMENT OF DAVID WESTERMANN, HAZELTINE CORP.

Mr. WESTERMANN. Mr. Chairman, Congressmen, I'm chairman of Hazeltine Corp., which is not a small business. It has sales of $120,000,000. It has about 3,000 employees and about 500 engineers, innovating all the time and most of those resources are in Suffolk County, L.I.

Mr. LLOYD. Without objection, we'll accept your presentation, written presentation.

Mr. WESTERMANN. I have not submitted one.

Mr. WYDLER. That's why we're accepting it.

Mr. WESTERMANN. I'll be pleased to submit it later if you'd like.

Mr. LLOYD. We would be pleased to accept it.

Mr. AMBRO. You're not here to get us to develop policies which will assure that Hazeltine revert to the status of a small businessman.

Mr. WESTERMANN. I hope not. I'm also chairman of the Long Island Forum for Technology or LIFT and an earlier witness, Santos Abrilz is president of that and I'm also a trustee of Polytechnic Institute of New York.

The subject for this panel is improving climate for innovation, and I would like to address that with some reference to the mission of LIFT. We've discussed here tax policy and patent policy and conditions affecting Government acquisition and procurement and I would address the latter. However important patent policy is, we should remember that technology is the application of invention to practical objectives and that is the field of know-how and that's equally or more important than patent policy, conditions affecting competition in the area of know-how and advance of the Nation's know-how.

LIFT was organized April 29, 1977. It has tax exempt status as a nonprofit organization. It is composed of about one hundred high technology companies, large and small, laboratories, universities and schools. It's based here at Polytechnic Institute of New York and also has in its membership, professional associations.

It was organized with a set of principles: One, to focus on the importance of technology and technology industry to the Long Island economy; that is, the Nassau-Suffolk economy as far and away the most important industry in this economy from the standpoint of bringing cashflow in from outside. It's principles also focused and the purpose was to focus the attention of the entire community on the importance of that and the importance of those issues which affect the health of the technology industry. Also, to focus on the benefits of technology industry: technology exports, technology counters inflation, and some segments of technology industry, particularly defense and aerospace, run counter to the normal business cycle or at least not in accordance with it and therefore, lend a balance to the economy.

The LIFT principles focus emphasis on small business and focus on the fact of the interdependence of large business in the technology area and small business in the technology area.

Large businesses in the technology area often add a rather small percentage of value to the product. Hazeltine Corp., for example, with $120 million of sales has 3,000 to 4,000 suppliers, adds 15 to 20 percent to value itself in its own plants, and procures 55 to 65 percent of its procurement from small businesses. Those small businesses are in three or four tiers of procurement and subprocurement below our company. We and our research and development are critical to them and their health is critical to us. It's a network, integrated and no part of it, in our view, could function without the other parts.

Again, patent policy is important, but know-how is advanced by this team of large and small companies working together on a consistent basis day by day, even without specific invention. On many issues that LIFT focuses on, the positions of small business and large business, are the same and should be the same.

For example, Santos Abrilz commented on the difficulty of understanding regulations. A small business may not be able to understand them. Larger businesses incur tremendous cost and waste of time in grappling with them. For example, the accounting provisions of the Foreign Corrupt Practices Act, leaving aside the antibribery provisions, but the accounting provisions which set a whole new set of obligations on all businesses.

Sandy mentioned the cost of proposing. The cost of proposing, the burden of regulations and boiler plate that have to be dealt with may

exclude small businesses. They may not exclude larger businesses but they burden them, they burden our products with cost, they burden the Government with cost and they add to inflation.

Several specific issues of that type which LIFT has addressed and will continue to address. One, we vigorously opposed the Minish bill when it was in Congress. I believe in the last Congress. Many companies around the United States opposed it for many reasons. We here opposed it because it would have imposed segmented renegotiation on defense contractors which would have disregarded their loss contracts and then recaptured the profit only on the mature product contracts, the profitable contracts; thereby, robbing the seed money for research and development from large companies and small companies alike. We have vigorously supported the Chiles Federal Acquisition Act as it stood when it was known as Senate bill 1264 in July 1977, when Senate testimony was taken and it was supported almost universally by the defense industry, technology industry, energy industry and most of the witnesses from major Government agencies. It's a tragedy that that bill as reintroduced as Senate bill 5 has first been emasculated, and the work that stemmed from the work of the Holifield Commission, over more than a dozen years of work that went into the research and study that resulted in the provisions of that bill, its preamble, and its specific provisions, it's been emasculated and as we understand it now, Senate bill 5 is dead.

In 1977, in its healthy form, S. 1264, Congressman Wydler and Congressman Downey each introduced a corresponding bill in the House of Representatives. That bill would have substituted competition for overburdening regulation, which Congressman Ambro referred to in his remarks at the beginning of this hearing. It would have substituted the use of functional specifications instead of specifications for products, detailed beyond reason by the Government procuring agencies, specifying the solution, preventing industry from providing a solution and making it impossible for many small businesses to compete, and expensive and not rewarding for larger companies. It would have recognized that negotiated fixed price procurement in high technology and defense work is an entirely proper way to procure, and would have given that equal status with advertised procurement, which in many instances of procurement is impractical. It would have ended the pervasive practice of best and final offer, parallel negotiation, auction type procurements by the defense agencies and other agencies, a practice which is unethical. It's practiced by the Government under the armed services procurement regulations as they now stand and the procurement statutes as they now stand and I'll give you the citations in my prepared statement. It's opposed universally by industry and by many contracting officers within the defense agencies. We have worked time and time again with our efforts to stop it.

It's a practice whereby the companies are asked to submit their bids in a first offer. Those offers are not the real offers and you may not disclose your real technology in those. If you do, you are probably dead in the water as a competitor. After they have the bids, they ask for a best and final offer, after the Government has had negotiations with all or discussions with all of the competitors. When that happens, it's not reasonable to expect that technology will not be transferred to the

weaker competitors from the better competitors and it's unreasonable to expect that there won't be price tipping, at least to the extent of telling someone you've got to come down and how much.

As a result, companies do not submit their best bids the first time. They may not even dare to submit their best bids the second time. It may go to the third or fourth round. The result is that you may have "buying-in" and the Government procuring from the weakest competitor purporting to use somebody else's technology which he doesn't understand and at a price where he doesn't understand the cost. You think you have a bargain. You may wind up in a "bailout," because what you've done is bought a "buy in" from a weak competitor, and you have weakened the entire technology base supporting the procurement system by the practice of defeating the most effective competitor.

We should go back to the practice in procurement where the contracting officer is required not to enter into parallel negotiations, but to take the best bid in accordance with the proposal, take that, put the others aside, attempt to negotiate a contract in the best interests of the Government, with the lowest bidder, with the best technology, in accordance with the proposal, in the first instance, and only if that negotiation effort fails, then go to the second bidder. That would be consistent with the principles of fair and open procurement recited in the preamble to the Chiles bill. It would be fair to everybody. It would encourage innovation. It would stop the destruction of teams that have developed know-how and the most competitive companies where the know-how resides in the team working together, and it would be consistent with the principle that in a democracy, the Government and its procurement practices, as all such practices, should work and earn the confidence of its citizens, and a Government which procures by the best and final parallel negotiation auction is not entitled to the confidence of its citizens whether they're corporate or the many, many professionals who work in the corporations who bid. That type of practice would have been stopped dead by the Chiles bill as it stood in July 1977.

The bill has since been emasculated as I've said and we believe it's dead. I think in the field of acquisition and procurement, the best single move that the Congress could make to unburden the system of procurement and remove a lot of burden from technology industry, where it serves the interests of Government, would be to resurrect the Chiles bill as it was, get the support of industry and Government professionals and students of the area behind it, and enact it. It should have been in place by now if there is going to be an increased flow of Government funds into acquisition because of the present international situation. It is not in place and that's unfortunate. Thank you.

[The prepared statement of Mr. Westermann follows:]

Testimony of David Westermann before the Subcommittee on Investigations and Oversight of the Committee on Science and Technology of the U.S. House of Representatives, January 28, 1980, at Polytechnic Institute of New York, Farmingdale, Long Island, New York.

* * *

Mr. Chairman, Congressmen, thank you for coming to Long Island and for permitting me this opportunity to testify.

I do not have a prepared statement but would appreciate the opportunity to submit one after the hearing, if you will permit.

I am Chairman of Hazeltine Corporation, which is not a small business. It is a publicly owned, high technology company with sales of $120 million a year, and almost 3,000 employees, including about 500 engineers who are "innovating" all the time. Most of our resources are located in Suffolk County, Long Island, New York.

I am also a Trustee of Polytechnic Institute of New York, a member of the Board of Directors of the Long Island Action Committee, and the Chairman of the Long Island Forum for Technology, or LIFT, and Chairman of the Long Island Mid-Suffolk Businessmen's Association, or LIMBA. Santos Abrilz, an earlier witness today, is the President of LIFT.

In your hearing so far there has been discussion of federal tax policy and patent policy and Congressman Ambro has referred to "overburdening government regulations," all as involving obstacles to small business and particularly those engaged in high technology.

I will focus my comments on regulatory problems of that type, particularly in federal acquisition and procurement policy and practice.

As important as invention and patent policies are, we should not lose sight of the fact that technology is the application of the results of invention to practical purposes, and that technology is advanced, and technological business is done, in competition, by the development and advance of "know-how". "Know-how" may be considered as broader than specific invention and it is not protected by patent. But "know-how" does involve innovation, and the competitive position or advantage of a business firm can be protected by "know-how". And "know-how" serves the interests of society and the nation, including defense, just as invention does. It is a national asset. It does not reside in a patent application, but does reside in the minds, skills, tools and working documents of human groups such as teams of engineers or manufacturing organizations. "Know-how" for a large company or an industry is developed and advanced by an integrated network of interdependent large and small companies.

It is this process of the competitive advance of "know-how," through competitive innovation, that is burdened by excessive regulation and government interference in business in the federal acquisition and procurement process.

LIFT was organized on April 29, 1977 as a nonprofit organization which now has about 100 members including technology companies both large and small, laboratories, schools such as the Polytechnic Institute of New York where it is based, and professional associations.

It was organized on the basis of a Statement of Principles, a copy of which is attached to this statement. Principle Nos. 3, 4, and 5 in that Statement direct attention to the fact that by far the most important industry in the Long Island, or Nassau/Suffolk, economy is high technology industry, and, in particular, aerospace, electronics and defense.

A LIFT study entitled, "Technology and the Long Island Economy" dated January 1978, prepared under the direction of Dr. Karle S. Packard, of the EATON Corporation, a copy of which is submitted herewith, established that whereas Long Island residents have an aggregate of about $13.5 billion of personal income per year, most of that is derived from jobs in New York City held by commuters, and from social security and welfare and other transfer payments, and investment income. Only $2.8 billion of that personal income is earned in jobs here on Long Island. $2.2 billion of that $2.8 billion is earned in manufacturing industry on Long Island shipping its products to customers outside the region. So, these are the jobs which bring fresh cash-flow into the Nassau/Suffolk economic system, by, in effect, "exporting" to markets outside of that system. Almost half of that, or $1 billion a year of this fresh cash-flow, is earned in jobs in Long Island high technology industry.

Long Island high technology industry has total revenues of about $2 1/2 billion per year. It is far and away the most important industry, and source of incoming cash-flow, in the Nassau/Suffolk economy, not even approached by agriculture or tourism.

LIFT principles No. 6 and 7 emphasize the benefits of high technology industry in providing new products and services for defense and material improvement in our society, constantly reducing costs through innovation and improvements to productivity, and acting as a significant counter-force to inflation.

LIFT Principle No. 10 emphasizes the goal of stimulating the emergence of new technological enterprises, and attacking the problems of small technology business.

LIFT Principle No. 13 makes the point that, despite the importance of technology to the Long Island region recognized in the earlier principles, the interests of LIFT are consistent with the National interest in terms of defense, national security, and the welfare of our society.

LIFT Principles 14 and 15 recognize that the health of our regional technology, and our National technology, depends to a great extent on government policies and practices protecting fair, free and open competition in government acquisition and procurement, and providing adequate opportunity for a fair return on capital employed.

I would like to return for a moment to the subject of small business and its interest.

It should be kept in mind that the larger high technology companies are vitally dependent on many small businesses from which they procure products and services, and those small businesses that constitute the procurement base of the large company are similarly dependent on it. The large company may add relatively little, say 15 or 20%, in value to its product in its own manufacturing contribution, as it depends on its

suppliers, in maybe 3 or 4 subcontract or subprocurement tiers, for materials, components, subsystems, services and innovation.

For example, Hazeltine, with $120 million of annual sales, has 3,000 to 4,000 suppliers, and spends 55 to 65% of its procurement dollars in orders to small businesses.

Similarly, the positions of large business and small business, in high technology, are and should be the same on many issues, particularly issues having to do with federal acquisition and procurement.

Santos Abrilz, a small business President who preceded me as a witness, is concerned that small businesses are unable to understand many government regulations, because they cannot afford the time or the expense of developing such understanding. Many government regulations and requirements are beyond the understanding, or at least the ready understanding of large business, and if an understanding is developed by the large company the cost and waste of time in doing that is burdensome. Congressman Wydler has expressed concern with the effect of the antibribery provisions of the Foreign Corrupt Practices Act in eroding American exports. Without getting into any issue about the antibribery provisions of that Act, its accounting provisions have posed a great additional and unnecessary regulatory burden, and difficulty of understanding, upon American business, including ethical companies which have long had policies against bribery and other immoral practices. The apparent purpose of those provisions is to absolutely prevent any wrongdoing whatsoever.

Similarly, Mr. Abrilz has expressed concern that under federal procurement practice, with its excessive regulations and boiler plate contract provisions, and detailed specifications, small companies may be excluded from bidding and competing for government business because they simply are unable to cope. A larger company may be able to deal with those procurement conditions, but it may cost it excessive amounts of money to do so, and those excessive costs are reflected in the prices of its products and services, and so in the costs of government, and so in inflation.

LIFT has dealt with a number of issues about these burdensome government procurement regulations and conditions.

As examples, LIFT vigorously opposed the Minish Renegotiation Bill (H.R. 4082 and then H.R. 5959) in the last Congress. While many companies across the country opposed that bill for many good reasons, LIFT opposed it primarily because of its provisions requiring segmented renegotiation of the profits of defense contractors. Under that approach, which would have replaced the policy of recapturing any excessive profit on the contractor's defense business in the aggregate, a contractor's loss contracts would have been set aside from the renegotiation process, and its profits on its profitable contracts won in competition on its mature products would have been recaptured, thereby robbing the contractor of the "seed" money which a high technology company requires for research and development for new products, and for start-up costs and the costs of "early learning curve" on new products. This would stifle the advance of technology, and the growth of new business including small business. Lower-tier subcontractor small

companies would suffer directly and as large company research and development was curtailed.

LIFT with equal vigor supported the Chiles or Federal Acquisition Act, as it was introduced by Senator Lawton S. Chiles of Florida in the 95th Congress, First Session, April 6, 1977 and as it stood in "mark-up" as Senate Bill 1264 as of July 1977. At that time, the Bill in its then form, was enthusiastically supported by companies across the country, and by almost all witnesses from government agencies. Similar bills were introduced in the House at that time (95th Congress) by Congressman Wydler (H.R. 10749), who is here today, and Congressman Downey (H.R. 10146).

It is a tragedy that since then, the Bill was first emasculated and reintroduced as Senate Bill No. 5, and then buried and is apparently dead. It is tragic that the Bill was not enacted, and the statute put in place in 1977. If there is to be a substantially increased outpouring of taxpayer's money in defense acquisition now, in response to the current international situation and to our apparent National reawakening to the Soviet threat, then the Chiles Bill should be in place now to protect the public purse and give our defense agencies a higher probability of success.

The single most effective thing the Congress could do now to free up and stimulate the advance of American technology, and American technological enterprise, including small business, would be to resurrect the Chiles Bill, in the form of the "mark-up" as of July 1977 (S. 1264), and get going again on the process of hearings and prompt enactment without substantial change, and especially without many of the debilitating and counterproductive changes in Senate Bill 5.

The Chiles Bill, in the form of S. 1264, represented the only right way to deal with the involved and complex problems of federal acquisition, including high technology acquisition, in the scale of billions of dollars a year, in a free society. In 1975 a distinguished professional in federal acquisition, Professor Robert Judson, then at the Naval Postgraduate School, pointed out that we had gotten into a massive complex and cumbersome situation by dealing with problems in the federal procurement process, over a quarter century, by a "patch-up" approach to "the symptoms of problems" with an "inexhaustible supply of answers,--simple, quick and wrong".

In 1974 Senator Chiles, a student of acquisition, decried the fact that we had (and we still have) a "hodgepodge of indirect controls" on industry "in the form of regulations, specifications, mandatory management systems, cost accounting standards, audits and many others" resulting from a "makeshift approach" to problems.

The Chiles Bill was not an ad hoc, "makeshift" or "patchwork" attack on the complex regulatory problems in federal acquisition. It was the deepest, most comprehensive approach to the overall problems in a quarter of a century. It was based on an intensive three-year study by the Holifield Commission on Government Procurement, established by an Act of Congress, (Public Law 91-129), with the participation of hundreds of dedicated professionals from government, industry, and the academic community, followed by six additional years of Senate staff drafting and testimony.

It dealt with identified problems that are real and significant, and it dealt with them systematically, and from the standpoint of basic principle.

The Bill was designed: to stimulate the advance of technology by encouraging competitive innovation,--not competition by price alone--fair, open and free competition for government business, with the monopsony power of the government customer balanced off.

It would have substituted competition in the place of government surveillance and interference as the regulatory mechanism; it would have required the use of goal or functional specifications stating the problem to be solved, or the need of the government, rather than the explicit and fine detail and design of the product sought, so that competitive industry innovation would have been called for, and given free play, rather than being stifled as it is now; it would have recognized negotiated fixed price procurement as an equally valid alternative, and not as an exception, to advertised procurements; it would have reduced or eliminated excessive and redundant government surveillance, monitoring, and auditing of the activities of contractors, and it would have eliminated the "best and final offer" "auction" process practiced by the government, which I will come back to.

The need was and is great. Ronald A. Chiodo, Chief Counsel for the Senate Subcommittee on Federal Spending Practices and Open Government said in a November 1977 issue of "Contract Management": "Regulations are so dense as to leave the procurement office with little opportunity to make a reasonable decision."

In the Spring 1975 National Contract Management Journal, Robert B. Hall, a government professional, said that the current procurement approach is "...to restrict real competition and generate high and uncontrollable costs" so that the contractor is then "burdened with the red tape which the government imposes...trying to control the noncompetitive situation".

Professor Murray Weidenbaum of Washington University says that "so much of (the) efforts (of defense contractors) are devoted to a proliferation of paperwork that, rather than doing, the contractor spends his time reporting..and the nation does not get the benefit of the innovation and efficiency that we expect..."

I noted that the Chiles Bill of July 1977 (S. 1264) would have ended the pervasive practice of "best and final offer" "auction" negotiations conducted "in parallel" with a number of bidding competitors at the same time. This practice is conducted in military procurement, under Defense Acquisition Regulations (ASPR), 3-805.1, .2 and .3 which are a purported implementation of certain language in 10 U.S. Code Annotated Section 2304(G).

With such "auction" negotiations being held with competitors "in parallel", it is not reasonable to expect the practice to be fair, to be free of price leaks to competitors, or to be free of technology transfers,--taking innovative ideas from the low cost, best technology, most effective competitors, and handing them to less effective competitors to use in the continuing bidding "auction". This is to defeat the long run interest of the government, notwithstanding that in a particular procurement the government may appear to get an

immediate bargain purchase. That supposed "bargain" may be from a contractor promising to use a technology which is not his, for a cost which he may not be able to meet. It may well be a contractor "buy-in" to be followed by a government "bail out".

The national interest loses if the most effective technological competitor fails to win, and his engineering team, with its accumulated "know-how", is broken up.

We should return to the practice in which competitive bidding for negotiated contracts is handled fairly, when the competitor knows that it can and must submit its best technology and lowest price in the first and only round of bidding, because that information will be protected from its competitors, and because it must win then or never.

It is urgent and vital to the integrity of defense procurement, based on free and open competition, that the statute and the regulations be amended sharply and decisively, on ethical principles, so as not to require parallel discussions with all those in a so-called "competitive range", and not to require that all bidders in the competitive range be permitted to revise their bids, and to affirmatively require that the representatives of the government, in any competitive negotiated procurement, make every effort to conclude a contract, in the best interest of the government, in the reasonable judgment of the contracting officer, with the responsive and responsible bidder whose bid is lowest, or most advantageous to the government in accordance with the request for proposal, in the first instance, and, pending that effort, abstain from negotiation and discussion on that matter with other bidders.

Relevant basic principles are that competition should be free and open, and the government's conduct of it should be characterized by fair dealing. Government should not interfere in competition. Relationships should be equitable. And above all, as a distinguished government professional, William Thybony, has said, "where government is based on the consent of the governed, every citizen is entitled to have complete confidence in the integrity of the government."

Again, in closing, the national interest has suffered and will suffer if the Chiles Bill, S. 1264 as it stood in "mark-up" in July 1977, the deep and thoughtful work product of years of effort of hundreds of professionals in government, in industry, in the professions, and in the universities is lost. The problems they dealt with are still with us. Their thinking and their work are still relevant.

The Bill is still the right approach and is vitally needed. We should not junk it and start all over again, with years more of study as one alternative, or "patchwork" approaches as the other, while the waste to our government, and the frustration of American technological industry, both large and small, continues.

Thank you. I will be pleased to respond to questions.

Mr. LLOYD. Thank you, Mr. Westermann and I'm going to ask a quick question and then get off and go to your next one, and that is, with all of it, how do we create the positive forces in the mind's eye of the society with the attitudes of the press who pressure us—now, you see I'm now speaking almost with two hats, because I am the person who serves on research and development in the armed services and you're talking to me directly. I don't know if you intended that, but that's what you're doing. And how do we then get the press, any of the press, I don't even know if any of the people are present here today, off our backs on this screaming that we are not adequately pursuing the lowest price?

Mr. WESTERMANN. I think that, in part, you have to stand up to the press, but I don't think that will do it alone. I think it's necessary for broad citizen attention to the problem and that is why we organized the Long Island Forum for Technology to try and focus community interest on these subjects. National organizations do it such as the National Security Industrial Association, Electronic Industries Association, AIA, and the National Contract Management Association which holds forums for these topics.

We believe that it's necessary for people in the congressional districts to focus on the problem and talk about it locally as LIFT is. That happened with respect to the Minish bill. It should happen on other issues.

Mr. LLOYD. Well, we'd be most pleased to hear from you on the armed services research and development and I'd be most pleased if you would like to communicate with me directly in that capacity, not as opposed to this one, but in parallel to this one. Mr. Gold. Oh, excuse me, I'm sorry, I asked the question then. Does anybody have any questions?

Mr. WYDLER. I don't think Dave answered your question directly. He answered it as a businessman would and you're really asking a politician's question and may be I could help more than him in this case. I think the only way you can handle it with the press is to try to explain the facts to them and the facts are you're talking about different things. You're not just talking about the Government putting out a proposal that's very specific and somebody coming in and making a bid on it. The Government very often puts out a proposal and asks a company to come up with an idea to do something. It's an innovative idea and not everybody's idea is the same. And what Dave is only saying is the sensible thing in a case like that is to judge the proposal on its merits, individually, and not try to go through a constant process of picking out one fellow's proposal and then giving it another fellow because he says I can do it cheaper, when he doesn't even know much about it to begin with. He's just hoping he can do it cheaper and you're going to get the Government into a lot of trouble doing business that way and you're going to have a lot of bad contracts. So, it's in the national interest not to do business that way.

Mr. LLOYD. Well, we have the perfect example of that in the area of Roland which was a weapon system which has just turned out to be a disaster to the Government and to everyone else.

Mr. Gold.

STATEMENT OF ALBERT GOLD

Mr. GOLD. Thank you, Mr. Chairman. I've submitted a written statement and with your permission——

Mr. LLOYD. Is it OK if I accept this for the record without objection?

Mr. GOLD [continuing]. We'll paraphrase. There is widespread perception, I believe a correct one, that the rate of innovation in the United States can be significantly increased through the improvement of the coupling of the technologically-oriented components of our national system of universities to technological industry.

This is an issue of national scope. However, it would seem to us that it is most effectively addressed at the regional level.

Neither IBM's laboratories at Yorktown Heights nor Bell Labs suffer any dirth of productive contact with the academic community.

It is the small to intermediate size technologically-oriented businesses which stand to be the primary beneficiaries of major improvements in communication. The Polytechnic Institute of New York, which has campuses in Brooklyn, here in Farmingdale on Long Island, and in White Plains in Westchester County, has joined with the State University Campus at Stony Brook in setting before the National Science Foundation a proposal to create an innovation center on Long Island.

In essence, we are proposing to enter into the brokerage business—which I'm sure most of you recognize as the world's second oldest profession.

Mr. AMBRO. The house that was not a home that we heard about before was——

Mr. GOLD. That's a matter pursued in the Government lab.

In what sense brokerage? Brokerage in its finest, truest meaning, brings together interested parties who have something to exchange with another for mutual benefit. What we hope an innovation center will do, is render available to small business and middle size business access to university-based technology and know-how they now lack.

It will provide a path for even the naive inventor to developmental resources and ultimately to a commercial marketplace, including within such a structure, a scrupulous screening mechanism. It will also serve as a neutral meeting ground, not only for various small companies, but also for small and large industrial corporations.

Technology transfer in the profoundest sense is a process that takes place between the bodies of matter contained in two different human skulls. These must have a sheltered, honest, and neutral place in which to meet. We propose to create such a place.

We plan, however, to go beyond that. There is a great deal of valuable or at least potentially valuable intellectual property, particularly that which comes out of the universities, which is in a crude, natural resource state. It is an idea. It is a gleam in someone's eye. It is, perhaps, a paper patent—and no more.

Before we can realistically ask that venture capitalists or even the Government participate in major investments, these must be brought through the next stage, through what one might think of as laboratory demonstration or prototype development. We would earnestly seek to incorporate within the center the means for bringing selected raw ideas to that next level of development.

Most of the notable recent successes in high technology development, in the real estate or industrial sector sense, are based in substantial measure, on university spin-offs. Ideas spring from the faculties deeply engaged in research. Often individuals beginning as university researchers by degrees become technological entrepreneurs. We hope to assist in setting in place here on Long Island, a means for facilitating such spin-offs in more substantial numbers than those of the recent past.

I believe it was our colleague from Brookhaven who said that BNL does not engage in management consulting. I would hope that the innovation center would. Given the often purely technical background of the new technological entrepreneur or the classic inventor, marketing and management help will be essential. A variety of skills are needed to incubate and bring new ideas to the market. None can be neglected.

You will see appended to the written statement, a crude diagram of the center's proposed structure. It emphasizes schematically a broad partnership in advising and setting policy for the center. It must include, not only the major universities that have served as the parents to the center, but also the other academic institutions in the region and representatives from all of the relevant industrial and financial institutions.

Let me, in closing, bring out from under the table another hat that I recently acquired. This is two-hat day. I also serve as a director of University Patents Inc. It is a small, Connecticut-based company, dedicated to transferring intellectual property from a small, select group of universities and other nonprofit clients into the marketplace. I might also note that before joining the Polytechnic a little over a year ago, I served as vice president at the Rockefeller University in New York City where I had a central role in establishing and managing of patent and licensing program.

The impact of patent law and Federal patent policy is highly variable and very dependent on the industrial sector address. Its impact is probably heaviest in the pharmaceutical area where FDA compliance costs make the bringing of a new drug to the marketplace so prohibitively expensive that lack of exclusivity virtually guarantees noncommercialization of an invention.

Federal patent policy is currently diverse and certainly at the least, nonuniform. At its best, it is probably represented by the institutional patent agreements, available to a limited number of major research universities, from the Department of Health, Education, and Welfare.

Substantial steps have been recently taken to improve the situation. In particular, Senators Bayh and Dole, along with, I believe now, some 50 cosponsors, have introduced before the Senate, bill S. 414, which combines the best features of the HEW Institutional Patent Agreement with universities with a number of related and equally healthy provisions involving small business. I believe it's companion bill in the House is H.R. 2414. Let me say only that while Bayh and Dole may not be perfect, it is both a very major step in the right direction in facilitating technology transfer from the university ultimately to the marketplace and is a very urgent matter. And I would press upon you my own view that such legislation should be enacted in the current session of the Congress. Thank you, gentlemen.

[The prepared statement and biographical sketch of Mr. Gold follows:]

PREPARED STATEMENT PRESENTED BEFORE THE HOUSE SCIENCE AND TECHNOLOGY SUBCOMMITTEE ON INVESTIGATION AND OVERSIGHT - January 28, 1980

by Albert Gold
Provost
Polytechnic Institute of New York

While the stimulation of innovation through the improvement of the coupling of universities and industry is an issue of national scope and great complexity, it must be attacked on a regional basis. The subtle and tortuous process involving the enhanced generation of creative technological ideas, their evaluation, development and ultimate transfer to the marketplace, seems practicable only when confined within a manageable geographic area.

To serve this end on Long Island, its two leading technologically oriented universities, Polytechnic Institute of New York, an independent institution, and the State University of New York's University Center at Stony Brook, have joined together in proposing to the National Science Foundation a plan for the establishment of a Center for Technological Innovation on Long Island. The objectives of the Center are:

- Provide a university-based resource, with bridges to the industrial and scientific community, to seek and evaluate new ideas under conditions which respect the proprietary and patent rights of the originators;
- Foster the generation of new technologically-based ideas for methods, materials, systems, products and devices by providing an inviting and hospitable intellectual framework;
- Provide assistance to innovators in bringing their ideas from the conceptual to a more practical stage involving demonstration;

- Render advice as to the commercialization or employment of new methods, materials, systems, products and devices, including market assessment and the development of a business plan;
- Assist in bringing together the elements of an entrepreneurial situation, including the identification of sources of venture capital;
- Serve as an agent for linking university research capability with the needs of industry, particularly for small companies with no in-house facility;
- Stimulate the development and offering of educational programs in innovation and entrepreneurialship, improved productivity, and the more effective use of resources.

The Center will seek to serve a broad-based community, aided by an Advisory Board drawn from a representative cross-section of the region's academic, industrial, governmental and other relevant interests. A schematic organizational diagram is appended to this statement.

It is hoped that the Center can be responsive to:

- The individual inventor, innovator or entrepreneur needing assistance in idea assessment, development, testing, and guidance in exploitation;
- The small business needing help to grow and outlets for its capability which might well be matched by the needs of other businesses;
- The large company desiring input on an exploratory idea, device, system, product, or service;
- The venture capital community seeking opportunities

for investment.

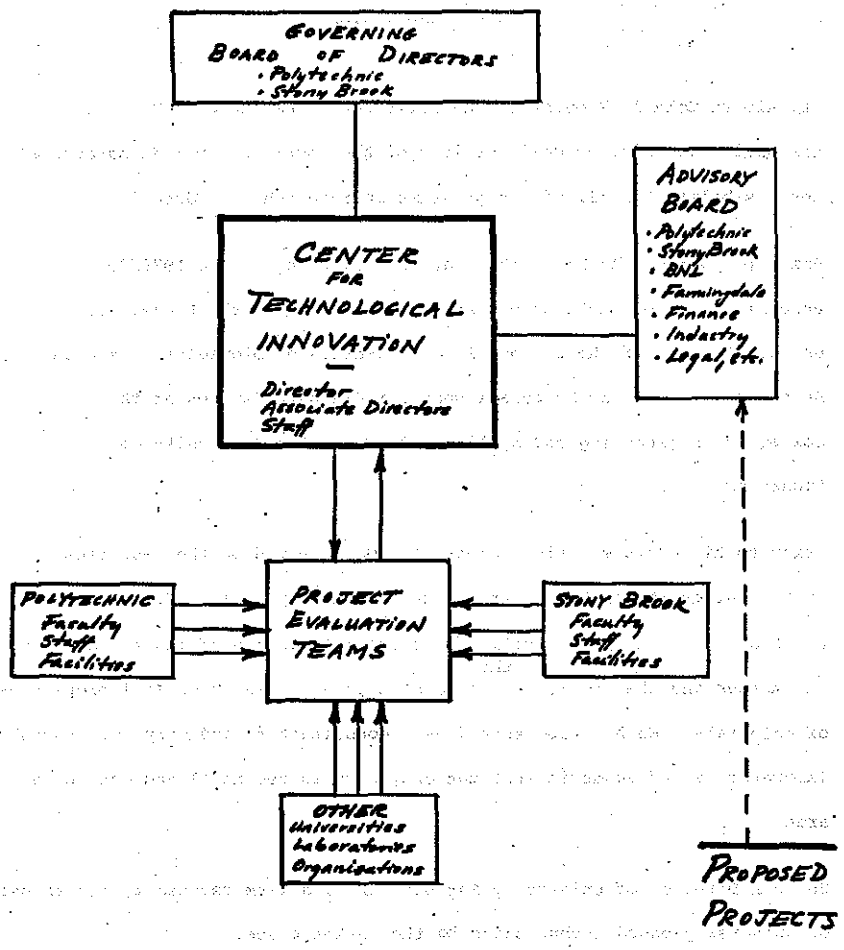
There is an obvious and important small business focus to this activity. The inclusion of larger technological companies, however, is essential not only because of their intrinsic importance to the region but because of the potential value of their interaction with small business in every aspect of the innovation process. Special attention will, of course, be given to the encouragement of academic spinoff ventures involving the development to a first commercializable level of technological ideas generated in the universities.

Initial funding has been requested from the NSF for the detailed planning phase of this program, recognizing that the organizational and financial structure of so delicate an enterprise can be critical in assuring its success. Particular attention will be paid to assuring that small business firms gain access to the vast expertise of the universities and the larger-scale companies as they seek to become more deeply engaged in the innovation process.

While I am certain that there are others more expert with regard to patent matters than I, who have or will appear before the subcommittee today, let me nonetheless presume to address that matter briefly. In almost a decade of personal experience in the area, I have found that one of the formidable obstacles in the path of bringing academically originated ideas through the developmental process and to the market has been the lack of uniform patent policy within the federal establishment. While some agencies, notably DHEW, have developed useful institutional patent agreements, many still cling to the notion that the public interest is best served by the vesting of ownership of all inventions that result from

federally supported research in the government itself. This effectively prevents exclusive licensing arrangements and eliminates most incentives for the necessary investment of capital and skills to turn new ideas into new products. The legislation introduced by Senators Dole and Bayh (S.414)and its House version(H.R. 2414) speaks cogently to this issue by providing for a uniform federal patent policy. It is critical for small business, not only because of the small business provisions of the bill, but also because it makes possible the exclusivity in the license of university owned patents needed to permit a small business licensee to prevail against larger scale competitors. I would earnestly urge your support for this significant legislation in the current session.

Thank you.


GOVERNING
BOARD OF DIRECTORS
· Polytechnic
· Stony Brook
ADVISORY
BOARD
· Polytechnic
· Stony Brook
· BNL
· Farmingdale
· Finance
· Industry
· Legal, etc.
CENTER
FOR
TECHNOLOGICAL
INNOVATION
Director
Associate Directors
Staff
POLYTECHNIC
Faculty
Staff
Facilities
PROJECT
EVALUATION
TEAMS
STONY BROOK
Faculty
Staff
Facilities
OTHER
Universities
Laboratories
Organizations
PROPOSED
PROJECTS

BIOGRAPHICAL SKETCH

Dr. Albert Gold is Provost of the Polytechnic Institute of New York. His duties as chief academic officer of the Institute include managerial responsibility for all of its programs in research and education.

Prior to joining the Polytechnic at the beginning of the 1978/79 academic year, Dr. Gold served as Vice President of the Rockefeller University, one of the nations leading centers of biomedical research. He has also served as Associate Dean for Graduate Studies at the College of Engineering and Applied Science at the University of Rochester.

Prior to his administrative career, Dr. Gold served on the faculties of the University of Rochester and the University of Illinois. His areas of research specialization were the interaction of laser radiation and matter and the physics of solid state, particularly optical properties of materials. He has also served as a consultant to industry, governmental laboratories and academic institutions, both in technical and managerial areas.

He is a Director of University Patents, Inc., a firm devoted to the transfer of university-based technologies to the market place.

He holds the doctorate in Physics from the University of Rochester (1960) and is a graduate of Lehigh University (1956). He was born in Philadelphia on July 2, 1935 and was educated in the public school system in that city.

Mr. LLOYD. Thank you very much, Mr. Gold. Are there any questions? I think we're getting close to the end and we're sorry about rushing out of here.

STATEMENT OF ROBERT SCHIFFER, ACTION COMMITTEE FOR LONG ISLAND

Mr. SCHIFFER. Thank you, Mr. Chairman. I do have a prepared text and I would appreciate if you would accept it.

Mr. LLOYD. Thank you. Without objection, we accept it for the record.

Mr. SCHIFFER. I want to thank the Chairman and the other members of the committee for bringing this hearing to Long Island; I think it's quite an important step in making the Long Island business community, particularly the small business community, very much aware of your interest and hopefully will stimulate a greater participation in their interest in Government contracting.

I am an officer of an organization called the Action Committee for Long Island, a nonprofit organization which has been organized by the leaders in business, education, and labor on Long Island to help stimulate our economy and, in particular, is concentrating on the area of high technology.

Mr. Westermann, who spoke earlier, is a member of our board and I would further add that he has helped immeasurably in these areas.

I am on a 2-year loan from Grumman Corp., to the action committee. Although Grumman is not a small business, they possess a strong feeling for the need of stimulating and assisting the over 700 firms that are involved in high technology on the island. In addition, Long Island is fortunate to have the continued support and cooperation of the Long Island Congressional Caucus in assisting high technology business and establishing the clearinghouse program to increase our R. & D. participation. Because the R. & D. of today is the production of tomorrow and if we don't increase the amount of R. & D. that is currently coming to the Long Island community, we will not only miss current opportunities, but also affect the growth potential of corporations that can, in fact, grow from small business into larger businesses. The small businessman would grow, if stimulated, and could become larger. Small businesses are not necessarily small by choice, but unfortunately by economic design.

The area of patent policy and patent protection has been discussed a number of times and I would like to also emphasize the fact that if I were asked the question, "What would be the three most important things that one could do to assist the small businessmen and their interaction with both public institutions and private institutions, those funded by the Federal Government, those funded by the State government, and those privately funded?" I would say that there has to be: (1) patent protection, (2) patent protection, and (3) patent protection, because if they don't have the ability to have that protection, they cannot enter into a financial relationship that would allow them to expand and, thereby, push the state of the art. In pursuing the advancement of the state of the art, the small business sector possesses clear motivation—reward—and the only asset that they have to establish their business and to raise capital are their patents. This is the basis of selling themselves to the public and to the venture capitalists. Without

patent protection, they cannot function in our economic system and, therefore, the United States will lose one of its most important assets—the ability to commercialize our inventions. The result will be that the equipment available in this country will be ordinary, instead of the best.

The areas that I think are very important and I would suggest where there should be a greater emphasis in funding would be in the NSF area of innovation centers. I think it's a marvelous program. I'm glad that my colleague mentioned it, because it is something that the action committee is quite interested in, because we feel that it will accelerate greatly the growth of ideas in an orderly way and stimulate venture capital and also allow greater visibility of new products and ideas that could be financed by local industry.

A point should also be made about where growth originates from. Approximately 80 to 90 percent of the growth in an area comes from those companies that are indigenous to the area and, therefore, it's quite important that those organizations that are in place be helped and these organizations will, in turn, spinoff other organizations, while some others will be attracted by the economic magnetism of the area. You see, the spirit of growth is contagious. There are centers of excellence in the United States and we are fortunate to be at one this morning and I'm fortunate to have lived on Long Island all of my life and have participated in the process of growth, but it is now in need of stimulation. Specific programs must be established with emphasis on linkage between small business and universities. Existing and new development centers should be regionally located and SBA, NSF, and DOC centers should work as a team.

Furthermore, it's very important that the step of taking the product from inception to commercialization be assisted by small business development centers, whereby small businesses can obtain counsel and assistance during the early months of formation. We must increase the number of successful new businesses started and reduce the failure rate.

The tax policy obviously is a very important area to the new innovative businessman. The ability to write off research and development equipment and buildings in a short timeframe is a very important thing and the ability of capital gains in terms of both the inventor, his officers, and the employees of the organization, is something that is particularly important. It would be economically worthwhile to reduce some of these impediments and stimulate the flow of business expansion, particularly for the small business. The small business sector basically backs up large industry in many ways. For instance, on Long Island, there's a very good relationship that takes place between small, medium, and large businesses. I'm sure it's not unique to the island, but it is one factor that is important to focus on. Many of the larger firms purchase their goods and services from the small firms in the region, so the larger firms are basically supported by having a large marketplace in which they can select technology and products. Mr. Westermann of Hazeltine, indicated that they purchase 50 to 55 percent of their services. That is typical, I think, of many of the medium to large firms and much of that, I'm sure, are procurements that take place within the Long Island community.

[The prepared statement of Mr. Schiffer follows:]

ACTION COMMITTEE FOR LONG ISLAND, INC.

Initiative in the Public Interest
By BUSINESS, EDUCATION and LABOR

TESTIMONY OF ROBERT M. SCHIFFER
VICE PRESIDENT, ACTION COMMITTEE FOR LONG ISLAND
BEFORE
THE HOUSE SCIENCE & TECHNOLOGY SUBCOMMITTEE ON
INVESTIGATIONS AND OVERSIGHT ON JANUARY 28, 1980

TOPIC AREA: SUGGESTIONS FOR INSPIRING THE CLIMATE FOR INNOVATION

THE ORGANIZATION I REPRESENT, THE ACTION COMMITTEE FOR LONG ISLAND, IS A PRIVATELY FINANCED GROUP OF LEADERS IN BUSINESS, EDUCATION, AND LABOR, WHICH HAS UNDERTAKEN A PROGRAM OF ENHANCING ECONOMIC DEVELOPMENT IN THE AREA OF HIGH TECHNOLOGY. IT HAS BEEN DOCUMENTED ON NUMEROUS OCCASIONS THAT THE LARGEST PERCENTAGE OF GROWTH IN A REGION IS FROM WITHIN, AND THAT THE LARGEST PERCENTAGE OF NEW PRODUCTS EMINATES FROM SMALL FIRMS.

THE ECONOMIC IMPACT ON THE LONG ISLAND REGION CAN BE SIGNIFICANTLY STIMULATED BY REMOVING SOME OF THE TRADITIONAL IMPEDIMENTS TO INNOVATIVE GROWTH. IN THIS, A TIME OF INFLATION, THE COUNTRY SHOULD DIRECT ITS DOLLARS TO AREAS WHERE THE MOST ECONOMIC GAIN CAN BE ATTAINED. IT IS IMPORTANT THAT WE NURTURE AND CULTIVATE CENTERS OF EXCELLENCE SO THAT WE CAN INCREASE THE RATE OF INVENTION AND PRODUCTIVITY. LONG ISLAND, WITH OVER 700 ORGANIZATIONS INVOLVED IN ALL TYPES OF HIGH TECHNOLOGY, SHOULD BE SELECTED AS A MODEL TO BE REPLICATED ELSEWHERE IN THE NATION.

P. O. Box 594 • 1111 STEWART AVENUE • BETHPAGE • LONG ISLAND • NEW YORK • 11714 • Telephone: (516) 575-5853

SOME SUGGESTED PROGRAM CHANGES TO INCREASE INNOVATION ARE:

- INCREASE THE NUMBER OF PROGRAMS LIKE THE NATIONAL SCIENCE FOUNDATION'S SMALL BUSINESS GRANT PROGRAM DIRECTED AT APPLIED RESEARCH AND COMMERCIALIZATION

- COMBINE AND ACCELERATE THE NSF INNOVATION CENTER PROGRAM AND JOIN IT WITH THE SMALL BUSINESS DEVELOPMENT CENTER PROGRAMS

- REWARD SELF-HELP AND LOCAL INITIATIVES WITH MATCHING GRANTS

HIGH TECHNOLOGY FIRMS HAVE BEEN CAPITALIZING ON THEIR KNOW-HOW AND, IN REAL TERMS, THE SINGLE LARGEST ASSET IN MANY CASES ARE THEIR PATENTS. THE PRESERVATION OF EXISTING PATENTS AND THE FIRMS' ABILITY TO PUSH THE STATE OF THE ART MUST BE REWARDED. THE RETENTION OF PATENT RIGHTS BY THE FEDERAL GOVERNMENT CREATES A SLOWING OF INNOVATION, AND A STOP GAP TO INCREASED PRODUCTIVITY.

IF COMPANY A CAN, AS A RESULT OF FEDERAL FUNDS, DEVELOP A NEW DEVICE, BUILD A PLANT, HIRE MORE PEOPLE, THEN WHY NOT EXPLOIT THEIR CREATIVE ABILITY AND LET THE ECONOMY FLOW?

THE CAPITAL NECESSARY TO FINANCE FIRMS IS BECOMING DEARER EVERY DAY. TAX POLICY MUST BE BROUGHT IN LINE TO AID INCREASED FUNDING IN R&D. PUBLIC AND PRIVATE INSTITUTIONS SHOULD BE UTILIZED IN A COOPERATIVE WAY, PARTICULARLY WITH SMALL HIGH TECHNOLOGY FIRMS INCAPABLE OF RESEARCH TESTING

AND DEVELOPMENT OF NEW PRODUCTS.

* IN DOD PROCUREMENT, A PERCENTAGE OF SALES IS USED TO DETERMINE THE R&D DOLLARS FUNDED IN COMPUTING OVERHEAD RATES. THIS PERCENTAGE SHOULD BE INCREASED.

* FEDERAL PROCUREMENT SHOULD BE ENCOURAGED TO TAKE UNSOLICITED R&D PROPOSALS AND IDENTIFY AREAS OF FUTURE INTEREST FOR THE NEXT TWENTY YEARS AT FIVE-YEAR INTERVALS.

Mr. LLOYD. I hate to interrupt you, but we're forced at this time to make our dash for the airport, so with your indulgence, I'll have to cut the hearing short at this point. We will be submitting some written questions to you. We do thank you all for being here today. Are there any other questions by any other member of the panel? Mr. Wydler?

Mr. WYDLER. No, Mr. Chairman. I just want to say the three members that are before us gave most impressive statements. I'd just like to say it's been a pleasure working with you, Bob, on the Long Island Action Committee. Mr. Gold, I wish you would let me have some details on 414, was it? I haven't heard of that before. We'll try to see what we can do to help, and Dave, I can tell you the Minish bill is dead, which is good news. I don't know whether the Wydler bill or the other bills, the Carney bill, whatever bills we have in the House can be revived. I'll give you a report on it. Thank you, Mr. Chairman.

Mr. LLOYD. Any other questions, statements? Thank you very much. The Chair will recess.

[Whereupon, at 11:50 a.m., hearing of the subcommittee was closed.]

SMALL, HIGH TECHNOLOGY FIRMS AND INNOVATION

SATURDAY, FEBRUARY 23, 1980

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Cocoa Beach, Fla.

The subcommittee met, pursuant to notice, at 9:40 a.m., in the officer's club at Patrick Air Force Base, Cocoa Beach, Fla., the Honorable Jim Lloyd presiding.

Mr. LLOYD. Good morning.

I am informed that anyone who has not yet signed up for the luncheon should do so now. They brought me down from Washington to bring you that message.

Seriously, I am very pleased to be here to welcome all of you this morning to what I consider a very important involvement and on the subject of small, high technology firms, and innovation. I would particularly like to take this chance to welcome my colleague and fellow Congressman Bill Nelson, who is a very valued member of our subcommittee; and I would also like to say he is a very bright gentleman in Congress and we are very much pleased to have the opportunity to have him on this committee. He has already contributed and I think in years to come he will do an excellent job for the people in this area.

We would like to extend our thanks to our witnesses for their participation in this hearing. As experts in the various high technology fields, you can greatly assist the subcommittee in identifying Government policies that should be changed to encourage innovation.

This hearing is one of a series of field hearings the subcommittee is holding to investigate the issues of small, high technology firms and innovation. Before coming here, we have held hearings in Appleton, Wis., and in Long Island, N.Y. At each hearing we heard from small, select, high technology firms. At Appleton, we heard from representatives of a small business development center connected with the University of Wisconsin. In Long Island, we heard from representatives from Brookhaven National Laboratories who described their efforts to transfer technology to industry for commercialization. In the future, we will be going to Albuquerque, N. Mex., and to Pomona, Calif., to find out how to improve the climate for innovation for small firms in the high technology field.

Our primary purpose for these hearings is to find out how the Government can help the small, high technology firm, and in that way, increase innovation. Between 1953 and 1973, small firms accounted for

one-half of major U.S. innovations. Small firms produce 24 times as many innovations per research and development dollar, yet, they only receive 3½ percent of the Federal research and development dollars. Obviously, the situation could be improved, and we are here to find out how.

My interest in this field is a longstanding and a personal one as I was a small businessman before coming to Congress.

Today we will be hearing from three panels. Our first and second panels will be made up of local representatives from small, high technology firms. We hope to hear how Government policies affect them and their suggestions for improvement.

Our third and last panel will be made up of representatives from NASA and NASA–STAC who will discuss NASA's technology transfer programs for small, high technology firms. The NASA–STAC—State Technology Applications Center—is run in conjunction with the State university system of Florida and it is one of only two such programs in the country.

Mr. Nelson, do you have any opening remarks?

Mr. NELSON. Yes, sir.

Mr. Chairman, I want to say what a pleasure it is for me to serve on your panel.

He is the perfect chairman, not only from being a former small businessman before he came to Congress, but having served for 21 years as a naval aviator with an insight into the technology that we deal with on the Science and Technology Committee; and I am most appreciative and very happy to serve under your leadership, and I thank you for coming to this part of the world.

We are very fortunate in that right here in east central Florida we have one of the high concentrations of small business, high technology, and so I am delighted that you would come here on my behalf, but I am also happy that we have this kind of concentration right here.

Out of the Mercury/Apollo and, now, Space Shuttle programs, this area is quite familiar with advanced technology and is very supportive of high technology; and, as you stated, Mr. Chairman, your concern for the lagging innovation rate, I, too, share that and agree that small, high technology firms can very well be a catalyst for improved rate of innovation.

I want to point out a couple of people. This is sort of like a homecoming here to me. We have three graduates of Melbourne High School that are in this audience. On your own staff is Ray Brill, who is the counsel on our Investigations and Oversight Subcommittee. Ray was in the class of 1961 at Melbourne High School, 1 year behind me; and, also, another one of our classmates, Elna Liley Humphrey, whose husband, George, is here and Elna is back here. Elna is right over there. So it is good to be back, but when I realize that we have been out of high school some, almost 20 years, it begins to make me think we might be grown up.

Mr. Chairman, I am concerned that small firms are not getting the percentage that they should be of the R. & D. dollar, and, yet, that they are producing many more innovations per R. & D. dollar than they are actually getting. I am concerned about the excessive regula-

tions and the paperwork requirements that discourage small, high technology firms from submitting proposals for Government contracts; and, perhaps, another area that is a major inhibitor to innovation is our archaic patent laws. The present setup doesn't encourage commercialization of inventions by industry because their patent rights are not secure.

Also, there is the recurrent problem of obtaining information from the Government. An improved information dissemination system is essential for needed technology transfer.

I am delighted with the panel that we have put together and I want to thank my administrative assistant, Steve Lewis, who operates out of the four Florida offices here, for helping our committee staff put this together. It is particularly a pleasure for me to welcome Lee Scherer, a former director of KSC who is now a small businessman and is going to testify in that capacity today; and I am delighted also that NASA is a witness in our hearing. We have a good relationship with NASA and they work well here with small, high technology firms. They have devised an innovative State Technology Applications Center that works closely with the Florida State University system to try to improve the rapid dissemination of the latest technological information.

Mr. Chairman, again, I am most appreciative that you would call this hearing in east, central Florida.

Mr. LLOYD. Thank you very much and we will begin the hearing.

Our first person to make a presentation today is Mr. Autry, and then there will be Mr. Scherer and Mr. Edwards.

If you wish, you may submit your statement for the record, paraphrase it, change it in any way. Whatever you decide, Mr. Autry.

STATEMENT OF AULTON AUTRY

Mr. AUTRY. Mr. Chairman, Members of Congress, ladies and gentlemen, I am Aulton Autry, president of Solar Energy Components, Inc., of Cocoa.

Our company is engaged in manufacturing, marketing, and installing solar energy equipment. We manufacture flat plate solar collectors and differential controllers. In addition, we fabricate pump assemblies and related components of solar systems.

These products are marketed on a direct basis in Brevard County and through 20 small dealers throughout other portions of Florida. We, also, are providing products to three new dealers outside of Florida.

Currently, we employ nine salaried or hourly employees, have six commissioned part-time sales persons and provide periodic work to a contract installation team.

From 1972 through mid-1974 the company devoted its efforts to research and development of compatible components for solar systems. In 1975 gross sales were $6,900. Since that time our gross sales have been as follows: 1976, $21,000; 1977, $121,000; 1978, $294,000; and 1979, $287,000.

The figures mentioned do not include gross sales of our dealers or the number of persons employed by the dealers.

Financing was critical to our early development. For example, although we were able to design and produce an efficient prototype solar collector, there was no machinery available on the marketplace to produce the components for such a collector. We had to design and produce jigs and machines that were ultimately used on our production line. This was a time-consuming and costly portion of our early development. The meager beginnings of this company were financed for the most part by individual investments of three partners. In 1977 the company attempted to obtain bank financing, however, banks in this area would not loan money to a fledgling solar firm. Loans in 1977 and 1978 were obtained for company expansion on the basis of personal collateral provided by two of the firm's partners. No governmental loans or grants have ever been obtained by this company.

As I previously noted, there has been little improvement in the grass sales during 1979. Inflation has taken its toll. Prices for materials such as copper, resin, metal fasteners, lumber, fiber glass, aluminum, and silicone have risen steadily. Also, overhead expenses, such as, labor, fuel for operating our vehicles, and insurance, have significantly increased. We have tried to hold the line on prices, but that has not been possible. Increased costs have made it almost impossible to accrue funds for capital investment or marketing. Even though we show a profit, we cannot earmark enough money for the necessary research and development or to expand our advertising and marketing program. With interest rates where they are, we simply cannot borrow sufficient capital to invest in these programs.

The inability to expand our marketing programs is possibly the most significant deterrent to increased business. I doubt that solar firms spend sums of money equal to that of power companies or oil companies for advertising. Additionally, there doesn't appear to be a large expenditure of public funds to encourage the use of solar systems. There are several tax incentives to both homeowners and business to encourage the use of hot water systems, however, I don't believe they are widely known or understood.

I feel that some positive measures can be adopted to help overcome some of the problems of the small solar business. First, the Department of Energy should be directed to significantly increase the amount of funds devoted to encourage the use of alternate energy sources, specifically the use of solar equipment. Second, a portion of funds allocated to HUD grants, tax credits, and sophisticated research and development should be used for loans to the small solar business firms. Millions of dollars have been allocated in the past couple of years for these grants and credits. In fact, there was some difficulty involved in expending some of the grant money. If a portion of these funds could be made available to small solar businessmen in the form of an interest-free loan or low-interest loan and give us a few years to repay it, we will, in turn, be able to market more solar equipment—good equipment—based on existing technology and also develop new and improved equipment. For example, we do well in Florida in domestic hot water systems, but we also must address the use of solar equipment for air-conditioning at competitive prices.

In the final analysis, use of tax funds in the areas I have specified to increase productivity and marketing of solar equipment can have a

most favorable impact on the economy of our Nation. Increased use of solar equipment decreases the use of fossil fuels and provides jobs for the unemployed. You, therefore, have small business helping to lower unemployment and not Government sponsored make-work programs.

[The prepared statement of Mr. Autry follows:]

SOLAR ENERGY COMPONENTS, INC.
STATEMENT PRESENTED FOR
CONGRESSIONAL HEARING
FEBRUARY 23, 1980

Mr. Chairman, Members of Congress, Ladies and Gentlemen, I am Aulton Autry, President of Solar Energy Components, Inc. of Cocoa, Florida. Our Company is engaged in manufacturing, marketing and installing Solar Energy equipment. We manufacture flat plate solar collectors and differential controllers. In addition we fabricate pump assemblies and related components of solar systems. These products are marketed on a direct basis in Brevard County and through twenty small dealers throughout other portions of Florida. We also are providing products to three new dealers outside Florida. Currently we employ nine salaried or hourly employees, have six commissioned part time sales persons and provide periodic work to a contract installation team.

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As I previously noted there has been little improvement in gross sales during 1979. Inflation has taken its toll. Prices for materials such as copper, resin, metal fastners, lumber, fiberglass, aluminum and silicone have risen steadily. Also overhead expenses such as labor, fuel for operating our vehicles and insurance have significantly increased. We have tried to hold the line on prices, but that has not been possible. Increased costs have made it almost impossible to accrue funds for capital investment or marketing. Even though we show a profit we cannot earmark enough money for the necessary capital improvements to increase productivity, to continue research and development or to expand our advertising and marketing program. With interest rates where they are we simply cannot borrow sufficient capital to invest in these programs.

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sources specifically the use of solar equipment. Secondly, a portion of funds allocated to HUD grants, tax credits and sophisticated research and development should be used for loans to the small solar business firms. Millions of dollars have been alloted in the past couple of years for these grants and credits. In fact there was some difficulty involved in expending some of the grant money. If a portion of these funds could be made available to the small solar businessman in the form of an interest free loan or low interest loan and give us a few years to repay it, we will in turn be able to market more solar equipment-good equipment based on existing technology and also develop new and improved equipment. For example, we do well in Florida in domestic hot water systems, but we also must address the use of solar equipment for air conditioning at competitive prices.

In the final analysis use of tax funds in the areas I have specified to increase productivity and marketing of solar equipment can have a most favorable impact on the economy of our nation. Increased use of solar equipment decreases the use of fossil fuels and provides jobs for the unemployed. You therefore have small business helping to lower unemployment and not government sponsored make-work programs.

Mr. LLOYD. Thank you.

Mr. Scherer, do you want to bring that mike over? Would you pull it closer to you, if possible, so we have no trouble hearing you.

STATEMENT OF LEE R. SCHERER

Mr. SCHERER. Mr. Chairman and Mr. Nelson, I am very pleased with the opportunity of appearing before this panel this morning to express some observations and opinions on a subject which holds particular interest to me—the problems of a small R. & D. firm in these times and, in particular, in dealing with the Federal Government.

I recently left Government service after 40 years, most of which was spent in R. & D., including 20 years, also, a naval aviator, Mr. Chairman.

For the past month I have been president of ROVAC, a small, high technology firm with bright ideas on a new type of air conditioning that does not require the use of chlorofluorocarbons, which, as you know, represents a major international problem. A great deal of technical innovation was necessary to reach the present state and to advance further is an uphill battle against substantial problems.

You all have heard or will hear of a consistent set of problems; Mr. Nelson has gone through a number of these. High-interest rates makes credit prohibitive for a struggling company. More tax incentives are needed for venture capital. Government regulations' pendulum has swung over very far. The major one is that innovation is stifled because of patent rights policies. These all concern me, but in the interest of brevity, I would like to highlight just a couple of areas that have particularly impressed me in my short tenure of having to worry about a P. & L. statement.

First, ROVAC is publicly owned and I am absolutely amazed at the costs of meeting all the SEC requirements—disclosure documents, legal fees, accountant fees, mailings to stockholders, and so forth. High technology companies, such as ours, don't anticipate making a profit for a substantial period of time. Most of them never make it at all. Sophisticated investors understand this and are willing to gamble because the potential gains are commensurate with the risk. However, the SEC, in its role of protecting the public, looks as hard, and I think harder, at a company such as this than they do at an average public company situation.

It seems to me there might be a special category for high technology companies just getting underway which would simplify the documentation and the scrutiny of the SEC. Such a categorization would serve as a warning to investors that it is a high-risk situation and thus calls for careful investigation. To me this seems analogous to a risk rating on bonds. Such a company as it became more mature would have the incentive to be removed from this special asterisk rating and fall under normal SEC procedures because that would attract a broader spectrum of investors and, thus, higher market price.

Second, a small company, such as ours, has to be concerned about the funds on hand because payrolls have to be met. There needs to be improved recognition of these facts from Government customers who tend to treat all contractors about the same; and I confess that I was

not particularly sensitive to this problem when I was monitoring Government contracts with small businesses.

Let me give you some illustrations of how the normal system hurts a company like ours.

Here is a recent proposal we made to the Department of Defense. With five engineers, we put together this proposal and it cost us over $8,000, which represents a substantial amount of money to a little company like ours. It seems to me there ought to be a way of devising a system that a company could be reimbursed for proposals such as these. One thought was that there could be some prescreening so that if the small firm was found to be technically qualified they might rate being reimbursed for the cost of the proposal. For example, they could be reimbursed up to 1 percent or a little less of the contract value. This idea may be unworkable because of the difficulty of prescreening. As an alternative, why not allow for reimbursement of proposal writing of the companies that end up in the final rating as being best qualified in the competitive range or, at a minimum, the winner ought to get reimbursed for their proposal, so that a small company would feel that at least they have a small chance at being repaid for its effort.

Another point under this same category, once a contract has been won, the company is paid by progress payments which lag as much as 90 days behind completion of the work. This is quite a financial burden. I think where financial circumstances warrant, advanced payments of several months should be permitted to enable companies to remain solvent while the normal bureaucratic lag is occurring. Now, I am told this is possible under the current regulations, but it is almost never used because the paperwork involved is so extensive. I know in NASA it has to be approved by the head of procurement at NASA headquarters before one can have these special kinds of payments. To me, this analogous to prepayment to builders in building a house. He normally doesn't start without some money.

Continuity of work is very important because you can't afford to have skilled people standing by. We had a recent contract with one of the agencies which called for a phase I effort to demonstrate feasibility, with a clear understanding that phase II would follow immediately if phase I was successful. We completed phase I a number of weeks ago, and, as of now, we have no indication as to when, if ever, phase II will start. There can always be circumstances that makes gaps necessary or that change a decision, but too often, I think, it is a lack of sensitivity to the problem by contract administrators and project managers.

These are special considerations that a large or mature company does not need, but small, starting businesses do, and they are particularly important in high-technology work where there is an inherent risk of unplanned costs.

The third point I would like to make is I certainly support strong program management by Government customers, but overzealous management of small contracts become quickly uneconomical for all concerned, and this generally takes the form of excessive reporting.

We have one current contract which runs less than $25,000 per month and we are required to report monthly on how funds are spent in 25 separate categories. So that is an average of little less than $1,000

in each of these categories. The contract requires in the 26 months that it runs, that we make 106 separate reports, which is an average of 1 a week. Now, would you care to estimate the time spent in doing the work as compared to the time spent in telling about it? This kind of problem is not amenable to legislative solution, but can only be solved by enlightened managers. But it shows the type of problem that affects small companies greatly since they don't have the resources to respond to customer demands as larger companies do.

My final point here is that large organizations have a Washington office or representatives in the company who tell them where to take unsolicited proposals. A small company can't afford this luxury or travel to Washington as an alternative. Personally, I am appalled at the difficulty of trying to do this by telephone. A large number of people in the Federal Government simply do not return calls from firms or people with whom they are not familiar. The last thing I want to propose is more bureaucracy, but I wonder if it would make sense to have a small information office where small companies could go to gain information or assistance on the proper agencies and departments within them for a given unsolicited technical proposal. Perhaps, this could be located in the National Science Foundation. We have had particular difficulty in dealing with the Department of Energy. A proposal for a more efficient heat pump that could also do residential cooling, perhaps, by solar energy, cuts across a number of jurisdictional lines. We are working on the problem from as many directions as we can find. My perception is the DOE has extensive problems these days. There seem to be continual reorganizations going on, high personnel turnover, and pressures from every special interest group. They are probably inundated by proposals from brilliant innovators and crazy inventors alike, and it's not always easy to tell the difference. It seems ironic that the biggest superproblem that our country has is one in which we are having the most difficulty in getting our act together, not only within the administration, but in Congress as well.

Finally, it is interesting to me to view the question of technology transfer from the other side of the fence. I am very proud of the programs that NASA has and the manner in which we implemented them at the Kennedy Space Center. We worked hard at trying to assist outside people who came to us with particular technical problems. Here, in the State of Florida, the program should be even stronger because of the State technology application center. Yet, when I joined a small technology company, I found there was very little knowledge of such programs, even though we are 15 miles from Kennedy Space Center. There was a lack of familiarity of technical briefs, or space spinoffs, or even that NASA had people available to help. Something more is needed to improve publicity about such programs over what we currently have. I think an agency such as NASA should put notices in selected trade journals or brief spots on television. This would require a lenient eye from Congress so as not to be judged as using appropriated funds for lobbying rather than the public service that it would be.

I strongly applaud the attention that has been given to the problems of small business in recent months by the administration and by

Congress. I think this is a further recognition that certain groups require special considerations, just as has been done over the past decade with various minority programs. I was responsible for the scientists who placed experiments on the Moon in the Apollo program and, later, responsible for construction of shuttle facilities at the Kennedy Space Center. If we had treated these two classes of people alike, we would still have gotten to the Moon, but the science probably wouldn't have been as good. As was said earlier, OMB has stated that businesses employing fewer than 1,000 people accounted for half of the Nation's innovations over a 20-year period. I am not suggesting that small, high technology companies be treated as prima donnas, but their special problems require special consideration, because they are worth it.

Thank you very much.

[The prepared statement of Mr. Scherer follows:]

STATEMENT OF LEE R. SCHERER, PRESIDENT, THE ROVAC CORP.

I am pleased with the opportunity of appearing before this subcommittee to express some observations and opinions on a subject which holds particular interest to me -- the problems of small research and development firms in these times, and in particular in dealing with the federal government.

I recently left government service after 40 years -- most of which were spent in research and development areas. For the past month, I have been President of The ROVAC Corporation -- a small high-technology firm with bright ideas on a new type of air conditioning that does not require the use of chlorofluorocarbons. Technical innovation was necessary to reach the present state. To advance further is an uphill battle against substantial problems.

I am sure you have or will hear of a consistent set of problems from most witnesses. High interest rates makes credit prohibitive for a struggling company. More tax incentives are needed for venture capital. The pendulum on government regulations has swung much too far. Innovation is stifled because patent rights are lost under government contracts. These all concern me also but in the interest of brevity, I would like to highlight just a couple of areas that have particularly impressed me in my short tenure of having to worry about a P&L Statement.

First, ROVAC is a publicly-owned company and I am amazed at the costs of meeting all of the SEC requirements -- disclosure documents, legal fees, accountant fees, mailings to stockholders, etc. High-technology companies starting up do not anticipate making a profit for a substantial period of time. Many of them never make it at all. Sophisticated investors understand this and are willing to gamble because potential gains are commensurate with the risk. However,

the SEC in its role of protecting the public looks as hard, if not harder, at such a company as they do at average public company situations. Why not have a special category for high-technology companies just getting underway which would permit simplified documentation and SEC scrutiny. In turn, this categorization would serve as a warning to investors that it is a high-risk situation that calls for careful investigation. It seems to me analogous to a risk rating on bonds. As a company becomes more mature it would have an incentive to be removed from the high-risk category and fall under normal SEC procedures in order to attract a broader spectrum of investors and thus higher market price.

Second, a small company such as ours must be continually concerned about funds on hand. Payrolls have to be met. There needs to be improved recognition of this fact from government customers who tend to treat all contractors about the same. And I confess that I probably was not particularly sensitive to this problem while monitoring government contracts with small businesses.

Let me give some illustrations of how the normal system hurts a struggling company.

a) Here is a recent proposal we made to the Department of Defense that cost us $8115 to produce. That represents a substantial sum to us and these costs are not reimbursable. I think a system could be devised by which a small firm could undergo a prescreening to determine that it was technically qualified. If so found, it would be reimbursed for proposal writing up to some preselected amount such as 1% or less of the contract. If this idea is unworkable because of difficulty of such a prescreening than an alternative could be to allow reimbursement for the proposal writing for those in the final

competitive range, or at least to the winner of the contract. Thus a company would feel that it has some chance at being repaid for its effort.

b) Once a contract has been won, a company is paid normally by progress payments that lag as much as 90 days behind completion of the work. This is quite a financial burden for a small company. I think when the financial circumstances warrant, advanced progress payments of several months should be permitted to enable companies to remain solvent while the normal bureaucratic lag is occurring. I understand this may be possible now but is very seldom used. To me, this is analogous to pre-construction payments to a builder of a residence.

c) Continuity of work is very important to a small company which cannot afford to have skilled people standing by. A recent contract with an agency called for a Phase I effort to demonstrate feasibility of a concept. The understanding was that, if Phase I was successful, Phase II to develop a prototype would follow immediately. Phase I was successfully completed a number of weeks ago. We have no indication as to when, if ever, Phase II will start. There can always be circumstances that make gaps necessary but too often it is simply a lack of sensitivity to the problem by contract administrators.

These are special considerations that a large or mature company does not need, but small starting businesses do, and they are particularly important in high-technology work where there is an inherent risk of unplanned costs.

Third, I certainly support strong program management by government customers but over-zealous management of small contracts quickly becomes uneconomical. This generally takes the form of excessive reporting. We have a current government contract which runs less than $25,000 per month. We are required to report monthly on how funds were spent in 25 separate categories! In the 26 months that the contract will run, we are required to make 106 separate reports! Would you care to estimate the time spent in doing the work as compared with the time spent in telling about it? This kind of problem is not amenable to legislative solution of course, but can only be solved by enlightened managers. It does show a type of problem that affects small companies greatly since they don't have the resources to respond to customer demands as larger companies do.

Fourth, large organizations have a Washington Office or representatives who can help investigate the proper office(s) to take an unsolicited proposal. A small company cannot afford this luxury or travel to Washington as an alternative. I am appalled at the difficulty of trying to do this by telephone. A large percentage of people simply do not return calls from firms or people with whom they are not familiar. I hesitate to propose still more bureaucracy, but wonder if it would make sense to have a small information office where small companies could go to gain information on the proper government agency(ies) and department(s) within them for a given unsolicited proposal.

It is interesting to me to view the question ot technology transfer from the other side of the fence. I was very proud of the programs that NASA has and the manner in which we implemented them at the Kennedy Space Center. We worked hard at trying to

assist outside people who come to us with particular technical problems. In the State of Florida, the program should be even stronger because of the State Technology Application Center. Yet when I joined a typical small technology company, I found there was very little knowledge of such programs. No one was familiar with Tech Briefs or Space Spinoffs or that NASA had people available to help. Something additional is needed to improve publicity about such programs over what we currently have. I think an agency such as NASA, could put notices in selected trade journals or brief spots on television. This would require a lenient eye from Congress so as not to be judged as using appropriated funds for lobbying rather than the public service that it would be.

I strongly applaud the attention that has been given to the problems of small business in recent months by the administration and by Congress. I think this is a further recognition that certain groups require special considerations as has been done with minority groups in the past decade. In NASA, if I had treated scientists in the same manner that I treated construction contractors, we could have still gotten to the moon but the science wouldn't have been nearly as good. OMB has stated that business employing fewer than 1000 people accounted for half of the nation's innovations over a recent 20 year period. I am not suggesting that small high-technology companies be treated as prima donnas but their special problems warrant special consideration -- because they're worth it.

Mr. LLOYD. Thank you very much, Mr. Scherer.

Rather than ask questions right now, Mr. Nelson and I have agreed that we will go ahead and listen to the next testimony, then we will ask questions. I will further deviate from our normal procedures in Washington, where we ask all the questions, and because the reason for that is we are usually so short of time. I think I would like to hear some questions from the audience or if the audience wishes to comment pro or con, with regards to any of the subjects here. You may, do so, as long as you don't attack any of the witnesses and, particularly, the chairman.

Mr. Edwards?

STATEMENT OF DR. THOMAS C. EDWARDS

Mr. EDWARDS. Thank you, Congressman.

I certainly am honored as well to be before this congressional subcommittee today testifying as a member of an evolving, high technology, energy-related company. I am especially pleased and impressed that members of the Committee on Science and Technology have taken this hearing action, and others, and have demonstrated the recognition of the disproportionately positive contribution to innovation of high technology in the United States by small companies; and so, within this context and within the context of the comments already made, I will offer the following.

Specifically, I will tell you a little about what ROVAC is, and echo, in some ways, that I would like to share.

ROVAC Corp. has been developing an energy-efficient nonpolluting air conditioning and heat pump technology. The corporation began its activities in 1974 when it became a publicly-held corporation. The importance of ROVAC resides in the fact that it has developed an air conditioning technology that is roughly twice as efficient as conventional automotive fluorocarbon air conditioning systems and, further, the ROVAC system does not require the use of fluorocarbons to produce effective cooling at high energy efficiency levels; and this is a brief aside, fluorocarbons that are used commonly in air conditioning are known to destroy the Earth's protective ozone layer and this ozone layer is responsible for filtering out ultra-violet radiation, which, if permitted to reach the Earth's surface, causes skin cancer, produces deleterious effects upon plant life and can cause climatic perturbations.

So, in short, ROVAC has created an important new technology and its present challenge is to survive and fully mature and commercialize that technology for extensive use in order to conserve energy on a wide scale and participate in the preservation of the Earth's ozone layer.

Now I would like to highlight just some of the interesting problems of getting ROVAC started. ROVAC Corp. became public through a small public securities offering yielding, $880,000. This was in 1974, as I indicated earlier. This small, but very important, sum seeded the modest development of this technology. However, some months after the completion of this public issue, the Enforcement Division of the Securities and Exchange Commission became suspicious that the ROVAC Corp. and its underwriter had violated certain of the com-

plex rules and regulations related to the Securities and Exchange Act of 1933. Now, this matter became extremely burdensome from both a financial and, as you might imagine, emotional standpoint. This difficulty with the Securities and Exchange Commission continued for many years, and it was manifested in long and expensive delays in the ability of the company to raise much needed developmental capital. It certainly stunted the growth of the company. Only very recently have we been able to establish what I would term "normalized" turn-around time with the Commission.

Now, on the other side of the coin, it is very clear that it is of supreme importance that the investment community be protected, at large, from fraud and similar malevolent activities by issuers of capital stock. It would seem reasonable, however, that high technology companies, which are clearly at the outset and highly disclosed as such very high risk situations, that the SEC be fully cognizant of the total ramifications of their actions. I think they just don't understand. I think if they knew more about it, they wouldn't behave in the fashion that they do. Therefore, on a constructive note, I believe that the Securities and Exchange Commission, and this is both at the Federal and State levels, should have at least some special section or a policy that will provide a normalized, if not a preferential treatment, for small, high technology, startup companies.

It is important to keep in mind that the major corporations of today in the United States were created and grew to stability without the strong and multitudinous regulations in existence today. We are feeling some now, however. I can certainly agree.

Now, our present situation. The ROVAC Corp. has, so far, survived the strong anti-ROVAC pressures applied by the established fluorocarbon industry, as well as the myriad of Government, SEC, and shareholder reporting requirements and so forth. It is important to note, however, on a very positive note, that projects and programs that have been funded by the Department of Defense for ROVAC technology development through the U.S. Air Force Systems Command for this technology, and we have also had support from the U.S. Navy in this connection, has been a very key factor in maintaining the existence and viability of ROVAC.

Therefore, it is certainly incumbent upon us to laud the efforts of the Department of Defense in its sponsorship of this technology as applied to military usage. So, in spite of the burdensome reporting requirements, the benefits accruing from the various DOD programs have outweighed the deleterious burdens of detailed reporting.

So, in this connection, I would recommend to this subcommittee the following thoughts:

(*a*) Minimize progress report writing requirements by the contracting officer. However, the technical contracting Government officer in charge of the particular program involved should make an adequate number of onsite visits to insure that the program for which he has personal responsibility is proceeding as scheduled.

Further, brief periodic cost reports and brief technical progress reports should be supplied by the contractor and, perhaps, at the time of such visits or at prearranged scheduled time, with the accent on the minimizing of time periods required for producing documentation.

In this connection, it is important to note that documentation time represents roughly 30 percent, a third, of the total effort required in technological development programs in which the ROVAC Corporation has been involved.

(*b*) Because small companies are almost always faced with cash flow difficulties, and some large ones as well, small companies should be paid, at the time of contract initiation, approximately 60 days worth of program funds. This would allow the Government time to process the billings that would follow therefrom and would not place undue cash flow burden on the small contracting company.

(*c*) Proposal preparation costs, as has been indicated already, are relatively large. Small qualified bidders, who are, incidentally, rather well screened, even before receiving a Request for Proposal package from the contracting agency, should be paid on a no-profit basis for its proposal writing activity.

(*d*) Patent rights. Patent rights arising from development programs supported by the Government should reside primarily with the contractor. The reason for this is that the entrepreneurial drive to bring to commercial fruition a highly technical product resides almost solely with the small company who generated that idea or group of ideas or inventions. While it may seem at the outset that because such innovations are paid for by the U.S. Government, that these innovations should be the property of the U.S. Government. The fact is, however, that in order for the Government; that is, the people at large, to benefit from innovation and technology, it has to be commercialized. The entrepreneurial power, devotion and dedication to causing this to occur resides almost completely within the company who provided the basic invention.

Now, for very general discussion and closure. It might be interesting to note that the ROVAC Corp. has spent a total of $2,600,000 directly on research efforts while, during the same time period, it has devoted $2,400,000 for nontechnology development efforts such as reporting, lawyers, accountants and other activities required for reporting purposes in all these areas. This inefficiency is appalling and I am certain not restricted solely to the ROVAC Corp. as a small, public, high technology entity. The Government, therefore, should do all within its power to emphasize not accounting or reporting, but, instead, to emphasize, as you indicate, innovation, research development and commercialization.

Now, on a closing note, because small, high technology, startup companies are, almost by definition, capital loss situations during their formative years, gaining capital for such enterprises is very difficult. This could be changed by the following:

(*a*) It should be recognized that large established U.S. corporations inhibit, in a number of ways, the growth of small, high technology enterprises whose technology may, in the future, compete with their present established product lines. This sort of activity has been especially prevalent in the case of our company where ROVAC is competing with a highly established industry—the fluorocarbon-based air-conditioning and heat pump industry—that wants to continue to use fluorocarbons and comparatively inefficient systems. While such nonprogressive behavior may seem perfectly natural, I submit that it is

not only against the national interest, but, in the long run, it is really against the interest of the large corporations themselves. This is because high technology enterprises are fountainheads, as you know, of new divisional operations, new licensed technology, new experienced personnel and so forth.

However, because few corporations have a general policy of encouraging new, highly innovative enterprises, the Government could do a great deal that would encourage such sponsorship by large corporations. For example, any capital invested in companies could be offset by a direct tax credit for the investing company even though capital stock would be provided from the small business to the large investing company. Such a policy would almost certainly increase the number of dollars spent in outside innovation activity and provide for the building of a bond between small and large companies.

Now, I think this is an extremely important point to make because it is the large companies in the United States that produce the products and it seems to be the small companies that seem to have the ideas, and there should be a union rather than an adversary relationship between the two.

(*b*) Venture capital, through the normal capital markets, would be much more easily available if the capital gains tax on investments in high technology-based enterprises would be, say, cut in half. Recall that the creation of new and profitable businesses creates a wider tax base. This would, of course, stem from increased productivity, and that is the whole reason we are here, brought about by new and advanced technology.

(*c*) Stock option plans should be issuable to key members of high technology enterprise with capital gains tax being payable only until such time as the stock is sold seems reasonable enough. The Tax Reform Act of 1976, however, destroyed the capability of startup companies to attract top talent by eliminating tax advantages of stock options.

So, in closing, the Government should do all that it can to encourage innovation, inventiveness, high technology development and product commercialization. This support should be very wide in spirit, in sense and in time.

Thank you very much.

[The prepared statement of Dr. Edwards follows:]

STATEMENT OF DR. THOMAS C. EDWARDS, CHAIRMAN OF THE BOARD, THE ROVAC CORP.

INTRODUCTION

I am honored to be before this Congressional Committee today testifying as a member of an evolving high-technology energy-related company. I am especially pleased and impressed that members of the Committee on Science and Technology have taken this hearing action and have demonstrated recognition of the disproportionately positive contribution to innovation and the production of high-technology in the United States by small companies. Within this context, the following comments are offered.

THE ROVAC CORPORATION - WHAT IT IS

The ROVAC Corporation has been developing an energy-efficient non-polluting air conditioning technology. The Corporation began its activities in 1974 when it became a small publicly-held corporation. The importance of ROVAC resides in the fact that it has developed an air conditioning technology that is roughly twice as efficient as conventional automotive fluorocarbon air conditioning systems and, further, the ROVAC system does not require the use of fluorocarbons to produce effective cooling at high energy efficiency levels. Fluorocarbons, used commonly in air conditioning systems, are known to destroy the Earth's protective ozone layer. This ozone layer is responsible for filtering out hard ultra-violet radiation which, if permitted to reach the Earth's surface, causes skin cancer, produces deliterious effects upon plant life, and can cause world climatic perturbations.*

*Report on the Progress of Regulations to Protect Stratospheric Ozone, EPA Report to Congress, August 1979.
Economic Implications of Regulating Chlorofluorocarbon Emissions from Non-propellant Applications, Rand, September 1979.
Protection Against Depletion of Stratospheric Ozone by Chlorofluorocarbons, National Academy of Sciences, 1979.
Stratospheric Ozone Depletion by Halocarbons: Chemistry and Transport, National Research Council, 1979.

ROVAC has thus created an important new technology and its present challenge is to survive and fully mature and commercialize that technology for extensive use in order to conserve energy on a wide scale and participate in the preservation of the Earth's ozone layer.

THE ROVAC CORPORATION - GETTING IT STARTED

The ROVAC Corporation became public through a small public securities offering yielding $880,000 to the Company in 1974. This small but important sum provided the initial seed capital to begin a modest level of development of this technology. Some months after the completion of this public issue, the Enforcement Division of the Securities and Exchange Commission became suspicious that The ROVAC Corporation and its Underwriter had violated certain of the complex rules and regulations related to the Securities and Exchange Act of 1933. This matter became extremely burdensome from both a financial and emotional standpoint. The staff of the Enforcement Division extracted a "Consent Agreement" from The ROVAC Corporation. While the Company is quite certain that no violations occurred, it was expedient for The ROVAC Corporation to sign such a consent agreement in order to prevent further capital drain in areas such as attorney's fees, trips, lost time, etc. This difficulty with the Securities and Exchange Commission continued for many years and was manifested in long and expensive delays in raising required developmental capital. Only recently has The ROVAC Corporation finally been able to establish a "normalized" relationship with the Commission where documentation "turn-around" time is reasonable.

While it is clearly of supreme importance that the investment community at large be protected from fraud and similar malevolent

activities by issuers of capital stock, it would seem reasonable that high-technology companies, which are admittedly at the outset (and so disclosed) very high-risk situations that the SEC be fully cognizant of the total ramifications of their actions. Individuals invest in high technology stocks, because, often, the high risk is commensurate with very high capital gains potential. Therefore, on a constructive note, I believe that the Securities and Exchange Commissions (both at the Federal and State levels) should have a special Section or at least a Policy that will provide normalized, if not, preferential treatment for small high-technology start-up companies.

It is important to keep in mind that the major corporations of today in the United States were created and grew to stability without the strong and multitudinous regulations in existence today.

THE ROVAC CORPORATION - PRESENT SITUATION

The ROVAC Corporation has, so far, survived the strong anti-ROVAC pressures applied by the established fluorocarbon industry, as well as the myriad of government, SEC, and shareholder reporting requirements. It is important to note, however, that projects and programs that have been funded by the Department of Defense for ROVAC technology development through the U.S. Air Force Systems Command (with support from the U.S. Navy) has been a key factor in maintaining the viability of The ROVAC Corporation. Therefore, it is clearly incumbent upon ROVAC to laud the efforts of the Department of Defense in its sponsorship of this technology as applied to military usage. So, in spite of the burdensome reporting requirements, the benefits accruing from the vaious DOD programs have outweighed the deleterious burden

of detailed reporting. In this connection, however, I would recommend that this Congressional Committee entertain the following suggestions:

a) Minimize progress report writing requirements by the contracting company. However, the technical contracting government officer in charge of the particular program involved should make an adequate number of on-site visits to insure that the program for which he has personal responsibility is proceeding as scheduled. Further, brief periodic cost reports and brief technical progress reports should be supplied by the contractor at the time of such visits or at a prearranged scheduled time -- with the accent on minimization of time periods required for producing documentation. In this connection, it is important to note that documentation time represents roughly 30% of the total effort required in technological development programs in which The ROVAC Corporation has been involved.

b) Because small companies are almost always faced with cash flow difficulties, small companies should be paid, at the time of contract initiation, approximately 60 days worth of program funds. This would allow the Government time to process the billings that would follow therefrom and would not place undue cash flow burden on the small contracting company.

c) Proposal preparation costs for a small company are, relatively speaking, very large. Small qualified bidders, who are well screened before even receiving a Request for Proposal package from the contracting agency, should be paid, on a no-profit basis for its proposal writing effort. Perhaps a maximum dollar allowance could be provided.

d) Patent rights arising from development programs supported by the Government should reside primarily with the contractor. The reason for this is that the entrepeneurial drive to bring to commercial fruition a highly technical product resides almost solely with the small company who generated that idea or group of ideas or inventions. While it may seem at the outset that because such innovations are paid for by the U.S. Government, these innovations should be the property of the U.S. Government. The fact is, however, that in order for the Government, i.e. the people at large, to benefit from innovation and technology, it must be commercialized. The entrepeneurial power, devotion and dedication to causing this to occur resides almost completely within the company who provided the basic invention.

e) It occurred with regularity that Statements of Work appearing in Requests for Proposals are not specific enough to provide for accurate bidding. Not only does this make the bidding process difficult (and often the results are lacking in fairness but, in the event that a bidder is successful in obtaining a contract with a non-specific statement of work, difficulties can arise between the technical and contracting officers and the contractor. This can and does lead to difficulties regarding the possibilities of program continuance and any new program that may emerge as a result of those in process. Thus, more specific work statements should be provided by contracting agencies.

GENERAL DISCUSSION - CLOSURE

It might be interesting to this Congressional Committee that The ROVAC Corporation has spent a total of $2,619,000 directly on research efforts while, during the same time period, it has devoted $2,429,000 for non-technology development efforts such as reporting, lawyers, accountants, and other activities required for reporting purposes in all areas. This inefficiency is incredible and I am certain, not restricted solely to The ROVAC Corporation as a small public high-technology entity. The Government therefore should do all within its power to emphasize not accounting or reporting but, instead to emphasize innovation, research development and commercialization.

Because small high technology start-up companies are, almost by definition, capital loss situations during their formative years, gaining capital for such enterprises is very difficult. This could be changed by the following actions:

a) It should be recognized that large established U.S. Corporations inhibit, in a number of ways, the growth of small high-technology enterprises whose technology may, in the future, compete with their present established product lines. This sort of activity has been especially prevalent in the case of The ROVAC Corporation where ROVAC is competing with a highly established industry - the fluorocarbon-based air conditioning and heat pump industry - that wants to continue to use fluorocarbons and comparatively inefficient systems. While such non-progressive behavior may seem perfectly natural, I submit that it is not only against national or international

interest, it is, in the long run, also against the interest of the large Corporations themselves. This is because high-technology enterprises are fountainheads of new divisional operations, new licensed technology, experienced personnel, etc.

However, because few major corporations have a general policy of encouraging new highly innovative enterprises, the Government can do a great deal that would encourage such sponsorship by large companies. For example, any capital invested in small companies could be off-set by a direct tax credit for the investing company even though capital stock would be provided to the investing company. Such a policy would certainly increase the number of dollars spent in "outside" innovation activity and also provide for the building of a bond between small and large companies.

b) Venture capital, through the normal capital markets, would be much more easily available if the Capital Gains tax on investments in high technology-based enterprises would be, say, cut in half. Recall that the creation of new and profitable businesses creates a wider tax base. This, would of course, stem from increased productivity brought about by new and advanced technology.

c) Stock option plans should be issuable to key members of a high-technology enterprise with capital gains tax being payable only until such time as the stock is sold. The Tax Reform Act of 1976 (TRA-76) destroyed the capability of start-up companies to attract top talent by eliminating tax advantages of stock options.

In brief, the Government should do all that is within its power to encourage innovation, inventiveness, high technology development, and product commercialization. This support should be very wide in spirit, in sense, and in time.

Mr. LLOYD. Thank you very much.

Mr. Autry, I did not fully understand what the size of your company was.

Would you define its size and scope, both financially, personnelwise, et cetera?

Mr. AUTRY. We have nine employees on an hourly basis and six commissioned sales people and we also support a contract installation team. In addition, we are building equipment for 20 small dealers in the State of Florida. We don't know really how many employees they have or what their gross sales are, but we provide the equipment. Plus three beginning dealers outside the State.

Mr. LLOYD. Your salesmen then really are selling your equipment to these builders and they, in turn, use the equipment themselves. They make installation of the solar panels wherever they need them.

Mr. AUTRY. On our direct marketing program we call it. It is where our commissioned sales people work. They contact builders, homeowners and so forth, and this is where—that sale goes on at the retail level, just as though we were the dealer ourselves.

Mr. LLOYD. OK.

Where do you get the solar cells which transfer sun energy into, I presume, heat energy in this case?

Is that correct?

Mr. AUTRY. We manufacture them.

Mr. LLOYD. You manufacture the——

Mr. AUTRY [interposing]. Yes.

Mr. LLOYD. What are they, selenium rectifiers?

Mr. AUTRY. No. They are flat plate collectors. In solar energy they are known as flat plate collectors. We use a selective coating and they are fluid collectors. In heat energy and fluid are—in most cases, in our case, water. We heat the water direct for home.

Mr. LLOYD. Oh, you heat the water directly. In other words, you don't change it into any other form of energy. It comes in, and the water is the transmission agent for the energy.

Is that correct?

Mr. AUTRY. That is right. This can be used for heating home water or heating the home or we designed the collector in the beginning for high heat. It is a higher heat collector or preheating for air-conditioning.

Mr. LLOYD. I am just trying to understand how it works is all. I am interested in that.

In other words, if I—I come to you and I say: Mr. Autry, I would like to change the standard method of handling my home. I want to have air conditioning on that. I want heat. I want to have total space requirement.

Would you address yourself to all of that?

Mr. AUTRY. No, sir. Not at this time. We can do the first two, but not the air conditioning. Air conditioning can be done, of course, but we don't feel it is quite cost effective to customers at this time.

Mr. LLOYD. I see. In other words, what I would get from you is I would get my hot water, I would get space heating, and if I had a swimming pool, I can heat the swimming pool.

Mr. AUTRY. That is right. Swimming pools.

Mr. LLOYD. What is the cost of installation, say, for a 2,000 square foot house? I am just throwing that out there. I don't even know if that is—I would have to think that would be somewhat applicable to the question. What is the cost of installation and then what is the cost of operation? Am I better off than going with the local electrical supply?

Mr. AUTRY. We don't think so. At the cost of water heating, we feel that this is cost effective because we can do this for a profit of $2,000. We do so on a lower cost because we are doing it for less people.

It is one of our hobbies.

Home heating in Florida, since the time needed for heating is so short as compared to the rest of the year, we don't feel that that is cost effective.

Mr. LLOYD. OK.

Do you use a type of forced air situation or does the water, hot water, flow underneath the floor? I don't——

Mr. AUTRY [interposing]. The way we have done it so far is we have a holding tank—we have a holding tank from which we circulate hot water underneath the floor of the house, just like the old water heating system.

Mr. LLOYD. I see. Thank you.

Mr. Scherer, you were—and, obviously, you are very important to us because you kind of stood on both sides of the fence and, as a result, I would have to say that it is very interesting to hear your experiences, even though very short, in the private sector on the ills of doing business with the Government. Certainly you have some recommendations.

How would we make the standard, average issue bureaucrat in Washington more sensitive to the things that you are now talking about? Since you have known both sides of the fence, how do we do it?

You do know, if I may, say so, that you and I both dealt in the area of weapons systems. We dealt in the areas of technology. Here we are in 1980 and, of course, we really do not have to address ourselves anymore, for instance, to space involvement because we have done it all. We have been to the moon. You do know what I am saying; and as a result, how do I get their attention? I am willing to listen.

Mr. SCHERER. Mr. Chairman, I don't know that I have any real bright ideas. An awful lot of the bureaucrats don't deal with small business directly. They are dealing with the major contractors, who are, in turn, dealing with small businesses through subcontractors, and there are going to be more of that in the future than in the past.

But there are certain areas, certain numbers of administrators, contract administrators and program managers, who have a number of small businesses that they are dealing directly with. The problem is to educate these people and to make the bureaucratic policy that exists more amenable to special considerations, such as the one under advanced payments. I don't think it is unreasonable at all for a very small company with financial problems to be given advanced payments to do a Government contract.

Mr. LLOYD. Neither do I.

How are we going to get OMB to say: That is the way we want to do it for a small businessman. Yet, you and I both know we have got to

go through OMB. Somewhere up there, in their infinite wisdom, they have to say: Yeah; that is the benefit of the Government.

Mr. SCHERER. My understanding is the policy now permits this; the problem is just in implementing that policy in the various agencies. They say this is the Government/taxpayers' money we are protecting and we want to see the work that you produce before we decide whether to pay you or not.

Mr. LLOYD. Well, let me point out to you, Mr. Scherer, that even in this endeavor here, it is almost unheard of, on the legislative side, for Congressmen to run out—go to the smaller communities to hold hearings. Normally, we hold hearings, as I did last week in Los Angeles and Las Vegas on weapons systems and I dealt with little companies, such as, Northup, General Dynamics, Ford Industries, et cetera. As you can see, and I make no bones about it, the traveling and—the roads are a little easier there. They are far wider, much more gloriously paved and the vehicles give a softer ride, and it is just easier to get things done than it is for the little committee to come to, "the inner lands" and to talk to people, whether it be here or out in New Mexico, or wherever it may be that we are trying to communicate.

How, then, do we even cover the credibility gap, where we get your people who deal with Government to look at me and say: Gee, I really believe he can do something. I mean, as you sit there, do you really believe that I am going to be able to do anything about your problem? Are you convinced this is really of any great value or are we just sitting here going through an exercise this morning?

Mr. SCHERER. Well, I am not sure I am in the majority of opinion on this, but I believe that congressional recommendations on changes are extremely effective with the Government agency which I worked with: NASA. NASA's response to Congressmen I think is very, very good. I know we have requirements that some answers go out within 24 hours and this sort of thing.

My experience with other agencies would indicate that that is not true across-the-board, but I think a recommendation from a committee such as yours can be very effective. It can be used by the Small Business Administration. It can be used by those advocates of small business in OMB and in the various agencies.

NASA has a rather extensive small business group and I think if they can point to specific recommendations from you, from this hearing, it can be very effective.

As I told you, it is a tough bureaucratic hurdle to get over for these advanced payments. Within NASA now, they could be more lenient with that and the approval, instead of going to the top procurement in NASA headquarters, could be done by the top procurement man right here at K.S.C., who happens to be in the back and I hope he is listening.

Mr. LLOYD. Mr. Autry, how would you respond to that?

I don't know what your experience has been in the past, but I would contrast it probably with Mr. Scherer in the fact that you probably have not dealt with congressional committees such as this one, nor have you dealt extensively in Washington, D.C. I believe that your orientation is right here and that your assumption is that I have got to make it or break it right where I am sitting, and, as a result, what do you expect us to do? How do you feel?

I mean, you have come here. You are giving your time, which is valuable. You are going to be working late tonight or tomorrow or whatever it may be to make up for what you did not do today. I already know that; and the reason I know that is because I was a small businessman myself and everytime I did some public service I would pay for it on Saturday or Sunday or early in the morning or late at night. The work was there and there was one guy to do it and that was me; so, as a result, I do have an appreciation of that, but what do you really think I can do for you? What can I do to help you solve your problems?

Mr. AUTRY. Well, Mr. Lloyd. That is a sure thing you have said. These people have gone where I would like to go and my lawyers have already told me about the problems they have already experienced. We don't have the clerical help or the money to go there, but to bring things down to a very simple line, which, again, I will do, all of the problems that I have looked at so far with our company and what we are trying to do, there is hardly any of them that cannot be cured with adequate financing, which we do not have. Now, in my opening statement I recommended that money be made available at something less than the 16¼ percent, or whatever. We are paying 16 percent.

Mr. LLOYD. I see by the papers that is the rate now.

Last month the inflation rate was 1½ percent, which would make it 18 percent per year, so we can anticipate in making some changes in what we are talking about even here.

Mr. AUTRY. Right. So, of course, I don't know how this would be brought about, but I do know the money is made available to smaller firms—I don't know if these gentlemen go along with me or not, but, again, we are getting right back to the same thing. If you want to do something, like put a man on the moon, it takes a lot of money; everybody understands that. If you put enough money there, he will get there some way or the other. Now, a small business, obviously, doesn't have as much redtape to cut through as some larger companies, but, the other thing that they don't have is money to do it with.

We have many new things we would like to do. Some we have already done. But they are gathering dust because we don't have the money to develop them. So all of the problems of some of my solar buddies, also manufacturers, a voice from the past—customers won't buy, can't get there, can't sell them and all these kinds of things—we feel that we have overcome most of these problems.

What we cannot overcome is what I mentioned before. Our company would like to grow and has been up until last year where we just couldn't get any more money. It increases by about three times a year. Now, we can no longer do it because we cannot make enough money to bring that company up, at that rate, the extra capital that has to be invested at any one time or at any one level of operation. Money that we have obtained through our own personal effects or collateral through banks and we believe that we can produce enough extra employment that the return and taxes and so forth should be considered and the fact the very field we are in, since that is what everybody seems to be trying to do anyway, is why we started. You could take a look at that, but, how you can do it, I don't know that much about government.

Mr. LLOYD. Mr. Edwards and I will yield to Mr. Nelson very shortly. I am not trying to steal all the time here, but I think this is an important area to cover not only what it is you want to do, but how you perceive we can assist you to accomplish this.

I note that you had a public offering of $880,000 and you are already up in hoc to, at least, according to the figures I saw, somewhere around $5 million, which causes the question: How did you get in a cash flow situation from the initial issue of stock to $5 million?

Now, you made a suggestion in your statement to the effect that we, let's get the people out here and take a look. How are you going to get people out of the agencies in Washington to come take a look?

I mean, I am going to tell you very bluntly, Mr. Edwards, I cannot get them out to come across to my office unless I say: "And if you don't show up, sir, I have a bill which will cut your budget." Now I have got their attention. The way I get—you talk about the problems of Department of Energy—is I call Dr. Duncan, which is a lousy way to do business. I got a little problem in my district out there where I had a little gasoline operator who was dealing with Texaco, one of those small, little companies, who has cut his allotment and increased his rent. They had done it three times. He decided that he wasn't sure how long he was going to stay in business at that rate, and I am not sure how he is going to do it either. It was very clear to me that somebody was really doing a job on him and I did not know what the purpose was. I talked to Texaco and I might as well have talked to the wall. I was really going to solve the problem. So then I personally called the regional director in San Francisco who dealt with that area in Los Angeles—I talked to a gal there—I couldn't believe that either she was that dumb or that insensitive. So then I called Mr. Duncan and said you have a gal out there by the name of so and so who is either this dumb or this insensitive, and this guy, the reason he can't do business with you is you don't even know how to articulate what you want.

I am not mad at Mr. Duncan. He just came in there and he is doing a heck of a job, in my opinion. But it is the only agency I know of the day it opened its doors it was 5 years behind, and I don't know how to get them going. I can blame, I can point fingers of guilt at Mr. Schlesinger, who is a personal friend of mine. I think he is a very capable guy. He should never have had that job. So what have I accomplished with that?

But the point that I make to you is when you say to me: "Hey, if you could just get these people down here," I know exactly what you are talking about. I wish I could reach out and say: "Hey, you come down and talk to those folks. They want to do business with you;" and we have our seminars in my area and I am sure and I know Mr. Nelson does the same thing on how to do business with the Government. I have to admit after setting up these seminars for 5 years running, I finally came up with a question, after hearing what the small businessmen are saying to me: What the blazes am I doing throwing these seminars, when the only thing I find out from the Government is they give me a bunch of telephone numbers, and nothing else happened. So how I am going to get those folks down here to talk to you and listen to the problems that you are having and translate that into meaning-

ful involvement so that I can get you on board doing business at a better rate than somebody else.

Mr. NELSON. Mr. Scherer didn't realize that he was coming to this hearing for him to make the solutions instead of us, so your insight would be valuable.

Mr. EDWARDS. I would like to comment on that. It is a bit frightening, however, it does confirm my suspicion that I have been developing for several years, that I am not sure who our country is run by—is it run by Congress or is it run by many, many nonelected individuals. I believe that when Congress says: "frog," the agencies, well, they really had better jump and they had better jump in the right direction or they had better get out; and it is the Congressmen that are elected by the people; it is not these other people that are supposed to. If they won't carry out what you tell them to do, there must be a way to get them out, and I think that would have a great deal of effect on how they are going to do their job.

Now, as a practical matter, and this just occurred to me as I heard this dialog, you know, it would be very helpful if a requirement, even a job requirement, would be to T.D.Y. with a small business from a bureaucrat for 1 or 2 months. You would be amazed at what you would learn in that time. I have been, also, with the Government. I have been on the other side of the fence. I was there for a year and I can understand. I was one of those guys that contractors would call up for help and I very quickly realized that I didn't know what the heck I was talking about compared to them. They were much brighter on the subject than me, and so when I finished, I left.

So I think you—you know, if you are asking—you are telling me, as one of your constituents, that you cannot get your agencies to move, I think you had better take out your boots and get some of these folks to do what needs to be done and I think that everybody knows what needs to be done. We need to increase the productivity of this Nation. Otherwise, we are going to go the way of almost every nation that has been in existence. We still have time, but it is running out.

As far as I can see, I think there is just a very, very strong—I don't know if bureaucracy is the right word, but there is a middle management in this country that is very powerful and it seems to be virtually untouchable and that is wrong. Most folks were not elected. Those folks have a job there to do for you because you guys work for us.

Mr. LLOYD. I hear you.

Mr. NELSON. Let me see if I can articulate a couple of points here and ask a few questions.

First of all, Mr. Chairman, I want you to know Mr. Autry is a genuine small businessman who came up by the bootstraps. He started in operation in a garage-type operation while he was carrying on another business. It was a part-time thing and so when he tells us that he has trouble with financing and that he had to get his original financing from three individual partners because he did not have any cooperation from the banks around here, I think he has put his finger on a substantial problem among small business, other than the governmental problems that we have been talking about.

Now, I have been rather distressed from time to time at the lack of creativity and lack of flexibility for innovation among private lend-

ing institutions, and, particularly, in this area. I don't know how we can solve it, except I can state that it is a problem, and, maybe, somehow, and in the private sector, this message needs to get through to the financial lending institutions, particularly in this area.

We have a unique area here, that is, a large technical pool of people. A lot of them were laid off after the 1969 layoffs. They didn't want to leave here because of the obvious benefits of raising families in this area and started their own small business, high technology firms.

Would anybody in the audience like to comment on that question? Yes, sir.

Mr. LLOYD. Would you identify yourself?

DOUG SWENSON. I am Doug Swenson and I am an executive at Micro-Processor Systems over in Orlando, Fla., and we are a custom O.E.M. manufacturer of the latest, state of the art, electronic systems for various clients, and we, in essence, design microprocessor electronics for almost any application that comes to us; and, in reference to your lending institution problems and so forth, we have had problems similar to Mr. Autry.

My partner and I started out in his garage and 4 years later we have 20 employees and we will probably do about $1 million worth of business this year. Now, we did get some significant financing from the SBA, and it was only because that we got a contract with a substantial client that the banks would even say: "OK. We are going to give you a loan to develop"—in this case it was a computer terminal for a time-sharing network. The bank said: "OK. You have got a substantial client, but we are going to loan you this money"—in this case, it was $125,000—"to develop this terminal for this customer, but we are going to do it through the SBA." Their liability, in essence, was $12,500 if the company defaulted on this note.

The problem we have now is—and, by the way, that—I don't want to say anything against the SBA because that was significant to our company and they did do a good job for us and we have had relatively little reporting requirements and restrictions and it was, in my opinion, a very good business relationship.

The problem we have now is to expand, we need more money to finance new business—similar to Mr. Autry's problem—but we now—the SBA now owns the shirt on my back and it is completely at the whim of my sponsoring bank, who, by the way, only has a $12,500 liability here, and the SBA, whether I get additional financing. So, I am, in essence, limited by my ability to raise lending institution capital.

Now, I could go out on the venture market, if I wanted to, but I don't particularly want to.

The other point I would like to make is we talked a little bit this morning about funding progress payments and so forth. I think that there might be vehicles available within, say, the small business administration to provide some of this in-term financing for progress payments and so forth. There could be a way there for the Government, through the SBA to, in essence, factor progress payments on Government contracts, and I would suggest to you that this might be something that ought to be explored on this particular aspect of financing Government contracts.

Mr. NELSON. Mr. Chairman, I know we are over our time for this panel, but let me pick up on this. We have got a former bank president out here, Doyle Frisbee from Titusville. I would like to ask him on his experience, what is the attitude of commercial banks in east, central Florida, from your experience and in your lifetime as a banker, in wanting to go out and take a risk in lending to a small business. Would you speak to that, Doyle?

Mr. FRISBEE. Yes. I will be happy to.

Mr. LLOYD. I tell you what, Mr. Frisbee, why don't you come on up here and would you hold it down to about 3 minutes. You know, we solved the world in 5.

Mr. FRISBEE. I understand. I am presently with "E" Prime Research and Development Laboratories in Titusville.

I just spent the last 34 years of my life with commercial banking and it is interesting to hear some of these gentlemen bring up their problems because I can readily understand some of their problems.

I think that we are living in an area where the Burt Lances and big banks, some of them in New York and around, that have really got into some trouble, has brought on some of the regulatory high pressure problems on the banks that have really created some serious problems.

This gentleman over here is in so much need of financial assistance he can't afford to pay the 16, 17, 19 percent that the banks are going to require him to pay. Wouldn't it be nice for this firm here to have spent the $2 million, excessive $2 million, that they have had to put out in accounting reports into research.

When a firm comes to a bank, the banker knows right off the bat that he has to say: "Give me a certified statement," grossly expensive to him and, yet——

Mr. LLOYD [interposing]. I just want you to know I just did. My statement had to be given to somebody because of an involvement in my own business interest and it is very expensive.

Mr. FRISBEE. Tremendously.

Yet, the banker knows that if he doesn't get it, when the bank examiner comes on the scene, he is going to get whipped if he doesn't have it. They do not make it a requirement. They do not say you have to have a certified statement, but, if you don't have it, you are going to get written up in your exam, the Board of Directors is going to be on you. So it is too easy to say we can't do it without it.

Mr. LLOYD. That translates simply. If you don't have your statement ready to go, you aren't going to get the money.

Mr. FRISBEE. That is right, exactly. And I do think that, on two areas, if the Government could, in some way or another, find a manner to make some funds available at a reasonable cost—you know, banks like to make as much money as they can, just like everyone else. But, at the same time, 2 percent on money is not so bad sometimes. They don't have to make 5, and I think that the regulatory scene could really be looked into very, very closely, and it might take some of the pressure off the banks and might turn up some of these people.

Mr. NELSON. Mr. Chairman, let me just say in conclusion, before we go on to the next panel, that, picking up one thing that Lee said about establishing a small information office within the bureaucracies.

I think it is an excellent idea, but you can also utilize, as Lee and Tom have and as a number of you have in this room, your own individual Congressman's office for the availability of information, because it is a fact, and Lee said it, when a Congressman's office starts calling they usually get the information from the bureaucracy; and I am sorry, Steve Lewis, that I am just laying some more work on you, but, you know, that that is the availability of this office and we would be delighted to serve in that capacity. In conclusion, let me introduce—I see one of my mayors here, Mr. Chairman, one of our local elected officials, the major from the city of Palm Bay. Frank, I appreciate your coming here.

Mr. LLOYD. Stand up, Frank. The best guys were mayors of cities. I want you to know that.

Mr. NELSON. That is right.

Mr. LLOYD. Thank you very much, gentlemen. As you can see, we never have enough time to do it right, but we always have time to try to do it over, but, in any event, we will go on with the next panel.

If anybody in the audience, after we are through, has anything to say, well, we would be glad to chat with you also.

We want all of you, whoever is here, to sign up for the luncheon, stay afterwards, and that way, we get a chance to know you a little better.

Mr. Nelson told me that everybody who signs up for the luncheon is going to get a free small business loan. Did I get that right?

All right. If we will have order, we will commence the next panel.

I guess we will start again in the same order; Mr. Searle, Mr. Humphrey, and Mr. Ivey.

Mr. Searle, you have the floor.

If any of you wish to, at the time you are giving your presentation, submit your statement for the record, we will be pleased to accept it. You may paraphrase it and of course, feel free to change it in any way.

STATEMENT OF DONN SEARLE

Mr. SEARLE. Thank you, Mr. Chairman.

Mr. Nelson and others involved in the hearing, I feel privileged to appear as a witness before your hearing this morning and I shall endeavor as best I can to outline the objectives of our organization, its technological capabilities and goals. I will also attempt to indicate clearly and to the best of my knowledge some of the problems encountered in the formation and development of small companies, such as ours, with high technology capabilities.

Surely there is a definite need for the research efforts of any legitimate and qualified organization working in the field of alternate sources of energy with the crisis facing the entire world at the present time. There is nothing imaginary about the energy crisis and no amount of wishful thinking or blissful hope is going to eliminate the real and very grave dangers to all mankind.

Let's begin by focusing attention on the agricultural business right here in our own State of Florida. This State is one of the Nation's largest in the production of agricultural products, such as citrus, cattle, sugar cane, vegetables, and other important food and grain crops.

Equally important to our overall economy is the tourist industry; and neither can survive without an adequate source of energy; and here is the most frightening aspect of the entire problem: Our great State is almost 100 percent dependent on outside sources of energy. I am sure I need not remind anyone of the consequences of a drastic curtailment of the flow of energy sources to our State, and we are not alone. Our Nation's total economy and its very security demands that immediate assistance be given by our Government to encourage the development of alternate sources of energy.

We at "E" Prime Research Laboratories are engaged in providing a packaged program which can make a vital contribution toward the development of alternate sources of energy throughout our Nation and the world.

Our initial emphasis will be toward freeing the farm from the use of petroleum fuels with the principal elements of the system being:

One: Substitution of nonpolluting alcohol for petroleum products in existing internal combustion engines that have been retrofitted, or in new engines designed for the purpose, in accordance with the principles developed in the "BETA" engine. This revolutionary new development, incidentally, can be observed in operation in Titusville, Fla., and will be demonstrated shortly at a major citrus operation in central Florida.

Two: Providing the expertise to produce fuel alcohol from either agricultural waste products or from grown agricultural products.

Three: The application of techniques to greatly increase crop production efficiency and reduce ecological hazards while minimizing the use of costly petroleum based fertilizers and other crop chemicals.

Four: By the utilization of citrasol, our own patented derivative of citrus waste, that can be used as a nonpolluting insecticide.

Our beginning efforts to accomplish our objectives have not been without considerable, and I might add, unnecessary cost, both in time and money, due to factors we will be discussing here today. Any innovative technology or procedure must first find acceptance and permission for introduction before entering into the marketplace by satisfactorily meeting the requirements and regulations of a host of government agencies.

Permit me to name a few: The U.S. Patent Office, frequently a costly and very time consuming procedure, perhaps, understandably so in some instances, nevertheless, it causes the early demise of many innovative small companies such as ours.

The Environmental Protection Agency, so often the regulations are so couched in legal language, that not only is it hardly understandable to the innovator of a new technology or procedure, but representatives of the agency, itself, cannot give you a clear and concise interpretation that will permit a new company to proceed with the development of its product.

Lack of real interest or technological assistance from the U.S. Department of Agriculture.

Paperwork and testing of products required by the Food and Drug Administration, which can be a heavy burden financially on a small company.

The assembling of a financial structure acceptable to such agencies as the Small Business Administration or the Small Business Invest-

ment Corporation in order to obtain financial assistance from our own Government. This often necessitates small newly organized companies even to go abroad for financial help. This can and often does result in the transfer of valuable technology to foreign lands, a strange reversal of the pattern of the former highly developed industrial organizations in our Nation, many of which found their origin in small innovative companies. We believe that many of these difficulties could be either minimized or eliminated. If many of these regulatory requirements were assigned to State and local governments here, there would be better response and recognition of the major problems faced by newly developing high technology companies, much quicker communication, less cost to the innovator, and, perhaps, a greater recognition and evaluation of the need for the technology and/or the resultant product.

I heartily agree with the statements which were made by members of the previous panel with regard to the difficulties encountered in such matters as I have variously mentioned here in regard to Government agencies.

I might add that I got my baptism in fire with some of those procedures with the War Production Board in the early stages of World War II and I know that the situation now is far more complex than it was even in those days.

I do feel that if such local organizations, as NASA's recent organization on technology, were created that the assistance to innovator programs could be handled on a much quicker basis, a much more informative basis and a much more helpful basis than the necessary techniques now required to go through the various agencies in Washington.

I will be happy to answer any of your questions if I have the capability of doing so, other than technological procedures involved in the "E" prime situation; and, incidentally, I might add, Mr. Chairman, that I have with me this morning some of the staff personnel of our company. If you have questions concerning our technology or our objectives in that regard, they would be happy to answer them.

Mr. LLOYD. Thank you very much, Searle.

We are going down the line on the presentations, Then we will come right back for questions.

Mr. Humphrey, welcome, and all of the statements made before are applicable to you and so forth.

STATEMENT OF GEORGE L. HUMPHREY

Mr. HUMPHREY. Mr. Chairman, and, of course, Mr. Nelson, Intec and myself certainly appreciate the opportunity to appear before you this morning.

Let me start with a capsule description of International Technology Corp. also known as Intec, is a diversified, high technology company providing energy measurement and control products, and systems engineering and management services. These products and services are delivered worldwide to industrial/commercial markets, Government markets, military commands, utility systems and educational institutions.

Intec was officialy incorporated in May 1978. The company resulted from the purchase of Technology Applications Laboratory (TAL) by an investor group that also brought in certain patents and licenses and additional captial.

The Energy Measurement and Control Products include the manufacture of scientific instruments which measure the effectiveness of solar collector panel surfaces—this is a NASA spinoff—and also includes the manufacture of automatic lighting controls to conserve electrical energy used in building illumination—this too is a NASA spinoff. We also are engaged in the sale and installation of load management systems and we provide a complete service in the installation of energy metering equipment including computer analysis of energy consumption data.

The other side of the business, and this is important to keep in perspective because it really tells you how our strategy as a small business and how we survive in this environment we are considering this morning. The other side of the business is systems engineering and management services, and these include assurance technology engineering consulting, reliability, maintainability, risk management, value engineering, quality assurance and life cycle.

Now, let me just say a few words about our financial policy. INTEC's capital requirements are satisfied through a combination of retained earnings, through commercial bank and savings institutions borrowings and through equity sales. In general, of course, retained earnings are used for R. & D. expenditures and additions to working capital; commercial bank term loans are used for equipment purchases, mainly computer systems in our offices; and mortgage loans have been used for building and land purchases. The equity capital provided the funds for the purchase of TAL in addition to the working capital at that time.

We are a closely held company and the current plan is to keep the company closely held until capital requirements dictate otherwise. When additional capital, equity capital, is necessary, private capital of a type not requiring SEC filings will be sought. Later on, as the need for capital further increases, the company will probably list its common stock on the OTC market. Debt capital will also be sought as required. I will have some comments on that and the climate in Florida in a moment.

To understand INTEC's financial policy, it is important to keep in mind its product and service lines. The systems engineering and management services are basically consulting activities which afford outstanding cash flow—receivables are rarely more than 30 days old and consulting is labor intensive, with full and part-time labor tied directly to the level of contracts at any given time. Manufacturing, on the other hand, is nearly the opposite situation. Our financial strategy up until this time has simply been to mesh these two business areas. To a large degree, this has permitted us to grow without the aid of outside financing.

We operate offices in Brevard County, Fla., and in Washington, D.C. Our office in Brevard County is 5 miles south of this meeting place, in Satellite Beach, and there we have our administrative functions and our computer operations and our R. & D. laboratory.

The Washington, D.C. office is located in Alexandria, Va. We simply had to open up a Washington, D.C., office as one's physical presence there is absolutely mandatory to do business with the Federal Government.

Now, let me say a few words on the Government's stifling of innovation. To me there is absolutely no question that the U.S. Government stifles technological innovation in this country. It does this by continuing to not recognize the overwhelming contribution of small business to the development of new technology. It does this by continuing through taxation, through regulation, through paperwork and a multitude of disincentives to deny and discourage entreprenurial activity. It does this by Federal agencies continuing to discriminate, in effect, against small businesses in awarding research and development contracts, despite the well documented fact that small businesses are far more innovative and cost effective than large corporations.

This stifling of innovation continues in spite of hard evidence over the last 15 years which demonstrates the important contribution of small business to technological innovation.

In a sense, Mr. Chairman, this underscores your opening remarks, but I would like just to add to them, if I may. In 1966, in my search of the records, I noticed that a blue ribbon panel, which was commissioned by the Department of Commerce at that time to study the contributions of small business to the development of science and technology, concluded that small business is responsible for over one-half of the scientific and technological innovation that is taking place in this century.

Further, in a recent National Science Foundation study, which I believe you quoted from, Mr. Chairman, it states that on the basis of a sample of major innovations introduced to the market between 1953 and 1973, small firms—up to 1,000 employees—were found to produce about four times as many innovations per R. & D. dollar as medium-sized firms of 1 to 10,000 employees and about 24 times as many as large firms—over 10,000 employees.

If one goes through the records further, one can find evidence upon evidence reinforcing small business contribution to technological innovation.

In spite of this remarkable achievement by small business, the Federal Government continues its discrimination in awarding R. & D. contracts to small business, even though it has been known for at least a decade that a disproportionately large share of Federal research and development funds go to large corporations who deliver significantly fewer results.

For example, while the amount of Federal dollars invested in R. & D. has increased from 9 billion in 1960 to over 27 billion in 1979, the amount of Federal research and development contracts going to small business has usually remained around 3½ percent. To me it simply makes no sense that small business receives such a token amount of the funds earmarked for a function that it clearly performs best.

Now, let me share with you two constraints on Government innovations that International Technology Corp. has had. Let me say further, Congressman Nelson, that you are familiar with these two examples

from conversations we have had in your offices. Second, that this is not a criticism of NASA. It is more a criticism of the follow-up from other governmental agencies on trying to market or trying to commercialize tech spin-off products.

I think that it is really more than this because the difficulty, as you will see in a minute, is when you have the developed product, that the difficulty lies in taking it on the road to commercialization, and that means taking it into the marketplace and getting it utilized.

Now, INTEC has had several years of experience in marketing its products and services to the Government and this experience covers NASA, and it covers DOE, GSA, U.S. Air Force, U.S. Army, U.S. Navy, National Bureau of Standards, and some others.

INTEC uses a wide variety of avenues in marketing to the Government. Sometimes we take a direct approach identifying problems or needs and submit unsolicited proposals. Other times we respond directly to RFP's as reported in Commerce Business Daily or in response to RFP's or RFQ's generated by being on a Federal agency bidder's list.

Marketing to the Government has not been easy. We have had our share of success and we have had some incredible difficulty. In general, the cost of sales to the Government is higher than with private industry. The paperwork is more time consuming, the requirement for travel and communication greater and the response time for proposals longer. In many cases, once you win the proposal and get on with the work, as we have heard before this morning, there have been some enormously embarrassing delays on getting payment from the Federal Government for contracts performed for the Federal Government.

Our greatest difficulties have been with products of innovation and, interestingly enough, with products of innovation which have been born, in the first instance, with the use of public money. To INTEC it has been astoundingly difficult to get Federal followup on federally sponsored technology transfer. Here are two cases.

The first is the OTEC powerplant. For those of you who are not familiar with it, the OTEC powerplant is a means of generating electrical energy offshore by using the temperature differential existing at various depths in the ocean. My colleague to the left here spoke about the energy crisis and he spoke about the energy problems in Florida. Considerable money was spent by NASA at Kennedy Space Center during 1974 to 1976 in developing an OTEC concept suitable for Florida waters.

INTEC sought and received a license from NASA to commercialize this powerplant and we take our obligation to NASA and to the U.S. Government in exchange for this license very seriously. But INTEC's efforts thus far in moving ahead with the NASA design in other divisions of the Federal Government have been discouraging.

The NASA OTEC requires about $10 million to complete the final design. Private investors are reluctant to invest because present patent policy would keep the rights to the follow-on design with the public. Efforts thus far with DOE to gain assistance in design completion indicate a preference to stay with larger corporations who are developing OTEC independent of NASA's design concept.

To us it is ironic that with so much already invested by the public in the NASA OTEC, that this investment is, in effect, being abandoned

in favor of supporting large corporation replication of much the same thing.

Our second case also involves a NASA spin-off. It is an automatic lighting controller. This too was developed by NASA and resulted in a U.S. patent issued to NASA as the administrator of the patent. INTEC is under license from NASA to commercialize the automatic lighting controller.

The automatic lighting controller operates by reducing artificial light to correspond to the availability of natural light. The electrical power savings are impressive. The automatic lighting controller saved as much as 90 percent of the electrical lighting costs on a given day during a 15-month test in the headquarters building at Kennedy Space Center, and during this test it was reported free from failure and met complete worker satisfaction.

Now, the automatic lighting controller is a developed product. It has passed the research and development phase. The next logical step in the marketing process or in the commercialization process is to demonstrate it to other Government agencies and to businesses in various building types and locational settings.

INTEC requires $250,000 to make such a demonstration in what we think—15 different cities—would be appropriate. The same difficulties have been encountered with the automatic lighting controller as with OTEC. Private investors worry about patent protection and DOE appears to prefer to duplicate the NASA effort through large corporation contracts.

We hope that these examples are worthwhile because they point out small business' willingness to assist Government in technological innovation and also notably to assist in energy generation and energy conservation and we hope they further point out Government constraints on technological innovation.

In conclusion, I have five basic recommendations to improve the climate of innovation. The first, which I am compelled to bring up, is to stop inflation. Even though we are talking about small business, inflation is just escalating to a point where I think it needs to be told and told again. It is very serious. If inflation is not contained it will continue to serve to undermine innovation in small business; and, of course, although inflation puts the squeeze on all businesses, regardless of size or industry, and on all consumers, regardless of income, small entrepreneurs have a limited ability to absorb the impact of increasing costs and prices. During inflationary times, sales drop, inventories accumulate and small firms are forced to borrow at higher interest rates to support themselves. At the same time employee wages are escalating to meet the higher costs.

Because, also, of their traditionally higher debt/equity ratio, small firms have a competitive disadvantage to begin with and a large share of this debt is short term. The more rapid the growth of inflation and the higher interest rates, as we are now experiencing, the greater the competitive disadvantage.

The second recommendation I have is to reduce the regulatory burden. Until recently, the Government has never differentiated, in our experience and in talking with others, between small and large businesses when considering the cost of regulatory compliance. This regu-

latory burden is like an excise tax whose rate declines as the company gets larger. This simply helps to further place the smaller business at a competitive disadvantage.

There are some encouraging signs: OSHA has recently relaxed its rules for firms with 10 employees and under; and the SEC, with its new and simpler form S–18, will make it easier and less expensive for small firms to raise equity capital.

We simply need more changes like this.

The next recommendation is to encourage capital formation. If inflation weren't so bad, I would have put this first. Exploring the technical and economic feasibility of untried technology means taking on the risk of failure. All of us on the panel are exploring untried technology. We are all confronted with the risk of failure; and, yet, we must foster attitudes and actions which encourage the formation of risk capital if we are to improve the climate of innovation.

Congressman Nelson, you mentioned earlier the negative response you experienced with local lending institutions in Florida. I would submit, and I do have some banking background, before I was with this company, that you have structural banking problems in this State. Florida has been a consumer-banking State and the banks simply have not caught up to having the people in place with the experience to deal with folks like ourselves. We have to go out of State to do our commercial banking.

One bank—and the institution shall remain unnamed, handles our foreign sales letters of credit. We have some scientific instruments on sale to India and we got a call from the head of the letter of credit department in Miami saying: "Gee, we found your letter of credit buried in our desk. It has been there for 2 months." These sort of things are frequently experienced in this State by local companies doing business with local commercial banks.

Mr. NELSON. Just as an aside, I might mention—it might be very timely—there is a meeting in about 3 weeks of the Board of Bankers Association. They are having a statewide convention. If you or someone could get a part of that program and get this message across, I will—whenever I have contact with them—continuously give them this message. It might be well served to the interest of small businesses.

Mr. HUMPHREY. But here again, in encouraging capital formation, there are some encouraging signs. Now, I deliberately put these encouraging signs in because some of these things are in the legislative process and I am earmarking them as the kinds of things that we are recommending be supported. The tax structure is starting to improve. Capital gains taxes were reduced by Congress in 1978 and depreciation writeoffs were accelerated; and I understand there is a 10–5–3 program you are all considering. Last year Senator Lowell Weiker (R.–Conn.) introduced a bill introducing a new hybrid security called a small business participating debenture. For those not familiar with this, these debentures would be offset with a fixed-term debt instrument and a stated rate of interest, plus the opportunity for the investor to share in the company's earnings.

Again, we need more changes and creative thinking like this.

The fourth recommendation is to improve small business set aside legislation. Much has been done in this area, but INTEC has yet to

experience any meaningful action. So far it has been all form and little substance. Public Law 95–507 provided important changes to the 1958 Small Business Investment Act. Of significance is the requirement—and this is in Chapter Two, Section (d) (1)—and I quote:

> It is the policy of the United States that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practical opportunity to participate in the performance of contracts let by a Federal agency.

What is needed now, in all candor, is Federal agency compliance with the intent of this act. I have not seen it or experienced it.

Finally, my fifth in recommendations is to modify the patent laws. Current Government patent policy constrains innovation. When an investor develops an idea with Federal funds, the invention theoretically belongs to the public.

I support ROVAC's position, but I would like to suggest going further with their recommendation. I would encourage support of any legislative proposal which would amend Government patent laws as far as inventions that emanate from public funds are concerned. I feel the investor should have the right to reimburse the Government for funds used in development of the product and retain full patent privileges.

Mr. Chairman and Congressman Nelson, thank you very much for this opportunity.

[The biographical sketch and prepared statement of Mr. Humphrey follows:]

GEORGE L. HUMPHREY
Executive Vice President

Mr. Humphrey has 20 years experience in marketing and financial management. Over this period he has been involved in market research, market planning, product development, economic analysis and financial planning activities for commercial, industrial, and consumer products and services. As Executive Vice President for INTEC, Mr. Humphrey is responsible for the corporation's marketing, financial planning, and business development activities. He is a member of the Executive Committee and is Secretary and Treasurer for the Board of Directors.

Prior to his present position at INTEC, Mr. Humphrey was a Principal Associate at Golembe Associates, Inc., a management consulting firm headquartered in Washington, D.C. He was responsible for all client management consulting activities pertaining to corporate marketing, strategic planning, market research and business development. During this time he was responsible for introducing several new financial products, including negotiable orders of withdrawal, automatic teller machines, and direct deposit of payroll.

Before his consulting assignments at Golembe Associates, Mr. Humphrey was Vice President and Director, Corporate and Market Planning for the Shawmut Corporation, Boston, Massachusetts, New England's second largest financial institution. He was responsible for the administration of the corporation's long-range planning, economic research, diversification planning, business development and branch office development activities. During this period, Mr. Humphrey established a marketing and planning function, where there was none, and added several non-banking activities including commercial finance, factoring, and agri-finance to the corporate structure.

Previous to his position at Shawmut Corporation, Mr. Humphrey was Administrative Officer, Kaiser Development Company, a subsidiary of Kaiser Industries, Oakland, California. In this capacity, he was responsible for the demonstration and testing of Kaiser industrial products in commercial and industrial building environments.

Mr. Humphrey has been quite active in many professional societies including the Institute of Electric and Electronic Engineers, Southeastern Meterman's Association, American Marketing Association, American Management Association, American Bankers Association, Urban Land Institute, and the Harvard Business School Association.

Education: University of California, Los Angeles, B.S. Economics
Harvard Graduate School of Business, M.B.A. Marketing, Finance

International Technology Corporation

STATEMENT BY MR. GEORGE L. HUMPHREY

EXECUTIVE VICE PRESIDENT

INTERNATIONAL TECHNOLOGY CORPORATION

SATELLITE BEACH, FLORIDA

HOUSE SCIENCE AND TECHNOLOGY

SUBCOMMITEE ON INVESTIGATION AND OVERSIGHT

HEARINGS ON

SMALL, HIGH TECHNOLOGY FIRMS AND INNOVATION

AT PATRICK AFB OFFICERS CLUB

SATURDAY, FEBRUARY 23, 1980

1670 Highway A1A, Satellite Beach, Florida 32937, 305/777-1400

BRIEF HISTORY AND DESCRIPTION OF INTEC

International Technology Corporation (INTEC) is a diversified, high technology company providing energy measurement and control products and systems engineering and management services. These products and services are delivered worldwide to industrial/commercial markets, government markets, military commands, utility systems, and educational institutions.

Historical Background

INTEC was officially incorporated in May 1978. The purpose was to create a company well positioned to provide products and services which could be profitably directed toward offering important solutions to worldwide energy and other resource shortages.

The formation of INTEC resulted from: (1) the purchase of Technology Applications Laboratory (TAL); and (2) the acquisition of several new patents and licenses, brought together by the former TAL owner/manager and a new investor management group.

TAL's background is significant. It was formed in May 1971 as an integral part of the C. Stark Draper Research Foundation of the Florida Institute of Technology. Over seven years it earned a reputation for excellence in providing systems engineering and management services to industry, government agencies, research organizations and public institutions. TAL provided a broad set of in-place professional engineering talents and customer contacts vital to achieving INTEC's mission; and it's headquarters location in Brevard County, Florida, assured the availability of a large and diverse supply of sophisticated scientific and engineering talent and support services.

The new investor group built upon TAL's business base by adding capital, patents and licenses, and talent in energy measurement and analysis, energy generation, and energy controls and conservation. This group brought advanced designs in the automatic lighting control area, acquired licenses to pursue electrical generation in Ocean Thermal Energy Conversion (OTEC), and added electronic research and development and manufacturing capabilities.

Current Products and Services

INTEC's present activities fall within two broad areas: Energy Measurement and Control Products and Systems Engineering and Management Services. Both areas interrelate in terms of cross-sales to customers and the deployment of human resources and equipment within the company to produce the product or deliver the service.

Energy Measurement and Control Products include the manufacture of scientific instruments to measure the effectiveness of solar collector surfaces, the manufacturing of automatic lighting controls to conserve electrical energy used in building illumination, the sale and installation of load management systems, and providing a complete service in the installation of energy metering equipment including computer analysis of energy consumption data.

INTEC's Systems Engineering and Management Services are broad in scope: the assurance technology engineering consulting includes reliability, maintainability, risk management, value engineering, quality assurance and life cycle cost consulting. Logistic planning support is also provided. The project engineering and management activities include OTEC development and energy conservation programs.

Other Systems Engineering and Management Services are advanced educational programs such as seminars, company training programs and correspondence courses. INTEC also provides advanced Research and Development Services to other companies in such areas as energy instrumentation and controls, OTEC/DOE programs, solar systems, and LNG controls.

Financial Policy

INTEC's capital requirements are satisfied through a combination of retained earnings, commercial bank and savings institutions borrowings and equity sales. In general, retained earnings are used for research and development expenditures and additions to working capital; commercial bank term loans are used for equipment purchases; and mortgage loans are used for building and land purchases. Equity capital provided the funds for the purchase of TAL.

INTEC is a closely held company. The current plan is to keep the company closely held until capital requirements dictate otherwise. When additional equity capital is necessary, private capital of a type not requiring SEC filings will be sought. Later on, as the need for capital further increases, the company will probably list its common stock on the OTC market. Debt capital will also be sought as required. INTEC's policy is to maintain an appropriate debt/equity mix in accordance with cash flow priorities as well as complying with lender requirements.

To understand INTEC's financial policy it is important to keep its product and service lines in perspective. The Systems Engineering and Management Services are basically consulting activities which afford outstanding cash flow--receivables are rarely more than 30 days old. Consulting is labor intensive, with full and part-time labor tied directly to the level of contracts at any given time. Manufacturing, on the other hand, is nearly the opposite situation. Our financial strategy has simply been to mesh the two business areas. To a large degree, this has permitted INTEC to grow without the aid of outside financing.

Facilities

INTEC operates offices in Brevard County, Florida and Washington, D.C. The office complex in Brevard County is located five miles north of the Melbourne Causeway (US 192) in Satellite Beach, and is just south of Patrick Air Force Base and the Kennedy Space Center.

The Florida offices house INTEC's administrative functions, computer operations, research and development laboratory, and manufacturing operations. These offices are owned by the corporation.

The Washington, D.C. office is in Alexandria, Virginia and is approximately ten miles from the White House. The office function is to facilitate government agency and military marketing as well as providing a base for general government relations. It is anticipated that the Washington, D.C. office will be expanded for systems engineering and management services in the Washington metropolitan area.

GOVERNMENT STIFLING OF INNOVATION

There is no question that the U.S. Government stifles technological innovation in this country. It does this by continuing to not recognize the overwhelming contribution of small business to the development of new technology. It does this by continuing through taxation, regulation, paperwork, and a multitude of disincentives to deny and discourage entreprenurial initiatives. And it does this by Federal agencies continuing to discriminate, in effect, against small business in awarding research and development contracts, despite the well documented fact that small businesses are far more innovative and cost-effective than large corporations.

This stifling of innovation continues in spite of hard evidence over the last 15 years which demonstrates the important contribution of small business to technological innovation.

In 1966 a blue ribbon panel, commissioned by the Department of Commerc- to study the contributions of small business to the development of science and technology, concluded that small business is responsible for over one half of the scientific and technological innovation that have taken place in this century.

And a recent National Science Foundation study, Industrial Research and Development and Innovation, states:

> "On the basis of a sample of major innovations introduced to the market between 1953 and 1973, small firms (up to 1,000 employees) were found to produce about four (4) times as many innovations per research and development dollar as medium-sized firms (1,000 to 10,000 employees) and about twenty-four (24) times as many as large firms (over 10,000 employees)."

In spite of this remarkable achievement by small business, the Federal Government continues its discrimination in awarding research and development contracts to small business, even though it has been known for at least a decade that a disproportionately large share of Federal research and development funds go to large corporations who deliver significantly fewer results.

While the amount of Federal dollars invested in research and development has increased from $8.7 billion in 1960 to over $27 billion in 1979, the amount of Federal research and development contracts going to small business has usually remained around 3 1/2 percent. It simply makes no sense that small business receive such a token amount of the funds earmarked for a function that it clearly performs best.

CONSTRAINTS ON INNOVATION--INTEC EXPERIENCES

INTEC has had several years of experience marketing its products and services to the Government. This experience covers NASA, DOE, GSA, U.S. Air Force, U.S. Army, U.S. Navy, National Bureau of Standards, and some others.

INTEC uses a variety of avenues in marketing to the Government. Sometimes we take a direct approach identifying problems or needs and submit unsolicited proposals, other times we respond directly to RFP's as reported in the Commerce Business Daily, or in response to RFP's or RFQ's generated by being on a Federal Agency bidder's list.

Marketing to the government has not been easy. We have had our share of successes and we have had some incredible difficulty. In general the cost of sales to the Federal government is higher than with private industry. The paperwork is more time consuming, the requirement for travel and communication greater, and the response time for proposals longer.

Our greatest difficulty has been with products of innovation, and interestingly enough with products of innovation born through use of public money. To us it has been astoundingly difficult to get Federal follow through on federally sponsored technology transfer. Two recent cases of difficulty follow:

1st Case of Constraint--OTEC Power Plant

The OTEC power plant is a means of generating electrical energy offshore by using the temperature differential existing at various depths in the ocean. Considerable money was spent by NASA at Kennedy Space Center during 1974-1976 in developing an OTEC concept suitable for Florida waters.

INTEC sought and received a license from NASA to commercialize this power plant. We take our obligation to NASA and the U.S. Government in exchange for this license very seriously. But INTEC's efforts thus far in moving ahead with the NASA design in other divisions of the Federal government have been discouraging.

The NASA OTEC requires about $10 million to complete the final design. Private investors are reluctant to invest because present patent policy would keep the rights to the follow-on design with the public. Efforts thus far with DOE to gain assistance in design completion indicate a preference to stay with larger corporations who are developing OTEC independent of NASA's design concept.

It is ironic that with so much already invested by the public in the NASA OTEC, that this investment is, in effect, being abandoned in favor of supporting large corporation replication of much the same thing.

2nd Case of Constraint--Automatic Lighting Controller

The second case is an Automatic Lighting Controller. This too was developed by NASA and resulted in a U.S. patent issued to NASA. INTEC is under license from NASA to commercialize it.

The Automatic Lighting Controller operates by reducing artifical light to correspond to the availability of natural light. The electrical power savings are impressive. The ALC saved as much as 90% of the electrical lighting costs on a given day during a 15-month test in the headquarters building at Kennedy Space Center. During this test, it was reported free from failure and met complete worker satisfaction.

The Automatic Lighting Controller is a developed product. It has passed the research and development phase. The next logical step in the commercialization process is to demonstrate it to other government agencies and to businesses in various building types and locational settings.

INTEC requires $250,000 to make such a demonstration in 15 different cities. The same difficulties have been encountered as with OTEC. Private investors worry about patent protection. And DOE appears to prefer to duplicate the NASA effort through large corporation contracts.

We hope these examples are worthwhile because they point out small business willingness to assist government in technological innovation and notably to assist in energy generation and energy conservation. And we hope they further point out government constraints on technological innovation.

RECOMMENDATIONS TO IMPROVE THE CLIMATE OF INNOVATION

1. Stop Inflation. Admittedly this is broad and is of concern to all, but if inflation is not contained it will serve to undermine innovation in small business. Although inflation puts the squeeze on all businesses regardless of size or industry--and on all consumers regardless of income--small entrepreneurs have a limited ability to absorb the impact of increasing costs and prices. During inflationary times, sales drop, inventories accumulate, and small firms are forced to borrow at higher interest rates to support themselves. At the same time, employee wages are escalating to meet the higher costs.

   Because of their traditionally higher debt/equity ratio, small firms have a competitive disadvantage to begin with. A large share of this debt is short term. The more rapid the growth of inflation and the higher interest rates, the greater the competitive disadvantage.

2. Reduce the Regulatory Burden. Until recently the government has never differentiated between small and large businesses when considering the cost of regulatory compliance. The regulatory burden is like an excise tax who's rate declines as the company gets larger. This simply helps to further place the smaller business at a competitive disadvantage.

   There are some encouraging signs: OSHA has relaxed its rules for firms with ten employees and under; and the SEC with its new and simplier form S-18 will make it easier and less expensive for small firms to raise equity capital.

   We need more changes like these.

3. Encourage Capital Formation. Exploring the technical and economic feasibility of untried technology means taking on the risk of failure. We must foster attitudes and actions which encourage the formation of risk capital if we are to improve the climate of innovation.

Here again there are some encouraging signs. The tax structure is starting to improve: capital gains taxes were reduced by Congress in 1978; and depreciation write offs were accelerated. Last year Sen. Lowell Weiker (R.-Conn.) introduced a bill introducing a new hybrid security called a small business participating debenture. These debentures would be offset with a fixed-term debt instrument and a stated rate of interest, plus the opportunity for the investor to share in the company's earnings.

We need more changes and creative thinking like this.

4. Improve Small Business Set Asides. Much has been done here but INTEC has yet to experience any meaningful action. So far it is all form and little substance. Public Law 95-507 provided important changes to the 1958 Small Business Investment Act. Of significance is the requirement that:

Chapter 2

Sec. 211. Section 8(d) of the Small Business Act is amended as follows:

"(d)(1) It is the policy of the United States that small business concerns, and small business concerns owned and controlled by socially and economically disadvantaged individuals, shall have the maximum practical opportunity to participate in the performance of contracts let by a Federal Agency."

What is now needed is Federal agency compliance with the intent of this act.

5. Modify Patent Laws. Current government patent policy constrains innovation. When an investor develops an idea with federal funds, the invention theoretically belongs to the public.

I would encourage support of any legislative proposal which would amend this policy so that an investor would have the right to reimburse the government for funds used to develop the product and retain full patent privileges.

Thank you for the opportunity to prepare and submit this statement.

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Mr. LLOYD. Thank you, Mr. Humphrey.
Mr. Ivey?

STATEMENT OF H. REESE IVEY

Mr. IVEY. Thank you, sir. My name is Reese Ivey. I am vice president of Wood-Ivey Systems Corp., which we call Wisco for short.

Wisco is a high technology, small business incorporated in Florida. In 14 years of operation it has successfully handled over 100 prime contracts from Government, industry and the medical profession. Twice Wisco has been selected by the U.S. Government as the "Small Business Prime Contractor of the Year" from our section of the country. We have one of the strongest engineering research and development capabilities in central Florida. We also are able to carry programs from the beginning state all the way through to demonstration and small production of hardware.

What does Wisco do? Wisco invents, designs, develops, and manufactures sophisticated hardware that is too difficult for most small businesses to build, but which is not needed in big enough dollar amounts to attract large companies. Wisco has an extremely strong engineering and scientific capability that covers many fields. Example of things that Wisco has accomplished or is currently doing include: oil control systems. We design and build electrical/electronic control systems that control and monitor the flow of crude oil being pumped into or out of United States strategic petroleum reserve sites in Louisiana and Texas. The equipment provides supervisory control over large pipelines, 1,000 horsepower pumps, motorized valves and so forth as needed to pump water, brine, or oil to leach out new salt caverns, fill them with reserve oil and recover the oil as necessary. The equipment controls the pumping of hundreds of thousands of barrels of oil per day. This work is for the U.S. Department of Energy.

The second illustration is aircraft tracking systems. We design and build aircraft tracking systems that are used by the U.S. Air Force for training purposes. The Wisco-built radio transmitters or beacons for the system are mounted in fighter aircraft, the missiles they shoot and the airborne targets at which they shoot. The beacons transmit continually during training shots. Wisco ground-based equipment listens for the beeps from the transmitters and computes the trajectory of the maneuvering fighter aircraft, the missile and the target at which they shoot. From as far away as 100 miles the ground-based equipment can very accurately determine such things as the distance that the missile misses the target.

Mr. LLOYD. Could I interrupt you, Mr. Ivey?

Mr. IVEY. Yes, sir.

Mr. LLOYD. Unfortunately, we are running very short of time and we need to review your statement, of course, and we will do that, but what we really want to do is get into the question area and what I would ask you to do, if I might, is for you to paraphrase this and hit the points that you particularly want to make as far as a specific system is concerned. We will have covered the other part of it.

Would that be unreasonable?

Mr. IVEY. I will try to do that.

Mr. LLOYD. All right. Thank you, sir.

Mr. IVEY. The total number of our personnel is currently about 75 and the total level of business is about $2,500,000 per year.

Initial financing was a combination of personal resources of the founders and a line of credit from a large company. We also used an SBA guaranteed loan part of the time.

On the effects of Government policies, we have an excellent capability to accomplish high technology programs directly for the Government and for the Nation as a whole. Nevertheless, we feel that Government policies are pushing us away from doing business with the Government specifically and are making it very difficult in general for small technology companies to generate capital, build more jobs, develop new products, buy more efficient tooling, improve productivity and do the other things that are basic to improving the standard of living of the United States and the world.

We believe that technology can help solve many of the problems of the United States. Full application of cost-effective technology can solve or greatly assist our Nation in many ways, solving many more problems than it generates, but we need a governmental climate that will nurture and assist innovative high technology companies. Today we are suppressing innovation, and every month the national productivity index is falling as U.S. equipment and designs grow more obsolete and as energy and natural resource shortages are not offset by technological advances. The trade deficit caused by oil imports alone may reach $80 billion this year, but, in our opinion, the Nation is doing very little to conserve energy or generate new near-term energy sources.

Specific recommendations: We, as a small, free enterprise business, oppose increases in Government and the associated regulations; however, only the Congress can remove many of the current obstacles to desperately needed healthy advances in technology. Some of the areas that need to be improved are these: Total taxes need to be decreased. Inflation needs to be controlled by increasing productivity and decreasing Government deficit spending. Productivity needs to be improved by encouraging the generation of capital and its investment in new production equipment and in more competitive new efficient products.

Increased profit margins on innovative Government contracts for difficult research and high technology products should be of a cost reimbursement-type rather than firm-fixed price because of high risk. The current mass of laws, codes, and regulations is so great as to overwhelm any small business capability to understand or comply with all of the requirements or to afford legal counsel to explain them all to us. A strong effort is warranted to decrease and simplify the great mass of laws, codes, and regulations that affect small business. There is no way that we can comply with all existing requirements. We were once fined $65 by OSHA for not posting a typed notice saying that we had a perfect safety record for a year.

Mr. NELSON. That is incredible.

Mr. LLOYD. Could I stop you there? I don't understand that one at all.

Why was OSHA interested in whether or not you were happy with your perfect safety record?

Mr. IVEY. We are required to post the notice on the wall a certain day every year regardless of what the safety record was; and we had had no injuries whatsoever for a year and the piece of paper would only have zero in the column and we did not bother to post it, so we were fined for not complying with the regulation.

Mr. LLOYD. I see.

Mr. IVEY. Further, Mr. Lloyd——

Mr. NELSON [interposing]. Have you—excuse me. Reese, have you experienced what George has experienced, that OSHA is letting up?

Mr. IVEY. Yes, sir. I see them letting up some. However, we were advised if we protested this $65, they would then come back and take a real serious look at what they could find that we might be doing that would be wrong.

Mr. NELSON. How many years ago was that?

Mr. IVEY. Mr. Nelson, that was 3 or 4 years ago. We have not been fortunate to have an individual by OSHA visit us since then.

Mr. NELSON. Are you saying you want me to stay out of that one?

Mr. LLOYD. No. He wants to—I think what he has done, by the fact that he has made a presentation here, requires that this committee must, out of necessity, go to OSHA and ask for an immediate review of this, why this occurred, and who the individual was. I intend to do exactly that, and I am sure that I will be supported strongly by Mr. Nelson.

Yes, sir.

Mr. WOOD. Congressman Lloyd, excuse me for interrupting.

Mr. LLOYD. Would you state your name?

Mr. WOOD. I am Rabun Wood. I am Reese's partner. It happened to me, and I have already done something that you feel you need to do. I went and talked to Lawton Chiles on this right after it happened. He took me to the appropriate people. I won't tell you what Les Fettig said, who was the man there. Well, he said: "Did you throw the S.O.B. out of your office?" I said: "No. I paid him because he did threaten me, said he would throw the book at me if I didn't pay him," but I believe the testimony that I made there did help get OSHA's teeth pulled and I will make it again.

Mr. LLOYD. Thank you very much.

Go ahead, Mr. Ivey.

Mr. IVEY. A different subject. The policies related to patents and inventions need to be changed because they deter inventions, development of new products and pull new ideas away from the motivated inventors and put them in Government archives where nobody will ever develop them.

We found that usually the guy who invents something is the only one who has an understanding of what it will do or why it will work or how to get it anyway, and no one else has the reasons or initiatives to develop it.

The Congress set up, through the Department of Energy, a system in the Bureau of Standards to review and possibly get funding for energy-related inventions. We have tried that system for three or four inventions. One of them is an efficient automobile, hybrid car, but we were advised that the hybrid car would not work for a, b and c reasons and those were the very least of our worries because the car worked

beautifully and despite all of those imagined reasons. So we questioned whether that invention evaluation system is working—the car system is working as well as anticipated.

The procurement regulations as established at highest levels are excellent although they need to be simplified and updated. The allowable profit margins need to be increased in proportion to inflation rates. Interest charged to us by banks and dividends or stock growth have to run about 3 percent above the inflation rate or we cannot obtain the loans or investment capital we need to buy new facilities, inventory or equipment as needed to stay efficient in production or to develop new products. The proposed Federal Acquisition Reform Act, S.5, appears to have many good features, but needs major rework at the detail level. Our concern is that we might lose many of the good features of the existing system.

The Defense Acquisition Circular Number 76–73 provides important guidance to improve profit potential and permit capital growth. We favor proceeding with it in the direction shown by that circular. The Vinson-Trammel Act is obsolete and should be repealed in view of other acquisition policies and procedures providing adequate protection against excess profits. The broadening of the Service Contract Act of 1965, as recommended by the Department of Labor should be avoided. That broadening in the subcontract area simply would keep many companies, such as our's, from selling equipment to the Government or to their prime services contractor. The entire act should, therefore, be reviewed with a view to eliminating objectionable features.

Excessive paperwork, reporting and auditing should be eliminated. Every day our company is required to fill in more and more forms, most of which are worthless on their face and duplicate information already available to the Government. We are audited by many different organizations when one Government auditor, plus an audit by our certified public accountant, should be sufficient for most of the purposes.

Obtaining information from the Government is still a problem although it has improved somewhat. Within the past week we made an earnest effort to obtain certain standards referenced by a procurement document and were unable to prepare a response to the procurement request since we could not obtain a copy of the required standard, even after many repeated telephone calls and a complete circle of the events.

Mr. NELSON. You still don't have it?

Mr. IVEY. We were never able to find anybody who would send us one.

Mr. NELSON. All right. Call my Orlando office and we will get it for you.

Mr. IVEY. Thank you, sir.

We also believe that interest paid by a company, as to a bank, should be an allowable business expense on Government contracts. Bonding requirements should be changed or eliminated since they waste dollars and tie up collateral that could be put to better use. The bonding company's criteria also tends to oppose the use of the S.B.A. If you have an S.B.A. loan, the bonding company tends to think that you are in a pretty shaky state of affairs.

On Government payments only 85 percent of the cost is paid in a progress payment. In addition, interest payments are not considered

as valid, business operating expenses. They are considered to be included in the region of a fee. When fees are limited to like 15 percent, those fees are not even big enough to pay interest payments in most cases.

We recommend payment of 100 percent of the cost up to the time of each progress payment and, in the case of many R. & D. programs, start off with a 20- or 25-percent advanced payment to avoid interest costs. We also need larger fees for the high risk of R. & D. programs; and due to the fact that currently the fee actually includes things like the interest that we owe to the bank, when we are only paid 85 percent of the cost and do not have a prorated share of the fee on those things, we are going in debt at a great rate any time we accept a Government contract, even with progress payments.

Small technology set-asides should be increased to include a fair share of high technology programs. We have found that many set-asides are bid by huge companies through small business fronts that give 20 percent of the work to the front company. Other set-asides for small businesses are funded for trivial prices as compared with the contract amount for similar programs to large companies; and in the back-up data I brought with me I give an illustration of, for an example, where the same type of work, but in a separate procurement program, cost 140 times as much when it was done by a big company.

Slowness of Government payments is frequently a problem, but most of that problem would go away if other agencies worked as efficiently as the Defense Contract Payment office in Atlanta. We feel their work has set an example that should be followed by all other offices. Quicker turnover of funds is extremely important to small businesses that are usually very short of cash. These companies can do an excellent job in high technology innovative work, but having their operating cash tied up in governmental paperwork delays does nobody any good. It doesn't save the Government any money and makes it very difficult for small businesses to survive. Advance payments should be made for small R. & D. programs.

In the area of inventions, one suggestion that we ask is for some giant computer in the Government to simply send an inventor the names of some reports by people who have already done work in his area. He can then read those things and is way ahead on developing his idea and he hasn't spent any money and it hasn't cost the Government more than 2 minutes of computer time to print him out what is going on there.

Another possibility is for somebody in the Government to screen the idea, decide what are some of the key problems that might occur, tell the inventor: "Why don't you look at those particular things," like where does the energy come from that you are using on this great invention, and the guy will say: "Well, it is a tiny, little battery that will drive that car down the road for 100 miles," and, eventually, he will see that that little thing won't work.

In the interest of responding to your request to summarize some of the things, I would like to simply mention that supplementary information, that I won't cover in detail, includes specifics on the excessive paperwork and repetitive or excessive auditing situations, additional comments on inflation, ideas for balancing the budget, ideas

on how small business can help improve productivity, how the public, in general, can conserve petroleum expenditures at least in the gasoline and diesel fuel area to the extent of about 20 percent. I have multiple copies of that. I have additionally a two-page writeup on productivity. In the parking lot I have a demonstrator or test vehicle which we have used to demonstrate improved driving procedures and minor car changes that let us get 63 miles per gallon in city traffic, driving that vehicle in the way that we recommend it to be driven. This is not a brand new invention. It is simply a better way to drive existing automobiles mass produced in the United States.

Mr. LLOYD. When you say "drive," do you mean steer them or do you mean "drive"—the power, transmission?

Mr. IVEY. How the driving individual would handle his braking, accelerating——

Mr. LLOYD [interposing]. Driving habits.

Mr. IVEY. Driving habits. Yes, sir.

But we are saying that, in the case of all our professional driving operations, we can attain 50 percent better than the EPA city rating. The average driver does not do as well as the EPA rating, as you know.

Mr. LLOYD. In other words, if you would train me, I would be a more economical driver, using the equipment that I have now. I do not have to make any mechanical changes.

Is that correct?

Mr. IVEY. Well, yes. You can do considerably better just driving it differently, without making mechanical changes. We have made certain minor changes to this vehicle, which are in addition to changes you would get just by technique.

Now, for example, we considered how automobiles were designed—why it was so hard to push them down the road, because friction in the engine and so forth uses up fuel. So we analyzed the friction sources; we changed the kind of oil it uses and other things like that. We used synthetic oil in there because it only has one-third of the friction of multiple viscocity oil that is frequently recommended by the Department of Energy.

Mr. LLOYD. Mr. Nelson?

Mr. NELSON. Mr. Chairman, I am familiar with each of these gentlemen and their operation, and each, in their own right, has pioneered in a lot of innovation. As a matter of fact, what Reese was just telling me, I now feel so guilty whenever I am driving anyplace and I have to accelerate from a light or I don't judge properly when that light up there is going to change and I have to use my brakes, he has got me feeling guilty, but that is the way—that is part of the pattern of the driving habits that will save so much energy that he is pointing out.

Donn Searle's outfit has a major breakthrough in a citrus byproduct that could be the answer to fire ants, which are a considerable pest all over the southern United States, and, although he pointed out a lot of deficiencies in the Government, it was through initial interest in the USDA that they were able to get initial funds to do some of the financing of their—already what they had broken through and had demonstrated locally here that it works.

And George's outfit has an idea that ultimately could be the major solution to the energy crisis in developing harnessing the temperature differential in the oceans and producing electrical energy from that.

I just want to make one announcement, because I know our time here is very short. As an appropriate followup to this, you all may be interested that the Secretary of Commerce of the United States is coming here as my guest in about 2 weeks. He will be my guest on the monthly television program that we have called: "Dialogue with Bill Nelson." It is going to be filmed on March 6, which is a Thursday, and our time right now is that it is going to be filmed approximately at 1 p.m. in the Channel 9 studios, in downtown Orlando. As you know, my format is to have audience participation, and you all are welcome, and I invite you to it, and I invite you to participate with your questions to Secretary of Commerce.

Mr. LLOYD. I don't have any further questions. I really do have a lot of questions, but, at this point, in the interest of time, we will move to the next panel. I thank all three of you for joining us today. We appreciate your coming.

[The prepared statement of Mr. Ivey follows:]

WISCO

WOOD-IVEY SYSTEMS CORPORATION

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WOOD-IVEY SYSTEMS CORPORATION (WISCO)

A BRIEF SUMMARY

WHAT IS WISCO?

WISCO is a High-Technology Small Business incorporated in Florida. In 14 years of operation it has successfully handled over 100 prime contracts from Government, industry, and the medical profession. Twice WISCO has been selected by the U. S. Government as the "Small Business Prime Contractor of the Year" from our section of the country.

WHAT DOES WISCO DO?

WISCO invents, designs, develops, and manufactures sophisticated equipment that is too difficult for most small businesses to build, but is not needed in big enough dollar amounts to attract large companies. WISCO has an extremely strong engineering and scientific capability that covers many fields. Example of things that WISCO has accomplished or is currently doing include:

OIL CONTROL SYSTEMS:

a. Designs and builds electrical/electronic control systems that control and monitor the flow of crude oil being pumped into or out of United States Strategic Petroleum Reserve Sites in Louisiana and Texas. The equipment provides supervisory control over large pipelines, 1000 horsepower pumps, motorized valves, etc as needed to pump water, brine, or oil as necessary to leach out new salt caverns, fill them with reserve oil, and recover the oil as necessary. The equipment controls the pumping of hundreds of thousands of barrels of oil per day. This work is for the U. S. Department of Energy.

AIRCRAFT TRACKING SYSTEMS:

b. Designs and builds aircraft tracking systems that are used by the U. S. Air Force for training purposes. The WISCO-built radio transmitters (beacons) for the system are mounted in fighter aircraft, the missiles they shoot, and the airborne targets at which they shoot. The beacons transmit continually during training shots. WISCO ground-based equipment listens for the "beeps" from the transmitters, and computes the trajectory of the maneuvering fighter aircraft, the missile, and the target. From as far away as 100 miles the ground-based equipment can very accurately determine such things as the distance that the missile misses the target.

MEDICAL EQUIPMENT:

c. Because of its reputation for reliability and innovation in high technology areas, WISCO was requested by a nationally recognized physician to design, develop and produce some new medical electronic equipment for 50 medical facilities. WISCO has now delivered that equipment and the users are well pleased with it. Additionally, WISCO equipment has been ordered. One of the types of medical equipment made by WISCO transmits electroencephalograph (brain wave) data over telephone lines from any of the instrumented locations and displays the brain waves at the consulting physician's location. Previously excessive mailing delays were involved in sending the data, but the advent of the WISCO equipment eliminated those delays, and made immediate diagnosis and consulting possible over great distances.

WHO STARTED WISCO?

WISCO was organized by three aerospace engineers with senior experience in research, systems engineering, and high technology management in Government laboratories and industry. The President, Senior Vice President and, Vice President/Operations are respectively: Rabun M. Wood, H. Reese Ivey, and Albert G. Lutz. Resumes are being transmitted separately for 17 of the most experienced scientific and engineering personnel. The total number of personnel employed by WISCO is currently about 75, and the total level of business is about $2,500,000 per year.

The initial financing was from a combination of personal resources of the founders and a line of credit from a large company. Soon the large company encountered financial problems and we paid it back and changed to using bank loans, an SBA guarantee, assignment of receivables, etc. As we grew we paid off the SBA loan and obtained more capital from our Employee Stock Ownership Plan (ESOP). Today all of our long term employees over 18 years of age own some company stock, and the company is 98% owned by the present and previous employees and their families. We also have a sizeable unsecured line of credit with our bank. Nevertheless, like many small high-technology businesses, we always need more contracts and more cash.

EFFECT OF GOVERNMENT POLICIES

We have an excellent capability to accomplish high technology programs directly for the Government and for the nation as a whole. Nevertheless, we feel that Government policies are pushing us away from doing business with the Government specifically, and are making it very difficult in general for small technology companies to generate capital, build more jobs, develop new products, buy more efficient tooling, improve productivity, do the other things that are basic to improving the standard of living of the United States and the world.

PERSPECTIVES OF THE PROBLEM

Many of the problems discussed here as affecting small technology companies are the same as those affecting big companies except that they hit small companies harder. The overall Government perspective that profit is bad is wrecking the free enterprise system. Free enterprise and the profit incentive is the basic reason that the United States in the past 200 years has made more goods than all of the rest of the world in all past history.

Except in the efficiency of food production our technology lead has slipped dreadfully. It is our understanding that this year Japan will build more automobiles than the United States; United States Steel is asking Japan to help it improve its productivity; Ford Motor Company cancelled a $140,000,000 contract with the Department of Energy for developing the Stirling engine cycle because all of their engineering time is needed to comply with Government regulations; Chrysler is cutting $1.5 billion from its product development programs through 1985 because of cash shortages related to low productivity and obsolescence of production equipment. We have frittered away the 5 year lead we had in building nuclear power plants.

TECHNOLOGY CAN HELP

Full application of cost-effective technology can solve or greatly assist our nation in many ways, solving many more problems than it generates. There may not be any other realistic way to clean up the environment, solve the energy problems, improve the standard of living, relieve inflation through improved productivity, etc. But we need a Governmental climate that will nurture and assist innovative high technology companies. During the past 10 years most patents and innovations have been made by small businesses, and most new jobs have been generated by small business. But today we are suppressing innovations, and every month the national productivity index is falling as United States equipment and designs grow more obsolete, and as energy and natural resource shortages are not offset by technological advances. The trade deficit caused by oil imports alone may reach $80,000,000,000 this year, but the nation is doing very little to conserve energy or generate new near term energy sources.

SPECIFIC RECOMMENDATIONS

We as a small free-enterprise business oppose increases in Government, and the associated regulations; however, only the Congress can remove many of the current obstacles to desperately needed healthy advances in technology. Some of the areas that need to be improved are these:

1. Total taxes (federal, state and local) need to be decreased.

2. Inflation needs to be controlled by increasing productivity, and decreasing Government deficit spending.

3. Productivity needs to be improved by encouraging the generation of capital, and its investment in new production equipment, and in more competitive new efficient products. Increased profit margins on innovative Government

contracts for difficult research and high technology products should be of a cost reimbursement type rather than firm fixed price.

4. The current mass of laws, codes, and regulations is so great as to overwhelm any small business capability to understand or comply with all of the requirements, or to afford legal counsel to explain them all to us. A strong effort is warranted to decrease and simplify the great mass of laws, codes, and regulations that affect small business. There is no way we can comply with all existing requirements. We were once fined $65.00 by OSHA for not posting a typed notice saying that we had a perfect safety record for a year.

5. The policies related to patents and inventions need to be changed because they deter inventions, development of new products, and pull new ideas away from the motivated inventors and put them in Government archives where nobody will ever develop them.

6. Procurement regulations as established at the highest levels are excellent although they need to be simplified and updated. The allowable profit margins need to be increased in proportion to inflation rates. Interest charged to us by banks, and dividends or stock growth have to run about 3% above the inflation rate or we cannot obtain the loans or investment capital we need to buy new facilities, inventory, or equipment as needed to stay efficient in production or to develop new products. The proposed "Federal Acquisition Reform Act",S.5 appears to have good features but needs major rework at the detail level. Defense Acquisition Circular Number 76-73 provides important guidance to improve profit potential and permit capital growth. The Vinson Trammel Act is obsolete and should be repealed in view of other acquisition policies and procedures providing adequate protection against excess profits. The broadening of the Service Contract Act of 1965 as recommended by the Department of Labor should be avoided. That broadening in the subcontract area simply would keep many companies from selling equipment to the Government or their prime services contractor. The entire Act should be reviewed with a view to eliminating it as soon as feasible. The Wage Determination process should be reworked or eliminated as being anti-competitive and inflationary.

7. Excessive paperwork, reporting, and auditing should be eliminated. Every day our company is required to fill in more and more forms, most of which are worthless on their face and duplicate information already available to the Government. We are audited by many different organizations when one Government auditor, plus an audit by our Certified Public Accountant should be sufficient.

8. Obtaining information from the Government is still a problem although it has improved somewhat. Within the past week we made an earnest effort to obtain certain Standards referenced by a procurement document, and were unable to prepare a response to the procurement request since we could not obtain a copy of the required Standard.

WOOD-IVEY SYSTEMS CORPORATION

9. We also believe that interest paid by a company (as to a bank) should be an allowable business expense on Government Contracts. Bonding requirements should be changed or eliminated since they waste dollars and tie up collateral that could be put to better use.

10. "Small business set asides" should be increased to include a fair share of high technology programs. We have found that many set-asides are bid by huge companies through small business "fronts" that give 20% of the work to the front company. Other set-asides for small businesses are funded for trivial prices as compared with the contract amount for similar programs to large companies.

11. Slowness of Government payments is frequently a problem, but most of that problem would go away if other agencies worked as efficiently as the Defense Contract payment office in Atlanta. Quicker turnover of funds is extremely important to small businesses that are usually very short of cash. These companies can do an excellent job in high technology innovative work, but having their operating cash tied up in Governmental paperwork delays does nobody any good.

The above mentioned problem areas include only a fraction of the policies that deter invention, innovation, and improved productivity.

We will be glad to discuss any area in more depth.

WOOD-IVEY SYSTEMS CORPORATION

H. Reese Ivey
Vice President

Mr. NELSON. Mr. Chairman, while we are moving to the next panel, let me remind you all that Mr. Chairman, Lloyd, and myself, and the staff are specifically staying here to have lunch with you, on a dutch-treat basis, to avail ourselves and you of the opportunity for further exchange on these ideas. Steve Lewis is taking the reservations for lunch.

Mr. LLOYD. Thank you very much.

In the interest of, you know, fairness and all of that, we are going to start left to right. We have been going right to left. So we will start with Mr. Thornton, who is the Director of the Technology Applications Center.

You may paraphrase your statement. I would remind you we are running short of time, and I really do have some questions. Cut it down, if you can, so that we can have an exchange.

Mr. Thornton.

STATEMENT OF J. RONALD THORNTON

Mr. THORNTON. Yes, sir.

Thank you, Mr. Chairman. It is a pleasure for me to be here today and I think the first comment I would like to make is that we have heard a lot of problems today—of course, we do have many of those—and we have heard about a growing need for solutions to those problems.

I think that the programs that we represent and will discuss with you today are a part of the solution to the overall problem, and that is the most positive way that I can say it. I firmly believe this and in our daily operations we try to perform our duties in that manner.

I come from a long, fairly extensive R. & D. background, aerospace as well as private R. & D. I spent some time with the NASA technology transfer program. So that gives me the opportunity to talk with you on a fairly broad basis. I can assure that the program that STAC represents, State Technology Applications Center, which is sponsored by NASA, the State university system here in Florida and the private user, the client that we represent, is, in this State, an innovation. The reason it is an innovation in our opinion is that it takes information that has been accumulated and indexed over the years and stored in computers and makes it available to the potential user at essentially the local level.

So what I am going to say now is that we are talking about primarily a marketing problem. I will call it awareness in some audiences, but let's be candid—it is a marketing problem, and—much of the work that I do and our job is to make sure that the user can find out about it. If he doesn't know about it, he obviously can't use it.

The way we make it available, essentially on the local level, is to use the full State university system here in Florida that is composed of nine universities. We work through the colleges of engineering and we work through the colleges of business, and that pretty well encompasses the gamut of information that has been incorporated at least for the clients that we are trying to reach and, especially, the high technology, small businesses.

The colleges of engineering, in four locations, and the college of business, at two universities, house our area offices and we have faculty members who work the problems.

So the key to our approach is this. We have over 150 different computerized data bases available and we can retrieve information on almost any subject. After receiving the computer output, we work with the client to determine the appropriate items relating to the problem. We then use the State university library system to retrieve the desired documents in hard copy form. These documents are then delivered to the client. If the client is interested in additional help, then we can make available to him faculty members through the State university system, either STAC personnel or others on a private consulting basis.

Now, I will point out and I will be very specific on this, we do not consult. We are not in competition with consulting engineers and so forth. They are one of our biggest clients it turns out in the use of high technology. We assist in information and data collection, but we will not help them make a decision. Anything we can do up to that point, we will do it.

So we believe that in having the availability of the information, through all these different data bases, the document retrieval, and faculty help or even independent consulting help, that we have achieved innovation. We are one of two States with this type program and we are concentrating on business and industry in Florida.

The next item of discussion that is important in this hearing is: How do we do it? Stated simply, it is a marketing problem.

We have a regional structure. Each STAC area office located at a State university has its set of counties within which they work. In order to find out how we can best serve the client, first of all we have to find out what they think of our program. STAC is in its fourth year and about a year ago a survey of client attitudes was conducted. I am sure you all are very familiar with attitude surveys—opinion polls—and will relate to the results we obtained from a polling of our clients. The numbers I will read to you I think are pretty impressive. The results show that 72 percent of the clients interviewed—72 percent thought that STAC was a meaningful help, 85 percent said they got the service they expected, 88 percent said the price was reasonable, 35 percent said they could have used more detailed help, either through consultants or whatever, 78 percent said it should be within a university system, primarily for the reasons that I have just given you, 87 percent said they would use the service again and 65 percent said they heard about the program through a personal contact.

Now, these numbers tell one very clear message. The service is needed. It is accepted. It is at a reasonable price. If we could get the word out to business people here in Florida, they would use it; and so that is the main thrust of our approach today.

Before one can reach the business people, though, we have to know where the businesses are and what are their products and/or services. We conduct marketing research and analysis to determine the makeup of each region.

Mr. LLOYD. Let me interrupt you there.

Mr. Thornton, would you be able to help Mr. Autry?

I don't know if you heard his testimony this morning.

Mr. THORNTON. Yes, sir. I heard it.

Mr. LLOYD. Would you be of value to him? I mean, are you somebody that he ought to be contacting, in your opinion?

Mr. THORNTON. Yes, sir. I don't want to appear overconfident about this, but we believe that any business person, especially in high technology, needing information about a specific problem, except in the case of raising money, i.e., a venture capital problem, can benefit from utilizing the services offered by STAC.

Mr. LLOYD. Of course you recognize, Mr. Thornton, that in all of this, any businessman, the major consideration at all times is either cash flow or cash acquisition for future development. That is automatic. Nobody is in business that does not face that problem. That is first.

Then, second, I would say, reflecting on my own experience, and from what I have heard over the last couple of months in our previous hearings is how somebody like Mr. Autry can magnify the effectiveness of his own organization, both manpower and equipment. So he would come to you for some problem solving, and to help him improve his base of knowledge without having had the knowledge in the first place.

Mr. THORNTON. Yes, sir.

Mr. LLOYD. He could just come in and punch your computer and start talking about—well, I need a certain type of raw material, I need sophisticated metals, I need machinery that will automate to this level, et cetera.

Is that true?

Mr. THORNTON. Yes, sir.

Now, the other important thing to a businessman is we can't take forever. We have to provide a quality service and we have to do it in the shortest time possible.

Mr. LLOYD. Always with the consideration of how he is going to pay for that over and above just meeting his pay requirements for his employees.

Mr. THORNTON. We found that if we work the problem we can react to a businessman's need with citation lists or abstract lists and with some documents in about a month's time. That might sound like a long time to you, but in about a month's time we can have information in his hands that he can readily use.

So the approach we taken is to identify the potential user and in preparation for this hearing today, I can tell you that in the State of Florida there are about 190,000 to 200,000 overall businesses—that includes everything—and in terms of the people that might use the service, we have to factor that down to some reasonable number, and I can't give you an adjusted figure. But in terms of high technology, we did search the computer data base and we found out that, with some reasonable selection, taking companies of $500,000 gross sales and with at least 20 employees, there are about 2,200 in the State of Florida. Maybe there are a total of 5,000. In the 3 years of existence of STAC we have done about 800 jobs, which may not sound like a lot, but we are a fairly small program still and we are trying to grow. But about 60 percent of those or so have been in the high technology area.

Mr. LLOYD. Let me ask you another question.

On the presumption that a small businessman—again, my friend, Mr. Autry, you don't mind me using you as an example?

Mr. AUTRY. Not at all. Help yourself.

Mr. LLOYD. Assume he has a small computer which handles his supply of parts, payroll, and some other things. All of a sudden he decides he wants to come to you for service. Can he interface with your computer provided the software matches?

Mr. THORNTON [interposing]. No, sir.

Mr. LLOYD. It doesn't come on line with your staff.

Mr. THORNTON. We strictly give him a printout.

Mr. LLOYD. And that is it?

Mr. THORNTON. Well, that is right. We have the NASA data base, together with all the other technological information. We do a lot in the energy area. We have access to the Department of Energy data base, which is very extensive. Believe it or not, the commercial world is the biggest provider of data base on all subjects and we interface them all.

Mr. LLOYD. Well, for instance, if he wants to do business with you, what would he do? Would he have—set up a small terminal? Could he do it that way so you can feed him that service? I am just trying to get the methodology.

Mr. THORNTON. No.

Mr. Autry will receive a call from us and one of our representatives will sit down with him.

Mr. LLOYD. I understand that.

What I am saying to you is I am a little business. I have a little plant over here in plastic extrusions and I want to get into the aerospace industry with that, and I am significant enough, not very big—I have my 10 employees, et cetera. If I have the terminal there, would I read out from your terminal, is that the way you would give me the information?

Mr. THORNTON. No, sir.

Mr. LLOYD. Or would you print it out and then mail it to me?

Mr. THORNTON. Print it out and mail it.

Mr. LLOYD. Why?

Mr. THORNTON. We are not sophisticated enough to do that.

Mr. LLOYD. That is fine. OK.

Mr. THORNTON. But, in any event, whether or not we can help a client or business person is solely dependent on the nature of his problems. If it is information retrieval, in need of knowledge to help build new products, perfect an existing product or process or if he needs marketing information to market his product, that is where we can help him. We don't own any data base. We use other people's data bases—NASA's, DOE's, private data bases—and we are simply users. So, in that sense, we have a full-time librarian that searches the computer every day, retrieves information; then our area offices make sure that the client gets information or whatever else we can help him with.

But, in terms of high technology, we know, at least a reasonable guess would be, that there are approximately about 5,000 high technology concerns in the small business category in the State of Florida, and we haven't scratched the surface.

The way we are trying to do it, in terms of awareness in marketing, is that we can't afford the paid advertising luxuries in newspapers, and business magazines, but we are trying to get free advertising, through newspaper stories, and business magazines such as Florida Trend Magazine, and articles in small newsletters of organizations that either need technology, or represent technological groups. We are beginning to pick up some recognition there; at least people are beginning to respond to us. Direct mail and trade shows such as the State of Florida Fair and various trade expos are a part of our advertising program. Those are the ways we are trying to get business to be more aware of us.

Now I will be candid with you and talk about Government bureaucracy. The universities are not without their own; and I have been in both now and I can assure you that in many ways it is just as frustrating in dealing with universities bureaucracy as it is in dealing with the Federal Government Bureaucracy. Even with that, we think that we are cutting through the redtape and reaching farther into the business community then before. I say that because we have had a significant increase in our activities in the past few months and it should continue to grow.

I would say to any businessman here today or that would, perhaps, hear about us, I am telling you a very positive story because I believe it and I know that technology transfer is critical to the solution of problems related to productivity and innovation. If we can't satisfy the client, we will work with him until we have exhausted all of our possibilities. We are not perfect, but at least we would like to have the opportunity to do that.

Mr. LLOYD. Well, I am sure that Mr. Nelson will also let his folks know and, of course, you work all over Florida.

Mr. THORNTON. Yes, sir.

Mr. LLOYD. And it would appear to me in getting this information, I would assume you contacted the rest of your congressional delegation and given them a briefing on your capacity.

Mr. THORNTON. No, sir. That is one thing we have not done.

Mr. LLOYD. Well, we will do it for you.

Mr. THORNTON. Of course, through NASA headquarters, I know that members of the Science and Technology Committee and subcommittees certainly hear about us. We have taken STAC to the State government, to the Governor's office, and the State Department of Commerce. We are interested in developing a referral service in State government and their activities with business people. If they will refer potential clients to us, then we will work the problem from that point forward.

Mr. NELSON. Mr. Chairman, let me just ask you, if you could write a little newscript and I think we could help you. It would be excellent for us to put that in our newsletter that goes out.

Mr. THORNTON. I would be happy to.

Mr. NELSON. And that would be an additional way of trying to spread your message.

Mr. THORNTON. And I have brochures over here on the tables that give telephone numbers, addresses at the local level or regional level.

Mr. LLOYD. Can we move on here?

Mr. THORNTON. Yes, sir.

Just, primarily, to talk about the kind of problems that we have solved. It covers the entire gamut of technological problems—computer software, all kinds of energy and environmental problems. For example, we had a lumber company owner over in Tampa who wanted to take the sawdust that they get from all their lumber mills and turn that into alcohol to mix with diesel fuel and, therefore, save fuel costs.

Mr. LLOYD. Were they able to do that?

Mr. THORNTON. Yes, sir. They took the information that we retrieved for them and then, independent of us, they set up a research program with the university and processed it. I have seen about that much of the alcohol. It is not in production yet, but they did it.

A frustration I have is—and this is another example—why can't we use alcohol in home-heating systems? We use it in automobiles. What is wrong with using grain—alcohol from our grain for home heating? We searched the computers and all the millions of documents and would you believe we found one. So we want to go back to the Energy Department and say: "Why can't we do something about this problem?" That is one that really surprised me and also disturbed me.

Mr. LLOYD. I have no way of knowing, but it takes so much energy to generate the alcohol, what kind of efficiency is there once you develop a product, from a space-heating point of view? You know, alcohol is extremely transportable, but it is not—as efficient, energy wise, as other fuels, is it? I don't know.

Mr. THORNTON. I can't answer that question.

Mr. LLOYD. I think you might have to review that.

Mr. THORNTON. OK.

Let me just conclude by saying that most of what we think are important avenues of improving productivity and innovation have already been discussed. What we would request and what we would like out of this hearing is for more small business people in the State to contact us, challenge us to help and we will do our dead level best.

This last point is philosophical, and I think it has been discussed today in many respects. I think one of our biggest problems is attitude. I spent a couple of years in Washington and I know what the attitude is, and it is very easy to forget what the people are like back home. You gentlemen deal with that situation everyday. I think it would be good if we could develop an attitude in this country, especially coming out of Washington, D.C., that it is OK to make a profit. If the bureaucrats in Washington would say: "It is OK to make a profit" and work this attitude through the legislation and regulations, I think a lot of our problems would go away. We have got to start someplace.

[The prepared statement of Mr. Thornton follows:]

NASA-STATE OF FLORIDA APPROACH TO TECHNOLOGY TRANSFER

Submitted to

INVESTIGATION AND OVERSIGHT SUBCOMMITTEE

SCIENCE AND TECHNOLOGY COMMITTEE

U.S. HOUSE OF REPRESENTATIVES

Washington, D.C.

Hearing On

SMALL, HIGH TECHNOLOGY FIRMS AND INNOVATION

February 23, 1980

Submitted by

NASA-FLORIDA STATE TECHNOLOGY APPLICATIONS CENTER (STAC)

J. Ronald Thornton, Director

February 19, 1980

NASA-STATE OF FLORIDA APPROACH TO TECHNOLOGY TRANSFER

Table of Contents

I. INTRODUCTION

In operation since January of 1977, the NASA-Florida State Technology Applications Center (STAC) is jointly sponsored by the National Aeronautics and Space Administration and the State University System (SUS) of Florida, and is operated by the SUS.

The primary mission of STAC is to facilitate technology transfer to Florida business, industry and government by providing information retrieval services and technical assistance. STAC can retrieve information from over 150 different computerized data bases, including both NASA and Department of Energy (DOE) RECONs; and has placed special emphasis on technological problems.

STAC is a part of a national information dissemination network established during the past several years by NASA. The NASA-Florida STAC is different from the other centers as it operates within the state of Florida and helping business and industry is its primary focus. The other NASA-sponsored centers either operate in a multi-state region or work predominantly with the public sector. STAC was established as an "experiment" in an attempt to alleviate some of the difficulties associated with operating a multi-state regional center. While it remains in an "experimental" status, the program has been well received by Florida and today the program is growing very rapidly.

The STAC approach is an innovation in technology transfer. First, it provides a delivery system for the vast amounts of information available in computerized data bases to business and industry users at essentially the local level. Today, there are six state universities involved, but eventually the entire SUS group of nine universities could be participants. No other NASA information dissemination center provides this level of market penetration. Next, the document retrieval capabilities within the SUS library system are extensive and the STAC client usually gets a portion of the reports and documents needed within a few days. Further, if additional assistance is required, STAC can place the client in direct contact with either a faculty member or outside consultant with expertise in the desired field.

II. STAC ORGANIZATION

The STAC is organized to utilize the wide-spread facilities of the SUS for the purpose of identifying the informational needs of the various users in Florida, locating the needed information, and placing it in their hands. Resource agencies utilized include SUS colleges of engineering and business; the library system of the SUS, especially that of the University of Florida; the financial and general capabilities of the Florida Engineering and Industrial Experiment Station (EIES); and the regional business development agencies of the Florida Department of Commerce and the federal Small Business Administration. The participating SUS universities include the University of Florida, the University of South Florida, the University of Central Florida,

the University of North Florida, Florida Atlantic University, and the University of West Florida.

A. ADVISORY BOARD

The SUS operates the STAC as a statewide service center and an Advisory Board is the governing body. The STAC Advisory Board is made up of representatives from each of the participating institutions and organizations. The Advisory Board also includes an ex officio member from the Board of Regents (BOR) office. The basic function of the Advisory Board is to provide the director of STAC and the President of the Host University, the University of Florida, with recommendations on policy and procedural matters, including courses of action designed to resolve administrative, budget, and management problems. The Advisory Board mechnaism also ensures the system-wide and statewide perspective that is appropriate and necessary for the important task of facilitating the flow of technical information to industry throughout Florida.

The President of the Host University is responsible for the administration of the STAC and the submission to the Chancellor's office of the request for the necessary state funds for the operation of STAC.

B. STAC OPERATIONS

The program is administered by the STAC Director. This includes coordination of the field offices' efforts and the library work, the collection of programmatic data and preparation of reports, management of budget and expenditures, evaluation of benefits to users, implementation of state-wide marketing efforts, and coordination with sponsors and cooperating agencies.

Field operations are conducted by the assigned staff of participating SUS institutions, especially the STAC Area Directors. The map in Figure 1 shows the regional structure of STAC. The Area Directors are faculty members of either the College of Engineering or College of Business at the participating SUS universities. Additional personnel assigned to STAC are called field representatives. The field representative is both salesman and technical assistant either directly or in conjuction with other staff, depending upon individual capability and user needs. Engineering staff members serve not only as direct input sources to the STAC Library Center, but also as technical advisors to field representatives with non-technical backgrounds. All field representatives develop and maintain communication with users, both in the entry of search questions and the document selection and delivery process in information transfer.

III. STAC SERVICES

The services offered by STAC are concentrated in the areas of computerized data base searches and document retrieval. However, during the past few months, client interest has increased to the point that the other services are now significant. The services provided by STAC have been defined as follows:

1. Retrospective Search
2. Current Awareness Search

} Computerized data base search

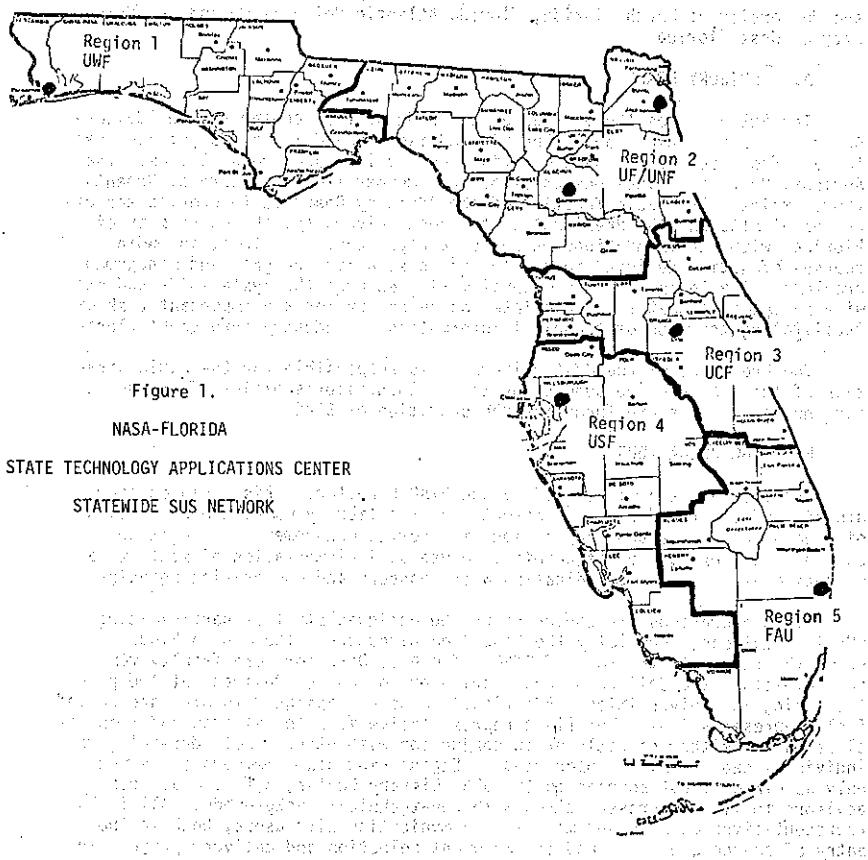

Figure 1.

NASA-FLORIDA

STATE TECHNOLOGY APPLICATIONS CENTER

STATEWIDE SUS NETWORK

3. Manual Search
4. Documents
5. Technical Assistance

A job for a client can consist of either any one or any combination of these services. Usually the client will require the retrospective search with documents, but a considerable amount of manual searching is required on jobs involving information that has not yet been computerized.

STAC services are offered to clients in one of two ways. The first and most predominant way is simply to contract with a client to conduct a search on a single problem area. This will remain the basic approach as Florida business is primarily small to medium in size. These businesses usually need to solve only one problem at a time.

For the larger, more sophisticated user, STAC offers a subscription for services rendered. A subscription means that a firm will contract with STAC to handle several problems during a period of one year for a fixed price. Currently each subscription is negotiated on an individual basis depending on the needs of the client.

IV. MARKETING AND AWARENESS

A major reorganization of the STAC marketing effort was conducted during 1979. The stimulus was derived from a survey of clients in early 1979 by the Denver Research Institute. The survey provided insight into client attitudes that indicated the need for marketing changes.

A representative summary of client attitudes are listed in Table 1.

Table 1 - Client Attitudes Show Strong Interest in STAC.

1. 72% received meaningful help.
2. 85% think service is what they expected.
3. 88% think price is reasonable.
4. 35% would use more detailed help.
5. 78% think STAC should be at University.
6. 87% would use STAC again.
7. 65% heard of STAC via personal contact.

These results show strong interest and need for a STAC program in Florida. But the major conclusion drawn was that more people would use the STAC service if greater awareness of the program existed. Since 65% of the clients heard about STAC through personal contact, a decision was made to focus marketing activities using this means of client contact.

In order to accommodate this need, the decision was made to use the STAC director as the marketing manager until such time as the program could afford a full time marketing manager. Further, more marketing analysis will be conducted on an area basis to streamline the client prospecting methods.

Also, in an attempt to optimize the business demographics in the given STAC areas, new area boundaries were drawn and are shown in Figure 1. The business level that exists in each area has been determined and is shown in Table II.

Table II. Florida's Business & Industry Base, 1979 Estimate

STAC Area	# of Employers	# of Counties	# of Industrial Areas
1	11,250	14	3
2	26,000	22	6
3	27,700	10	8
4	48,800	12	10
5	76,250	9	8
TOTALS	190,000	67	35

It is emphasized that the information in Table II reflects all Florida businesses and a significant number of these would never have a need to use STAC. But, this business distribution is very useful in determining the staffing required to work in each area.

Another important aspect of the marketing plan is to know in detail the types of business and industry in the state. Table III shows the Standard Industrial Code (SIC) distribution of business and industry throughout the state.

Table III. Florida's Diverse Business & Industry Base, 1979 Estimate

SIC Code	Business and Industry Area	# of Businesses	# of Total
01-09	Agriculture, Forestry, Fisheries	2,000	1.1
10-14	Mining	200	0.1
15-17	Construction	23,000	12.1
20-39	Manufacturing	14,000	7.4
40-49	Transportation, Communication Power and Energy	12,000	6.3
50-59	Wholesale and Retail Trade	65,000	34.6
60-67	Finance, Insurance, and Real Estate	22,000	11.6
70-89	Personal, Business, Health, Education, and Cultural Services	51,000	26.8
	Total	190,000	100

By comparing the types of businesses in which STAC clients are involved with the information in Table III, an assessment can be made as to which business areas STAC is servicing most effectively. This brief discussion of marketing analysis illustrates the approach used by STAC in an attempt to reach the largest number of Florida businesses.

A number of ways have been used to increase the general awareness of STAC by Florida business and industry. An informal referral approach is beginning to show results. Also, printed and electronic media, direct mail, and trade shows are utilized. The following list illustrates recent STAC activities in this regard.

A. Major news stories in January-February, 1980:

1. Florida Trend Magazine
2. Florida Kiplinger Letter
3. Florida Specifier

B. Articles in Newsletters/Magazines:

1. "Economic Trends" - Florida Department of Commerce (DOC)
2. "The Solar Collector" - Florida Solar Energy Center
3. "Run-off" - Water Resources Research Center
4. Several newspapers throughout the state

C. Direct Mail:

A comprehensive direct mail program is now underway to be conducted throughout the next several months. Approximately 10,000 brochures were mailed in late 1979.

D. Trade Shows:

STAC had exhibit booths at the following:

1. Trade Expo in Tampa
2. Florida State Fair in Tampa
3. Engineering Expo, University of South Florida, Tampa

V. STAC ACTIVITY IN HIGH TECHNOLOGY

Since the beginning of STAC operations in Florida, assistance to research and development, consulting engineering, and manufacturing firms has been a high priority. Approximately sixty percent of the 800 jobs accepted by STAC have involved the transfer of scientific and technological information to this group of business and industry.

In the beginning, the larger aerospace and high technology firms such as Honeywell, Motorola, Martin Marietta, Pratt and Whitney, and Harris Corporation were vital to STAC's success, but gradually STAC's user clientele has become small company oriented. Today, about seventy percent of all STAC

clients have 100 employees or less and at least sixty percent are involved in high technology applications.

To illustrate the types of problems STAC has encountered, the following list is a representative cross section of the needs of Florida's high technology users. Only the subject titles are listed as confidentiality of client activity is an important part of the STAC involvement.

1. Computer Software (Several Problems)
2. Waste and Pollution (Several Problems)
3. Digital Video and Signal Processing
4. Grain Elevator Dust Explosions
5. Pulverization of Coal
6. Water Conservation Methods
7. Chemical Composition of Oils
8. Refrigerants
9. Vibration and Shock Environments
10. Laser Coolant Design
11. Alcohol/Gasohol Production (Several Problems)
12. Reverse Osmosis
13. Aircraft Flow Field
14. Rocket Engine Design
15. Medical Electronics

Another important aspect of STAC assistance to Florida business is the emphasis on certain technological fields that affect us all. Two prominent examples are energy and the environment. Through the NASA and DOE data bases alone, STAC has helped solve fifty problems in these two areas alone within the past year. A few of these problems are listed for reference.

1. Electric Cars
2. Flue Gas Desulfurization
3. Methane Generation
4. Alcohol/Gasohol Production
5. Ocean Currents
6. Nuclear Reactor Safety
7. Energy Impact on Florida
8. Radioactive Wastes
9. Reprocessing Motor Oil
10. Fuel Sources and Availability
11. Ground Water Systems
12. Water Consumption
13. Water and Air Quality
14. Crevice Corrosion
15. Septic Tanks

Detailed information on these and other problems handled by STAC are available upon request.

VI. INNOVATION, PRODUCTIVITY, AND THE NATIONAL ECONOMY

The United States has a phenomenal technological base and efforts such as NASA's technology transfer program are beginning to make some impact on our economy. This is verified by economic benefit studies conducted by NASA to help assess their technology transfer activities. STAC has definitely helped Florida and the surface has barely been scratched. Any program to increase innovation and productivity must have effective technology transfer as a fundamental element in its design.

Just as fundamental to increased innovation and productivity is the success of small, high technology companies. It is increasingly difficult for the small businessman or entrepreneur to take a new idea and develop it into a viable product in today's economy. The technical, financial, and governmental problems associated with such a project are well known and failure can be predicted in a large number of cases. In existing companies, much of the capital that was used twenty years ago for research and development programs is now spent complying with governmental regulations, meeting higher production and marketing costs, and generally trying to stay in business. There is very little incentive for someone to start a new company except a strong desire and determination to succeed in the "free enterprise" marketplace.

The needs of small, high technology companies could be more easily met if technology transfer efforts are expanded, government regulations streamlined, and venture capital made more readily available. In the latter case, there are available sources of capital, but there is no way that a high technology company that must be considered highly speculative can compete with certain areas of the real estate market, certain mineral investments, and high quality diamonds and art. Additional technology transfer should emphasize the avoidance of duplication in product and process ideas, the exploitation of government patents that currently lie dormant, and increased utilization of information sources such as those offered by STAC. Governmental regulations cannot be streamlined until the federal government officials in all branches realize that it is unrealistic to apply common compliance procedures to companies of all types and sizes.

Mr. LLOYD. Thank you very much, Mr. Thornton.
Mr. Cerrato?

STATEMENT OF RAYMOND J. CERRATO

Mr. CERRATO. Mr. Chairman and members of the subcommittee, it is a pleasure and an honor to be here today to tell you about NASA's activities in working with and assisting the business community, State and local government, and educational institutions in our mutual quest to acquire technology.

NASA's involvement with the business and university communities has a direct influence on the accomplishment of its primary functions which are space exploration, aeronautics and space research and development, and space applications.

In the area of research and development, our primary concern is to get the job done in the best and most cost effective way possible. This does include doing business with small and large high-technology companies as well as doing business with educational institutions, large, small, and also those with predominantly minority enrollment.

At KSC, for example, we have sponsored 47 research grants, from 1973 to date, with 10 minority institutions. I refer here to appendix I which identifies a total expenditure of $847,515 R. & D. dollars over a 7-year period.

In support of those research and technology projects which are within my area of responsibility at the Kennedy Space Center, we have sponsored at least six R. & D. contracts, from 1975 to date, with five small businesses. I refer here to appendix II which identifies a total of $50,472 research and development dollars over a 3-year period.

Activities involving technology transfer are in two categories. The first, the technology utilization program, is concerned with technology dissemination and with the transfer of nonaerospace related inventions and innovations to the private and public sectors. The second activity is concerned with developing the capabilities in various user organizations, including small businesses, to use space acquired data, and with creating awareness of the potential benefits to be derived from use of information extracted from remote sensing observations.

To assist in the accomplishment of the technology transfer activity, we, at the Kennedy Space Center, and throughout NASA, operate very closely with a very large network of organizations, and that includes the Federal Laboratories Consortium for Technology Transfer, of which there are 187 member laboratories, which includes the entire Department of Defense; also the State technology assistance programs, one in Florida and also in Kentucky, which Ron Thornton has just talked about, these are comprised of State universities and the State departments of commerce. We also operate with seven Industrial Application Centers; three Biomedical Application Teams; three Technology Applications Teams; the Computer Software Management and Information Center; the Scientific Technical Information Facility; the 10 NASA Field Centers and three Regional Remote Sensing Applications Centers. I refer here to appendix III.

In the past 2 years my office has responded to at least 46 inquiries from small businesses, seeking answers to technological problems and

this involves, on our part, telephone calls, visits either to us or us going to visit the small businesses, and also a great deal of correspondence. I refer here to appendix IV.

During 1979, for example, there were at least 2,600 inquires from all over the United States requesting technical support packages, sometimes referred to as TSP's, and this is on KSC innovations which are published in NASA tech briefs. I refer here to appendix V which lists examples of innovations receiving the most inquiries for techncal support packages.

Mr. Chairman, this concludes my statement. I have given you an abbreviated overview of KSC's R. & D. and technology transfer programs for which I am responsible. I have tried to highlight those areas of specific interest to the business community. I will be happy to answer any questions you may have.

Thank you.

[The prepared statement of Mr. Cerrato follows:]

HOLD FOR RELEASE UNTIL
PRESENTED BY WITNESS

STATEMENT OF

MR. RAYMOND J. CERRATO

CHIEF, RESEARCH AND TECHNOLOGY PROJECTS BRANCH

JOHN F. KENNEDY SPACE CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

Mr. Chairman and Members of the Subcommittee:

It is a pleasure and an honor to be here today to tell you about NASA's activities in working with and assisting the business community, state and local government and educational institutions in our mutual quest to acquire technology.

NASA's involvement with the business and university communities has a direct influence on the accomplishment of its primary functions which are space exploration, aeronautics and space R&D, and space applications.

In the area of R&D our primary concern is to get the job done in the best and most cost effective way possible. This includes doing business with small and large high technology companies as well as doing business with educational institutions, large, small, and those with predominantly minority enrollment.

At KSC for example, we have sponsored forty-seven research grants, from 1973 to date with ten minority institutions. I refer here to Appendix I, which identifies a total expenditure of 847,515 R&D dollars over a seven-year period.

In support of those research and technology projects which are within my area of responsibility at KSC, we have sponsored six R&D contracts, from 1976 to date, with five small businesses. I refer to Appendix II which identifies a total of 50,472 R&D dollars over a three-year period.

Activities involving technology transfer are in two categories. The first, the Technology Utilization Program, is concerned with technology dissemination and with the transfer of non-aerospace related inventions and innovations to the private and public sectors. The second activity is concerned with developing the capabilities in various user organizations, including small businesses, to use space acquired data, and with creating awareness of the potential benefits to be derived from use of information extracted from remote sensing observations.

To assist in the accomplishment of technology transfer we operate very closely with a large network of organizations, i.e., the Federal Laboratories Consortium for Technology Transfer, of which there are 187 member laboratories; the State Technology Assistance Programs in Florida and Kentucky which are comprised of State Universities and the State Departments of Commerce; seven Industrial Application Centers; three Biomedical Application Teams; three Technology Applications Teams; the Computer Software Management and Information Center; the Scientific Technical Information Facility; the ten NASA Field Centers and the three Regional Remote Sensing Applications Centers. I refer here to Appendix III.

In the past two years my office has responded to forty-six inquiries from small businesses, seeking answers to technical problems. These involved telephone calls, visits, and correspondence. I refer here to Appendix IV.

During 1979, there were 2600 inquiries from all over the United States requesting Technical Support Packages (TSP's) on KSC innovations published in NASA Tech Briefs. I refer to Appendix V, which lists examples of innovations receiving the most inquiries for TSP's.

Mr. Chairman, this concludes my statement. I have given you an abbreviated overview of KSC's R&D and Technology Transfer Programs for which I am responsible. I have tried to highlight those areas of specific interest to the business community. I will be happy to answer any questions you may have.

EXAMPLES OF RESEARCH WITH
MINORITY EDUCATIONAL INSTITUTIONS

FLORIDA A & M, TALLAHASSEE, FL

"Development of Methods of Analysis for Halocarbon and Hydrocarbon in Partially Purified Waste Water"

6-1-73	to	5-31-74	24,225
6-1-74	to	6-30-74	NC Ext (No Cost Extension)
7-1-74	to	7-31-74	NC Ext
8-1-74	to	7-31-75	18,212
8-1-75	to	12-31-75	NC Ext
			$42,437

BETHUNE-COOKMAN COLLEGE, DAYTONA BEACH, FL

"Restoration of Lagoonal and Estuarine Productivity"

9 - 72	to	8 - 73	19,884
9-1-73	to	10-31-73	NC Ext
11-1-73	to	10-31-74	26,942

"Lagoonal Restoration and Remote Sensing Techniques"

11-1-74	to	10-31-75	24,996
11-1-75	to	10-31-76	27,658
11-1-76	to	10-31-77	29,158
10-31-77	to	5-30-78	NC Ext
			$ 128,638

NEW MEXICO HIGHLANDS UNIVERSITY, LAS VEGAS, NM

"Bicyclic and Cage Compounds"

1-1-75	to	12-31-75	16,436
1-1-76	to	3 - 76	NC Ext
			$ 16,436

UNIVERSITY OF SOUTHERN COLORADO, PUEBLO, CO

"Environmental Stress Cracking of Polymers"

8-15-76	to	8-14-77	29,900
8-15-77	to	9-30-77	NC Ext
10-1-77	to	12-14-77	NC Ext
12-15-77	to	2-28-78	NC Ext
2-28-78	to	2-31-79	18,600
3-1-79	to	7-31-79	NC Ext
			$ 48,500

FLORIDA A & M, TALLAHASSEE, FL

"Morphological, Biochemical and Growth Characteristics of Salmonella and Shigella in the Banana River"

4 - 74	to	3 - 75	25,085
4 - 75	to	3 - 76	25,000
			$50,085

SOUTHEASTERN OKLAHOMA STATE COLLEGE, DURANT, OK

"Application of Physico-chemical Instrumentation Techniques to the Analysis of Thermophilic Microorganisms and Sterilization Resistant Microbial Spores"

7-1-74	to	6-30-75	26,009
7-1-75	to	12-31-75	NC Ext
1-1-76	to	6-30-76	NC Ext
7-1-76	to	9-30-76	NC Ext
10-1-76	to	9-30-77	25,000
10-1-77	to	9-30-78	NC Ext
10-1-78	to	3-31-79	NC Ext
			$ 51,009

KENTUCKY STATE UNIVERSITY, FRANKFORT, KY

"Zoological Effects of Variations in Atmospheric Oxygen Levels"

5-1-74	to	4-30-75	38,000
5-1-75	to	4-30-76	20,000
5-1-76	to	4-30-77	40,000
5-1-77	to	4-30-78	40,000
5-1-78	to	4-30-79	40,000
5-1-79	to	4-30-80	40,000
			$218,000

SAVANNAH STATE COLLEGE, SAVANNAH, GA

"Toxic Elements and Organic Degradation Products in Aquatic Bodies and Sediments around KSC"

10-1-74	to	9-30-75	30,500
10-1-75	to	9-30-76	26,000
10-1-76	to	9-30-77	27,200
10-1-77	to	12-23-77	NC Ext
12-24-77	to	3-22-78	NC Ext
3-23-78	to	3-22-79	27,000
3-23-79	to	9-23-79	NC Ext
			$110,700

SAVANNAH STATE COLLEGE, SAVANNAH, GA

"Environmental Interactions and Chemical Constituents Occurring in Oily Wastewater Disposal System"

- 80	to	- 81	$53,905

HOWARD UNIVERSITY, WASHINGTON, DC

"Feasibility Study of Using Field Effect Transistor to Measure Electric Field Strength"

- 80	to	- 81	$39,815

TUSKEGEE INSTITUTE, AL

"Permeability of Polymeric Materials to Condensable Gasses and Organic Liquids"

- 80	to	- 81	$31,309

MORRIS BROWN COLLEGE, ATLANTA, GA

"Polymeric Fractography: A Scanning Electron Microscopy Atlas of Fractures"

- 80	to	- 81	$56,681

FLORIDA A & M	$ 42,437
FLORIDA A & M	50,085
BETHUNE-COOKMAN	128,638
NEW MEXICO HIGHLANDS	16,436
UNIVERSITY OF SOUTHERN COLORADO	48,500
SOUTHEASTERN OKLAHOMA STATE	51,009
KENTUCKY STATE	218,000
SAVANNAH STATE	110,700
SAVANNAH STATE	53,905
HOWARD UNIVERSITY	39,815
TUSKEGEE	31,309
MORRIS BROWN	56,681
	$ 847,515

Examples of Small Business Contracts

Lightning Current Monitor (LCM)

Lightning Technology, Inc., Pittsfield, Mass., calibrated the KSC patented device used to detect and measure a lightning strike. Two contracts for $10,000 each were funded in 1978. The LCM was used on a DOE project as low-cost instrumentation on the Tampa Electric Power System. The Navy and others used the LCM for low-cost lightning strike instrumentation.

Sub-Soil Survey for the U.S. Dept. of Agriculture Soil Conservation Service

Technos, Inc., Miami, Florida, provided consulting services and a developed radar to demonstrate to the USDA SCS the feasibility of measuring sub-soil by UHF radar techniques. Soil measurement below water is virtually impossible without the UHF radar aid. The radar was made by Geophysical Survey System, Inc., Hudson, N.H. The Technos, Inc., contract was for $5,000 in 1978.

Toxic Waste Disposal Pond

Porcher and Kowloski, Titusville, Florida, under a specified sub-contract to Florida Institute of Technology built a toxic waste disposal pond. FIT had a major contract with KSC. The Titusville contractor contract was for $17,000 in 1976.

Light Controller for Energy Conservation

Warren and Williams, Inc., Titusville, Florida, was contracted to build a prototype light controller. This was a contract for $1,722. INTEC, Inc., Satellite Beach, Florida, redesigned the light controller under a contractor for $6,750. Both contracts were in 1976. The light controller is a device to turn lights on or off on an as-needed basis.

APPENDIX II

Federal Laboratory Consortium

The Federal Laboratory Consorium (FLC), has grown to 187 major laboratories.

KSC participates in technology transfer projects in a diversified manner on a local, regional and national scale. KSC's capabilities are known to the other FLC contacts who route technology needs to KSC as warranted by our expertise. On a national, regional and local scale FLC meetings and technology transfer contacts are made, examples are:

1. Mr. C. L. Lanham, Harry Diamond Laboratory was contacted by Mr. McComb, Library of Congress who was contacted by Ms. Anita Cole, Librarian, at Appalachia Correctional Institute, Florida. The need was to dry law books by a vacuum drying process. KSC is determining the possibility of using a small vacuum chamber for this process.

2. A presentation was made at Regional FLC meeting in Panama City, Florida, which resulted in a call from South Carolina on the technology used in sub-soil measurements for USDA SCS. KSC has a technology transfer project which lends technology toward locating grave sites, which will be used.

3. On the local level a presentation was made to the Florida League of Cities which led to technology transfer follow-up for a New Smyrna Beach Councilwoman. The information was found in the State Technology Applications Center (STAC) and forwarded to the councilwoman.

APPENDIX III

NASA's Technology Transfer Network

The NASA system of technology transfer personnel and facilities extends from coast to coast and provides geographical coverage of the nation's primary industrial concentrations, together with regional coverage of state and local governments engaged in technology transfer activities.

★ *NASA field center Technology Utilization Officers:* manage center participation in regional technology utilization activities.

☆ *Regional Remote Sensing Applications Centers:* provide training, conduct demonstrations and offer technical assistance to users of remote sensing data.

● *Industrial Applications Centers:* provide information retrieval services and assistance in applying relevant technical information to users needs.

□ *State Technology Applications Centers:* provide technology transfer services similar to those of the Industrial Applications Centers, but only to state governments and small businesses within the state.

○ *The Computer Software Management and Information Center (COSMIC):* offers government-developed computer programs adaptable to secondary use.

▲ *Application teams:* work with public agencies in applying aerospace technology to solution of public sector problems.

The following pages list key technology transfer personnel and addresses of the various facilities. For information of a general nature about the Technology Transfer Program, address inquiries to the Director, Technology Transfer Division, NASA Scientific and Technical Information Facility, Post Office Box 8756, Baltimore/Washington International Airport, Maryland 21240.