PROGRAM IN INFORMATION POLICY

ENGINEERING-ECONOMIC SYSTEMS DEPARTMENT

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GOVERNMENT PATENT POLICY

An Analysis of the Effects of Three Alternative Patent Policies on Technology Transfer and the Commercialization of Government Inventions

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ABSTRACT

This paper addresses the effects of present and proposed Government patent policies on the process of technology transfer and the commercialization of inventions resulting from Government sponsored research.

The function of the patent system in Government research and the value of patents resulting from Government sponsored research are examined.

Three alternative patent policies--title in the contractor, title in the Government, and the waiver policy--are examined in terms of their effects on the commercialization of inventions, industrial competition, disclosure of inventions, participation of research contractors and administrative costs.

Efforts to reform the present Government patent policy are also described.

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Introduction

The problems with the present patent policy for federally funded R&D--(1) lack of uniformity in individual agency policies, and (2) a very low rate of commercialization--are fairly well agreed upon, but which approach offers the best solution is still being debated with the same arguments as in 1949. But the following factors point to an increasing momentum towards some means of resolution:

--the growing concern and the resulting administrative domestic policy review over the declining rate of U.S. technological innovation;

--the recent presidential proposal for a uniform Government patent policy allowing contractors to retain exclusive licenses to resulting inventions; and

--the introduction of four bills during the 96th Congress dealing exclusively with the Government's patent policy.

The present movement in Congress to reform the Government's Patent Policy has been a long and slow moving process. Present efforts to establish a uniform policy date back to the rapid build up of government sponsored research during the second world war. Congressional patent policy guidance since that time has oscillated between a policy where the Government obtains title to all inventions arising from Government research contracts (the "title policy") and a policy where the contractor retains the title to such inventions while the Government obtains a paid-up, irrevocable license to use the invention (the "license policy").

The Carter administration recently announced its proposed Government patent policy which would allow small businesses and non-profit corporations to retain title to resulting inventions while allowing large corporations the right to obtain only an exclusive license to resulting inventions and only within a designated "field of use." This proposal is currently only a recommendation and has not been issued as a binding executive order.

There are two distinct views of the function of the patent system--as a reward for an inventor's creativity or as an incentive for the creation, development and commercialization of inventions. This paper addresses only the latter since it is this function that is important in the process of technology utilization.

The patent system was adopted in the United States to "promote the progress of science and the useful arts."[1] It accomplishes this function by providing the inventor with an exclusive right (in essence a property right) to the use of his invention. The patent system attempts to thereby encourage inventiveness, development and commercialization of inventions and the reporting of new inventions and hence the widespread public availability of new technological ideas.

There are two interpretations of the incentive function of the patent system; first, that the patent increases the incentives for people to invent socially useful (i.e., profitable) patentable technologies and that it also increases the incentives to develop, test and market (i.e., commercialize) these inventions.

Outside of Government sponsored research, the patent system's influence on calculated profit may direct the inventor's activity into channels of general usefulness. [2] But under Government research contracts, where the area and amount of research are fairly well-defined prior to the research, the major determinant of the number of useful inventions is the quality of the researchers sponsored and the level of Government funding. The ability of a contractor or specific inventor to obtain the patent rights to the resulting inventions is unlikely to greatly alter the type or quality of the research.

The more important incentive provided by patents in Government sponsored research is the incentive for the patent recipient to promote or perform the invention's commercialization and thus reap the benefits offered by the patent rights. This function has also been called the prospect function [3], since it is closely analogous to the American mineral claim system or homesteading system on public lands. The function of each is to promote the utilization of an otherwise public resource at an efficient rate which maximizes the amount of the social benefits produced.

This argument rests upon the assumptions that the $30 billion of Government sponsored research produces patentable inventions that have social value and that the ability of an inventor to capture a larger share of the invention's social benefits as profits increases the probability of the invention's

commercialization. Since social benefits are the sum of producer and consumer surplus, the profits made by the inventor still are a benefit to society. Viewed in this way, if a license policy increases the probability that a socially useful invention will be made commercially available as compared to a title policy, then it results in greater social benefits and should therefore be preferred. Therefore, the claim that a license policy is a "giveaway" of public property seems unreasonable although part of the social benefits will temporarily be in the form of private profits.

The two primary arguments against the incentive function are that patents are only a minor inducement to private firms to develop and commercialize inventions in comparison to factors such as the expected commercial value of the invention, and the cost of developing the invention; and secondly that any social benefits resulting from the patent system are outweighed by the costs resulting from the dislocation of resources caused by the patent system.

The dislocation costs refer to the outputs lost when resources are diverted to the inventing of patentable ideas from their previous use.

> "insofar as inducement (to inventive activity) is furnished only by the expectation of a patent monopoly, a diversion of resources takes place and other production is foregone. What grounds are there for concluding that the output induced by this type of monopoly has any greater claim to be regarded as 'generally useful' than that which would have been induced in its absence by the open market?" [4]

The Value of Patents Resulting from Government Sponsored Research

There are a number of misconceptions regarding the number and value of the patents resulting from Government funded research which have traditionally overestimated both the number and the value of these patents. As an example, there were .41 inventions per million dollars of NASA research, funded in 1978 (NASA R&D expenditures in 1978 = $3.011 billion, 1978 invention disclosures = 1239). There were .074 inventions on which patent applications were filed per million dollars of research and .044 inventions on which patents were granted (assuming the Patent Office's historical .6 ratio of patents granted to applications filed) per million dollars of research.

From this small number of patented inventions different studies have shown that from 1-20% of these will be commercially used and even a smaller number will yield any income.

The incomes yielded from those commercialized have usually been quite moderate. Therefore the expected value of the patentable inventions resulting from NASA sponsored research has been quite low. Similar results can also be found in private firms, Research Corporation, and others although the rates of both disclosure per dollar of research and commercialization of inventions disclosed have been somewhat higher.

Therefore, the claims that Government contractors that obtain patent rights may make millions of dollars is not supported in fact. Nor is the claim that the Government ownership of rights to inventions results in multimillion

dollar losses. But this is not to say that patent rights do not provide a relatively important incentive to private firms to commercialize these inventions. This relatively high perceived value of this incentive can be seen in the very active support many private firms have given to policies which allow the contractor to obtain exclusive rights to the invention.

Analysis of Alternative Patent Policies

This section of the paper examines the policies--the title policy, the license policy, and NASA's present waiver policy--upon the basis of the costs and benefits resulting from each policy. The costs and benefits are broken down into the policies' effects in five sectors:

- o commercialization or utilization of inventions,
- o competition,
- o participation of contractors in Government research,
- o disclosure of inventions, and
- o administrative costs of the program.

This report does not place quantitative values on these costs and benefits because of the unavailability of sufficient data to give reliability to such results.

Commercialization of Inventions

The effect of Government patent policy on the rate of utilization of Government sponsored inventions has traditionally been the most important issue in the debate between advocates of the title and license policies. Commercialization is

important because it is the major means by which an invention reaches the public and its advantages (cost reduction, increased product quality, ...) are transformed into social benefits. Most supporters of the license policy have claimed that the increased likelihood of commercialization of inventions is the greatest advantage in allowing contractors to retain exclusive rights to their inventions. This argument is based on the assumptions that most high technology companies are more capable of promoting the dissemination and use of inventions than the Government and that exclusive rights provide a necessary incentive to bring forth the risk capital necessary for the development, marketing, and commercialization of new inventions. Title policy proponents have responded that not only are patents a minor determinant in corporate decisions to commercialize inventions, but the potential inability of interested future developers to gain access to the technology results in an actual decrease in the likelihood of commercialization.

License Policy Arguments:

There are two major arguments behind the position that the ability of contractors to retain title to inventions will increase the rate of commercialization of Government sponsored inventions;

- a patent provides a contractor with the exclusive right to license or use an invention, resulting in a reduction of the risks accompanying its development and commercialization and thereby increasing

the incentives for the investment of the necessary risk capital,

- contractors who have retained title to inventions have been more successful at commercializing those inventions than the sponsoring agency, in part because of their closer tie to the marketplace and prospective developers (oftentimes the contractors themselves) and the possession of a product "champion" (the inventor himself).

The first of these two arguments is based upon the "prospect" theory of a patent (discussed in the previous section). This view of the patent system envisions the patent, not as a reward for past inventiveness, but as a necessary incentive to develop, test, and use or market an invention. Traditionally, the cost required for development and commercialization of an invention have been an order of magnitude (or more) larger than the basic research costs. For NASA inventions, the private or public utilization of space technology usually requires large costs in adaptive engineering, development and marketing. By reducing the risk of other companies appropriating the results of this process of commercialization, patents provide a greater incentive for contractors to invest capital and, as the Harbridge House Study on Government Patent Policy pointed out, it is the lack of full technical development of Government inventions that has been the most frequent and important barrier to industrial use [5]. A patent does not disallow others from

using a patented technology, it only demands that they negotiate a reasonable payment for its use with the patent owner.

One result of this incentive is an increase in the amount of private resources being expended on technological innovation, an increase which most economists have regarded as being important both in reversing the declining levels of U.S. productivity and in modernizing technological industries that have fallen behind foreign competitors.

In support of the second argument, there is statistical evidence that contractors actually have been substantially more successful than the Government in promoting the commercialization of Government sponsored inventions, either through inter-corporate licensing or in-house development. Of the over 1200 NASA inventions to which contractors have obtained title since 1959, approximately 16% have been commercialized (Appendices B and C). In comparison, of the over 3500 inventions to which the Government has acquired patents since 1959, only 1% have been commercialized (Appendices D and E).

These figures are subject to question because of the difficulty in obtaining data many years after initial invention, the variation in definitions of "commercialization" and the statistical bias caused by contractors requesting the most commercially attractive inventions under a waiver policy. This variation is indicated in Appendix F showing the results of five different studies of the commercialization of NASA inventions. The most reliable data is probably that

compiled by NASA's patent and licensing office, since their data gathering techniques are the most extensive and their definitions have been subject to only minor variations over time (Appendices B, C, D, and E).

These higher rates of commercialization by contractors are caused in part by contractors requesting waivers on the commercially valuable inventions, but there are a number of other factors also involved. Contractors are usually chosen because of their being the most qualified in a certain field of research and, therefore, they are often in the best position to promote the commercialization of inventions in that field. These companies or universities as a result usually have much closer ties to the marketplace than do the sponsoring agencies. These contractors are also guided by the profits that inventions can offer to channel their investments into areas of public usefulness. They also have greater freedom in the types of license agreements that they can subsequently negotiate with other users of the invention.

Contractors also already have a "product champion" since it is usually the inventor that has the greatest interest in seeing an invention actually developed and utilized. It is widely believed that the transfer of a technology from one organization to another requires the transfer of people familiar with the technology. One obvious solution is to provide inventions to the organization possessing the technology to develop it themselves. Patent rights provide this type of incentive.

It is interesting to note that the patent attorneys at several agencies, including agencies which now pursue a waiver policy, have informally supported the use of a license policy in almost all Government research contracts (Appendix G).

Title Policy Arguments:

There are three major arguments against contractors being allowed to retain title to inventions in order to encourage commercialization:

- o patents play a minor role in determining corporate decisions to commercialize inventions in comparison to factors such as favorable price conditions, the state of business confidence and costs of capital;
- o contractors retaining title to Government sponsored inventions are oftentimes interested in only making sure that their competitors don't use the inventions, thereby decreasing the likelihood of commercialization;
- o it is impossible to show that the gains from the movement of people and funds to the development of patentable inventions are not offset by losses in other areas of output--specifically the development of non-patentable inventions.

Waiver Policy Arguments:

The waiver policies adoped by NASA, DOE, NSF, and HEW have offered several advantages. They are flexible and therefore allow contractors interested in commercializing an invention a chance (a 76% chance at NASA) to obtain exclusive rights to

an identified invention. In those cases where the contractor has not expressed an interest in the invention, or the waiver has been denied, the Government then has the opportunity to seek out other possible users on an exclusive or non-exclusive basis. Such a flexible system initially appears to offer the advantages of both the license and title policies, but there are a number of disadvantages as well.

It is obviously impossible for NASA's Invention or Contribution Board or DOE's patent office or any other Government entity responsible for waiver decisions to be able to know what the necessary factors are in an invention's commercialization.

Commercialization is dependent upon a number of complex unknowns such as future market demand, the quality of the invention, and the companies interest in the invention. Also present waiver guidelines support Government retention of title in cases where the "principal purpose of the contract is to create, develop or improve products, processes or methods which are intended for commercial use" or "which directly concern public health, public safety or public welfare," areas where it seems incentives to commercialize the inventions are the most important (see Appendix A).

Past records also show that many contractors perceive the waiver process as cumbersome and resulting in a waste of both time and money. Processing time for a waiver by NASA can vary from several weeks to a year depending upon the perceived urgency of the request. A waiver must also be

accompanied by a general outline of the contractor's proposed plan for the invention's commercialization. For large companies familiar with NASA's waiver process, the waiver requests do not pose a high cost. But for small companies or those unfamiliar with the waiver process, the costs of a waiver request may appear to be very substantial. Some NASA contractors have reported that they were unaware that waivers were even granted.

Another problem with the waiver system is that it introduces a factor of uncertainty in the commercialization process. An example of this uncertainty is provided by the changes that took place in HEW in 1978. Up until that time, HEW had followed a policy of granting most waiver requests to universities and small businesses (under Institutional Patent Agreements). Many contractors had participated in HEW contracts with this expectation, but in 1978 Secretary Califano called for a review of all future waivers and essentially froze all future waivers.

Effects on Industrial Competition

Opponents of a license policy have argued that the ability of contractors to retain patent rights has resulted in the formation of product monopolies, the increase of product costs to the consumer, and the lessening of market competition. Although patent rights do permit the private capture of returns created by the use of a patented invention, they by no means assure it. In fact, past studies have shown no significant examples of monopolization resulting from patents obtained on

Government sponsored inventions with the most extensive patent policy study concluding "that undue concentration would result from the license policy is a possibility so negligible that it may be disregarded" [6].

The main reason that contractor retained patents have not resulted in monopolization is, as previously mentioned, that there are few patented inventions of sufficient quality to allow the capture of a market. It is interesting to note that in thirty-four antitrust cases studied by the Harbridge House, where forced licensing of the defendent's patent portfolio had been one of the economic remedies for restraint of trade, only two companies in the survey have ever received applications for licenses although the patent portfolios were in some cases as large as 300 patents [7].

Monopolization has also not occurred because contractors have in general been very willing to license the use of their inventions to other users. In fact licensing has oftentimes provided the contractor with the most valuable means of optimizing the value of the patent, either in addition to or in place of in-house development.

A more reasonable concern than monopolization is that a few valuable inventions will be neither utilized nor promoted by the contractor. Since NASA currently publishes Tech Briefs and Technical Support Packages on contractor-owned patents arising from NASA sponsored research, this lack of use is presently minimized.

It should also be noted that the Government presently has a means of protecting against monopolization, "excessive profits" or non-use of an invention in the form of "march-in-rights." March-in-rights give the sponsoring agency the right either to require the contractor to license an invention to another company at a reasonable rate or to license the invention itself under certain limited conditions. Although march-in-rights have never been enforced, it seems that they could be used effectively in the few situations where they might be needed.

Of several agency patent counsels interviewed, a few stated that for march-in-rights to be effective the sponsoring agency must monitor the contractors' use of the invention through the submission of a contractor's invention utilization report. The submission of the utilization reports was said also to increase the likelihood of the contractor using the invention by encouraging a careful assessment of the invention's commercial value. Such a monitoring program could result in enforcement through the action of the contractor's competitors who could, in the case of valuable inventions, monitor their misuse and request the Government to enforce its march-in-rights.

It has also been suggested that when a contractor has not used the invention after a certain number of years that the patent rights should be transferred back to the sponsoring agency, so that it can promote the invention's utilization. However, such a proposal is plagued by the problem of defining a "reasonable

period of time" and what constitutes use of an invention.

Participation of Contractors

The willingness of a contractor to participate in Government sponsored research is highly dependent upon two factors: the contractor's perceived value of any resulting patents to which he may retain exclusive rights and the reasons a company enters into Government sponsored research.

For those companies that regard patents as an essential form of protection in developing a new product, the title policy may oftentimes deter the company from entering into a Government research contract. Past studies have shown that such companies are not in the majority and are concentrated in industries which are technologically based but innovate at a moderate rate (excluding rapidly innovative industries where trade secrets provide a more effective means of protection).

Many companies, especially large corporations, have traditionally regarded patents as being essentially defensive in nature (i.e., means of avoiding lawsuits for infringement by other companies who later patent a similar invention). For these companies, gaining exclusive rights to Government sponsored inventions has little value since the Government does not enforce infringement on the patents that it owns. The participation of those companies which see patents as having neither offensive nor defensive value are essentially unaffected by Government patent policy although several such companies have nonetheless vigorously supported a license policy.

Those companies which do value patent rights might be expected to lower their contract bids under a license policy by an amount proportional to the perceived value of the exclusive rights in any future inventions, although there has been no good evidence to substantiate such a belief. The value of potential patents rights to a contractor before performance of the contract are estimated to be worth less than one dollar ($1) for an average one million research contract [8].

Many of the opponents of the title policy have claimed that that policy's major disadvantage is not the inflated cost of contractor's research bids but the lower quality of research that the Government obtains. This lower quality is due to a number of factors including the refusal of many of the most qualified contractors to perform Government research. Surveys of companies have shown that only a few companies actually refuse to participate because of an agency's patent policies. Lack of interest in the area of research, unwillingness to transfer the necessary personnel and facilities away from commercial research and a general unwillingness to work under Government supervision have been the more common reasons for qualified contractors not participating in Government research.

One area where contractor participation has been adversely affected is in contracts which require the availability to the public of any background patents; i.e., those privately owned patents which are deemed necessary for the use of any inventions

resulting from subsequent Government contracts. Companies have also claimed that participating in Government contracts has resulted in valuable proprietary information becoming publicly available because of the Freedom of Information Act and the requirement for background patents (Appendix G).

There have also been claims that a large number of contractors segregate their industrial research teams from their Government research, resulting in a lower quality of Government research. If corporations' proprietary information has been jeopardized, such segregation seems to be a reasonable response.

NASA's ability to grant advance waivers should decrease the likelihood of losing the participation of qualified contractors. Advance waivers have been requested from NASA 906 times and granted 463 times between 1958 and 1978. Although considering how few advance waivers are requested, contractors apparently either perceive the waiver requests as time consuming and/or too expensive, or the value of obtaining patents is too low to justify such requests. Although the waiver request requires only the completion of a prepared form and the identification of the contractor's ability to commercialize or license any resulting inventions, many small companies are not aware of the process or view it as too expensive. This can be seen from the fact that the vast majority of NASA waiver requests come from large companies familiar with NASA's waiver policies.

Disclosure of Inventions

All Government research contracts require that contractors report any resulting inventions to the sponsoring agency. Disclosure is considered so important by some that a draft bill proposed by the Departments of Commerce and Justice in 1979 recommended criminal sanctions against any contractor not reporting new inventions. Aside from the complete infeasibility of such a proposal,* it indicates the fear by some Government officials that there are contractors who do not disclose inventions they see being commercially valuable and thus decrease the social benefits gained from the research.

A high rate of disclosure by itself is not advantageous, as can be seen from NASA's records. Some companies have traditionally reported large numbers of inventions that never proved of any commercial value, while others have only reported those inventions that they thought to be novel breakthroughs. Although the cost of screening an invention is not very high, since 1963 contractors have reported an average of nearly 1800 inventions annually, while only 5% of these have resulted in patent applications. In comparison, NASA employees have reported only an average of 335 inventions annually with 34% resulting in patent applications. It, therefore, is obvious that promoting disclosures is of and by itself of little value.

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* Due to the inability to definatively define what constitutes an invention or the inability of, for example, a scientist in one field to recognize that his minor discovery may be a breakthrough in a completely different field.

It is not obvious that any patent policy is clearly advantageous in promoting the disclosure of valuable inventions. License policy advocates have claimed that the ability to retain exclusive rights would remove the disincentives for not reporting inventions. Yet in those contracts where NASA has granted advance waivers the number of inventions disclosed per dollar of research has declined substantially, although much of this is due to the contractor's diminished need to disclose inventions that are not of a patentable or otherwise valuable nature.

As the Deputy Assistant Attorney General for Antitrust matters recently remarked--

> "We do not believe that disclosure has been a problem in private R&D contracting situations largely because of the high costs of concealment and the penalties in loss of reputation and future business caused by having concealment later discovered." [9]

Although there is little conclusive evidence to show that any one patent policy results in a more complete and effective disclosure of inventions, there is some evidence indicating that NASA's attempts to promote disclosures from contractors have resulted in an excess of disclosures of inventions that have little or no commercial value, wasting the time and money of both the contractor and the Government invention review board. This cost must, of course, be weighed against the possibility that a few valuable inventions might otherwise not be reported.

Administrative Costs

The administrative costs of each of the three Government patent policies is not very substantial and are unlikely to be a major factor in choosing between each policy. Nonetheless changes in policy could offer some cost reductions in comparison to NASA's waiver policy.

Presently the costs directly and indirectly attributable to NASA's waiver policy stem from the following activities;

1) compilation of the inventions disclosed by contractors and employees,
2) screening of the inventions by NASA and IITRI,
3) processing and filing of patent applications,
4) compilation of waiver requests,
5) compilation of licensing requests,
6) determination of waiver and license requests by the ICB,
7) review of the invention utilization reports, and
8) promotion and description of NASA inventions by the Technology Utilization office.

The license policy would decrease these administrative costs by decreasing both the number of inventions that must be screened for patent applications by the Technology Utilization office, eliminate the compilation and determination of waiver requests, decrease the number of license requests and determinations, and increase the number of invention utilization reports.

The title policy would increase the number of inventions to be screened, patented, licensed, and promoted and would eliminate the waiver compilation and determinations.

Several critics of NASA's present policy have claimed that NASA files patent applications on many more patents than are necessary. Since the Government only uses patents defensively, except when it is granting exclusive licenses, publication will give the same defense against infringement but without the cost of the patent application processing and filing fees.

Appendix A

NASA's Patent System

NASA's patent policy is based upon Section 305 of the National Aeronautics and Space Act of 1958 and the Presidential Memorandum on Government Patent Policy of 1971 (PRM). NASA's policy and procedures are detailed in NASA's revised implementing regulations (e.g., NASA Patent Waiver Regulations [10]; NASA Domestic Patent Licensing Regulations [11]; and NASA Foreign Patent Licensing Regulations [12]).

NASA's patent policy has evolved into a waiver policy which retains for the Government a broad, irrevocable royalty-free license but allows Government contractors to request the Government to waive its rights to the title of an invention to the contractor. Invention waivers may be requested either prior to performance of a contract for all resulting inventions (advance waivers) or after identification of an individual invention under a given contract. Recommendations on all waiver requests are made by the NASA Inventions and Contributions Board (ICB) to the NASA Administrator although almost no ICB recommendations have ever been reversed by the Administrator.

Guidelines to be considered by the ICB in considering waiver requests are outlined in the Space Act, Presidential Memorandum of 1971 and the implementing regulations. The stated objectives of NASA's patent policy are:

- o serving the public interest;
- o protecting public health, safety and welfare;
- o fostering inventiveness;
- o encouraging reporting of inventions;
- o providing for the widest possible dissemination of new technology;
- o promoting the investment of risk capital in new inventions;
- o promoting industrial competition;
- o promoting early utilization of inventions; and
- o avoiding undue market concentration.

There are similar guidelines of each Federal agency but widely varying interpretations of these objectives has resulted in each Federal department or agency developing a different patent policy.

Statistically, NASA's policy has been largely one of title in the Government with contractors acquiring title to only 4% of the contractor inventions disclosed. [13] This low percentage of contractor acquired rights is due primarily to the small number of contractor requests for waivers. Between 1959 and 1979, 76% of the requests for individuals' waivers had been granted with 51% of the requests for advance waivers being granted.

From these figures it would appear that either NASA has been patenting many inventions that their inventors do not perceive as having significant commercial potential and for

which the Government's rights could probably be just as effectively protected by publishing, or the process of requesting a waiver is or at least appears to contractors to be an overly expensive or time consuming obstacle to gaining title to an invention, or both.

NASA'S PATENT POLICY

Title In The Government

1) National Aeronautics and Space Act (1958):

> "any invention conceived or actually reduced to practice in the performance of any work under any contract... becomes the exclusive property of the government unless the Administrator determines that the interests of the United States will be served by waiving all or any part of the Government's rights..." (section 305)

2) Presidential Memorandum (1971):

(a) Where

(1) a principal purpose of the contract is to create, develop or improve products, processes, or methods which are intended for commercial use (or which are otherwise intended to be made available for use) by the general public at home or abroad, or which will be required for such use by governmental regulations; or

(2) a principal purpose of the contract is for exploration into fields which directly concern the public health, public safety, or public welfare; or

(3) the contract is in a field of science or technology in which there has been little significant experience outside of work funded by the Government, or where the Government has been the principal developer of the field, and the acquisition of exclusive rights at the time of contracting might confer on the contractor a preferred or dominant position; or

(4) the services of the contractor are

(i) for the operation of a Government-owned research or production facility; or

(ii) for coordinating and directing the work of others, (Section 1)

Title In The Contractor

1) National Aeronautics and Space Act:

No such allowance mentioned.

2) Presidential Memorandum:

(b) In other situations, where the purpose of the contract is to build upon existing knowledge or technology, to develop information, products, processes, or methods for use by the Government, and the work called for by the contract is in a field of technology in which the contractor has acquired technical competence (demonstrated by factors such as know-how, experience, and patent position) directly related to an area in which the contractor has an established nongovernmental commercial position, the contractor shall normally acquire the principal or exclusive rights throughout the world in and to any resulting inventions.

(c) ...the agency may prescribe by regulation special situations where the public interest in the availability of the inventions would best be served by permitting the contractor to acquire at the time of contracting greater rights than a nonexclusive license. (Section 1)

3) Institutional Patent Agreements:

In accordance with the language regarding exceptional circumstances in §1-9 107-3(a) and/or the language regarding special situations in §1-9 107-3(c), agencies may enter into Institutional Patent Agreements (see §1-9 107-6(c)) with universities and nonprofit organizations having technology transfer programs meeting the criteria of §1-9 109-7(b). The agreements permit those institutions, subject to certain conditions, to retain the entire right, title, and interest in inventions made in the course of their contracts.

Waivers

1) National Aeronautics and Space Act:

(f) Under such regulations in conformity with this subsection as the Administrator shall prescribe, he may waive all or any part of the rights of the United States under this section with respect to any invention or class of inventions made or which may be made by any person or class of persons in the performance of any work required by any contract of the Administration of the Administrator determines that the interests of the United States will be served thereby. (Section 305)

2) Presidential Memorandum:

Advance Waivers;

In exceptional circumstances the contractor may acquire greater rights than a nonexclusive license at the time of contracting where the head of the department or agency certifies that such action will best serve the public interest. (Section 1(a))

...the agency may prescribe by regulation special situations where the public interest in the availability of the inventions would best be served by permitting the contractor to acquire at the time of contracting greater rights than a nonexclusive license. (Section 1(c))

Deferred Determination Waivers;

Greater rights may also be acquired by the contractor after the invention has been identified where the head of the department or agency determines that the acquisition of such greater rights is consistent with the intent of this Section 1(a) and is either a necessary incentive to call forth private risk capital and expense to bring the invention to the point of practical application or that the Government's contribution to the invention is small compared to that of the contractor. Where an identified invention made in the course of or under the contract is not a primary object of the contract, greater rights may also be acquired by the contractor under the criteria of Section 1(c). (Section 1(a))

Appendix B

NASA WAIVER STATISTICS
1959 THROUGH 1978*

Individual Waivers

1.	Number of inventions reported by NASA contractors	31,357
2.	Petitions for waiver requested	1,366
3.	Waivers granted	1,035
4.	Petitions denied	148
5.	Petitions withdrawn	139
6.	Petitions pending	44

Advance Waivers

1.	Advance waivers requested	906
2.	Advance waivers granted	463
3.	Advance waivers denied	293
4.	Requests withdrawn	111
5.	Requests pending	39
6.	Number of inventions reported under contracts having advance waivers and contractor intends to file	216

Inventions Waived

1.	Total inventions waived	1,254
	Under individual waivers 1029	
	Under advance waivers 225	
2.	Inventions for which waivers have been voided	266

* Statement of Gerald Mossinghoff, NASA Deputy General Council, before the U.S. Senate Subcommittee on Science, Technology and Space, July 23, 1979.

Appendix C

UTILIZATION/COMMERCIALIZATION STATISTICS ON WAIVED INVENTIONS*

Number of Waived Inventions Surveyed:	121
Percent of Total (788) Active† Inventions:	15%
Total Number of Responses:	102
Percent Response:	84%

Types of Inventions Surveyed	Reports Requested	Reports Received	Percent Response
Previous Indications of Probability of Use in 1977-1978	100	83	83%
Newly Waived Inventions	13	12	92.3%
Nonresponsive to 1977 Request	8	7	87.5%

Status of Surveyed Inventions	Number of Inventions
Utilized/Commercialized (First Use-2 inventions)	7
Development Efforts Continuing	39
Licensing/Promotion Only	34
No Further Development Expected	22

Total Number of Active† Inventions (Through 1977):	788	
Total Number of Inventions Voided:	258	
Total Number of Inventions Utilized/ Commercialized:	193	(18.5%)

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* See Appendix B
† Waiver not voided

Appendix D

NASA LICENSING STATISTICS
U.S. PATENTS AND PATENT APPLICATIONS
December 31, 1978*

U.S. PATENTS HELD BY NASA

U.S. Patents and Patent Applications Available for Licensing	3,512
Employee Inventions	2,378
Contractor Inventions	1,134

NONEXCLUSIVE LICENSES

Licenses Granted to Date	502
Licenses Revoked or Terminated	260
Licenses in Force as of this Date	242
Inventions Covered by Licenses in Force	124

EXCLUSIVE LICENSES

Licenses Granted to Date	21
Licenses Revoked or Terminated	12
Licenses in Force as of this Date	9
Inventions Covered by Licenses in Force	9
Different Licenses	8

* See Appendix B

Appendix E

COMMERCIAL USE OF NASA OWNED INVENTIONS LICENSED BY NASA IN THE UNITED STATES December 31, 1978*

NONEXCLUSIVE LICENSES

Nonexclusive license in force	242
Utilization reports received from licensees	138
POSITIVE USE REPORTS	
Reports of commercial use	50
Inventions covered by these reports	34
Employee inventions	28
Contractor inventions	6
NEGATIVE USE REPORTS	
Reports of no commercial use	88
Inventions covered by these reports	56
Employee inventions	40
Contractor inventions	16

EXCLUSIVE LICENSES

EXCLUSIVE LICENSES GRANTED TO DATE	21
Employee inventions	14
Contractor inventions	7
POSITIVE USE REPORTS	
Reports of commercial use	6
Employee inventions	4
Contractor inventions	2
NEGATIVE USE REPORTS	
Reports of no commercial use	15
Employee inventions	10
Contractor inventions	5

* See Appendix B

Appendix F

COMPARISON OF NASA INVENTION COMMERCIALIZATION STATISTICS
(Five past studies)

Study	# of inventions waived	# commercialized (%)	# of inventions licensed (# of licenses)	# commercialized (%)
Robert Solo [13] 1966	160	7 (4.4%)	48 (118)	1 (2.1%)
Watson & Homan [14] 1966	189	21 (11%)	47 (108)	5 (10.6%)
Phillip Wright [15] 1974	668	97 (14.5%)	– –	– –
Kaskovich [16] 1974	333	52 (13.5%)	? (226)	60 (>26.5%)
NASA [17] 1979	1046	193 (18.5%	– –	– –

Appendix G

PERSONAL INTERVIEWS CONDUCTED

In order to gain a better perspective on industry's views OF NASA's patent policy, personal interviews were conducted with the owners of several small firms and patent attorneys from several medium and large firms that have performed NASA research in the past. Interviews with the patent counsels from eight Federal agencies (NASA, DOE, DOD, USDA, HEW, DOI, NSF, DOT), the Office of Federal Procurement Policy (OFPP), the American Patent Lawyers Association, Research Corporation, and numerous industry associations were also conducted.

These interviews proved invaluable in providing insight into the industry and Government views of alternative Government patent policies. Findings from these interviews have been included in the report where relevant.

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