IDA PAPER P-1696

GUIDELINES FOR MAKING LEASE/BUY DECISIONS INVOLVING DEFENSE COMMUNICATIONS SYSTEM COMPONENTS

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January 1983

Prepared for

Defense Communications Agency

INSTITUTE FOR DEFENSE ANALYSES
COST ANALYSIS GROUP

The work reported in this document was conducted under Contract MDA 903-79-C-0018 for the Defense Communications Agency. The publication of this IDA Paper does not indicate endorsement by the Defense Communications Agency, nor should the contents be construed as reflecting the official position of that agency.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Guidelines for Making Lease/Buy Decisions Involving Defense Communications System Components		5. TYPE OF REPORT & PERIOD COVERED Final 6. PERFORMING ORG. REPORT NUMBER IDA Paper P-1696
7. AUTHOR(s) Joseph W. Stahl, Robert P. Schiazza, Herbert A. Schulke, Jr., Herman O. Stekler, R. William Thomas		8. CONTRACT OR GRANT NUMBER(s) MDA903-79-C-0018
9. PERFORMING ORGANIZATION NAME AND ADDRESS Institute for Defense Analyses 1801 N. Beauregard Street Alexandria, Virginia 22311		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Task T-2-130
11. CONTROLLING OFFICE NAME AND ADDRESS Defense Communications Agency Cost and Economic Analysis Div., Code 690 8th and South Courthouse Road Arlington, Virginia 22204		12. REPORT DATE January 1983 13. NUMBER OF PAGES 73
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Lease, communications, buy, decisions, satellites, ADP, economic analysis.

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This study is intended to assist the decision maker faced with a lease/buy decision. It enumerates and discusses the many factors that should be considered before reaching a final decision. It consists of (1) the factors to be considered in a lease/buy decision, (2) a discussion of issues involved in performing an economic analysis, and (3) a literature survey of major directives, regulations and reports.

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Contract MDA 903-79-C-0018

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PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) for the Defense Communications Agency under Contract MDA903-79-C-0018: T-2-130, "Development of Guidelines for Making Lease/Buy Decisions Involving DCS Components." The study was under the technical direction of Messrs. Irwin L. Seidel and Richard C. Brannon of the Comptroller Directorate, Cost and Economic Analysis Division. Mr. Joseph W. Stahl was the IDA Project Leader.

ACKNOWLEDGMENTS

The authors are indebted to the following organizations and people for their cooperation in providing much of the information upon which this paper is based.

Defense Communications Agency

Mr. John R. Casteel — Code H670
Mr. Michael N. Dollard — Code J600
Mr. Francis J. McQuaid — Code J600
Dr. William J. Wenker — Code C753

Defense Commercial Communications Office, Scott AFB

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Communication Electronics Command, Fort Monmouth

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Brigadier General T. D. Rogers, Commander
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Mr. Robert T. Scanlon, Technical Director, Communications Programs
Mr. J. J. Coco, Telecommunications Program Office
Mr. Robert Nieffer, Telecommunications Program Office

MITRE

Mr. Eugene D. Lundberg, Director, Economic Analysis D-93
Mr. Charles Plummer, Chief, Cost Analysis D-93

Raytheon - Executive Offices

Mr. Steve Rowen
Mr. N. Sisak

GTE-Sylvania, Telecommunications Systems Operation

Mr. Stanley A. Fierston

Harris Electronics Systems

Mr. Frank R. Cargiuolo

Rockwell International, Dallas

Mr. Harold E. Gilliatt

Western Union - Government Systems Division

Mr. Joseph A. Stroud, Manager Finance, Autodin Systems

INTRODUCTION

The Defense Communications Agency (DCA) through the Defense Communications System (DCS) furnishes essential communication facilities through which the National Command Authorities (NCA) and the DoD control the worldwide U.S. military forces. Effective, rapid control must exist for peacetime conditions and through all levels of conflict. The DCS also provides communications for administrative users and other governmental agencies. Lease/buy decisions continually arise in the planning and operation of the DCS as user requirements change, technology matures, and the DCS evolves.

The Communications Services Industrial Fund (CSIF) is a revolving fund established to provide initial financing for communications services leased by DCA. Under a proposed policy currently being studied, DCA would be responsible for all DCS equipment, whether leased or bought. DCA would have the responsibility of determining, for each type of equipment or service in the DCS, which approach (lease or buy) would be in the government's best interest.

The inherent nature of the DCS makes the use of commercial communications equipment feasible. This fact, in turn, makes the use of leased communication services and equipment a very desirable alternative in many instances. Many factors relating to performance, logistics, management, and economics are interrelated and must be evaluated collectively before the lease/buy decision can be made, but the lease/buy area has been the subject of little systematic thought, and little or no guidance exists, except in the economic analysis area. This study is

intended to assist the decision maker faced with a lease/buy decision. It enumerates and discusses many of the factors that should be considered before reaching a final decision.

This paper has three chapters. The first discusses the factors to be considered when making a lease/buy decision. These factors have been grouped into four categories: (1) Performance Considerations, (2) Logistics Considerations, (3) Management Considerations, and (4) Economic Considerations. Although each factor is discussed independently as to conditions under which it favors a lease or a buy decision, it must be emphasized again that the decision should be predicated on the collective analysis of all applicable factors. It is unlikely that any single factor could be so dominant as to force either a lease or a buy decision by itself. The second chapter discusses minimum fee leases and the current tax effects on them. It also contains guidance as to applicable analytic techniques to be used in performing an economic analysis. The third chapter is a literature survey. It includes short descriptions of the major directives, regulations and reports used in this study, in conjunction with personal interviews, to develop the checklists contained in Chapter I. These are documents that the person making the lease/buy decision should be aware of and review for assistance and guidance in making a decision. There are three areas where specific laws and regulations are critical--contracting, security, and commercial activities. If any of these areas seem to be determining the outcome, the decision maker should contact the responsible in-house office for guidance and advice about his particular situation. Further, in the case of ADP acquisition, there are many regulations, and it is desirable to consult the ADP policy office as early as possible.

Chapter I

FACTORS TO BE CONSIDERED IN LEASE/BUY DECISIONS

This chapter presents a discussion of our analysis of factors to be considered when making lease/buy decisions. In accordance with the Task Order the factors are grouped into four areas: Performance, Logistics, Management and Economic Considerations.[1] Some factors appear under more than one of the four categories of considerations. Further, many of the factors also affect the relative costs of leasing or buying. The factors were developed from personal interviews (see Acknowledgments) and from a review of the literature (see Chapter III).

Tables 1 through 4 provide a checklist of the factors along with a method for numerically scoring the relative desirability of leasing or buying a particular piece or set of equipment. The scoring procedure and an example are provided in Appendix A. This is offered as an *aid* in the decision process; i.e., a method for summarizing the subjective evaluations given to the factors. The final decision, of course, will still be subjective and will also be influenced by the relative costs of the lease/buy alternatives.

In arriving at a lease or a buy decision, the decision maker should consider all these factors in the light of the circumstances involved in his particular situation and should then weigh them in making his final decision. It is unlikely

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[1]The primary economic consideration is, of course, the relative cost of the lease and buy options. There are, however, certain general or qualitative economic factors which--although they may influence or be embodied in the costs--need to be evaluated separately (see Section D).

that any single factor could be so dominant as to force either a lease or a buy decision by itself. In considering each factor, the decision maker should evaluate whether that factor influences him toward a buy decision, or toward a lease decision, or is neutral. Depending on his particular situation, a factor may lie anywhere in a spectrum from strongly pro-buy through neutral to strongly pro-lease. If appropriate for his situation, the decision maker should consider both leasing total end-to-end service and/or leasing of equipment as lease suboptions; buy options would involve equipment only.

In the discussion of each factor, we have attempted to provide guidance as to whether it generally would influence a decision maker toward a lease or a buy decision. However, it should be understood that these are general tendencies which will vary in degree of positiveness and importance from case to case. Indeed, it is possible that in some cases a factor could favor a buy decision while in other cases it might favor a lease decision. Further, in some cases we can only deal in relative terms. For example, in discussing "Degree of Militarization of the Equipment" (one of the Performance Considerations) we can only say that off-the-shelf commercial equipment tends to be more amenable to a lease arrangement than is military-specific equipment. Lacking the details of a specific situation, we cannot say that commercial equipment should be leased and military specific equipment should be bought. In a particular case, perhaps both types should be bought, but the tendency to buy the commercial equipment would probably be less strong than the tendency to buy the military-specific equipment. Other factors are less equivocal in their influence. For example, the Office of Telecommunications Policy Circular No. 13 (one of the Management Considerations) is intended to influence the decision maker toward leasing of services, but its influence can obviously be overridden by other factors influencing the decision maker toward a buy decision.

The decision maker should first consider the factors in the four categories of Performance, Logistics, Management, and Economic Considerations. A review of these considerations may lead to a clear lease or a clear buy decision. In such cases, it may be decided that it is not necessary to proceed with a cost analysis of the lease option versus the buy option. For example, the Navy was directed to acquire the LEASAT program through leasing. On the other hand, the Prototype Ground Mobile Communications Center was acquired by buying without an evaluation of the comparative costs of purchasing and leasing.

In the case of some considerations, pertinent documentation in the Literature Survey (Chapter III) is referenced.

A. PERFORMANCE CONSIDERATIONS

In this section performance considerations in lease versus buy decisions will be discussed. These factors are listed in Table 1, which also indicates how these factors might be used in a rating scheme to help in making the lease/buy decision.[1] The guidelines are general in nature and specific equipments, services and circumstances may result in exceptions to the general trends indicated in the discussions to follow.

1. Degree of Militarization

As equipment becomes more military-specific, the risks and unknowns involved in meeting the military specifications and testing increase and a lease arrangement becomes more complicated and expensive in order to provide adequate safeguards to the contractor to cover the higher risks involved. One of the major risks is that there would not be any other potential lease customers for the military-specific equipment if the government terminated the lease. For these reasons it is generally

[1]For a discussion of the use of the tables in this manner, see Appendix A.

Table 1. PERFORMANCE FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Degree of Militarization											
2. Site Location											
3. Security Requirements											
4. Survivability Requirements											
5. Reconstitution Requirements											
6. Peacetime Availability											
7. Rate of Technological Change											
8. System Interfaces											
9. Growth Rate/Flexibility											
Totals											
Minimum											
Neutral											
Maximum											

preferable to buy military-specific equipment. These problems usually do not exist in the case of off-the-shelf commercial equipment because there are no technical development risks, and the equipment could probably be re-sold or re-leased to other customers if the government terminated the lease.

2. Site Location

A mobility requirement generally results in the equipment's being more military-specific, which favors a buy decision (see item 1 above). Further, a mobile site probably would involve difficulties in contractor personnel access and in replacement and removal of spares and components, so that government maintenance would be preferred, which in turn would also favor a buy decision (see item 4 under Logistics Considerations). When the equipment is to be installed at a fixed site, contractor O&S may be planned, which might be either neutral in its effect on the lease/buy decision or tend to influence the decision toward a lease only weakly (see B. Logistics Considerations below).

Equipment to be installed in CONUS sites tends to be more amenable to a lease arrangement than does equipment to be installed overseas. The leasing of indigenous equipment from foreign contractors may involve risks due to host country political/economic instabilities. The overseas requirement may result in the equipment's being more military-specific because of the non-U.S. operating environment (power supply, climatic conditions, security, etc.). Further, a CONUS site tends to be more amenable to contractor maintenance than an overseas site because of accessibility to the contractor (see paragraph above). However, leasing of equipment may be desirable in stable overseas environments such as NATO; it can decrease stateside logistical requirements and facilitate interfaces with allies.

3. Security Requirements

Security requirements may involve classified technology in the equipment itself, information being handled by the equipment or site security. DODI 4100.33 (OMB Circular A-76) explicitly states that merely because a program is classified "is not an adequate justification for in-house performance of that activity." Therefore, leasing is an acceptable option if security requirements are properly considered in the lease. Strict security requirements tend to result in more military-specific equipment and a greater tendency toward DoD operation and maintenance (see 1 and 3 above). Buying may facilitate direct DoD control of any classified technology embedded in the equipment by execution of appropriate DoD security requirements. In case of security questions, consult the Security Office.

4. Survivability Requirements

A requirement for high survivability may be satisfied by using commercial-type equipment in a protected environment or by militarizing the equipment. Both approaches should be considered. The selection of the approach using military-specific equipment tends to make the buy decision preferable (see item 1 above).

5. Reconstitution Requirements

A high reconstitution requirement might be met by incorporation of DoD-specific features. This approach would tend to influence the decision toward a buy decision (ses item 1 above). However, in some cases a vendor may be more capable of reconstitution than the government since it can draw on facilities developed for civilian use. One reason for favoring lease for CONUS communications is the robust nature of the commercial common carrier networks and widespread availability

of equipment vendor repair capability for commercial equipment which is widely used.

6. Peacetime Availability

Where the contractor both owns the equipment and provides O&M, he may have a strong financial incentive to fix any problems in the minimum possible time because lease payments may be suspended when service is interrupted for more than a specified period of time. It is difficult to administer and enforce effective incentives in a maintenance contract (where the government owns the equipment) to achieve reliability as high as is possible with a total lease arrangement (where the contractor provides and maintains the equipment). Similarly, the strong financial incentive is lacking where the government both owns and operates the equipment. An additional factor that may permit a contractor to achieve higher peacetime availability is the redundancy that exists in many of the commercial common carrier networks (see item 6 above). However, it might be possible to achieve higher wartime availability if DoD owned and operated the equipment.

7. Rate of Technological Change

Leasing may be more advantageous in the case of equipment expected to be subject to rapid technological change than in the case of equipment subject to less rapid technological change. The government's flexibility is enhanced if the lease is properly structured so that (a) the lessor will have a strong financial incentive to incorporate design improvements, and (b) the government may terminate the lease and acquire updated equipments. Also, the continued introduction of new equipments into the DoD logistics systems and continual retraining needs could be uneconomical. However, leases of equipment expected to experience rapid obsolescence may be more expensive, and should be so recognized, and may contain basic termination liability

provisions. Where the technological change is slower, then buying may be favored since the equipment can be expected to have a long productive life.

8. System Interfaces

In cases involving system interfaces, it is generally desirable to minimize the number of parties directly involved in the hardware/system integration process. Multiple parties may overlook or have trouble agreeing on some aspects of the interface problem. Therefore, whichever option (lease or buy) satisfies this objective would tend to be the preferred option.

9. Growth Rate/Flexibility

This factor reflects the need to consider the operating environment and requirements and how they are expected to change over the life of the equipment. Is the service level projected to grow in the future? Is the system capable of being modified or expanded to meet future requirements? Decision makers should avoid buying equipment that may not satisfy future needs. Considerations such as these could tend to favor either a lease or buy decision.

B. LOGISTICS CONSIDERATIONS

In this section logistics considerations in lease versus buy decisions will be discussed. These factors are listed in Table 2. These logistics considerations should influence the decision as to whether to lease or buy equipment. The reason for this is that there can be advantages in having the owner of the equipment also provide the Operations and Support (O&S). On the other hand, there can be problems involved in one party's operating and maintaining equipment belonging to another party. This is particularly true in the case of contractor-owned equipment maintained by government personnel; it is not so true of

Table 2. LOGISTICS FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Integrated Logistics Support (ILS)											
2. Trained O&M Personnel											
3. Operating Environment											
4. O&S Performance											
5. Probability of Work Stoppage											
6. Rotation Sites											
7. "AN/" Nomenclature											
8. COMSEC Keys											
Totals											
Minimum											
Neutral											
Maximum											

government-owned equipment maintained by contractor personnel. Accordingly, the tendency of each consideration must first be assessed as to whether it generally favors the use of DoD or contractor O&S. The anticipation of DoD O&S would tend to influence the decision toward a buy. However, if it is anticipated that contractor O&S will be used, this factor might be either neutral in its effect on the lease/buy decision or tend to influence the decision toward a lease only weakly. To avoid repetition in discussion of these considerations, we will not explicitly state the two-step logic in each case.

The guidelines are general in nature and specific equipments, services and circumstances may result in exceptions to the general trends indicated in the discussions to follow.

1. Integrated Logistic Support (ILS)

Having one party provide the ILS system for equipment owned by another party can lead to problems of accountability and responsibility such as who owns spares taken from the ILS system and installed in the other party's equipment, responsibility and damage caused to the other party's equipment by the provider of the ILS system, the right of the provider of the ILS system to incorporate modifications in the equipment to improve its reliability/maintainability characteristics, reimbursement for such modifications, etc. Such problems can require much contract administration and legal work.

If maintenance and support are readily available from the contractor in the area of deployment, it may be advantageous for the contractor to provide the ILS. If such an arrangement is anticipated, it would tend to influence the decision toward a lease, for reasons such as those enumerated above. Conversely, if DoD already has a suitable ILS system in place, it would probably be best for DoD to provide the ILS and this situation would tend to influence the decision toward a buy. In some

cases, Interim Contractor Support (ICS) could be used for government-owned systems before the government has full capability for ILS through its internal system.

DoD Directive 5000.39 should be used as a guide in evaluating the ILS system.

2. Trained O&M Personnel

If trained DoD personnel do not exist or are unavailable, the decision may tend toward a lease because of the problems attendant in acquiring and holding trained personnel. The personnel may not be available because of the strength authorizations of the uniformed services or limitations in the Training Commands. Generally speaking, peacetime strength levels are low and in wartime personnel shortages can be critical. This favors using civilian or contract personnel which in turn might be either neutral in its effect on the lease/buy decision or tend to influence the decision toward a lease only weakly. If a lease appears to be the best choice, but some equipment is needed for training DoD personnel, consideration should be given to purchasing only enough equipment to meet training needs and leasing the remainder.

The existence of trained O&M personnel in DoD would tend to favor a buy decision since there would be no reason to pay the contractor for training or the use of his trained personnel. Further, sustained operations in a combat environment and overseas locations may require the utilization of military personnel, in which case a buy decision may be preferred.

3. Operating Environment

An expectation that the equipment will be required to operate in a combat environment would tend to influence the decision toward a buy decision. A lessor probably would not be willing to expose his equipment or personnel to the risks

of a combat zone unless an extensive wartime clause has been negotiated to protect him from these risks. However, if it is not expected that the equipment will be required to operate in a combat environment then this fact would eliminate the above influence toward a buy decision.

4. O&S Performance

If DoD will perform the O&S, this fact would tend to influence the decision toward a buy decision in order to avoid the problem of DoD personnel working on and modifying contractor-owned equipment. However, if it is expected that the O&S will be performed by the contractor, this factor might be either neutral or tend to influence the decision toward a lease only weakly (see 1. Integrated Logistic Support above).

Software is an exception to the above discussion. For system software and application packages it is generally preferable for the originators to perform the maintenance since they are generally more knowledgeable and cost-effective in this type of work than the users. This is true regardless of whether the initial decision was to buy or lease the system software and application packages. Therefore, in the case of software, the decision to use contractor maintenance should not affect the original lease/buy decision.

5. Probability of Work Stoppage

Government policy does not permit this consideration to enter into a lease/buy decision. Note that DoDI 4100.33 (OMB Circular A-76) states that "A possibility of a strike by contract employees is not an adequate justification for in-house performance of that activity."

6. Rotation Sites

The requirement to have rotation sites for DoD personnel returning from overseas is a factor favoring a buy decision and is acceptable as a reason for buying per OMB Circular No. A-76 and Office of Telecommunications Policy Circular No. 13 (see Chapter III).

7. "AN/" Nomenclature

If the equipment already has an "AN/" nomenclature assigned to it, then the equipment is in some DoD logistics system. Therefore, an in-house ILS system may exist, which would favor a buy decision (see 1. Integrated Logistic Support above). Also, there should be data available from the DoD maintenance system which may be useful in making the lease/buy decision.

8. COMSEC Keys

The requirement for COMSEC keys may have implications for a lease/buy decision. The control and distribution of keys must be considered. In a lease the use of the keys must be detailed as to responsibilities and access. In a buy decision this may be less of a problem if DoD personnel operate and maintain the system. In case of security questions, consult the Security Office.

C. MANAGEMENT CONSIDERATIONS

In this section the management considerations in the lease versus buy decision will be discussed. These factors are listed in Table 3. The guidelines are general in nature and specific equipments, services, and circumstances may result in exceptions in the general trends indicated in the discussions to follow.

Table 3. MANAGEMENT FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Financial Status of Company											
2. Small Businesses											
3. Site Location											
4. Acquisition and O&M Funds											
5. Multiple Lessors											
6. OTP-13											
7. Brooks Bill											
8. DODD 5000.37											
9. Federal Property and Administrative Services Act											
10. OMB Circular No. A-76											
11. Government Contract Placement											
12. Schedule											
13. Management Flexibility											
14. Performance Standards											
15. Military Service User Preference											
16. Connection Approval Required (Host Nation)											
17. Defense Acquisition Regulation 1-317											
Totals											
Minimum											
Neutral											
Maximum											

1. Financial Status of Company

If a company is financially weak and the lease is a long term lease, then there is the possibility of the service deteriorating and possibly stopping. This may favor a buy. With a financially strong company this would not be a problem. For further information consult the Contracting Office.

2. Small Businesses

The present political environment, through the Small Business Administration, favors increased opportunity for small businesses. Therefore, one must be careful not to exclude small businesses from competing in a lease/buy decision situation. General policy is defined in Defense Acquisition Regulation 1-702 (see Chapter III). For further information consult the Contracting Office.

3. Site Location

When the potential lessor is already operating or maintaining equipment at, or in the vicinity of, the proposed site or sites, then this fact could influence the decision toward a lease. However, if the lessor is not already there and the government is already operating at the site, then the buy decision may be favored.

4. Acquisition and O&M Funds

Sometimes a lease if favored simply because the acquisition funds are not available with which to buy the equipment, while O&M funds are available for leasing. The converse is also true: a buy decision may be favored because acquisition funds are available with which to buy the equipment, while O&M funds are not available for leasing. If possible, this situation should be avoided by advance planning, wherein the program manager determines the best approach (lease or buy)

and then receives the proper type of funds for that approach. If this is not possible, he should then attempt to reprogram funds rather than implementing the less desirable approach (lease or buy) simply because that is the approach that can be implemented with the type of funds available.

At the present time, if the equipment/service is to be financed from industrial funds, then it is only possible to lease the equipment/service. However, it has been proposed that in the future the industrial funds be used to both lease and buy equipment/services (see Frank C. Carlucci memorandum, "Financing of Equipment Purchased for Industrial Fund Activities," dated August 19, 1981).

5. Multiple Lessors

In a lease situation the characteristic of having to deal with only one lessor may be an advantage to the lease decision because dealing with only one lessor will probably require less management staff. If there are many lessors involved, however, it may be more desirable to buy the equipment rather than trying to manage many lessors. The size of the management staff required to buy versus to monitor lessor(s) must be evaluated.

6. OTP-13, Federal Use of Commercial Telecommunications Service

The Office of Telecommunications Policy Circular No. 13 states that for telecommunications services in CONUS, the government shall rely on the private sector. This means that these services shall be leased except for certain circumstances, such as:

"(1) Not available in the time needed,
(2) Not adequate from either a technical or operational standpoint, or
(3) Significantly more costly."

It also states "The cost estimate of the non-commercial approach must include, as a minimum, all of the factors called out by OMB Circular A-76." Note that OTP-13 deals with leasing of services--not leasing of equipment. However, leasing of services (e.g., telephone services) can be an alternative (just as is leasing of equipment) to purchasing and operating equipment.

7. Brooks Bill

The Brooks Bill (PL 89-306) amended Title I of the Federal Property and Administrative Services Act of 1949 by adding a new section on Automatic Data Processing Equipment (ADPE). It establishes guidelines and controls for the "purchase, lease, and maintenance of automatic data processing equipment by Federal Agencies." The provisions of this bill should be considered in making lease/buy decisions involving ADPE.

The documentation requirements and the review process defined in the bill, and their potential effect in delaying procurement while the administrative requirements are met, must also be taken into account in making the lease/buy decision.[1]

In an effort to relieve the barriers to efficient ADP procurement that have developed in the wake of PL 89-306 (The Brooks Bill), Congress has enacted Sec. 908 of PL 97-86, which defines the critical defense missions that are exempted from the provisions of PL 89-306.

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[1]See Carter Administration's *Federal Data Processing Reorganization Study, Acquisition Team Report* and Institute for Defense Analyses Memorandum Report, *Review of DoD Acquisition of ADPE*, Chapter III.

8. DoDD 5000.37, Acquisition and Distribution of Commercial Products

This DoD Directive says that "DoD Components shall:

(1) Purchase commercial, off-the-shelf products when such products will adequately serve the government's requirement, provided such products have an established commercial market acceptability, and

(2) Use commercial distribution channels in supplying commercial products to users when it is economically advantageous to do so and the impact on military readiness is acceptable."

The effect of this directive is to encourage the use of commercial equipment and services, which in turn affects the lease/buy decision as discussed in item 1 under Performance Considerations.

9. Federal Property and Administrative Services Act

The Federal Property and Administrative Services Act of 1949 permits multi-year leases with public utilities up to a maximum of ten years. All leases with lessors that are not public utilities are restricted to one year only. This act tends to restrict the use of leases with lessors that are not public utilities.

There is presently a legal question as to which non-regulated equipment lessors can be considered to be "public utilities." As of 8 July 1981, DCA Code 670 issued the following guidance: "If the service in question is one which is currently offered by a regulated telecommunications carrier, somewhere, at either the State or Federal level, then the service is a "public utility" service within the meaning of 40 US Code 481(a)(3), and a multi-year contract may be entered into, and Basic Termination Liability (BTL) may be provided. Once the public utility nature of the service is established,

45 Comp. Gen. 60 (the Jones Coal case) provides the authority to lease the service from any source, regulated or non-regulated."

10. OMB Circular No. A-76

This circular defines the guidelines under which activities can be performed by the government in-house versus by contractors. Accordingly, this circular applies primarily to O&S activities, but, as pointed out in the section on Logistics Considerations, O&S activities in turn may affect lease/buy decisions. These guidelines favor leasing on a "new start."[1] A "new start" will not be approved on the basis of economy unless it will result in savings compared to contract performance at least equal to 10 percent of government personnel costs, plus 25 percent of the cost of ownership of equipment and facilities, for the period of comparative analysis. This circular states that a Government commercial or industrial activity, operated by military personnel, may be justified when:

"(a) The activity or military personnel assigned are utilized in or subject to deployment in a direct combat support role,

(b) The activity is essential for training in those skills which are exclusively military in nature, or

(c) The activity is needed to provide appropriate work assignments for career progression or a rotation base for overseas assignments."

DoD Instruction 4100.33, *Commercial or Industrial Activities--Operation of*, and DoD Directive 4100.15, *Commercial and Industrial-Type Activities*, implement this circular. For further information, consult the Commercial Activities Office.

[1]A "new start" is a newly-established Government commercial or industrial activity, including a transfer of work from contract to in-house performance.

11. Government Contract Placement

The contracting activities might be performed by different personnel for a lease than for a buy. For example, a lease might be prepared by DCA personnel while a buy might be prepared by one of the services. Depending on availability of personnel, desirability for DCA to retain full control, etc., this factor could influence the decision toward either a lease or a buy. For further information consult the Contracting Office.

12. Schedule

A tight schedule may tend to favor a lease. This is because the restrictions on buying generally lead to longer response times. For example, implementation of the Brooks Bill (see previous discussion) has lengthened the time required to buy some computers such that the equipment has been leased to avoid the time delays.

13. Management Flexibility

With a lease there may be reduced management flexibility depending upon the options written into the lease. The only option may be to terminate the lease. If the equipment is DoD-owned then it can be modified, moved, replaced, etc., without requiring negotiations, so management generally has more flexibility than with a lease. On the other hand, if the requirement itself is uncertain, a lease would have greater flexibility if it could be cancelled or modified easily.

14. Performance Standards

Performance standards may be easier to enforce in a lease than in a buy. With the lease one can reduce or stop the payments for lack of service. However, after a buy it is difficult to recoup funds for failure to meet performance standards.

A well-written warranty may eliminate this advantage in the buy case (see Warranties under Economic Considerations).

15. Military Service User Preference

In certain circumstances the military service user may have good reasons for preferring to lease or buy particular types of equipments or services based on previous experience or unique requirements. Any such preferences should be reviewed in the decision making process.

16. Connection Approval Required (Host Nation)

Most overseas countries have procedures that must be met and lists of approved equipments that can be used when connecting to the Host Nation's telecommunications system. For example, the French government will not allow foreign nationals to carry portable computer terminals into France. To connect into data nets through the French telephone system, one must buy or lease a terminal in France. Restrictions of this type could favor either a lease or buy decision.

17. Defense Acquisition Regulation 1-317

This regulation defines several circumstances under which a lease is preferred. These include (1) government requirement is of short duration, (2) probability exists that the equipment will become obsolete, and (3) equipment is special or technical and the lessor will provide the equipment and the maintenance at a lower cost (see Chapter III). For further information consult the Contracting Office.

D. ECONOMIC CONSIDERATIONS

The primary economic consideration is, of course, the relative cost of the lease and buy options. For guidance in performing cost analyses see DCAC 600-60-1, OMB Circulars

No. A-76 and A-94, and Appendix B of this paper. There are, however, certain general or qualitative economic factors which--although they may influence or be embodied in the costs--need to be evaluated separately. These are listed in Table 4. The decision maker should collect actual data or make estimates for his specific situation.

1. System Capacity Utilization

A requirement for the long-term full capacity utilization of a system would tend to influence the economics toward a buy decision. Conversely, if only part of a system's capacity is needed, it would tend to influence the decision toward a lease if the lessor can also lease the remaining capacity to some other user. Also, if the full capacity is required on only short-term basis, then it will probably be preferable to lease (see DAR 1-317 under Management Considerations). A requirement for a surge capacity might also have an influence on the lease/buy decision.

2. Federal Tax Effects

The 1981 tax law has increased the tax deductions available to lessors. These increased tax deductions should result in lower lease charges to federal agencies. However, these deductions also result in reduced tax revenues to the Treasury Department. Therefore, if the tax effects are considered, the buy decision may be favored while if the tax effects are ignored, the lease may be favored. Trying to evaluate the tax effects for small programs may not be worthwhile as this can be costly, time consuming and requires expertise in the tax laws and knowledge of the tax situation of the lessor. At least a general evaluation, however, should be performed so that the relative tax effects are included in the decision making process.

Table 4. ECONOMIC FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. System Capacity Utilization											
2. Federal Tax Effects											
3. Economic Adjustment Clauses											
4. Warranties											
5. Installation Costs											
6. Work Breakdown Structure (WBS)											
Totals											
Minimum											
Neutral											
Maximum											

3. Economic Adjustment Clauses

The inclusion of economic adjustment clauses in a lease would reduce the attractiveness of a lease because of the possibility of subsequent increases in the leasing cost. Such clauses might involve the unknowns associated with future inflation and interest rates, basic termination liability (BTL), war clauses, etc. (At the present time, BTLs can only be applied to some leases; i.e., public utility service leases.) Also, negotiating and administering economic adjustment clauses in a lease may be time consuming.

4. Warranties

A well written warranty could reduce the risks in a buy decision by providing protection for the government approaching the protection in a lease that is performance sensitive; i.e., a lease that requires payment only when the system is operational within the proper standards. A Reliability Improvement Warranty (RIW) provides an incentive to the manufacturer to assure and/or improve reliability and maintainability even though the government owns the equipment.

5. Facility/Installation Costs

A general consideration of facility/installation costs may indicate that they favor one decision or the other. The lease might be favored, for example, if the equipment is to be installed in an existing facility with available power, environmental conditioning, etc., owned by the lessor while the buy decision might require the government to build a new facility. Conversely, a buy decision may be preferable where the government might have an existing facility while the lessor would have to build a new facility.

6. Work Breakdown Structure (WBS)

As is the case with the previous item, this should be a neutral factor in the lease/buy decision; however, if the WBS used does not include some categories, the decision could be biased. An example of this would be power costs. If the power requirements are the same for both systems, the cost should be the same and the WBS category for power costs could be eliminated. If the power requirements are different, then the category should not be eliminated from the WBS. Each category in the WBS must be examined to see that none are eliminated by an incorrect assumption that the costs are the same for this WBS category.

Chapter II

ECONOMIC ANALYSIS OF LEASE/BUY DECISIONS

This chapter examines the economic analysis employed when a government agency, such as DCA, must choose between purchasing or leasing a piece of equipment. The chapter is brief, with the main discussion of the analytical details to be found in Appendix B. Here, we consider the main concerns of the economic analysis.

Prior to 1981, it was almost always more expensive for a government agency to lease an asset for its *entire* life than to purchase it.[1] Since leasing is merely a technique for financing the purchase of a capital asset, the government agency incurred lower costs by purchasing. Its implicit cost of funds was lower than that paid by a private leasing company, which would have to pass on the higher interest costs in its lease fee charges.

However, the 1981 tax law created some situations in which a government agency, as opposed to the total government, would incur lower costs if it leased rather than purchased. These situations could occur even if the leasing company borrowed at a higher rate than the government. At every private interest rate, the government agency's cost of leasing would decline relative to purchasing if the lessor passed through to the agency all the savings resulting from the new Accelerated Cost

[1]We first ignore tax consequences which increase the cost to the government, but not to the government agency. These are introduced in the computation in Appendix B.

Recovery System. This form of depreciation permits a leasing company to recover its investment in the equipment more quickly than was permitted under the old law. Since this benefit occurs during the early periods of a lease, the time value of these tax savings permits the lessor to quote a lower fee charge to the government. Leasing *may* be favored over purchasing when the equipment costs may be recovered quickly (three- or five-year ACRS) and the term of the lease is relatively long.[1] The actual calculations are contained in Appendix B.

This analysis assumes that in setting a lease charge, the lessor will take into account the tax benefits which accrue to the firm. If the benefits are passed on, the agency which leases received an implicit tax subsidy because the U.S. Treasury incurs a revenue loss when the time value of money is considered. There are no tax implications involved in purchasing new equipment because the results are the same whether the government purchases the equipment or the leasing company buys it.[2]

These conclusions are based on minimum lease fees. If the lease fees were higher, the total government cost would also be higher. For every dollar of additional lessor's revenue from the government, taxes would increase by the effective tax rate.

For guidance on the proper analytic techniques to perform a lease or buy economic analysis, see DCAC 600-60-1. It also provides guidance as to the economic data required, such as:

(1) economic life
(2) annual lease prices

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[1]Equipment for which the three-year deduction may be used includes autos, and machinery and equipment with an asset depreciation (ADR) mid-point life of four years or less. The five-year system is used for most machines and equipment.

[2]We have not looked at the case where the manufacturer is the lessor.

(3) termination charges
(4) one-time purchase price, etc.

After these data have been collected the analysis can be performed and the relative costs of the lease and buy cases estimated.

Chapter III

LITERATURE SURVEY

This chapter contains the literature survey. For each directive, regulation and report, an abstract is included for the user's information. The documents have been grouped in the following categories:

A. Federal Policy and Laws
B. Office of Management and Budget Circulars and Report
C. General Accounting Office Reports
D. DoD Policies
E. DCA Instruction and Circulars
F. Service Circulars and Regulations
G. Satellite Studies
H. Automated Data Processing Studies
I. Other

A. FEDERAL POLICY AND LAWS

Office of Telecommunications Policy Circular No. 13, Federal Use of Commercial Telecommunications Service, 21 June 1974.

This circular establishes guidelines designed to clarify the normal federal role as a user, rather than a provider, of telecommunication service. The policy emphasizes the need to place maximum reliance on the private sector in providing telecommunication services to the federal government.

Federal Property and Administrative Services Act of 1949 (63 Stat. 377).

This act established the General Services Administration as the procuring agency for the government. The act permits multi-year leases with public utilities up to a maximum of ten years. All leases with lessors that are not public utilities are restricted to one year only. The definition of "public utilities" is currently being reviewed.

Public Law 89-306 (Brooks Bill), Automatic Data Processing Equipment

This act amended the Federal Property and Administrative Services Act of 1949 by adding Section III "to provide for the economic and efficient purchase, lease, maintenance, operation, and utilization of automatic data processing equipment by federal departments and agencies." However, there is some doubt that the act has actually accomplished its objectives (see Federal Data Processing Reorganization Study below).

Public Law 97-86, Section 908, Procurement of Automatic Data Processing Equipment

This act amended the Brooks Bill (see above) by defining conditions under which its provisions are "not applicable to the procurement by the Department of Defense of automatic data processing equipment or services...."

B. OFFICE OF MANAGEMENT AND BUDGET CIRCULARS AND REPORT

Office of Management and Budget Circular No. A-76, Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government, 26 September 1980.

This circular establishes the policies and procedures to be used to determine whether needed commercial or industrial type work should be done by contract with private sources or in-house using government facilities and personnel. DoD

Instruction 4100.33, Commercial or Industrial Activities--Operation of, implements this circular.

Office of Management and Budget Circular No. A-94, Discount Rates to be Used in Evaluating Time-Distributed Costs and Benefits, 27 March 1972.

This circular prescribes a standard discount rate to be used in evaluating the measurable costs and/or benefits of programs or projects when they are distributed over time. It prescribes a discount rate of 10 percent per year in real terms for most programs.

Office of Management and Budget Circular No. A-104, Comparative Cost Analysis for Decisions to Lease or Purchase General Purpose Real Property, 14 June 1972.

This circular prescribes the economic basis for determining whether general purpose real property to be acquired for government programs should be leased or purchased.

Federal Data Processing Reorganization Study, Acquisition Team Report, Executive Office of the President, Office of Management and Budget, PB-283 757, 20 June 1978.

The federal government's acquisition of data processing resources has been criticized as inefficient and ineffective. Complaints abound regarding the length of the process, inadequate sharing of facilities, insufficient competition, the obsolescence of equipment, conversion costs, insufficient planning, inadequate specification, improperly prepared solicitation documents and evaluation thereof, and lack of concern about return on investment. This report describes the current acquisition process, documents the extent and causes of real or perceived problems, identifies, describes and analyzes viable options as possible solutions to these problems and makes recommendations for improvement based on these options.

C. GENERAL ACCOUNTING OFFICE REPORTS

Better Management of Defense Communications Would Reduce Costs, General Accounting Office, LCD-77-106, 14 December 1977.

This report discusses the problems of dedicated communications services and how to identify services suitable for inclusion in common-user networks. The report emphasizes the management problems and the lack of a central agency with the authority to implement the necessary changes.

Reduced Communications Costs Through Centralized Management of Multiplex Systems, General Accounting Office, LCD-80-53, 15 May 1980.

This report contains recommendations to the Director, Office of Management and Budget, to establish a policy, organizational arrangements, and implementing regulations to ensure that multiplex technology is exploited on a government-wide basis.

Methodology Used in Lease-Versus-Purchase Decision for Tracking and Data Relay Satellite System, General Accounting Office, LCD-76-127, 15 July 1976.

This review was to evaluate the acceptability of the general methodology NASA used to compare lease and purchase alternatives for acquiring the Tracking and Data Relay Satellite System.

D. DoD POLICIES

Defense Acquisition Regulation 1-317, Code of Federal Regulations, Title 32, National Defense, 1 August 1981.

This regulation states, "There are situations in which the government's equipment requirements may be more economically filled by rental than by purchase. This is particularly true in the case of certain expensive commercial equipments. The

decision to rent rather than purchase must be made on a case-by-case basis, and rental should be used where it is in the government's interest. The criteria to be considered in each case include the following:

> (i) the Government requirement is of short duration, and purchase would be costlier than rental (generally, long-term rentals should be avoided in the absence of compelling circumstances).
>
> (ii) the probability that the equipment will become obsolete and that replacement within a short period will be necessary.
>
> (iii) the equipment is special or technical, and the lessor will provide the equipment, as well as maintenance and repair services, at a lower cost than would otherwise be available to the Government."

Defense Acquisition Regulation 1-702, Code of Federal Regulations, Title 32, National Defense, 1 August 1981.

This regulation states, "It is the policy of the Department of Defense to place a fair proportion of its total purchases and contracts for supplies, research and development, and services (including contracts for maintenance, repairs, and construction) with small business concerns. Every effort should be made to encourage participation by such concerns in the acquisition of supplies and services that are within their capabilities. Heads of contracting activities and heads of field contracting and contract administration activities are responsible for the effective implementation of the Small Business and Small Disadvantaged Business Utilization Program(s) within their respective activities and for the accomplishment of assigned program goals. Heads of contracting activities and heads of field contracting and contract administration activities will assure that contracting and technical personnel attached to their activities are informed of the benefits that accrue to the Nation and to the Department of Defense through

the proper use of the capabilities of small business concerns in the acquisition of military requirements and that these individuals take all reasonable action to increase the level of participation by small business firms in the awards for products and services by their activities."

DoD Directive 4100.15, Commercial and Industrial-Type Activities, February 4, 1980

This directive prescribes DoD policy for the establishment and operation of DoD commercial and industrial-type activities as required by OMB Circular No. A-76.

DoD Instruction 4100.33, Commercial or Industrial Activities--Operation of

This instruction implements the policies established in DoDD 4100.15 and OMB Circular No. A-76 and establishes procedures and criteria for use by the military departments and defense agencies in making determinations whether to start, continue, curtail, or discontinue commercial or industrial activities which they operate or manage.

DoD Directive 5000.1, Major System Acquisitions, USDRE, 29 March 1982

This directive defines the DoD acquisition policy for major systems or major modifications to existing systems, and implements the concepts and provisions of Office of Management and Budget (OMB) Circular A-109, Major System Acquisitions, April 5, 1976.

DoD Instruction 5000.2, Major System Acquisition Procedures, USDRE, 19 March 1980

This instruction provides supplementary procedures for Department of Defense use in implementation of DoD Directive 5000.1 (see above).

DoD Directive 5000.37, Acquisition and Distribution of Commercial Products (ADCP), USDR&E/ASD (MRA&L), 29 September 1978.

This directive establishes the policies and responsibilities for the acquisition and distribution of commercial products (ADCP) within the Department of Defense.

DoD Directive 5000.39, Acquisition and Management of Integrated Logistic Support for Systems and Equipment, ASD (MRA&L), 17 January 1980.

This directive establishes policy and responsibilities for Integrated Logistic Support (ILS), including manpower planning, as an inherent part of major system acquisitions, including single-component, multi-component, and international acquisitions, to meet system readiness goals within established cost, schedule, performance, manpower, and other logistic constraints.

DoD Instruction 7041.3, Economic Analysis and Program Evaluation for Resource Management, ASD(C), 18 October 1972.

This instruction outlines policy guidance and establishes a framework for consistent application of (1) economic analysis on proposed programs, projects, and activities, and (2) program evaluations of on-going activities. Attached guidelines provide detailed procedures for performing economic analyses and program evaluations.

E. DCA INSTRUCTION AND CIRCULARS

DCA Instruction 260-70-3, Project Monitor's Handbook for the Preparation and Processing of Acquisition Actions, April 1978.

This instruction states the policy, prescribes procedures, and delineates the roles and responsibilities of personnel whose duties involve the preparation and processing of acquisition actions for the Defense Communications Agency.

DCA Circular 310-130-1, Submission of Telecommunications Service Requests, December 1979.

This circular prescribes instructions for the preparation and submission of Telecommunications Service Requests (TSR's) applicable to requirements for Defense Communications System (DCS) service, and for non-DCS service leased by the Defense Commercial Communications Office (DECCO) and DECCO activities for DoD and other government departments, offices, and agencies.

DCA Circular 350-135-1, Defense Commercial Communications Procurement Procedures, February 1977.

This circular delineates responsibility, prescribes procedures, and establishes the policy for the centralized procurement of commercial communications services to satisfy the telecommunications requirements of the departments, agencies and offices of the DoD and the other U.S. government agencies authorized by the Secretary of Defense to procure service through the Defense Commercial Communications Office (DECCO).

DCA Circular 600-60-1, Defense Communications Agency Cost and Planning Factors Manual, May 1976 plus changes.

This circular provides a guide for personnel who prepare and review cost estimates and economic analyses of DCA-managed systems, programs, and projects. It presents DCA cost data, planning factors, estimating procedures, methods and formats related to communications systems planning, programming, budgeting, and program evaluation.

F. SERVICE CIRCULARS AND REGULATIONS

Department of the Army Circular 235-1, Industrialized Activities and Labor Relations Commercial/Industrial-Type Activities (CITA), 1 March 1981.

This circular implements DoD Directive 4100.15 and DoD Instruction 4100.33. It provides guidance on Army policies,

responsibilities, and procedures for determining whether commercial/industrial-type work should be performed by contract or by in-house personnel.

Air Force Regulation 178-1, Economic Analysis and Program Evaluation for Resource Management, 14 December 1979.

This regulation outlines policies and procedures, and assigns responsibility for preparing and evaluating an economic analysis and/or program evaluation. It requires that an economic analysis be prepared and evaluated when an Air Force program or project is first proposed, and again when an ongoing program evaluation or project reveals that a significant adjustment is necessary. This regulation also states when an economic analysis is not required. It applies to all commands and separate operating agencies and implements Department of Defense Instruction (DODI) 7041.3, 18 October 1972, Economic Analysis and Program Evaluation for Resource Management.

Air Force Regulation 300-12, Volumes I and II, Procedures for Managing Automated Data Processing Systems (ADPS), 12 September 1977.

This regulation establishes procedures to manage the Air Force Automated Data Processing Systems.

Air Force Logistics Command Regulation 400-21/DARCOM-R-700-99/NAVMATINST 4790.23B/MCO P4410.22B, Logistics: Wholesale Inventory Management and Logistics Support of Multi-Used Nonconsumable Items, 25 February 1982.

This regulation provides uniform guidance and procedures for applying Primary Inventory Control Activity (PICA) materiel management assignment criteria, whereby one service will provide certain logistics support functions to all military users of nonconsumable items.

G. SATELLITE STUDIES

An Analysis to Determine if the Department of Defense Should Own or Lease Communications Satellites, Major Donald L. Steelman, Thesis at the George Washington University, September 1965.

The problem addressed in this thesis concerns the managerial impacts of the COMSAT Corporation and the DoD in the development of a communications satellite program. Specifically, should the DoD own and operate a separate communications satellite system, thus taking advantage of the qualifying language in the Communications Satellite Act, or should a global satellite communications system be developed by the COMSAT Corporation with the DoD leasing the required capacity from the Corporation? With due consideration for national policy, the problem was analyzed from the management and policy standpoint as it relates to the respective requirements and objectives. The technical design of the satellite system is not a major consideration in this thesis.

Lease Versus Buy Considerations for MILSATCOM Systems and an Acquisition Strategy for STRATSAT, by Leonard G. Larson and Ralph L. Spaulding, DCA Technical Report No. 80-1, April 1980.

This report examines the lease/buy question as it applies to MILSATCOM systems to illuminate the issues involved and identify the factors that tend to drive a decision toward one or the other acquisition method. The report is organized into five sections: (1) Lease versus Buy Considerations for MILSATCOM Systems--a tutorial on the various aspects pertaining to lease versus buy considerations; (2) Acquisition Strategy for STRATSAT--discussion of four possible acquisition strategies to acquire STRATSAT; (3) Comparative Cost Analysis of STRATSAT Lease versus Buy Options--discussion of methodology and results of the lease versus buy cost comparisons; (4) Contractor Responses to Leasing STRATSAT--review of contractor positions and views related to

the practicality and feasibility of leasing STRATSAT; and (5) Appendixes--description of leasing arrangements for GAPFILLER, LEASAT, and TDRSS.

MILSATCOM Acquisition Strategies: Lease-Versus-Buy, A Briefing, Patricia M. Dinneen, Rand Working Draft WD-1579-AF, August 1982.

This study presents a decision framework in matrix form that can assist planners and policy makers in determining what, when, and how much MILSATCOM services and equipment to lease or purchase. The matrix permits evaluation of different lease and purchase options (rows) with respect to how well they can satisfy explicit cost, policy, and performance criteria (columns). The matrix can be used to quantify and qualify important cost/performance/policy trade-offs and may be updated, as needed, to reflect changes in the criteria and supply options.

Who Should Provide Military Space Communications, V. L. Vermerire, Air War College Report No. 3210, January 1966.

This report discusses the development of the three groups (DoD, NASA and COMSAT) involved in satellite communications. Active versus passive satellite attributes are reviewed in a general introduction to space communications. Finally, there is a discussion of the pros and cons of government ownership.

H. AUTOMATED DATA PROCESSING STUDIES

Financing Method Analysis of Defense Department ADPE, W. E. Howard, Air War College Report No. 3935, March 1970.

The study develops a specific analytical structure, reviews the industry range of values for new ADPE terms and charges and selects for analysis a representative set of systems values. The need for uniform treatment of uncertain study variables (economic life, machine utilization, and

residual value) is demonstrated by cash flow analysis. The study then develops, rationalizes, and tests the implications of standard treatments of the uncertain variables.

Lease Versus Purchase of Commercial Data Processing Equipment, U.S. Army Electronics Logistics Research Office, Report No. USAELRO-62-163, July 1963.

This study examines the merits of leasing or purchasing commercial data processing equipment required by combat logistics support organizations in field armies and by TOE signal support elements in training at selected CONUS depots.

Review of DoD Acquisition of ADPE, T.C. Bartee, et al., Institute for Defense Analyses Memorandum Report, May 1981.

This memorandum report represents the results of a review by IDA of the problems of ADPE acquisition in the DoD. It concentrated on commercial ADPE procured under the provisions of the Brooks Bill (P.L. 89-306), but in many respects is applicable also to embedded computers.

A Study of the Cost-Effectiveness of Having the Department of Defense Procure and Maintain Its Communication-Electronic Computer Systems, Harper S. Alford, et al., Thesis, Air Force Institute of Technology, SLSR 19-70, 19 August 1970.

Due to the increased usage of computers by the Department of Defense, procurement and maintenance decisions have to be made. This research effort compares the quality of DoD computer maintenance with contract computer maintenance by selecting the Overseas Automatic Digital Message Switching Centers (ADMSCs) as a representative computer system. A study was performed to determine whether equipment should be procured or leased and whether the DoD or the contractor should maintain it.

I. OTHER

Contractor Facilities Lease/Buy Decisions, J.E. Muehleisen, Defense Systems Management School Report PMC 75-2, November 1975.

This paper explains the development of a computer program that used the Armed Services Procurement Regulation methods to compare the costs of lease/buy decisions. It included tax effects that are now not current.

Analyzing Capital Expenditures, Private and Public Perspectives by G. David Quirin and John C. Wiginton, 1981, Richard D. Irwin, Inc., ISBN 0-256-00460-9.

This book provides a systematic and thorough treatment of the theory of capital expenditure management. It has a framework based on contemporary financial theory. Chapters 8 and 9 are the public-sector analog of the discussions of measuring required rate of return and benefits and costs in the private sector.

Appendix A

DECISION AID FOR EVALUATING LEASE/BUY ALTERNATIVES

DECISION AID FOR EVALUATING LEASE/BUY ALTERNATIVES

Tables A-1 through A-4 illustrate the factor scoring procedure mentioned in Chapter I. *Both the weights and scores are completely arbitrary and do not apply to any specific system. They are presented for illustrative purposes only.*

The first step is to assign weights to each factor category. The weights should add to 1.0. For example,

Factor	Weight
1. Performance	.40
2. Logistics	.20
3. Management	.17
4. Economic (qualitative)	.23
Total	1.00

Next, the weights for the individual factors are assigned as shown in the individual tables. Note in Table A-1 that "Degree of Militarization" was given a higher weight than the other factors. In Table A-3, all factors were given equal weights. Care should be taken in deciding upon the weights, because they have an important influence on the total scores.

Once the weights have been assigned, the minimum, neutral, and maximum scores for the factor categories and the sum of all categories are automatically established. These are given at the bottom of each table.

Table A-1 illustrates a case where the equipment is highly militarized and requires tight security controls, survivability and reconstitution capabilities. These suggest a buy preference.

Table A-1. EXAMPLE SCORING OF PERFORMANCE FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Degree of Militarization		x								.10	.02
2. Site Location		x								.03	.06
3. Security Requirements		x								.03	.06
4. Survivability Requirements		x								.03	.06
5. Reconstitution Requirements		x								.03	.06
6. Peacetime Availability					x					.03	.15
7. Rate of Technological Change									x	.08	.72
8. System Interfaces								x		.03	.24
9. Growth Rate/Flexibility								x		.04	.32
Totals										.40	1.69
Minimum											.40
Neutral											2.00
Maximum											3.60

Table A-2. EXAMPLE SCORING OF LOGISTICS FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Integrated Logistics Support (ILS)		x								.05	.10
2. Trained O&M Personnel			x							.05	.15
3. Operating Environment					x					.02	.10
4. O&S Performance			x							.02	.06
5. Probability of Work Stoppage			x							.02	.06
6. Rotation Sites					x					.02	.10
7. "AN/" Nomenclature					x					.01	.05
8. COMSEC Keys	x									.01	.01
Totals										.20	.63
Minimum											.20
Neutral											1.00
Maximum											1.80

Table A-3. EXAMPLE SCORING OF MANAGEMENT FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. Financial Status of Company			x							.01	.03
2. Small Businesses			x							.01	.03
3. Site Location							x			.01	.07
4. Acquisition and O&M Funds									x	.01	.09
5. Multiple Lessors									x	.01	.09
6. OTP-13									x	.01	.09
7. Brooks Bill						x				.01	.06
8. DODD 5000.37						x				.01	.06
9. Federal Property and Administrative Services Act									x	.01	.09
10. OMB Circular No. A-76									x	.01	.09
11. Government Contract Placement			x							.01	.03
12. Schedule			x							.01	.03
13. Management Flexibility								x		.01	.08
14. Performance Standards			x							.01	.03
15. Military Service User Preference			x							.01	.03
16. Connection Approval Required (Host Nation)								x		.01	.08
17. Defense Acquisition Regulation 1-317								x		.01	.08
Totals										.17	1.06
Minimum											.17
Neutral											.85
Maximum											1.53

Table A-4. EXAMPLE SCORING OF ECONOMIC FACTORS

Factor	Score									Weight	Weighted Score
	Buy				Neutral	Lease					
	1	2	3	4	5	6	7	8	9		
1. System Capacity Utilization								x		.04	.32
2. Federal Tax Effects		x								.04	.08
3. Economic Adjustment Clauses			x							.04	.12
4. Warranties			x							.04	.12
5. Installation Costs								x		.04	.32
6. Work Breakdown Structure (WBS)			x							.03	.09
Totals										.23	1.05
Minimum											.23
Neutral											1.15
Maximum											2.07

However, the rate of technological change, system interfaces and flexibility factors indicate a preference for leasing. The factor scores tend to compensate so that the total score (1.69) for the factor category is pushed toward a neutral position, but it still indicates a lean toward a buy decision.

The scores for the other factors are summarized below and totaled to an overall score. The total score is only slightly less than 5 which indicates a lean towards a buy position. The failure to achieve a definitive low or high score suggests that the final decision should probably be based on the relative cost of leasing versus buying the equipment.

Factor	Weighted Score	
1. Performance	1.69	
2. Logistics	.63	
3. Management	1.06	
4. Economic	1.05	
Total	4.43	
Minimum	1.00	Buy
Neutral	5.00	Neutral
Maximum	9.00	Lease

We emphasize that this process should be regarded only as an *aid* to decision making. It is not a substitute for sound judgments based upon experience. However, the procedure is useful as a focusing mechanism for the issues involved in the evaluation. Several persons could score the equipment independently, and the scores and reasons for the scores discussed. It is anticipated that this process will usually yield a consensus opinion. If controversy were to emerge, the specific factors entering into the disagreement can be easily identified.

Appendix B

ECONOMIC ANALYSIS OF MINIMUM FEE LEASES

ECONOMIC ANALYSIS OF MINIMUM FEE LEASES

This appendix provides the supporting calculations for the discussion of minimum fee leases and tax considerations found in Chapter II. Topics include the methodology used, the conditions under which one option may be preferable to another, and the tax consequences of selecting the leasing option.

A. METHODOLOGY

When it performs a lease/buy economic analysis, DCA's only economic concern is with the relative costs of the various options.[1] It is not concerned with how the quoted lease fee and the purchase price were set by the lessor and by the equipment manufacturer, respectively. However, since there is a relationship between a *minimum* fee lease and actual leasing rates, we also present an analysis which shows the procedures that a lessor would use in calculating a *minimum* lease fee which would just cover his costs plus a normal return on his invested funds.

1. Lease/Buy Decisions

This analysis will focus on a lease/buy decision in which the lease is simply a financing vehicle designed to obtain

[1] In addition to simple leasing and buying, these may include various forms of lease with an option to buy. For simplicity of presentation, this case was not examined.

the equipment for its *entire* expected economic life.[1] It is explicitly assumed that this decision will not affect system performance, operations, the quality of maintenance available, logistics, management, etc.

The economic analysis of a decision involving the choice between purchasing or leasing communications equipment is straightforward. An agency, such as DCA, would compare the costs of the two methods of acquiring a capital asset and choose the cheaper option. For DCA, this means comparing (1) the cost of buying a piece of communication equipment now and maintaining it for n years with (2) the cost of an n-year lease and maintenance of that equipment. We assume the equipment will be kept for its entire economic life and will have no residual value at the end of the lease.[2]

The appropriate procedure is to compare P, the purchase price, with the present discounted value of n lease payments (net of maintenance) of size L (in constant dollars). DCA would be indifferent between purchasing and leasing if

$$P - \sum_{t=1}^{m} M/(1+r)^t = \sum_{t=1}^{n} L/(1+r)^t,^3 \qquad (1)$$

where M is the annual maintenance fee, m is the length of the warranty, and r is the discount factor, which is ten percent for government purchases of capital goods. If the price, less the value of the warranty, is less than the present discounted value of the n lease payments, purchase of the item is more desirable economically (conversely if P is larger).

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[1]We also assume that the lease is made by a third party (not the manufacturer) so that the tax consequences resulting from the sale of the equipment are the same whether the government leases or buys.

[2]Residual value can be introduced as presented in the discussion of the BEPLOT program. We ignore it here to simplify the analysis.

[3]Assuming end-of-period discounting.

2. Minimum Fee Leases

Prior to 1981, it was almost always more expensive for a government agency to lease an asset for its *entire* life than to purchase it.[1] Since leasing is merely a technique for financing the purchase of a capital asset, the government agency incurred lower costs by purchasing. Its implicit cost of funds was lower than that paid by a private leasing company, which would have to pass on the higher interest costs in its lease fee charges.

However, the 1981 tax law created some situations in which a government agency would incur lower costs if it leased rather than purchased. These situations could occur even if the leasing company borrowed at a higher rate than the government. The government agency's cost of leasing could be less relative to purchasing if the lessor passed on all the savings resulting from the new Accelerated Cost Recovery System. This form of depreciation permits a leasing company to recover its investment in the equipment more quickly than was permitted under the old law. Since this benefit occurs during the early periods of a lease, the time value of these tax savings permits the lessor to quote a lower fee charge to the government. Leasing *may* be favored over purchasing when the equipment costs may be recovered quickly (three- or five-year ACRS) and the term of the lease is relatively long.[2]

To illustrate this point, we calculated the minimum fee that a lessor would accept in leasing equipment to the government. A number of these calculations were undertaken using

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[1]We first ignore tax consequences which affect the cost to the government (Treasury), but not to the government agency. These are introduced in Section B.

[2]Equipment for which the three-year deduction may be used includes autos, and machinery and equipment with an asset depreciation (ADR) mid-point life of four years or less. The five-year system is used for most machines and equipment.

alternative assumptions. The relative costs of leasing and purchasing, assuming various interest rates on the lessor's mortgage, lengths of lease, and alternative ACRS, are presented in Table B-1. (An example of the methodology used to calculate the data in this table is presented below.) These calculations show the lowest cost lease that the government agency could obtain on the assumption that the lessor passed on all the tax benefits and had a ten percent after-tax internal rate of return.

Table B-1. RATIO OF PRESENT DISCOUNTED VALUE OF A MINIMUM FEE LEASE TO PURCHASE PRICE, FOR VARIOUS ACRS, LEASE LENGTHS, AND LESSOR INTEREST RATES

Lessor Interest Rate on Mortgage[a]	Three-Year ACRS		Five-Year ACRS	
	Lease Length (Years)		Lease Length (Years)	
	5	10	5	10
10.5	1.06	0.95	1.09	0.98
12.0	1.09	1.00	1.12	1.03
13.5	1.12	1.04	1.15	1.08

[a]It is assumed that the lessor borrows 80 percent of the purchase cost of the equipment, and the term of the loan is the same as the length of the lease.

The results indicate that even if the lessor incurred only a 12 percent interest rate, leasing would not be cheaper than purchasing. Only with a 10.5 interest rate and a ten-year lease could there be a cost advantage to leasing.

In most situations, DCA would find that the quoted lease fee was substantially higher than this minimum charge. Consequently, DCA would find that in most circumstances leasing would be more expensive than purchasing if the lease covered the equipment's entire useful life.

The analysis just presented assumed that the equipment would either be purchased or leased for its *entire* useful life. When confronted with a lease/buy decision, DCA must also consider (1) whether it would use the equipment at capacity for the entire period or would only need to lease a fraction of its capabilities and (2) whether technological change may make the equipment obsolete earlier than had been assumed in calculating the residual life of the equipment. If these factors suggest that the good may not be held for its entire useful life, an alternative methodology may be used to examine the lease/buy decision.

An alternative analytic approach for examining the lease/buy options when the equipment may not be held for its entire useful life has been developed by DCA--the BEPLOT Model. This model calculates the number of months that a capital asset must be held before purchasing becomes preferable to leasing. The important parameters of the model are the purchase price, the size of the lease payments, and assumptions about the residual value and useful life of the asset.

3. Calculating the Lowest Possible Lease Fee

First we assume that the lease price is the lowest possible fee that the lease company could charge the government without losing money. This is based on the company recovering its interest costs on the portion of the transaction financed by borrowing and earning its opportunity cost, or internal rate of return, on its equity. If the purchase option is preferable under these circumstances, it certainly will be preferred under other, more realistic, assumptions about the lessor's pricing policy.

Over the term of the lease, the lease payments must recover both the cost of the equipment which is being leased and the interest payments. In addition, the firm will seek to earn its

minimum rate of return on equity. All tax savings accruing from the depreciation allowance are assumed to be passed on to DCA. We further assume that all capital charges are taken as expenses in the first three years of the lease in accord with the new ACRS, and that 80 percent of the value of the equipment is depreciated.[1]

The following additional assumptions are made and the calculations are presented in Table B-2: (1) equipment costs one million dollars, (2) the useful life is five years, (3) there is no redisual value, (4) the interest rate at which the leasing firm borrows is 12 percent and its after-tax internal rate of return is ten percent, and (5) the leasing firm is in the 50 percent combined federal and state corporate profits tax bracket.

a. Calculation of Payments That Leasing Firm Must Make

We assume that the leasing firm borrows 80 percent or $800,000 to buy the equipment and has to pay a 12 percent interest rate. It must make yearly payments to repay this loan. If there are five equal annual payments of $221,928, the loan would be fully amortized.

b. Calculation of Tax Savings

A leasing firm can subtract its depreciation charges and interest payments from its pretax income for the purpose of calculating its taxes. This annual tax savings is 50 percent of the sum of these interest costs and depreciation charges.

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[1]This is in accord with established IRS regulations which require that a firm maintain a 20 percent equity in the property being leased. For three-year property, the current Accelerated Cost Recovery System permits depreciation charges of 25 percent in the first year, 38 percent in the second, and 37 percent in the third year. For property placed in service after 1984, the ACRS permits deductions of 33 percent in the first year, 45 percent in the second year, and the remainder in the third year. This is the schedule used in this example.

Table B-2. CALCULATIONS FOR DETERMINING THE LOWEST POSSIBLE LEASE FEE

Year	Capital Consumption Using ACRS	Interest on Balance of Loan	Sum of Depreciation + Interest + Capital Loss	Tax Savings (50%) on Sum	Present Discounted Value of Tax Savings
1	$330,000	$96,000	$426,000	$213,000	$193,636
2	450,000	80,889	530,889	265,444	219,375
3	20,000	63,964	83,964	41,982	31,542
4	0	45,008	45,008	22,504	15,371
5	200,000[a]	23,778	123,778	61,889	38,428
				Total	$498,352

[a]Capital loss of $200,000; $100,000 is deductible from taxable income.

There is also a capital loss of $200,000 in year five to reflect the difference between the undepreciated book value and its residual or market value, which is assumed to be zero. One-half of this amount may be deducted from taxable income. These amounts are then discounted to reflect the fact that a tax saving in the future is not as valuable as one available now. The total present discounted value of these savings is $498,352. Table B-2 shows the year-by-year costs reflected in this total.

This figure, $498,352, can be converted to a stream of equal yearly savings whose present discounted value (at ten percent per year) is the same figure. The yearly stream of savings is $131,464.

c. Calculation of Return on Equity

We have assumed that the firm's internal rate of return after taxes is ten percent and that the firm initially invests $200,000. A yearly flow (F) of $52,760 (after taxes) for five

years discounted at ten percent has a present value of $200,000. This flow recovers the equity investment and provides a ten percent rate of return.

d. Calculation of Lowest Cost Lease Fee

The lease fee which, after taxes, recovers the repayments of the borrowing, yields the minimum rate of return, and takes into account the entire amount of savings is calculated from the formula:

$$L = (R - S + F)/(1 - t) \qquad (2)$$

where R is the yearly repayment flow, S is the annual stream of tax savings, F is the flow required to recapture the equity and yield a minimum rate of return, and t is the marginal tax rate.

In our example this is

$$L = (221,928 - 131,464 + 52,760)/(.50) = \$286,447.$$

e. DCA Decision Option

In this example, the discounted present value of five lease payments of $286,447 is $1,085,859. This is larger than the purchase price and therefore the decision would be to purchase. Thus, the purchase option is preferred even though all the assumptions have been set to favor the lease option.

B. FEDERAL TAX CONSEQUENCE OF LEASE/BUY DECISIONS

This section examines the tax consequences of leasing from the Treasury's point of view. There are no tax implications involved in purchasing new equipment because the results are

the same whether the government purchases the equipment or the leasing company buys it.[1]

A leasing company obtains several tax shields (benefits), at least some portion of which are typically passed on to the lease in the form of a lower lease payment. These tax shields include deductibility of interest expenses, depreciation allowances, and the investment tax credit. However, a lessor cannot claim the investment tax credit for items leased to a nonprofit organization or to a government agency. In addition, IRS Revenue Procedures (75-21) stipulate that a lessor may take depreciation allowances equal to no more than 80 percent of the unadjusted basis of the item being leased. Thus, the lessor will have a book value of 20 percent of the original acquisition cost at the end of the lease. If the item has no economic value at the end of the lease, the firm will have a capital loss equal to its undepreciated book value.

Our calculations of the tax implications of leasing are based on a number of assumptions. First, it is assumed that the lessor will take advantage of all the depreciation allowances permitted under the current tax laws. Thus, the depreciation allowances will be based on either the three or five-year schedule of the Accelerated Cost Recovery System (ACRS). Second, the lessor will finance the purchase of the equipment that is being leased. We assume that a mortgage which will be amortized over the lifetime of the lease will be used to finance 80 percent of the purchase price. The interest charges associated with this mortgage will be calculated from a typical mortgage repayment schedule.

If leasing were chosen over the purchase option, associated with the lease would be these depreciation allowances and interest charges which are subtracted from the taxable income

[1]We have not looked at the case where the manufacturer is the lessor.

and, thus, represent potential revenue losses to the Treasury. These potential losses (tax shields) are equal to the sum of the charges multiplied by the appropriate marginal tax rate.

On the other hand, the lessor would earn revenue from the lease, and the mortgage holders would earn interest income. These revenues would add to their taxable income. Thus, the Treasury would earn tax revenues equal to the lease plus interest payments multiplied by the appropriate marginal tax rates for the lessors and mortgage holders. (All other expenses and income are assumed to be negligible and are excluded from these calculations.)

The depreciation allowances for the k^{th} year after an item has been placed in service are calculated from (3)

$$Dep_k = \alpha_k P \ , \tag{3}$$

where α_k is the k^{th} year depreciation deduction permitted by the relevant schedule of the Accelerated Cost Recovery System (ACRS) of the 1981 tax law. There are different schedules for property classed as 3-, 5-, 10-, and 15-year property.

The gross tax loss to the Treasury in year k is

$$T_k = \tau \left[(Dep_k) + (i_k) + CL_k \right] \tag{4}$$

where τ is the relevant corporate tax rate, i_k represents the interest expenses in the k^{th} year involved in financing the equipment leased, and CL_k is the capital loss incurred. The tax gain (gross tax revenue) can be calculated from (5)

$$R_k = \tau \ (L + I), \tag{5}$$

where L is the lease payment and I is the interest payment.[1]

[1]It is assumed that the lessor and mortgage holders have the same tax rates, an assumption that may not always hold true.

The yearly net tax subsidy from the Treasury is:

$$S = T_k - R_k \ , \tag{6}$$

which should be discounted at ten percent. Therefore, the net tax cost (C) of a lease transaction to the Treasury in present-discounted-value terms is given by

$$C = \sum_k \left(\frac{T_k - R_k}{(1+.10)^k} \right) . \tag{7}$$

These equations calculate minimum lease fees. If the lease fees were higher, the total government cost would be higher.