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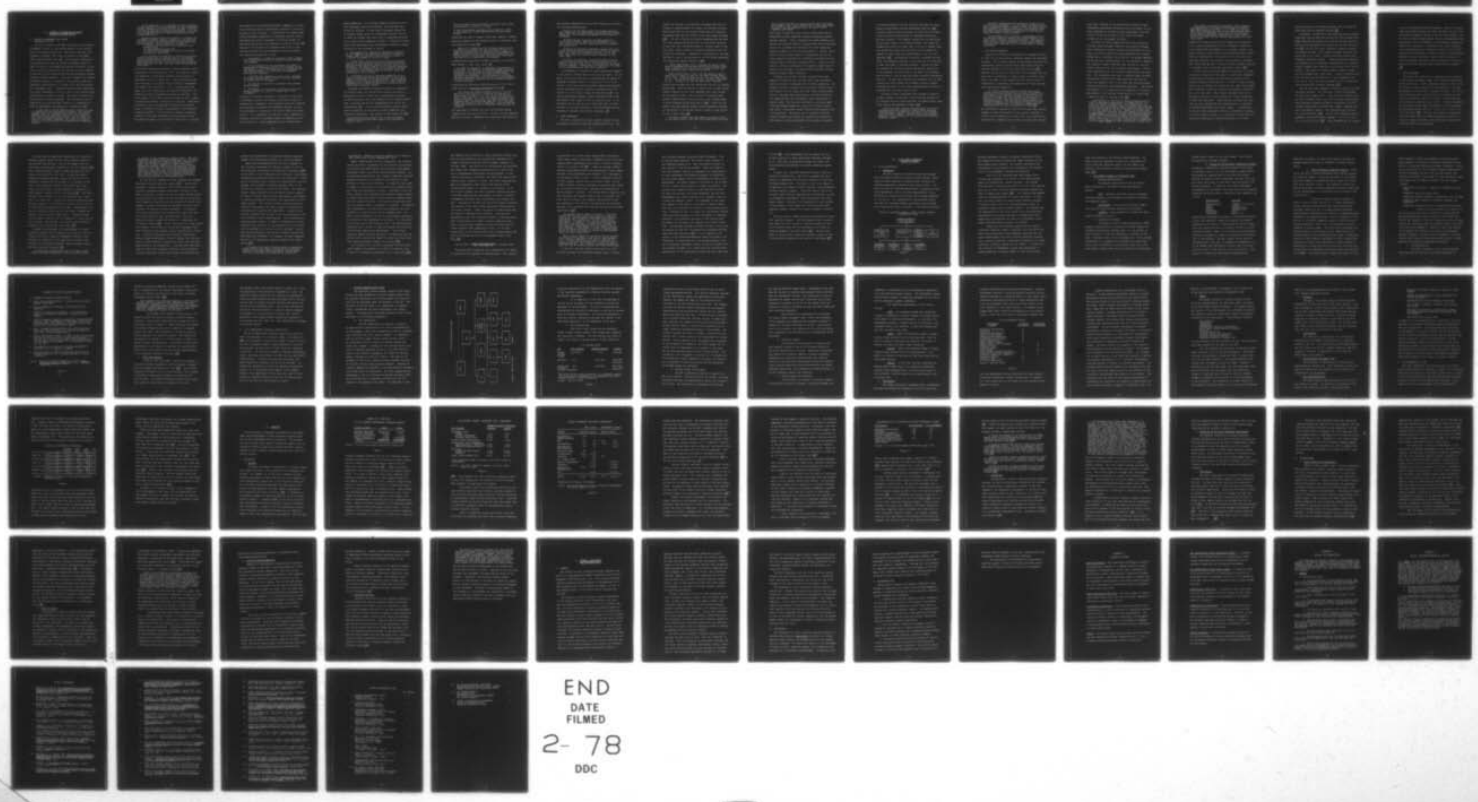

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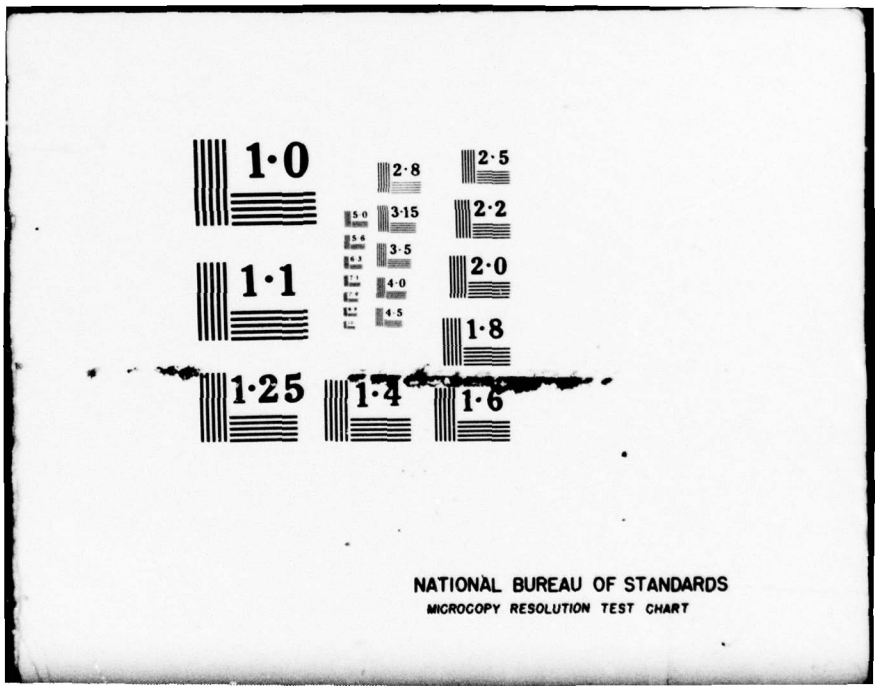
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NAVAL POSTGRADUATE SCHOOL
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TOTAL CONTRACTOR LOGISTICS SUPPORT:
A NEW CONCEPT IN NAVAL AVIATION

by

Antonio Apap

December 1977

Thesis Advisors: J. W. Creighton
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Total Contractor Logistics Support:

A New Concept in Naval Aviation

by

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Submitted in partial fulfillment of the
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ABSTRACT

This thesis investigates a new concept in Naval Aviation: total contractor logistics support. The Federal Government's policy of relying on the private sector for goods and services, as promulgated in OMB Circular No. A-76, is examined in depth. The history and present experiences of the military services concerning contractor aviation logistics support are outlined and discussed. The Navy's T-44A program, including the acquisition, total logistics support contract, and the Navy's experience with this first "turn key" operation of aircraft, is discussed in depth. Finally, the major advantages and disadvantages of total contractor support in Naval Aviation are explained and analyzed.

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I. INTRODUCTION

In April 1977, the Navy received the first T-44A twin-engine trainer of a planned 66 unit aircraft buy. The advent of the T-44A ushers in a completely new concept in Naval Aviation: a "turn key" operation of aircraft by the Navy brought about by total contractor logistics support. This concept involves a Contractor On-Site Support Center at the operating base which is totally responsible for all aircraft maintenance and supply support, as well as other logistics support functions such as maintaining a Technical Library and providing and maintaining the required Ground Support Equipment. The Navy's responsibilities in this new program are limited to ground training and flying the aircraft.

> There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all who profit by the old order, and only lukewarm defenders in all who profit by the new order. This lukewarmness arises partly from the fear of their adversaries who have the law in their favour, and partly from the incredulity of mankind, who do not truly believe in anything new until they have actual experience of it [1].

Although the above quotation was written by Machiovelli in 1513, it is equally applicable today.

A. OBJECTIVE

It is the objective of this thesis to evaluate the concept of total contractor logistics support in Naval Aviation.

To accomplish this objective the sequence of events that culminated in total contractor logistics support for the T-44A program and the T-44A acquisition are examined, and the advantages and disadvantages of this new concept are analyzed. During the course of this study the following specific questions are addressed:

1. What Federal Government Policy allows this magnitude of contractor support services?
2. What experiences have the military services had with contractor aviation logistics support?
3. Why did the Navy choose the T-44A program as its first experience with total contractor logistics support?
4. How does the T-44A logistics support contract function administratively?
5. What has been the Navy experience with the T-44A support contract to-date?
6. What are the advantages and disadvantages of total contractor aviation logistics support?

B. LIMITATIONS

Contractor aviation logistics support takes many forms such as: Contractor depot maintenance, interim contractor support, contractor material support, contractor material support plus intermediate/depot maintenance support, and total contractor logistics support. All of the above forms of contractor logistics support are discussed in this

thesis; however, the primary emphasis concentrates on the new concept of total contractor logistics support.

There are many DOD, Air Force, Army, and Navy directives concerning the utilization of services contracts. This thesis was not written strictly within the framework of these directives because of their transitory nature which would severely limit the useful life of a paper tied too closely to specific directives. Therefore, specific reference to directives is avoided in an attempt to make this thesis a valuable reference concerning contractor aviation logistics support concepts, instead of a paper explaining existing directives.

Total contractor logistics support includes provisions for a contractor On-Site Support Center to accomplish the required aviation logistics support functions; therefore, the scope of this thesis is limited in application to land-based Naval Aviation activities.

Finally, although the experiences of the Army and Air Force in the area of contractor aviation logistics support are discussed, it is done in a broad and general sense, and certainly not in the depth that the Navy experience is covered.

C. OVERVIEW

In Section II, the history of the Federal Government's policy on the services contract is examined and the present policy as promulgated by OMB Circular No. A-76 is discussed in detail. Also, the history and present experiences of

the Army, Air Force and Navy concerning contractor aviation logistics support are discussed, with specific emphasis on the Navy experience.

The T-44A acquisition and the details of the logistics support contract are covered in Section III. In addition, the contractor's On-Site Support Center is explained, and a brief review of the first six month's experience with the T-44A support contract is provided.

Section IV contains an analysis of the advantages and disadvantages of total contractor support and other types of contractor aviation support.

A summary of the thesis and the author's conclusions and recommendations are contained in Section V.

II. HISTORY OF CONTRACTOR AVIATION LOGISTICS SUPPORT IN DOD

A. OFFICE OF MANAGEMENT AND BUDGET CIRCULAR NO. A-76

For over 22 years it has been the policy of the Federal Government to rely, to the maximum extent, on the private sector for goods and services. This policy was first promulgated in January 1955, when the Bureau of the Budget (BOB) issued Bulletin 55-4 /2/. This Bulletin established the general policy that the Federal Government would not start or carry on any commercial-industrial activity to provide a service or product for its own use if such a product or service could be procured from private enterprise through ordinary business channels. With minor changes, the Federal Government's policy of reliance on the private sector was repeated in BOB Bulletin 57-7 (April 1957) and BOB Bulletin 60-2 (September 1959). Although these Bulletins emphasized the Federal Government's policy to rely on the private enterprise system to supply its needs, they were not specific on how the policy should be applied. This deficiency was recognized by the late President Johnson in a memorandum to Heads of Departments and Agencies on 3 March 1966 /3/.

> We must seek in every feasible way to reduce the cost of carrying out our governmental programs. But we must remember that our budgetary costs---our out-of-pocket expenditures---do not always provide a true measure of the costs of Government activities. This is often true when the Government undertakes to provide for itself a product or a service which is obtainable from commercial sources.

> At the same time, it is desirable or even necessary, in some instances for the Government to produce directly certain products or services for its own use. This action may be dictated by program requirements, or by lack of an acceptable source or because significant dollar savings may result.
>
> Decisions which involve the question of whether the Government provides directly, products or services for its own use must be exercised under uniform guidelines and principles. This is necessary in order ---
>
> to conduct the affairs of the Government on an orderly basis
> to limit budgetary costs; and
> to maintain the Government's policy of reliance upon private enterprise.
>
> At my direction the Director of the BOB is issuing detailed guidelines to determine when the Government should provide products and services for its own use. These guidelines are the result of long study, based on experience over the past six years since the guidelines were issued.

The detailed guidelines President Johnson referred to were promulgated in BOB Circular No. A-76, "Policies for Acquiring Commercial or Industrial Products and Services for Government Use," on 3 March 1966. This same Bulletin has been reissued in its present form as Office of Management and Budget (OMB) Circular No. A-76. Although only nine pages long, A-76 definitizes the Federal Government's "go commercial" policy concerning products and services. The first aspect of A-76 which should be noted is that it makes no distinction between a product and a service. Therefore, according to A-76, contracting for aircraft maintenance should be treated the same as purchasing an off-the-shelf commercial product. The Circular is specific concerning products or services obtainable from the private sector: "No Executive Agency will initiate a "New Start" or continue

the operation of an existing Government commercial or industrial activity except as specifically required by law or as provided by this circular." A "New Start" is a newly established Government commercial or industrial activity involving additional capital investment of $25,000 or more, or additional annual costs of production of $50,000 or more [4]. Circular A-76 provides five instances when it is in the national interest for the Government to provide directly the products and services it uses.

1. Procurement of a product or service from a commercial source would disrupt or materially delay an Agency's program.

2. It is necessary for the Government to conduct a commercial or industrial activity for purposes of combat support, or for individual and unit retraining of military personnel, or to maintain or strengthen mobilization readiness.

3. A satisfactory commercial source is not available and cannot be developed in time to provide a product or service when it is needed.

4. The product or service is available from another Federal Agency.

5. Procurement of the product or service from a commercial source will result in higher cost to the Government.

Circular A-76 further stipulates: "A decision to rely upon a Government activity for reasons involving cost must be supported by a comparative cost analysis which will disclose as accurately as possible the difference between the cost the Government is incurring or will incur under each alternative." It is important to note that a cost comparison is required only when a Government agency contemplates an in-house operation. A cost comparison is not required when

going commercial. A-76 includes specific details on how a cost comparison should be conducted, and concludes that section by stating: "A "New Start" ordinarily should not be approved unless costs of a Government activity will be at least ten percent less than costs of obtaining the product or service from commercial sources." Circular A-76 sets forth three additional major requirements relating to administration of the Government's policy.

1. Each agency will compile and maintain an inventory of its commercial or industrial activities having an annual output of products costing $50,000 or more, or a capital investment of $25,000 or more.

2. A "New Start" should not be initiated until possibilities of obtaining the product or service from commercial sources have been explored and not until it is approved by the Agency Head or by an Assistant Secretary or official of equivalent rank on the basis of factual justification for establishing the activity under the provisions of this Circular.

3. A systematic review of existing commercial or industrial activities should be maintained in each agency under the direction of the Agency Head. Activities remaining in the inventory after June 30, 1968, should be scheduled for at least one additional follow-up review during each three-year period.

Although the Federal Government's policy of relying on the private sector for products and services has been in existence for over 22 years and is specifically detailed in OMB Circular No. A-76, the progress of the Federal Government, including the DOD, in implementing this policy has disappointed many. In 1971, OMB requested a special report from the agencies on the status of their commercial and industrial activities. The reports to OMB showed that [5]:

2,899 activities (16 percent) had not been reviewed, although A-76 required such review to be completed by June 30, 1968.

With more than 15,000 activities reviewed, only 99 were discontinued as a result of review.

Of the 55 New Starts proposed since October 31, 1967, 44 were approved, 9 were pending, and two were disapproved.

Concerning the area of support activities, Edward C. Lesson, Executive Director of the National Council of Technical Service Industries stated [6]:

> There is no reason why such a policy should not be followed in an economy such as now exists in the U.S. - where the working force is comprised 60% by people engaged in service type, non-product activities where the private sector can, and does, provide every conceivable type service in a competitive environment.

Concerning the distinction between a product or a service, Major Robert L. Nier, USA, stated [1]:

> ...in terms of regulatory or management requirements or procedures, A-76 makes no distinction between a product or service. Yet in terms of actual implementation, the Department of Defense and its agencies have almost separated the two goods. The procurement of products has been implemented more extensively, has more guidance, functions with less problems, and is currently subject to less criticism.

Concerning the historical ineffectiveness of A-76, John F. Judge, Editor of Government Executive, stated [6]:

> The historical ineffectiveness of A-76 is in part due to its lone position - there are no Statutes or Federal Laws to back it up. And the Service Contract Act of 1965 helps too. This Act means, in effect, that before a contract can be let, the Labor Department will determine what the prevailing wage rate is in the area where the contract is to be performed - and the winning bidder must pay that rate to employees working under the contract.

The Department of Defense has also had problems making progress with the policy of A-76. In 1972, the GAO reported [7] that reviews of commercial and industrial activities by

the military departments had not been effective and listed the following deficiencies:

> Except in a few cases where cost studies had been made, there were no explanations supporting local recommendations that in-house performance of activities be continued.
>
> Although the Air Force and the Navy spent $1.7 billion for in-house, depot level maintenance in FY 1969, they did not review these activities as required by Circular A-76.
>
> Although the military departments should have completed the first three-year cycle of reviews by June 30, 1968, they were all far behind schedule. As of June 1971, many activities had not been reviewed for the first time.
>
> The Army installations visited had started new in-house activities which had not been subjected to the analysis required under A-76, nor included in the inventory as required. Installation officials were not aware of the requirement for "New Start" approval.

The Department of Defense has made significant progress in the service contract area in the past few years. For example, DOD service contracts for maintenance and repair of equipment increased from $0.77 billion in 1973 to $1.87 billion in 1976 and aircraft/aircraft engine repair/modification/rebuilding service contracts increased from $0.64 billion to $1.25 billion during the same period /8/. Although significant progress towards implementing A-76 has been made in DOD, there is still a long way to go. It is estimated that as late as 1975, there were about 400,000 military and civilian personnel in DOD performing services ostensibly available from private enterprise /9/.

B. ARMY EXPERIENCE

The first contractor aviation logistic support of any consequence occurred in the Army during World War II. The

reason for turning to contractors for support was not for economy or effectiveness, but simply for national survival. Before World War II, the United States Army Air Corps was graduating less than 500 pilots a year from flight training /10/. The war in Europe was rapidly expanding and the Army Air Corps needed more pilots than it could train in-house. In May 1939, the late General Henry H. Arnold, Chief of the Air Corps, called a group of aviation contractors into his office for a meeting. According to a transcript of the meetign kept by one of the contractors, the following transpired (the quotes are General Arnold's) /11/:

> "We've been doing a lot of talking for about a year. We've investigated you people and now we're going to act. There's going to be a war, and it's going to bust right open, and we've got to build an Air Force."
>
> Then he said that on July 1 we were going to get 50 Cadets and it would be our job "to train 'em and teach 'em to fly." Then he looked at us, into the face of each of us. "If you let me down on this," he said, "God help us all." He wasn't in the room more than 5 minutes.

History has recorded that the contractors did not let General Arnold down. From the initial 50 Cadets the Civilian Flying Schools trained in 1939, they expanded until they trained 81,024 pilots in 1944. All told the 60 Civilian Flying Schools trained nearly 200,000 pilots in the primary phase of pilot training during World War II /12/. After the war some of the high ranking German Officers expressed surprise at the ability of the United States to train so many pilots in such a short time /11/.

> We didn't believe that was possible because we knew at the outset of WW II you had a very small Army Air Corps

> and we didn't see how you could possibly take the necessary number of Air Force Officers out of that small cadre you had to do the training and do the other jobs of logistics and combat.

This review of Army Air Corps history during World War II establishes several important concepts concerning aviation logistic support. First, although the primary emphasis concerning the Civilian Contract Flying Schools was on training pilots, the contracts also provided for total contractor logistics support of the training operation. Second, utilization of the civilian sector in coordination with an in-house capability provided the flexibility required for such a great surge in the pilot training effort. Finally, utilization of civilian contractors for logistic support made it possible for the Army to assign military personnel to more directly related combat functions.

Although the Civilian Contract Flying Schools were phased out after the war, the Army still uses contractor logistics support to complement its in-house capability. For example, the Army utilizes total contractor aviation logistics support at Fort Rucker and other large training bases while at the same time maintaining an in-house capability for organizational and intermediate level maintenance at smaller bases. The Army also maintains an in-house depot level maintenance capability, such as the Corpus Christi Army Depot, a helicopter repair facility which employs over 4,000 personnel. The Army's use of contractor aviation logistic support has resulted in economy and flexibility. The economy is achieved primarily from saving the expense

of training mechanics and the stability provided by a permanently established civilian maintenance facility [12]. Civilian contract support provides the Army with the flexibility required during periods of increased tension and military build-up. For example, during the Viet Nam build-up the hours flown at the Aviation School, Fort Rucker increased from 33,675 in August 1965 to 61,314 in August 1966, and during this period the contractor at Fort Rucker increased his work force from approximately 2,200 to 2,900 employees [13]. Although the contractor increased his work force, the manpower available in the area was not sufficient to meet the surge in training required. Because the Army had retained an in-house aircraft maintenance capability, it was possible to divert some of the depot level maintenance workload to the Atlanta Army Depot Aircraft Maintenance Activity. In this case, neither the contractor nor the Army acting alone could handle the increased logistic support workload required, but with both expanding their efforts in coordination, the crisis could be met.

The Army's recent experience with contractor aviation logistic support is outlined in the following synopsis of an interview with Mr. Raymond Powers, ILS Branch Chief, Army Troop Support and Readiness Command [14].

> Most major Army aviation training bases have total contractor aviation logistics support which includes organizational, intermediate, and depot level maintenance and supply support. Smaller Army aviation bases generally have a combination of in-house and contractor logistics support.

The Army's experience with contractor logistics support has been favorable. At Fort Rucker the Army has used total contractor logistics support since the early 1950's. The contracts last about three years, and although there have been several different contractors at Fort Rucker, there have been no major problems.

The contractor at Fort Rucker is responsible for all the aviation logistics support for seven different aircraft types at several outlying airfields. The Army provides all the flight instruction at Fort Rucker except for instrument training which is accomplished by another contractor.

C. AIR FORCE EXPERIENCE

When the Air Force was established as a separate service in 1947, all of its aviation logistics support was performed in-house. The Civilian Contract Flying Schools had been disestablished, and the in-house depot maintenance operation had been reduced to 30% of its World War II level /15/. However, as the on-set of World War II had dictated that the Army turn to contractors to train pilots, the Berlin blockade by the USSR in 1948 prompted the Air Force to turn to contractors to supplement the inadequate Air Force in-house depot maintenance capability.

The aerial resupply of Berlin during this crisis caused an overnight expansion of airlift requirements. The demands of an expanded aircraft program during 1948 meant more flying, and the increase in flying time resulted in the need for more and more area support or maintenance work. With the depot workload greater than in-house resources, the Directorate of Supply and Maintenance at Headquarters, Air Materiel Command had no alternative but to turn to industry for help /15/.

The contractors selected by the Air Force were those already engaged in depot maintenance of the civilian versions of the Air Force transports (C-47 and C-54), thus enabling the contractors to commence the Air Force workload with minimum

lead time. Because of the success with contractor depot maintenance experienced during the Berlin Blockade, the Air Force expanded its contractor depot maintenance from zero in 1947 to 54% of the total in 1957 where the growth leveled off to the present 60% level.

The first Air Force experience with total contractor aviation logistics support came with the return to primary pilot training by Civilian Contract Flying Schools in 1951. Again, as with the Army Air Corps experience with contract primary pilot training in World War II, the primary emphasis was on the pilot training aspect of the contracts. However, the logistics support functions were procured in the contracts along with the pilot training requirements. The Air Force experience with the Contract Flying Schools was excellent. The contractors were able to perform normal aircraft maintenance functions with fewer personnel than the Air Force had required, while at the same time providing unprecedented versatility and maintenance capability. The following examples of the versatility and capability of aircraft maintenance of the Contract Flying Schools is quoted from a thesis by Major W. Dunning, USAF /10/.

> Deficiencies in the J-69-T-9 engine prompted the Air Force to purchase a modification to change the T-9 to a J-69-T-25 engine configuration. This modification replaced all but six internal engine components and resulted in raising the engine thrust rating from 920 pounds in the T-9 to 1025 pounds in the T-25. Almost the entire fleet of T-37 aircraft installed and spare engines were modified at base level, by civilian contract maintenance personnel. The T-9 to T-25 modification changed the aircraft model number from T-37A to T-37B and to the author's knowledge was the first time in Air Force history that an engine and aircraft model change had been accomplished at base level.

> The Inspect and Repair as Necessary (IRAN) program is a recognized Air Force depot level system of extensive major maintenance of aircraft. T-37 IRAN work requirements were incorporated into periodic maintenance inspections and were performed by all six Civilian Contract Flying School maintenance organizations. This removed the T-37 aircraft from any further requirements for depot level IRAN.

Perhaps the ultimate criterion for judging the performance of an aircraft maintenance activity, assuming it meets all of its operational requirements, is its safety record. The primary Contract Flying Schools had an amazing safety record. "From the introduction of the first T-37 in 1957 until the last plane departed the Contract Flying Schools in December 1960, there were no major or minor aircraft accidents assessed to a primary cause of aircraft maintenance error" /10/.

In 1959 the Air Training Command was requested to reduce the costs of basic pilot training to a level more comparable to the primary training costs which were obtained by the Civilian Contract Flying Schools. In order to obtain current data on the utilization of contractors for other than primary pilot training, a services contract was awarded to Serv-Air, Inc. on 15 July 1960. This contract required Serv-Air to provide all service functions except for flight instruction at Vance Air Force Base. These services included such functions as civil engineering and transportation, in addition to aircraft maintenance and supply support. A description of the Air Force experiment at Vance is presented in Section IV of this thesis; however, it is important to note that the contractor performed all required services to Air Force

specifications with 35% fewer personnel than a similar Air Force Base with an identical mission /16/.

At present, in addition to utilizing contractor operated facilities such as Vance AFB and the Air Force Eastern Test Range where Pan Am Airways has a service contract which involves 30,000 employees at an annual cost of over $100 million /1/, the Air Force uses contractor logistics support for weapons systems. These weapons systems logistics contracts are of two types: interim contractor support and permanent contractor support. Interim contractor support is an alternative to the immediate implementation of in-house logistic support when receiving a new aircraft into the inventory. The period of interim logistic support varies, but has averaged about three years. Interim contractor support has been used successfully on such programs as the F-4C, C-141, and F-111 and is planned for the F-16 and Advanced Medium STOL Transport programs /17/.

The Air Force uses permanent contractor support for off-the-shelf aircraft. The first such contract was awarded for the C-9A in August 1967. Under the C-9A contract, the Air Force performs flight line and on-aircraft maintenance, while McDonnell Douglas performs or subcontracts all off-aircraft maintenance including heavy checks, component repair, and engine overhaul. The contractor also provides all supply functions /18/. The Air Force presently has six permanent contractor support programs: C-12, E-4, C-9A, T-43, U-18B, and VC-9C /19/. These programs are all similar

to the C-9A program previously described. The Air Force provides some common supplies for these aircraft, such as tires and avionics equipment already in the Air Force system. The Air Force performs organizational and some intermediate level maintenance, with the remainder of the logistics support provided by the contractor. According to Mr. David Ellenburg of the Headquarters AFLC Controller's Office, the Air Force experience with permanent contractor support of off-the-shelf aircraft has been successful, and the Air Force plans to utilize permanent contractor logistics support in future programs such as the Advanced Tanker-Cargo Aircraft program [19].

D. NAVY EXPERIENCE

The Navy's post World War II experience with contractor aviation logistics support began with contractor maintenance at the depot level. With a beginning similar to that of the Air Force, the Navy started with contracting for the depot maintenance of off-the-shelf transport aircraft. One of the first extensive depot contracts was with Lockheed Air Service for the Navy's fleet of C-121/EC121 (Super Constellation) aircraft during the early 1950's. The Navy subsequently has contracted for depot maintenance of other transport and training aircraft such as: C-117, C-118, C-130, T-29, T-34, and TS-2A [20]. The Navy has retained a substantial Naval Air Rework Facility (NARF) capability and plans to continue to share the depot level maintenance workload between the NARF's and contractors.

The Navy has had significant experience with contractor material support during the test and evaluation phases of new aircraft acquisitions. One of the longest such contracts was with McDonnell Aircraft for the F-4B program /21/. This interim materials support program extended over five years, from May 1958 to July 1963. During this period McDonnell provided materials support for the F-4B at ten different locations and for as many as 42 aircraft at one time. Also during this period the aircraft were flow a total of 18,404 hours. Another example of contractor interim support occurred in the P-3A program /21/. The Navy's contract with Lockheed for the P-3A extended from 1 April 1961 to 30 March 1963. During this period Lockheed provided material support at six different locations with as many as 29 aircraft being supported at one time. Surprisingly, during this relatively short period (two years) Lockheed supported a total of 18,669 flight hours. Lockheed stocked 17,280 support items for the P-3A program at a total cost of $26.0 million, and returned to the Navy a parts inventory valued at $24.6 million two years later /21/.

Although the advantages and disadvantages of interim contractor support will be examined in Section IV, the following quote from a Logistics Management Institute study provides an indication of the magnitude of possible cost savings with a contractor material support program during the early acquisition phases /21/.

> Provisioning conferences for the P-3A began during January and ended during March 1962, some nine months

in advance of the planned Navy support date. The first operational flights occurred during June 1962, and were supported through the contractor material support program. Had the Navy planned to support these first operational flights organically, initial provisioning decisions would have had to be made beginning, at the latest, in July 1961. Had this provisioning schedule been used, some additional 3,500 design changes would have impacted upon the early provisioning decisions. Thus, the full impact of these changes was avoided by provisioning some six to nine months later.

In 1966 the Navy awarded its first contract for extended contractor aviation logistics support /22/. The Navy had purchased a limited number of TC-4C aircraft which were specially configured Grumman Gulfstream I aircraft to be used as electronic trainers for the A-6 weapon system. Since the acquisition was limited and the airframe was an off-the-shelf commercial aircraft, the Navy decided to contract with Grumman to support the engine and airframe, while the Navy supported the peculiar avionics equipment. In addition, the contract specified that Grumman would supply all Technical Publications to Navy specifications. The TC-4C logistics support program was difficult to administer for two primary reasons /22/. First, there was not a clear interface between the airframe and the avionics equipment which made dividing the Navy/Grumman support responsibility difficult. Secondly, maintaining the Technical Publications current became increasingly difficult because they were not under the Navy Technical Publications system, nor were they administered as FAA publications. Although there were problems with this first extended contractor logistics support contract, important lessons were learned, and the Navy was

assured that contractors could provide extended logistics support for off-the-shelf aircraft in a Navy environment.

Based upon the experience with the TC-4C program, in 1967 the Navy contracted for logistics support of the CT-39E/G aircraft with Rockwell International Corporation [23]. The CT-39E/G is an off-the-shelf Navy version of the Rockwell International Corporation Model 265-40/60 Sabreliner. Unlike the TC-4C aircraft which included an extensive Navy avionics package, the Government Furnished Equipment (GFE) in the CT-39E/G was limited to a Navy UHF and TACAN. The logistics support concept employed in the CT-39E/G contract required the Navy to perform organizational maintenance, and Rockwell to perform intermediate and depot level maintenance and all supply support. The contract further stipulated that all contractor maintenance and supply support be conducted in accordance with approved FAA regulations. As part of the contract, Rockwell was required to set up and operate an on-site storeroom at each operating base. The procedures for obtaining parts support, or repair of reparables, involved turning in the worn part to the contractor's on-site storeroom in exchange for a new part or RFI component. Unlike most service contracts, the CT-39E/G contract avoided over-specifying work standards, for example, the Work Standards section of the Operational Logistics Support Plan (OLSP) states [23]:

> All depot level work including repair of reparables, engine overhaul and repair, the Annual Airworthiness Inspection and other work performed by the Contractor must be in accordance with appropriate Federal Air

Regulations. Materials issued in support of all maintenance levels must be from FAA-approved stock.

Again, learning from the TC-4C experience, the contract limited the Navy's responsibility for Technical Publications to providing the NATOPS Manual and Checklists, Maintenance Requirement Cards, and UHF and TACAN Technical Manuals. All the remaining publications were standard Commercial Technical Manuals provided by the contractor and available to Navy personnel at the on-site storeroom. Although the Navy owned no spares or repair parts, all peculiar Ground Support Equipment (GSE) was purchased by the Navy. According to the contract, Rockwell was compensated for materials support monthly by submitting reports which detailed material demands placed with the on-site storeroom. The reports included each line item and whether it was a consumable or reparable. Consumables were compensated at a fixed price and reparables were compensated at a fixed price of 50% of component cost. For depot level maintenance such as the Airworthiness Inspection, the contractor was compensated on the basis of a fixed price per man hour and for the materials used. The Airworthiness Inspection was in effect an IRAN and replaced the usual Navy PDLM (Periodic Depot-Level Maintenance). The CT-39E/G logistics support contract was easier to administer than the earlier TC-4C contract and formed the basis for future aviation logistics support contracts in the Navy [22].

On 31 January 1968, the Navy contracted with Bell Helicopter Company for delivery of 40 TH-57A helicopters with an option to purchase an additional 25 at a later date [24].

The contract also provided for total contractor material support for the lifetime of the aircraft and represents the largest contractor aviation logistics support operation in the Navy today. The TH-57A is an off-the-shelf FAA certified Bell Model 206A JetRanger helicopter which is used in the Navy's undergraduate helicopter training program. At the time the contract was initiated, the TH-57A was based at NAS Ellison Field, Pensacola, Florida. The TH-57A training program has subsequently been moved to NAS Whiting Field, Milton,Florida where it is currently in operation. As in the CT-39E/G program, the TH-57A contract required the Navy to provide organizational maintenance, and Bell to provide intermediate and depot level maintenance, plus supply support. Although the CT-39E/G and the TH-57A support contracts were similar, there were several significant differences in the latter contract. First, the method of compensating Bell for repair of reparables was different. Each part was guaranteed by Bell for a specified number of operating hours. When a part failed, the number of actual operating hours prior to failure were compared with the certified time between overhauls (TBO) guaranteed by Bell. If the part failed prior to the certified TBO, the following formula was used to calculate the cost of a replacement part to the Navy [25].

$$\text{Cost of Part} = \frac{\text{Actual Operating Hours}}{\text{Bell Certified TBO}} \times \text{Overhaul Price}$$

The second major change was the incorporation of a penalty clause for late delivery of required parts. The contract

required Bell to furnish parts causing NORS-G (Non-Operational Ready Supply, Grounding), replaceable within the Navy organizational maintenance level within 24 hours of presentation of a DD form 1348 [25]. Items not causing a NORS-G condition replaceable within the capabilities of Navy organizational level maintenance were required to be furnished by the contractor within 15 days. A final difference from the CT-39E/G support contract was in the area of GSE. In the CT-39E/G contract the Navy purchased all peculiar GSE, whereas in the TH-57A contract Bell supplied and maintained all GSE not common to the Navy. The present TH-57A logistics support operation has changed slightly from the original contract and is working to the complete satisfaction of the Navy operators of the TH-57A as evidenced by the following synopsis of an interview with LCDR Paul Wilkes, HT-8 Maintenance Officer [26].

> The present TH-57A support contract is with Bell Textron and includes total supply support, repair of reparables, and intermediate and depot level maintenance beyond the capability of the HT-8 Maintenance Department. A change to the contract within the past year allows the Squadron to perform some intermediate and depot level maintenance under the supervision of Bell Techreps. Crash damage or other unusual maintenance problems are referred to the TH-57A Program Manager at the Naval Air Logistics Center at NAS Patuxent River for final disposition.
>
> Bell's supply support is excellent and has enabled the Squadron to maintain a NORS rate of approximately 0.7%. The Bell personnel work hard to keep the aircraft up, and they get along well with the Navy maintenance personnel. The contract is relatively easy to work with and no unusual problems are being experienced.

In May 1973, the Navy received the first of 12 C-9B aircraft purchased from McDonnell-Douglas under a contract

that included extended contractor logistics support. Also an off-the-shelf aircraft, the C-9B is a Navy version of the McDonnell-Douglas DC-9. The C-9B support contract is very similar to the TH-57A contract. Under the terms of the C-9B contract, the Navy is responsible for organizational level maintenance and McDonnell-Douglas is responsible for all supply support and for intermediate and depot level maintenance. The supply support is provided by the contractor for a fixed price adjusted for flight utilization. The contract has a penalty clause for late delivery of parts. The parts are divided into three categories, and the time requirements vary from 30 minutes for a category A part, to 60 days for category C parts. The remainder of the logistics support is the same as in the TH-57A contract except that the C-9B contractor is required to furnish parts worldwide. According to CDR T. H. Hite, VR-1 Maintenance Officer: "Utilizing the contractor for logistics support is extremely effective. The contractor provides 24 hour service each day except for Christmas, and supports the aircraft worldwide. The McDonnell-Douglas personnel are easy to work with, and because of them the C-9B Operational Readiness and NORS rates have been excellent [27]." As an example of the quality of the maintenance/material support provided by the contractor, in conjunction with the professionalism of the VR-1 Maintenance Department, during the month of August 1977 the Squadron averaged 146.4 flight hours per aircraft while maintaining a 94.3% Operationally Ready rate and a NORS rate

of 0.1% /28/. This achievement was not unusual for VR-1, as their previous 12 month Operational Readiness averaged 87.4%. This kind of performance speaks for itself, the Navy/Contractor partnership in aviation logistics support works!

In April 1977, the Navy received the first T-44A of a planned 66 aircraft buy. The T-44A is another Navy purchase of a commercial off-the-shelf aircraft, in this case the Beech Kingair E-90. The advent of the T-44A ushers in a completely new concept in Naval Aviation: total contractor aviation logistics support. Under the terms of the T-44A contract, Beech provides organizational maintenance, as well as intermediate maintenance, depot maintenance, and total supply support. Because of the importance of this contract to the purpose of this thesis, the T-44A acquisition and logistics support contract are covered in-depth in Section III.

The Navy plans to expand industry participation in aviation logistics support. The Navy presently has a contract with Beech for total contractor logistics support of the T-34C aircraft which will be introduced in the Naval Air Training Command in the near future /22/. The Navy also plans to utilize total contractor logistics support in the CTX acquisition planned for the 1980-1982 time frame /29/.

III. T-44A TOTAL CONTRACTOR LOGISTICS SUPPORT

A. T-44A ACQUISITION

1. Background

The Navy conducts all advanced phase multi-engine pilot training at Naval Air Station, Corpus Christi, Texas. There are three echelons of command within the Naval Air Training organization located at NAS Corpus Christi: the Chief of Naval Air Training Headquarters; Training Air Wing Four Headquarters; and on the same organizational level, the Naval Air Station Corpus Christi and Training Squadrons 27, 28, and 31. The organizational relationships within the Naval Air Training Command pertaining to multi-engine pilot training are shown in Figure 1. The Naval Air Station

NAVAL AIR TRAINING COMMAND (CORPUS CHRISTI COMPLEX)
ORGANIZATION CHART

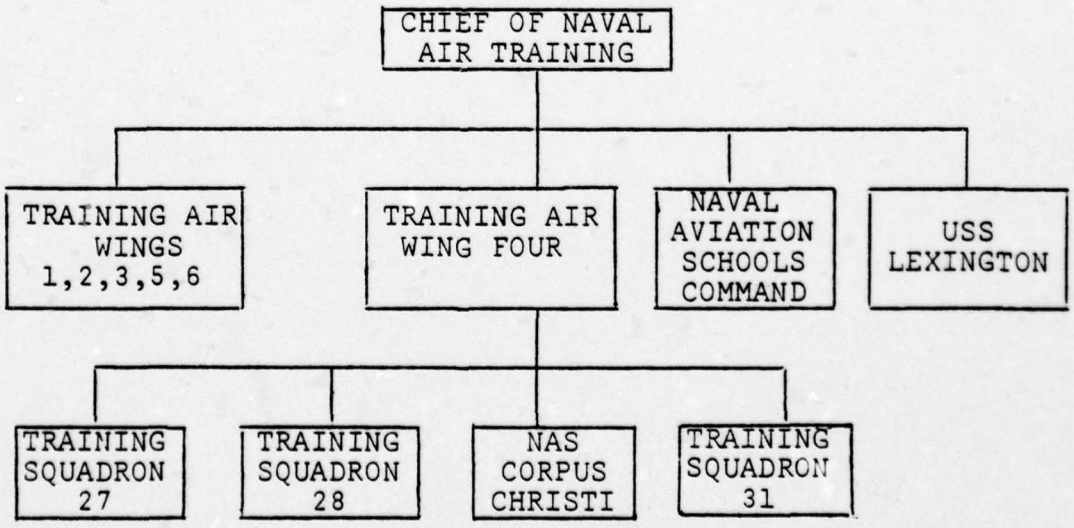


Figure 1

Training Department conducts the ground training and Training Squadrons 28 and 31 perform the flight training for the multi-engine pilot syllabus. The overall supervision and coordination of multi-engine pilot training is the responsibility of the Commander, Training Air Wing Four.

Until 1977 all advanced phase multi-engine pilot training was conducted in the TS-2A, a twin reciprocating engine, non-pressurized, trainer aircraft. The average TS-2A has been in service since 1955, is on its tenth service tour, and is one of the most expensive training command aircraft to operate and support [30]. Its reciprocating engines limit the training envelope to 10,000' and below. In addition, the TS-2A offers no turbine engine operator training to flight students that will, upon graduation, report to squadrons flying turbine powered aircraft. The advanced age and obsolescence of the TS-2A coupled with the established requirement for continued training of undergraduate multi-engine pilots established the need for a replacement multi-engine advanced trainer aircraft, the VTAM(X).

Based upon the successes experienced with partial contractor logistics support, especially with the TH-57A program, and anticipating further manpower reductions for the shore establishment, the Chief of Naval Operations directed that a study be conducted concerning the feasibility of total contractor logistics support for the VTAM(X). In late 1974, The Institute for Management Science and Engineering of George Washington University began to study this problem

under the auspices of the Office of Naval Research. The study, which was completed in March 1975, concluded that total contractor logistics support for the VTAM(X) was feasible, cost effective, and had no over-riding disadvantages [30].

2. The VTAM(X) Request for Proposal (RFP)

a. Program Characteristics

The program characteristics for the VTAM(X) were established by the Chief of Naval Operations as follows:

Cost - Minimize life cycle cost by purchasing available hardware, and by maximum utilization of contractor logistics support.

Performance - Accept state-of-the-art commercial aircraft specifications tailored to Navy needs.

Schedule - Plan acquisition to accept the first VTAM(X) aircraft in FY 1977.

b. Acquisition Strategy

Utilizing the Chief of Naval Operation's VTAM(X) program characteristics, the Naval Air Systems Command developed an acquisition strategy based on a new concept in Naval Aviation, a "turn key" operation of aircraft by the Navy. The major thrust of this strategy was a "total package procurement" in a competitive environment involving three option lots of aircraft at a firm fixed price, and a five year support package where the firm fixed price deliverables

(flight hours) relate to real world needs. This totally new acquisition strategy included:

(1) Buying an Off-the-Shelf Commerical Aircraft. Purchasing a commercially available aircraft would result in avoiding a five to six year development program thereby minimizing the schedule while at the same time saving millions of dollars in R&D, production, and life cycle support costs which would be inevitable when developing a new military aircraft. In addition, the stated performance requirements for the VTAM(X) were amply met by the following commercial aircraft already in production and commercial use in 1975:

Manufacturer	Aircraft
Beech Aircraft	Kingair E 90 and C-12
Cessna	Citation
Piper	Cheyenne PA31T
Rockwell	Rockwell 690A
Mitsubishi	MU-2
Swearingen	Merlin III

Another major advantage of buying an off-the-shelf aircraft is that the competitive commercial aircraft environment coupled with the ability to specifically define the production unit enabled the Navy to structure the RFP on a firm fixed price basis. Page 1 of the VTAM(X) Type Description, as shown in Appendix B, contains the General Type Description of the aircraft. The Navy avoided overly detailed specifications in the RFP, for example, in paragraph A.1.a. of the VTAM(X) Type Description the Navy left the option open for either a turbo prop or a pure jet aircraft. This policy of avoiding over specifying requirements was

consistent throughout the entire RFP thereby allowing for maximum competition among the commercial aircraft manufacturers.

(2) Total Contractor Logistics Support. Building on the Navy's previous experience with limited contractor logistics support, a plan was developed for the VTAM(X) that would depend on a partnership with industry for total life cycle logistics support. This approach involved contractor investment in support equipment and parts inventories, and the establishment of a contractor service center at NAS Corpus Christi.

Prior Navy contract support programs in naval aviation had been limited to: (1) depot maintenance of Navy aircraft using detailed work specifications and government materials; and (2) augmenting Navy-performed organizational maintenance with commercial intermediate/depot maintenance and support services. With the exception of the TH-57A, the contractor augmented support in naval aviation typically applied to small lots of off-the-shelf aircraft dispersed at several bases. The logic behind selecting contractor support in these cases is best summarized by the following quote from a NAVAIRSYSCOM point paper; "Underlying theory held that numerous counterpart aircraft, operating in commercial aviation, were supported by a viable network of manufacturers, dealers and service facilities, and that participating in the commercial system was better than duplicating it"[29]. The planned VTAM(X) program was similar to the

TH-57A program in that both programs involved relatively large numbers of off-the-shelf aircraft operating from one base in a controlled mission environment (training). Building on the success of the contractor support experienced in the TH-57A program, the Navy took the next logical step forward and decided on the concept of total contractor logistics support for the VTAM(X) program. This new concept included:

Maintenance according to commercial standards and practices.

Commercial spare and repair parts.

Commercial support equipment, publications, and training.

Commercial depot support of airframes, engines, and components.

Commercial organizational and intermediate maintenance.

Figure 2 provides guidance for support contract design and was used as a model for constructing the maintenance/materials support section of the VTAM(X) RFP. The RFP was designed to have the contractor provide all maintenance and supporting logistics elements under a long term, firm fixed price agreement. Appendix C shows that portion of the VTAM(X) RFP relating to the scope of maintenance/materials support. As can be seen in Appendix C, the Navy avoided overly detailed specifications and relied on normal approved FAA commercial maintenance procedures.

c. The Approved RFP

The Navy's decision to avoid overly detailed specifications and the use of government materials by

GUIDANCE IN SUPPORT CONTRACT DESIGN

1. Maximize contractor responsibility.

2. Avoid split responsibility. A narrow line can easily become a grey area.

3. Rely on commercial standards, specifications and materials.

4. Insist on contractor investment. It increases his stake in the ultimate success (or failure) of the program.

5. Avoid unnecessary paperwork, especially routine printed reports. When necessary, make the paper serve two or more purposes. For example, an invoicing system that doubles as a performance status report.

6. Risk: assign high probability risk, other than very high cost items; reserve low or unknown probability risk, such as crash damage repair.

7. Define performance clearly in terms of what is expected, but not how to do the job. Avoid guidance which relieves the contractor from near total responsibility for the design and management of his approach to meeting the need.

8. Use penalties as a device for getting management's attention; not to bankrupt a company.

9. Use incentives to reward performance beyond what is normally expected; not to reward capacity to expand production.

Source: Naval Air Systems Command Point Paper, Total Contractor Logistics Support, by J. P. Mulligan, 2 May 1977.

Figure 2

relying on existing commercial systems in the VTAM(X) RFP was in consonance with the Federal Government's acquisition policy as stated by the Director of the Office of Federal Procurement policy (OFPP) [31]:

> The Government will purchase commercial, off-the-shelf products when such products will adequately serve the Government's requirements, provided such products have an established commercial market acceptability. The Government will utilize commercial distribution channels in supplying commercial products to its users.

The design of the VTAM(X) RFP was based on the lessons learned from previous aviation logistics support contracts. That previous experience had yielded the set of principles listed in Figure 2. These principles had guided the contract design process which resulted in a proposal request that was a clear statement of the Navy's needs in terms compatible with industry practice. The VTAM(X) RFP was approved on November 24, 1975 and mailed to eight commercial aircraft manufacturers. The success of the RFP was demonstrated by the absence of requests for clarification after the RFP was issued and by the overall responsiveness of the proposals received by the Navy [29].

3. The T-44A Contract

On May 25, 1976 the VTAM(X) contract was awarded to the Beech Aircraft Corporation, and the program's designation was changed from VTAM(X) to T-44A [32]. The contract specified an initial buy of 15 T-44A aircraft, with options to purchase 51 additional aircraft at a fixed price of $511,206 each. The contract further specified total logistics support by Beech from the receipt of the first

operational T-44A at NAS Corpus Christi in April 1977, until the expiration of the contract on September 30, 1981. The logistics support section of the contract also specified a firm fixed price whereby the Navy pays Beech $92.61 per hour for the first 65 flight hours per aircraft each month, and $41.80 for each additional hour. The contract provided for incentives for the contractor if aircraft sorties exceeded an average of 0.4 per aircraft on flyable days, and for penalties if the average monthly operational readiness of all aircraft was less than 0.80. The contract also contained an inflation clause.

B. T-44A OPERATIONAL LOGISTICS SUPPORT PLAN

The T-44A Operational Logistics Support Plan (OSLP No. AC049) was published in its present format on 18 March 1977 [33], and represents a totally new concept in naval aviation. The total contractor support concept embodied in the T-44A OSLP provides the Navy with its first "turn key" operation of aircraft. The five major logistics elements (maintenance, supply, training, publications, and GSE) are the contractor's responsibility. The Navy provides some facilities, the NATOPS manual and checklist, and flies the aircraft. Although this description of the T-44A operation sounds simplistic, it is nevertheless the essence of the program. Because of the importance of this first test case of total contractor logistics support in the Navy, the major provisions of the OSLP will be discussed in detail.

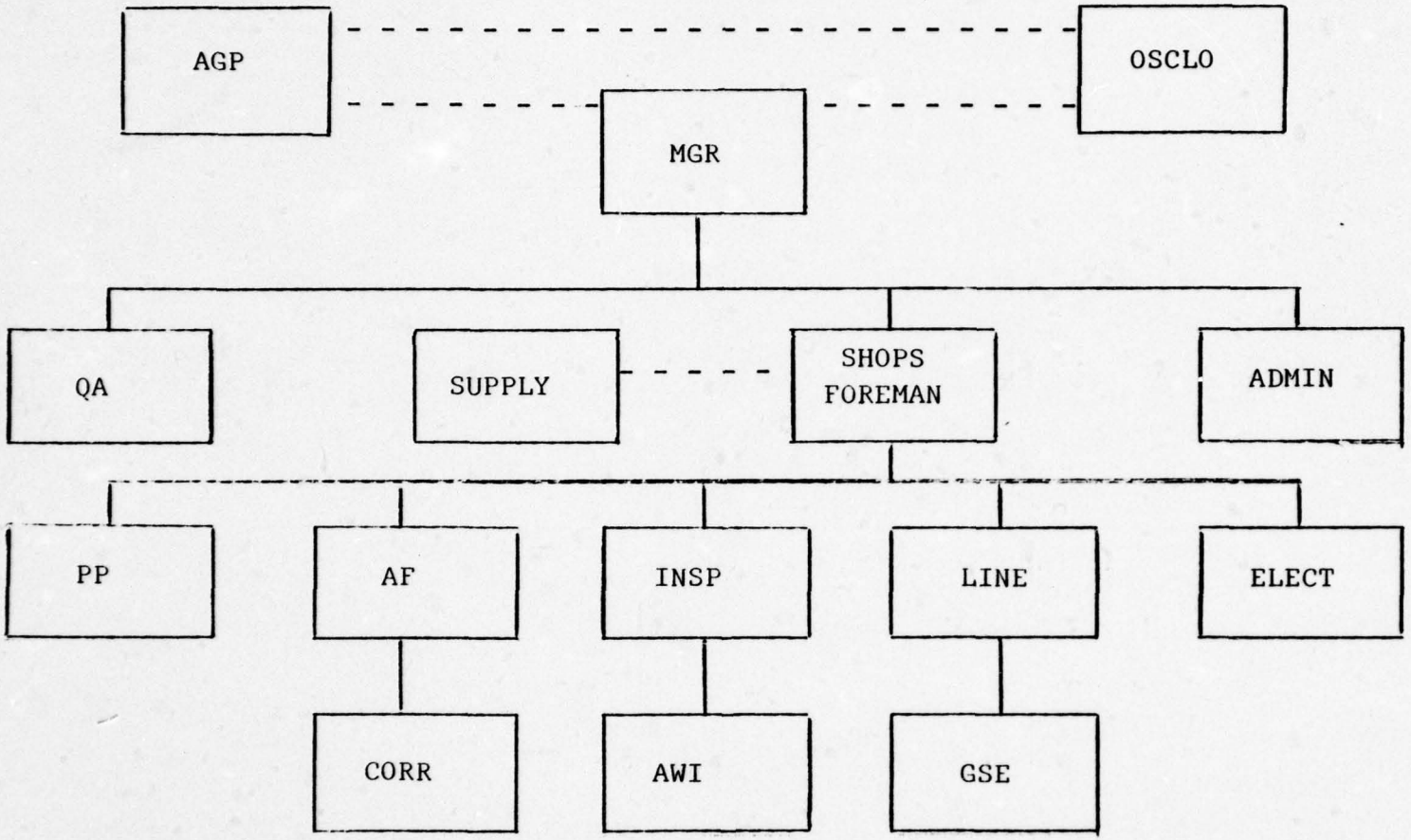
1. On-Site Support Center (OSC)

The contractor service center located at NAS Corpus Christi has been designated an On-Site Support Center (OSC). All aircraft maintenance and related support activities for the T-44A are performed under the auspices of the OSC. The functions of the OSC equate to a combination of organizational, intermediate and depot maintenance, plus supply support. The organization and administration of the OSC are discussed in the following paragraphs.

a. OSC Organization

The OSC organization is depicted in Figure 3. As Beech Aircraft Corporation's key on-site representative, the OSC manager bears total responsibility for all functions that constitute the T-44A support program. In cooperation with the On-Site Support Center Liaison Officer (OSCLO), he coordinates the OSC's efforts to totally support the flying hour program. Although the OSC provides flyable aircraft to Training Squadrons 28 and 31, the OSCLO does not report to the squadron commanders, but rather to the Commander, Training Air Wing Four (CTW-4). The OSCLO is responsible to CTW-4 for a smooth interface between the Navy and the OSC, and for settling minor disputes. Problems of a greater degree are forwarded to the Administrative Contracting Officer (ACO) for resolution. The OSCLO designates and promulgates a list of Authorized Government Personnel (AGP) who are authorized to coordinate services with the OSC manager in the absence of the OSCLO. The remainder of the

T-44A OSC Organization Chart



Source: OSLP No. AC049

Figure 3

functions depicted on the OSC organization chart are similar to the functions performed in a typical aviation squadron maintenance department.

It is important to note that the employees in the OSC are in the employ of the contractor, and are not employees of the government. The ACO is responsible for accrediting the contractor's employees to the Navy in accordance with current regulations. As civilian employees on a Naval Air Station, contractor employees are subject to all applicable regulations of the Department of the Navy.

b. OSC Working Hours

Most T-44A flight operations are conducted Monday through Friday; however, some flights are scheduled and conducted on weekends. The OSC working hours shown in Figure 4 are based on average hours of flight operations

OSC WORKING HOURS

DAY	FULL SERVICE	LIMITED SERVICE	ON-CALL
Monday through Friday	0600-2330*	N/A	2330-0600
Saturday	N/A	0800-1600	0001-0800 1600-2400
Sunday and Holidays (except Christmas)	N/A	1200-2000	0001-1200 2000-2400

*The hours of full service operation is a seasonal average and is adjusted as necessary to be compatible with the seasonal hours of flight operations.

Source: OSLP No. AC049

Figure 4

and allow one hour for pre-flight and one hour for post-flight maintenance/service. Full Service operation includes all OSC maintenance, supply and administrative services; however, the degree and tempo of Full Service are not specified in the OSLP because they will vary. For example, the need for certain support functions such as personnel administration and the Technical Library are not constant during the 0600-2330 duty day. Limited Service is restricted to aircraft servicing (fueling, oiling, nitrogen, oxygen) cleaning, and inspection (pre-flight and post-flight). On-Call Service refers to non-routine situations such as flight operations rescheduled because of bad weather. The contract requires the OSCLO to attempt to provide the contractor with 72 hours notice of the requirement for On-Call Service. The OSC manning level requirement must be agreed to and documented in advance by the OSCLO because the contractor must be compensated for a minimum of four hours pay for each employee called in for On-Call Service. The contractor is not obligated to provide Full or Limited Service during any holiday observed by the Naval Air Station, but is required to follow the On-Call Service procedures on holidays except for Christmas.

c. Physical Plant and Equipment

The OSC is physically located in hangar 57 at NAS Corpus Christi. The Navy provides the spaces, utilities, janitorial services for administrative spaces, and security for the OSC. The contractor is responsible for policing

the ramp and adjacent hangar areas. Arrangements have been made for the Navy to provide ramp sweeping vehicle services upon the contractor's request. The contractor is also responsible for normal line division functions such as taxi directing of aircraft in and out of the flight line, and securing of aircraft including tie down and other normal aircraft securing procedures.

The contractor is responsible for furnishing all ground support equipment (GSE), tools, test equipment, office equipment and communications equipment required to support all functions performed by the OSC. Upon expiration of the contract, the ownership of all tools and equipment furnished by the contractor will be transferred to the Government.

d. Technical Library

The contractor was required to establish and must maintain current at the OSC a Technical Library of all T-44A publications to include: operations and maintenance manuals for aircraft, engines, installed equipment, components and contractor furnished GSE; and technical directives including FAA Airworthiness Directives, Manufacturer's Service Bulletins/Letters/Instructions, and NAVAIR Technical Directives. Navy personnel are granted access to the OSC Technical Library when required.

e. Record Keeping and Reporting

The contractor is required to maintain records of maintenance actions to aircraft, installed equipment and

components in accordance with FAA requirements appropriate to an FAA Certified Repair Station. The maintenance records must be made available to personnel designated by the OSCLO and the cognizant squadron commanders.

OSC reporting requirements to CTW-4 are as follows:

Daily. On occurrence during each flying day, a report is submitted to reflect changes in aircraft status with respect to Operational Readiness. In the event of a disagreement between a squadron and the OSC related to the readiness status of an aircraft, a final and binding decision will be made by the OSCLO.

Weekly. Report the projected number of operationally ready aircraft for the following week. This report is utilized by Training Air Wing Four activities to prepare the weekly and daily flight schedules.

Monthly. Report the projected number of operationally ready aircraft for the following month. This report is utilized by Training Air Wing Four activities for long range planning.

Special. In the event the Navy identifies an adverse NORM or NORS trend, or a repetitive malfunction causing flight emergency/abort, the OSCLO must request of the contractor a special report on the cause thereof, and a get-well plan.

2. Maintenance

The normal functions of organizational, intermediate and depot maintenance are combined in the T-44A OSLP into

Squadron Maintenance and Conditional Maintenance. Squadron Maintenance consists of those maintenance functions and procedures performed on a recurring basis at a firm fixed price. Conditional Maintenance consists of those maintenance functions and procedures whose cost/risk/volume factors do not lend themselves to firm fixed pricing. For example, crash damage comes under Conditional Maintenance in the contract. Figure 5 lists the T-44A aircraft maintenance elements and

T-44A MAINTENANCE COSTING

MAINTENANCE ELEMENT	SQUADRON MAINTENANCE	CONDITIONAL MAINTENANCE
Preventive Maintenance	X	
Servicing	X	
Corrective Maintenance	X	
Repair of Reparables	X	
Airworthiness Inspection	X	
Calibration of Equipment	X	
Engine Replacement	X	
Engine Repair (normal)	X	
Engine Repair (Navy culpable)		X
Engine Overhaul		X
Airframe (depot)	X	
Crash Damage		X
Other Damage (birdstrikes etc.)		X
Technical Directives (commercial)	X	
Technical Directives (NAVAIR)		X
Corrosion Control	X	
Support of GSE	X	
All Other Maintenance	X	

Source: OLSP No. AC049

Figure 5

the type maintenance/costing associated with each element. Conditional Maintenance costing (provisional) is computed on a firm fixed price for the labor rate with materials and manhours variable.

Squadron Maintenance can be performed on-site or off-site. On-site Squadron Maintenance refers to aircraft maintenance and servicing performed at NAS Corpus Christi and outlying fields in the Corpus Christi Training Complex, including: NALF's Cabiness and Waldron, OLF Orange Grove, NAS's Kingsville and Chase Field and Corpus Christi International Airport. Although the majority of T-44A multi-engine training is performed within the Corpus Christi Training Complex, the syllabus does require cross-country training which established the need for off-site Squadron Maintenance. Off-site Squadron Maintenance is aircraft maintenance, exclusive of aircraft servicing, to an aircraft downed off-site because of a requirement for maintenance which would otherwise be considered Squadron Maintenance. The procedures for repairing an aircraft off-site are simple. The pilot notifies his squadron of the nature of the discrepancy and the aircraft's location. The information is passed to the OSC which may either: (1) arrange for a vendor such as a local Fixed Base Operator to perform the required maintenance, or (2) dispatch a maintenance team and supplies to perform the required maintenance. The aircraft downed off-site remains in an excusable delay status until the vendor begins to work on the aircraft or the contractor's maintenance team arrives at the aircraft. The government has the choice of providing transportation or reimbursing the contractor for commercial transportation if the contractor decides to dispatch a maintenance team. In

addition, the government is obligated to pay a fixed rate of per diem for the contractor's maintenance team.

3. Supply

The normal functions of aviation supply for the T-44A are accomplished by the contractor under a provision of the OSLP termed Squadron Materials. The Squadron Materials section of the OSLP requires the contractor to provide all materials required in performing Squadron Maintenance, including off-site maintenance. These materials include:

Spare Engines
Reparables
Consumables
Manufactured Structural Components
Bench Stock (common aircraft hardware)
Bar Stock
Aircraft Engine Oil
Peculiar Fluids and Lubricants
Aircraft Cleaning Materials
Materials Required to Support GSE

The only materials the Navy supplies are fuel for maintenance and flight operations, and fuel for the GSE.

The OLSP requires the contractor to maintain an adequate inventory of all of the above materials. The inventory must be sufficient in range and depth to support both the T-44A and GSE operations. The required materials are divided into two groups by value and usage. Category I materials are low and high usage, low value materials; Category II materials are low usage, high value materials. Category I materials must be stored at the OSC, whereas Category II materials may be stored at a place designated by the contractor. The contractor is further required to keep adequate inventory records of all storeroom transactions.

The ACO or his representative have access to the contractor's Squadron Materials records.

4. Training

Training of the initial cadre of Navy pilots was accomplished by the contractor at NAS Corpus Christi. Initial training for a cadre of Navy ground school instructors and the CTW-4 Maintenance Performance Monitoring Team was conducted at Beech's Wichita facility. Corrosion control training of contractor personnel is provided by the Navy (NAMTD 1004) at NAS Chase Field, Texas. All further training of Navy pilots and ground personnel, and all training aids (OFT etc.) will be provided by the Navy.

5. Publications

The contractor is responsible for providing and maintaining all maintenance publications in a Technical Library at the OSC. All operations and maintenance manuals for the aircraft and GSE are standard commercial type publications. The Navy is responsible for providing the NATOPS manual and checklist.

6. Ground Support Equipment (GSE)

The contractor is responsible for providing and maintaining all required GSE. Upon termination of the contract in October 1981, the ownership of all GSE will be transferred to the government.

7. Navy Responsibilities

The Navy's support responsibilities for the T-44A are relatively minimal. In addition to providing the contractor with space and utilities, the Navy provides:

Recovery of aircraft downed as a result of crash damage.

Support and maintenance of pilot personnel protective equipment.

Maintenance and on-call sweeping of the ramp.

Fuel, oxygen, nitrogen, tie-downs, fire bottles, and chocks.

Servicing of aircraft on cross-country flights, including required inspections (pre-flight and post-flight).

Functional check flight crews.

In addition to the responsibilities listed above, the Navy maintains a maintenance monitoring program at Training Air Wing Four Headquarters. The Maintenance Monitoring Team is coordinated by an aviation warrant officer and consists of five enlisted maintenance monitors and two enlisted data analysis personnel. Since over-the-shoulder or add-on quality assurance actions by the Navy are not part of the maintenance program, the Maintenance Monitoring Team's responsibilities are limited to evaluating support effectiveness by means of end item checks, maintenance performance monitoring, aircraft status checks, and report reviews.

C. T-44 EXPERIENCE TO DATE

The first operational T-44A was delivered to the Navy at NAS Corpus Christi, on schedule, in April 1977. From that date until the writing of this paper (October 1977), a total of ten T-44A aircraft have been delivered and are all being actively utilized in multi-engine pilot training. Interviews with various key personnel at NAS Corpus Christi

indicate that the T-44A program is proceeding extremely well. Figure 6 shows the maintenance performance statistics of the T-44A and the TS-2A in the areas of Operationally Ready (OR), Not Operationally Ready Maintenance (NORM), and Not Operationally Ready Supply (NORS) for the three month period June-August 1977. The maintenance performance statistics for the TS-2A were added to Figure 6 as a point of

T-44A/TS-2A MAINTENANCE PERFORMANCE

			OP READY	NORS	NORM	#A/C
JUNE 1977	TS-2A	Hours	26307.1	2550.6	8582.3	52
		%	70.3	6.8	22.9	
	T-44A	Hours	3147.1	0.0	21.9	6
		%	99.3	0.0	0.7	
JULY 1977	TS-2A	Hours	29368.0	725.6	8043.4	51
		%	77.3	1.9	20.8	
	T-44A	Hours	4431.2	0.0	33.8	6
		%	99.3	0.0	0.8	
AUGUST 1977	TS-2A	Hours	27697.9	1150.1	8908.1	50
		%	75.7	3.1	24.3	
	T-44A	Hours	5154.3	0.0	30.7	7
		%	99.4	0.0	0.6	

Source: Commander Training Air Wing Four Maintenance Monitoring Team.

Figure 6

reference and not for comparison with the T-44A statistics. Since all of the T-44A aircraft have been averaging considerably more than the 65 hours per month required by the contract, it can be clearly seen that the T-44A is carrying its share of the flight load and the OSC is performing extremely well. The supply support provided by the OSC has been sufficient to avoid any loss of Operationally Ready time because of NORS, and the aircraft have required very little

maintenance down time, resulting in an average Operationally Ready figure of 99.33% for the three month period, well above the 80.0% required by the contract.

There have been other beneficial fallouts of the T-44A program. For example, thus far there have not been any T-44A ground aborts because of non-availability or mechanical failure, and the T-44A turnaround time has averaged 30% less than TS-2A turnaround time [34]. The only requirement for Conditional Maintenance thus far was because of a bird strike. In this case the contractor repaired the aircraft in a timely fashion and at a reasonable cost [35]. The OSCLO stated that the relationship between the OSC and the user activities has been excellent thus far, and there have been no difficulties with contract interpretation or compliance [36]. Finally, the contractor is satisfied with the logistics support contract. The OSC Manager stated that there were no difficulties with the contract and anticipated that Beech would perform the T-44A logistics support to the Navy's complete satisfaction [37].

Although it is too early to make a final judgement on the T-44A program at this time, from the experience with the program thus far it appears that the Navy has made an effective acquisition, and that the total contractor logistics support concept will be a success.

IV. ANALYSIS

In this section, an analysis is presented of the advantages and disadvantages of total contractor logistics support of Navy land-based aviation activities. The analysis will also include other types of contractor support, such as contractor material support and interim contractor support, because of their inherent interrelationships with total contractor support.

A. ADVANTAGES

1. Economy

The major advantage of contracting for aviation logistics support services is the possibility for tremendous cost savings. For example, in a study which compared contract aircraft maintenance at Vance AFB with Air Force organic aircraft maintenance at Reese AFB, it was found that during FY 1974 the Vance Contractor performed the same quantity and quality of maintenance as the Reese organic organization while saving the Air Force $2,199,515 /16/. A breakdown of the expense elements at Vance and Reese for FY 1974 are presented in Figure 7. Another example of Air Force cost savings realized with contractor logistics support occurred in the C-9A program. As part of the C-9A acquisition, the Air Force contracted with McDonnell-Douglas for all logistics support, other than organizational maintenance. The Air Force

REESE AFB - VANCE AFB

FY 1974 AIRCRAFT MAINTENANCE OPERATING BUDGETS

Expense Element	Reese	Vance
Military Personnel	$5,148,500	175,000
Civilian Personnel	1,806,930	-0-
Travel and Utilities	2,100	800
Service Contracts	6,085	4,743,000
Supply Expenditures	1,931,700	1,777,000
TOTALS	$8,895,315	$6,695,800

Source: U.S. Air Force Report WN-9443-PR, April 1976.

Figure 7

Logistics Command estimates that the C-9A logistics support contract saved the Air Force $7.68 million in initial spares and $8.74 million in recurring organic support over the first five years of the program /18/. Figure 8 provides a breakdown of the estimated C-9A contract and organic support costs. In a study by Daniel N. Mealy which compared total contractor logistics support with Navy organic support for the VTAM(X), he estimated that total contractor support would result in a savings of $13.95 million in nonrecurring costs and $7.30 million per year in recurring costs. These savings were calculated based upon the estimated Navy costs of providing the required logistics support for the VTAM(X) compared to representative contractor prices for comparable services. Figure 9 provides a breakdown of the estimated VTAM(X) contract support prices and organic support costs. A final example of cost savings by contracting for aviation logistics support is presented in a study by D. Wieland and W. Wilkinson

C-9A SUPPORT CONCEPT ESTIMATED COST COMPARISON[1]

Cost Element	Support Dollars (Millions) Contract	Organic
Investment Costs		
Spares	-0-	7.68
Initial GSE/Spares	0.173	-0-
On-board Spare Kits	0.432	-0-
Aircraft Heavy Maintenance	2.050	2.050
Contract/Air Force Management		
Administrative & Incentives	1.973	0.184
Technical Representatives	0.280	0.127
Recurring		
Supply and Maintenance	9.167	20.453
Manpower	4.696	4.696
Total 5-Year program cost	18.771	35.190

[1]1967 escalated dollars (millions) for first 5 years of operations.

Source: Air Force Logistics Command, C-9A Cost Study, April 30, 1969.

Figure 8

/38/. They estimate that total contractor logistics support in the T-34C program will net the Navy a 50% cost savings when compared to traditional Navy support.

The primary reason that contractors are able to provide military activities with aviation logistics support at less cost than providing these functions in-house is because of substantially higher military personnel costs. There are several reasons why military personnel costs are higher than a contractor's personnel costs for accomplishing a given aviation logistic function.

First, a contractor obtains more direct labor work hours from his personnel per month than a military commander

VTAM(X) ESTIMATED COST/PRICE COMPARISON[1]

	NAVY (cost)		CONTRACTOR (price)	
Element	Nonrecur./Recur.		Nonrec./Recur.	
Engineering & Repair Analysis	930			
GSE	105	35	135	20.5
Publications	472	190	53.5	21.4
Maintenance & Eng. Services	150	50		20.0
Technical Reps.	270	45		
Provisioning	8,519	1,500		
Training	946	200	149	
3M & Supply Data		284		
Spares & Reparables		2,700		2,700.0
Personnel		5,012		1,700.8
Engine and Airframe Ovhl.	1,650	3,457		1,788.9
POL		1,470		1,470.0
TOTALS	14,292	14,943	337.5	7,721.6

[1]Constant 1975 dollars (thousands)

Source: George Washington University Technical Memorandum No. 60153, March 20, 1975.

Figure 9

obtains from his personnel. The contractor's personnel have only one job, that of performing the assigned logistics support function, whereas the military commander must provide his military personnel time from their normal work week for military functions such as: military watches, general military training, in-rate training, inspections, physical training, sick call, special liberty, etc. In addition, contractor personnel have fewer legal holidays and less annual leave/sick leave than military and civil service personnel. Estimates of this personnel availability advantage enjoyed by the contractor range from 9% for military personnel /16/ to 20% for civil service personnel /6/.

Second, indirect contractor costs for support of personnel are much lower than military support personnel costs. "A recent OSD study estimates Navy indirect support at 30% of direct personnel costs. This "support tail" represents the people needed to house, feed, pay, maintain discipline and provide for the amenities of base support of military populations. Avoidance of these indirect personnel costs provides the Navy most of the "margin of profit" between contractor and Navy support of an essentially fixed base operation /38/."

Third, the military requirement for on-the-job and formal training is much greater than for contractors. The contractor has the option of hiring personnel with the desired skills and level of experience, i.e. licensed FAA mechanics, whereas the military commander must accept the personnel ordered into his command whether or not they are specifically

trained for the command's logistics functions. The military commander's training requirements are also greatly increased by the military's rotation policies. Returning to the comparison of contractor support at Vance AFB with organic support at Reese AFB, it was discovered that the contractor at Vance was performing all logistics support services with 576 people, while Reese had a staff of 887 to perform essentially the same functions. A large portion of this disparity (38%) was attributable to training requirements. Reese had 168 apprentices on board, while the contractor at Vance had only 50 personnel at the helper level /16/.

Fourth, military organizations encourage promoting their best performers into supervisory, hands-off positions, whereas contractors reward good performance with good pay and in general have few hands-off supervisors.

Finally, the contractor has the option to hire part-time workers, to pay overtime during peak work load periods, and to lay off workers during slack periods. The military personnel systems are not responsive to cyclical variances in work loads, therefore the military commander is staffed for the average work load which results in being under staffed during peak work load periods and over staffed during slack periods. Figure 10 is a breakdown showing the utilization of the additional 311 military personnel at Reese AFB. It provides a good example of the general personnel advantages of contractors.

A final example of the contractors' advantage in the area of personnel costs occurred in the T-44A program.

UTILIZATION OF 311 ADDITIONAL MILITARY PERSONNEL AT REESE

Utilization	No. Personnel	% OF DIFFERENCE
Personnel Availability	28	9%
Training	118	38
Military Requirements	19	6
Air Force Options (supervisors, training staff)	47	15
Contractor Options (overtime, part-time, hands-on supervisors)	100	32

Source: U. S. Air Force Report WN-9443-PR, April 1976.

Figure 10

Daniel Mealy estimated that organic support of 75 VTAM(X) aircraft would require 456 direct and indirect Navy personnel [30], whereas Beech estimates that a total work force of 89 will be required to support 66 T-44A aircraft [37].

Another major economic advantage of contracting for aviation logistics support is the avoidance of program start-up costs, such as initial spares inventory, bench and test equipment, and GSE costs. The Air Force estimated that a savings of $7.0 million was achieved by requiring the contractor to stockpile spares as part of the C-9A logistics support contract [18]. It is estimated that the Navy saved $13.9 million in start-up costs in the T-44A program [30] as a result of total contractor logistics support. Start-up cost savings, or at least cost deferrals, have been realized in other Navy logistics support contracts that were short of total contractor logistics support. For example, program start-up costs were saved in the CT-39E/G, Th-57A and C-9B programs, and start-up costs of $16.0 million were deferred

for two years in the P-3A interim contractor support program [21]. There are several major reasons why contractor material support, at least during the first few years of a new program, results in substantial savings.

> It allows the design of the new aircraft to become stable prior to provisioning for organic support, thus delaying the provisioning decision to a more logical and cost-effective date [17].
>
> It permits provisioning based on usage data instead of mathematical models. It has been estimated that in some cases where provisioning was accomplished without usage data, up to 80% of the line items stocked did not have stock issues during the first two years of operation [39].
>
> Contractor material support programs during the first few years of a new aircraft's operation result in higher availability than could be accomplished through organic support [21].
>
> Contractor material support programs save the costs of entering parts into the Federal Stock System and the carrying costs of maintaining the parts in stock once entered [38].

2. Flexibility

Contracting for aviation logistics support services provides the Navy with additional flexibility not possible with these services accomplished in-house. Given that changes to the operational requirements of the Navy's land-based aviation community are a certainty, it is easy to see that contracting for a portion of the aviation logistics support requirements will provide the Navy with the additional flexibility required to expand and contract its logistics support effort to meet peaks and valleys inherent in an operational requirements curve. According to Wieland and Wilkinson [38]:

> The contractor also offers some advantage in his ability to respond more rapidly than the Navy can to changes in the work force requirement. Navy personnel practices are of necessity more cumbersome than those of industry. The Navy must operate within a finite and legally constrained end strength. There is no pool of talent to draw from and constraints on funds for moving people cause delay of substantial proportions in relocating them in response to changing priorities. Inertia in the Navy personnel system results in delay in obtaining trained people on-site to meet increased demands and excess people are retained on-site when the workload decreases sharply. The contractor has a far greater ability to hire and fire as needs change. He can draw from the national labor pool of FAA certified technicians when needed, and can terminate excess employees much more rapidly than can government. While the hire and fire process must be used with discretion, it does offer an alternative for management of crisis.

The T-44A logistics support plan provides an excellent example of how flexibility can be built into a logistics support contract. The T-44A support contract provides the Navy with 65 flight hours per month per aircraft at a fixed price. This 65 hour figure is averaged over three months to allow for such factors as student load variance and weather. The contract also allows for surges in operational requirements by providing additional flight hours, above the contracted base of 65, at a fixed price per hour. This degree of flexibility is impossible to achieve with in-house logistics support.

Contracting for aviation logistics support also provides flexibility in the lead time required for establishing a new program. "Contractors can mobilize work forces with short notice compared to the time required to recruit, train, and deploy additional military personnel" [40]. As an example of how a logistics support contract, when coupled with an off-the-shelf aircraft purchase, can reduce the lead

time for establishing a new aircraft program, the T-44A contract was awarded to Beech in May 1976 and the Navy began training with the aircraft in April 1977.

3. Reduction of the Navy's Manpower Requirements

The mandated reductions in military personnel strength experienced by the military services following the Viet Nam War have required the Navy to significantly reduce the authorized billets and manning levels of the shore establishment in order to retain proper manning of operational units. The increased utilization of contractor aviation logistics support in the shore establishment would allow the continuation of necessary functions, such as flight training, while at the same time reducing the manpower requirements.

4. Performance

The Navy's experience with contractor material and intermediate/depot maintenance support has been successful thus far. The Navy has saved money and has benefited by realizing better NORS and OR rates than could be achieved with in-house capabilities. During the five years of interim contractor support in the F-4B program, the NORS rate never exceeded 3.54% per month, while during the first 12 months of Navy organic support the average NORS rate was 13.3% /21/. In the TH-57A program the NORS rate has averaged less than 1% and the OR rate has averaged approximately 80% /26/. The Navy's C-9B program has been equally effective, with a NORS rate averaging less than 1% and a 12 month OR rate averaging 87.[illegible]% /28/.

The Navy's only experience with total contractor logistics support has been with the T-44A program, and thus far that experience has been totally successful. For the first three months of operation, the T-44A logistics support program boasted a remarkable 99.33% OR rate and a perfect NORS rate of 0.0%. Although it is too early to form a final judgement on the T-44A logistics support program at this time, from the experience to date it appears that the contractor's performance will exceed the Navy's expectations.

B. DISADVANTAGES

1. Risk to Mission Accomplishment

There are three primary risks to mission accomplishment inherent in an aviation logistics support contract. The first, and perhaps the most important of these risks, is the possibility of a strike or other labor disruption against the contractor. Special no-strike contract clauses and the Taft-Hartley Act notwithstanding, the possibility of wildcat strikes, walk-outs and slow-downs pose a very real threat to mission accomplishment. Concerning the possibility of strikes at Air Force contract support bases, LCOL Fisher stated: "The possibility of labor disputes was always recognized by the Air Training Command when plans were made for training at contract bases. If disputes did occur, all savings under this type operation would be counteracted. If the incident occurred during an emergency, the harm would far exceed financial considerations" [12].

Realizing the severity of this threat, the Air Training Command has published plans for emergencies created by strikes and other labor disruptions to contractor performance [40]. Working with the contractor to avoid any possible labor disruptions before the situation gets serious should be effective in most cases; however, a well thought out contingency plan would be invaluable should a strike occur.

The second risk to mission accomplishment is the possibility of marginal performance by the contractor. Fortunately, the Navy has not experienced marginal performance with any of its aviation logistics support contracts to-date. Most services contracts contain a clause which requires the ACO to notify the contractor of deficient performance, and then the contractor is allowed a reasonable time to correct the deficiency. It can be easily seen how this procedure could adversely affect mission accomplishment, as the contractor could "stay one step ahead of the default clause by correcting each deficiency, but at the same time additional deficiencies are created" [40]. After the initial award during the acquisition phase, most aviation logistics support contracts are for one year with the option to extend the contract for two additional years, if the contractor's performance is satisfactory. However, even one year of marginal contractor performance could have extreme adverse effects on mission accomplishment.

The third major risk to mission accomplishment can occur during the change-over period from the incumbent

contractor to the new contractor. "The transitional period (the last month of the incumbent contract period and the first month of the new one) causes reduced effectiveness attributable to the need for detailed coordination briefings of the new personnel and time for familiarization with the base layout, equipment and personnel" [40]. Fortunately, this is a short duration problem that occurs infrequently because if the incumbent contractor has performed satisfactorily the government has the option to extend the contract two more years. The Navy's experience with aviation logistics support contracts indicates that in addition to performing satisfactorily for the entire three year contract period, the incumbent contractor normally submits the best bid and thereby obtains a new contract. As an example, Bell has retained the TH-57A contract for 10 consecutive years [26].

2. Loss of Control

Contracting for logistics support services reduces the Commanding Officer's direct control over the operation. The Commanding Officer does not have a direct line of authority to the contractor. If there is a problem with contract performance, the Commanding Officer must present his desires to the ACO, who, as the party to the contract in behalf of the government, is the only legal representative with authority to negotiate with the contractor. This loss of absolute control over the logistics support function can manifest itself in the desire of Navy officials to

over-inspect the contractor's work. "Unless the temptation is stifled to build a redundant organization with the Navy checking on everything the contractor does, substantial additional expense will occur" [38]. Concerning the tendency of military officials to over-inspect the work of contractors, Major H. F. Bronson stated [41]:

> There is no difficulty in gaining contractor compliance for those items that are clearly spelled out in the contract as the contract inspection clause allows the government to reject services and supplies that do not conform to contract specifications. The problem becomes more of one of the contractor expecting the Air Force Quality Assurance Representative (AFQAR) to perform the primary inspection while the contractor gears his system to react to the AFQAR's findings.

Whenever possible, such as when the logistics support contract is for an off-the-shelf commercial aircraft, the work and inspection specifications should require adherence to FAA regulations and procedures, and the Navy's quality assurance program should be limited to normal aircraft flight line inspections and maintenance trend analysis.

A preliminary base wide education program is required when a logistics support contract is initiated for the first time at an installation. Clear lines of authority and communications with the contractor must be established and understood by all personnel. Unauthorized orders to contractor personnel can result in serious consequences, such as relieving the contractor of responsibility for the actions of his personnel, and obligating the government to compensate the contractor for unauthorized work performed. A continuous base wide education program, which should

include all new reporting personnel, is required to preclude unauthorized actions.

3. Loss of In-House Expertise

Inherent in the process of contracting for aviation logistics support is the loss of in-house expertise in both the enlisted and officer communities. This loss is most evident in the enlisted community, because a total logistics support contract prohibits any hands-on activity by Navy personnel. In the T-44A program, the only enlisted personnel involved with the aircraft are physically located away from the maintenance hangar and flight line, and their functions are limited to monitoring maintenance performance and record keeping. Therefore, if at some future date the Navy should decide to perform T-44A maintenance in-house, there would not be a pool of enlisted personnel with hands-on maintenance experience to start the program or to train others.

The loss of in-house expertise in the officer community is not as evident as for the enlisted community, but is there nevertheless. Using the T-44A program as an example, the decision to contract for all maintenance support eliminated the maintenance departments in the squadrons affected, which in turn eliminated many of the traditional ground billets for the instructor pilots. This loss of maintenance ground billets affects the officer community two ways. First, the Junior Officer Flight Instructors are denied the opportunity to obtain valuable Branch Officer/Division

Officer experience. Second, the Navy will not have a cadre of experienced officer maintenance personnel should a decision to change to in-house maintenance be made in the future.

There is another related, but ill-defined disadvantage of contractor logistics support when utilized in the Naval Air Training Command. "Contractor support will also "civilianize" training operations. The molding of attitudes and perceptions of embryonic Naval Officers which occurs subtly through personal interactions with officers and enlisted men of a completely military organization will be diminished" [38].

4. Sea-Shore Rotation

Although contracting for total logistics support of some land-based sea duty and overseas aviation activities is conceivable, the primary thrust of a contractor logistics support program would occur in the shore establishment. Each services contract awarded to replace a shore establishment logistics support function would reduce the available enlisted shore duty billets. Since the sea duty and overseas aviation activities would not be significantly affected, the net result would be to change the sea-shore rotation of aviation enlisted personnel in the direction of more sea duty/overseas duty and less shore duty. Anticipating the eventual contracting of all aviation logistics support in the Naval Air Training Command, Wieland and Wilkinson stated [38]:

> The price of contractor support will also include the loss of perhaps 4,000 shore duty billets when contractor support is adopted throughout the Naval Aviation training establishment. While this is a small percentage of the total aviation personnel structure, the loss of these "good deal" assignments can only be perceived by the maintenance people involved as one more inroad into the attractiveness of a Naval career.

The sea-shore rotation disadvantage is the problem that will be most difficult to solve. Certainly an all sea duty/overseas duty assignment enlisted rotation policy is impossible. Therefore, the sea-shore rotation morale effects of each decision to contract for logistics support must be carefully balanced against the possible advantages of such contracts. One means of reducing the impact of this problem is to investigate the feasibility of contracting for logistics support of sea duty, overseas duty, and undesirable CONUS aviation activity locations.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The concept of total contractor aviation logistics support is in consonance with Federal Government policy as promulgated in OMB Circular No. A-76. This circular provides specific guidelines and procedures for implementing the 22 year standing policy of the Federal Government to rely, to the maximum extent, on the private sector for goods and services.

The contractor aviation logistics support experiences of the military services differ considerably, with each service implementing the policy of A-76 in a different manner. The Army contracts for aviation logistics support at the base level extensively, particularly at training bases. The most notable of these support programs is at Fort Rucker, where contractors have been providing the Army total contractor logistics support for the entire aviation training complex satisfactorily since the early 1950's. The Air Force contracts for aviation logistics support in several different ways. In addition to an extensive contractor depot maintenance program, the Air Force contracts for total base support at several facilities, utilizes interim contractor support for new aircraft programs, and contracts for extended material and intermediate/depot maintenance support of

specific aircraft (off-the-shelf commercial aircraft). The Navy does not contract for total Air Station support, but does contract for aircraft depot maintenance, interim support of new aircraft programs, material and intermediate /depot maintenance support of off-the-shelf commercial aircraft programs, and in one case (T-44A), total contractor logistics support. Although the experiences of the military services with contractor aviation logistics support differ, they all have reported success with their respective programs in the areas of economy, manpower savings, and improved performance.

The Navy chose the T-44A as its first experience with total contractor logistics support for two primary reasons. First, studies that compared Navy organic support with contractor logistics support of off-the-shelf training aircraft indicated that substantial cost savings could be realized with contractor support. Second, Navy successes with other logistics support contracts, particularly the TH-57A program, indicated that total contractor support of a new off-the-shelf training aircraft would be successful and the next logical step in increasing the Navy's growing partnership with the aviation industry.

The T-44A total contractor logistics support contract provides the Navy with its first "turn key" operation of aircraft. With the exception of some ground training, the five major logistics elements (Maintenance, supply, training, publications and GSE) are the contractor's responsibility. The contractor physically performs all of these

functions in an On-Site Support Center located at NAS Corpus Christi, the operating base. The Navy's responsibilities in the T-44A program are limited to providing facilities to the contractor, providing NATOPS Manuals and Checklists, and flying the aircraft.

The Navy's experience with the T-44A logistics support contract has been totally successful thus far. During the first three months of operation, the OR rate for the T-44A averaged 99.33%, and the NORS rate was perfect (0.0%).

The advantages of total contractor aviation logistics support are: economy from manpower and start-up cost savings, flexibility in meeting operational requirements, reduced manpower requirements, and improved performance. The disadvantages are: risk to mission accomplishment from labor disruptions and marginal contractor performance, loss of control over logistics functions because the contractor does not report to the commanding officer, loss of in-house expertise in both the enlisted and officer communities, and the adverse morale effects of increasing the length of enlisted aviation personnel sea duty tours.

B. CONCLUSIONS

The utilization of total contractor logistics support at selected Naval Aviation shore-based activities is a fundamentally sound concept, and implementation of this concept should be expanded. The beneficial impacts of the advantages of total contractor logistics support far outweigh the consequences of the potential disadvantages. In addition, with

careful planning the disadvantages of total contractor logistics support can be minimized or eliminated, whereas the advantages of this concept are inherent and will occur whenever the concept is implemented. Although the total contractor logistics support program is in its infancy in the Navy today, this concept will claim an ever increasing share of the Navy's aviation logistics support in the future.

C. RECOMMENDATIONS

Based upon the research and analysis conducted in the process of completing this thesis, the following suggested methods of enhancing the Navy's future contractor logistics support programs are recommended.

1. Coordinate an aviation logistics support symposium with the Army and Air Force for the purpose of furthering the knowledge of all concerned on how the other services contract for aviation logistics support. The agenda should include a complete description of each service's aviation logistics support contract types and lessons learned from previous contractor support experiences.

2. All new aircraft acquisition programs should be studied for possible use of interim contractor logistics support, contractor material and intermediate/depot maintenance support, or total contractor logistics support.

3. Particular attention should be directed to the enlisted sea-shore rotation problem when planning future aviation logistics support contracts. Every effort should be made to alleviate this problem by use of contracts for

aviation logistics support of sea duty, overseas duty, and undesirable CONUS aviation activity locations.

4. The possibility of contracting for total/partial logistics support of Naval Air Stations and other shore-based Naval Aviation activities should be investigated.

APPENDIX A

GLOSSARY OF TERMS

Depot Maintenance - That maintenance performed on aircraft requiring major overhaul or a complete rebuild of parts, assemblies, subassemblies, and end items, including the manufacture or parts, modifications, testing and reclamation as required. Depot maintenance serves to support lower categories of maintenance by providing technical assistance and performing that maintenance beyond the capability of lower level activities.

Direct Maintenance Man Hours - The total number of accumulated direct labor hours (in hours and tenths) expended in performing a maintenance function.

Intermediate Maintenance - That maintenance which is the responsibility of, and is performed by, designated maintenance activities in support of using organizations. Its functions normally consist of calibration, off-equipment repair or replacement, repair or replacement of damaged or unserviceable parts, and providing technical assistance to using organizations.

NATOPS - An acronym formed from the words "Naval Air Training and Operating Procedures Standardization." It is a standard operating procedures manual for aviation.

Not Operationally Ready Maintenance (NORM) - A condition status of an aircraft which is not operationally ready, because maintenance work must be accomplished such as scheduled inspections and unscheduled maintenance.

Not Operationally Ready Supply (NORS) - A condition status of an aircraft which is not operationally ready nor can maintenance work be performed to return it to an operationally ready status until the required items of supply become available.

Operationally Ready (OR) - A condition status which indicates that an aircraft is safe for flight and that essential equipment necessary for performance of its primary mission is operative.

Organizational Maintenance - Those maintenance functions normally performed by an operating unit on a day to day basis in support of its own operations. This work is normally accomplished by maintenance personnel assigned to the aircraft reporting custodian; however, in some instances organizational maintenance is performed by intermediate or depot level activities.

Quality Assurance - A planned and systematic pattern of all actions necessary to provide adequate confidence that the maintenance performed conforms to established technical requirements.

APPENDIX B

VTAM(X) TYPE DESCRIPTION

The following are minimum standards or requirements, required at the time of delivery of the subject airplane unless otherwise stated. All material/equipment shall be CFE (Contractor Furnished Equipment). Only new aircraft with acceptance flight and delivery flight time on airframes and engines are required.

A. GENERAL

1. The aircraft shall:

a. Be a twin-engine, turbine-powered aircraft capable of self-starting, and FAA type certificated under FAR-23, 25 or equivalent on the date of response to the RFP.

b. Have provisions for crew of two pilots seated side-by-side, a forward facing cockpit observer, plus a minimum of two passengers.

c. Have a maximum gross take-off weight of 9000-15000 pounds.

d. The airplane shall have a service life not less than 12,000 hours and 30,000 landings, as demonstrated by laboratory test, for operation in the category for which certificated.

e. Be capable of operating on JP-4 and JP-5 fuel.

f. Have aircraft runway clearance compatible with runways rigged with cross-deck arresting gear equipment (E-28, M-21) with take-off and touchdown speed considerations.

g. Have exterior paint finish in accordance with the high visibility color requirements of specification MIL-C-18263. Insignia and marking and warning and cautionary markings shall be in accordance with MIL-I-18464 and MIL-M-25047.

h. Be FAA certified under FAR parts 23 or 25 for operation into known icing conditions.

i. Have adequate visibility for formation flying and to insure safe operations of the aircraft under VFR conditions.

j. Have an FAA Supplemental Type Certificate on that model which incorporates any Navy unique requirements necessitating such a supplemental certification on date of delivery of the first production aircraft.

APPENDIX C

VTAM(X) MAINTENANCE/MATERIALS SUPPORT

1.0 SCOPE. The contractor shall, at the time and in the manner stated in the contract, provide all materials, services, tools, facilities, and data (including maintenance requirements/specifications), required to support and maintain all VTAM(X) aircraft, and support equipment acquired from the contractor, under this contract, exercised options of this contract, and/or follow-on contracts, which aircraft shall be operated by the Chief, Naval Air Training Command and based at NAS Corpus Christi, Texas, except such of the foregoing materials, services, tools, facilities and data, which are specified herein as being Government-furnished.

1.1 For pricing purposes, the maintenance and material requirements are categorized as follows:

a. Squadron maintenance/materials (see para. 3.0 and 5.0) which shall be Firm Fixed Price (FFP); and
b. Conditional maintenance/materials (see para. 6.0) and engine overhaul which shall be provisioned.

1.2 The operational requirement/environment with respect to these deliverables (maintenance/materials) is given in para. 7.0.

1.3 The contractor shall establish and maintain an On-site Support Center (OSC) in Government-furnished space (see para. 4.0) for the purpose of providing services and materials.

1.4 The contractor shall be solely responsible for all materials (including acquisition, configuration, repair, packaging and shipping) until they are consumed in support of the VTAM(X) aircraft. All repair and overhaul will be performed in accordance with FAA approved commercial procedures, except corrosion control, which will be as specified herein.

1.5 The Navy shall be responsible for support and maintenance of pilot personal protective equipment (except such equipment provided as installed equipment), for maintenance of the ramp, for providing fuel and oil for operations of aircraft and contractor-furnished ground support equipment, and for the recovery of downed aircraft.

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