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STUDENT REPORT

USED AIRCRAFT ACQUISITIONS--
AIR FORCE LESSONS LEARNED

MAJOR PETER W. MOATES

85-1890

"insights into tomorrow"

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TITLE USED AIRCRAFT ACQUISITIONS--AIR FORCE LESSONS LEARNED

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Submitted to the faculty in partial fulfillment of
requirements for graduation.

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PREFACE

With little notice or fanfare either from within the Air Force or outside, used aircraft are rapidly becoming a significant part of our nation's arsenal. My goal in preparing this study on recent used aircraft acquisitions was to focus what I feel is much needed attention on the key lessons to be learned from these programs. Hopefully, by "reading and heeding" these hard learned lessons, all Air Force managers who deal with used aircraft acquisitions will be better able to take advantage of the potential benefits and avoid the potential pitfalls associated with such programs. Perhaps even more importantly, these managers should readily appreciate the significant differences between used aircraft acquisitions and more conventional programs.

I would like to thank my sponsor, Lieutenant Colonel Fay J. Pledger, for his patience and willingness to help, and my acquisition mentor, Lieutenant Colonel Wallace T. Bucher, for his efforts over the years to teach me "the business." Most importantly, I wish to thank my wife, Melanie, for her usual understanding and good humor, and Eris for her tireless secretarial and moral support.



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EXECUTIVE SUMMARY

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"insights into tomorrow"

REPORT NUMBER 85-1890

AUTHOR(S) MAJOR PETER W. MOATES, USAF

TITLE USED AIRCRAFT ACQUISITIONS--AIR FORCE LESSONS
LEARNED

I. Purpose: To provide information about the lessons learned from the acquisition of used aircraft by the USAF and to develop suggested generic contract features for future used aircraft acquisitions.

II. Problem: The rapid expansion of USAF acquisition operations into a new and unique arena of business demands greater insight and understanding on the part of those responsible for implementing that expansion. It also demands that sound business practices be adhered to and that Air Force managers fully appreciate the significant differences between used aircraft acquisitions and more conventional programs.

III. Data: Analysis of recent used aircraft acquisition programs reveals that there are significant potential benefits and potential pitfalls involved with acquiring used aircraft for the USAF. On the positive side of the ledger, the low cost of buying used airframes and the almost immediate availability of these

CONTINUED

aircraft are extremely enticing features for Air Force planners concerned with getting "rubber on the ramp" as soon as possible. Similarly, the ability to tap into proven commercial training programs and to carefully evaluate a known and proven product before purchase reduces both costs and risks for the Air Force. However, on the negative side are the potentially high costs involved with purchasing required technical data and unique support equipment and spares. There is also potential difficulty involved with evaluating condition acceptability since, like used cars, used aircraft vary enormously in quality. Costs, both monetary and schedule, can also be overlooked or underestimated for any required modifications needed to make the aircraft acceptable to fulfill the military mission. The schedule costs can also be high as a result of a rapid buy with a much longer period required to set up the support system needed to sustain the aircraft. Finally, the standard source selection schedule may need to be modified primarily because of a potentially expanded Pre-Award Survey required to accommodate the large number of used aircraft vendors.

IV. Conclusions: Lessons learned from recent USAF programs show both potential benefits and potential pitfalls associated with used aircraft acquisitions. While every aircraft program has unique characteristics, it is necessary to outline suggested generic contract features to better help Air Force managers deal with the significant differences between used acquisitions and conventional programs.

V. Recommendations: A generic used aircraft program contract should be Firm Fixed Price. Data should be priced out as part of the basic contract and all aircraft modifications should be included. Unique support equipment should be obtained as part of the basic contract along with contractor provided initial training. Finally, the contract should include provisions for Contractor Logistics Support for the life of the system.

Chapter One

INTRODUCTION

PURPOSE

This study is designed to provide information about the lessons learned from the acquisition of used aircraft by the United States Air Force. The primary focus of this information is on the potential benefits and potential pitfalls associated with acquiring used aircraft systems, as deduced from Air Force experience with such used aircraft acquisitions as the C-18, Air National Guard Support Aircraft (ANGSA), C-19, and certain lease-buy programs. The goal will be to combine an understanding of the USAF programs with an in-depth knowledge of the key benefits and pitfalls involved with procuring used aircraft, in order to provide some suggested generic contract features for future used aircraft acquisitions.

This information is provided primarily for management personnel assigned to an aircraft System Program Office (SPO). More specifically, it should prove of use to both newly assigned SPO project officers and to more seasoned program managers who will be working on a used aircraft procurement program for the first time. Hopefully, contracting officers, System Staff Officers and Headquarters USAF Program Element Monitors will also

find the information useful in their dealings with matters pertaining to the acquisition of used aircraft.

BACKGROUND

For the first time in recent history the Air Force is moving into the used aircraft acquisition business to a significant degree. No longer is it necessarily tied to long term development and production programs to fulfill key aircraft operational needs. More often the Air Force finds user requirements are equally or even better met through the acquisition of used aircraft systems.

This trend toward used aircraft procurements is a new one, with the Program Management Directive (PMD) for the first major used aircraft program, the C-18, having been released only in June of 1981 (10:1). Since that time, two more Air Force used aircraft acquisition programs (the ANGSA and the C-19) emerged and moved along the path toward Initial Operational Capability (IOC). During this period several unique Air Force lease-buy programs (C-20A, C-21A, and C-12F) have also emerged which display many of the characteristics of the "pure" used aircraft programs.

This rapid expansion of USAF acquisition operations into a new and unique arena of business demands greater insight and understanding on the part of those responsible for implementing that expansion. It also demands that sound business practices be adhered to. Moreover, it is the Air Force manager's responsibility to ensure all needed modifications are made to

support systems, used aircraft represent a known quantity with a relatively stable baseline.

During the Pre-Award Surveys for each of the current used aircraft programs, Air Force Systems Command engineers, manufacturing and quality assurance experts, and line-savvy maintenance personnel teamed up to provide a detailed analysis of candidate airframes (see also: Chapter Four on Condition/Verification of used aircraft). As will be discussed in Chapter Four, these inspections revealed an enormous difference in the quality of available aircraft. Having the ability to send experts out to the field and evaluate these aircraft helps ensure only acceptable machines are purchased, and that the cost per airframe reflects relative quality. This in-depth "inspect before bid" capability simply is not possible for buyers of developmental aircraft, including those with "fly before buy" stipulations.

well as such "off-the-shelf" programs as the C-20A and C-21A) this tailoring of existing training programs can be accomplished at no additional cost to the government. The key is to make the modification of the existing training programs a "no additional cost" option to the Contractor Logistics Support (CLS) contract.

Another potential benefit of a used aircraft training program is that in some cases the contractor can provide all of the training required by the Air Force indefinitely and more cheaply than would otherwise be possible. While the C-18, ANGSA, and C-19 programs included only initial training of aircrews and maintenance personnel in their contracts, one "off-the-shelf" aircraft program, the KC-10, is taking full advantage of American Airlines' state-of-the-art aircrew training program. By contracting with American for complete aircrew training, the Air Force is assured that fully qualified aircrews are provided to the two KC-10 wings without any actual flying hours in the aircraft. This potential for tapping into in-place, proven, and often superior airline type training programs holds great promise for purchasers of used airline aircraft.

KNOWN PRODUCT

The final major benefit of used aircraft is the Air Force knows up-front, before purchase, exactly what is being bought. Unlike developmental programs wherein changes to design, capabilities, and even requirements (particularly for long-term programs) cause continual perturbations to the aircraft and

Buying used aircraft allows the Air Force to get "rubber on the ramp" much more quickly than in conventional acquisitions. The used programs neatly avoid the schedule pitfalls involved with the design, development and production phases that conventional programs are subjected to. Even the recent new "off-the-shelf" programs are constrained by their prime contractors' production schedules.

TRAINING

Used aircraft also offer the benefit of existing training programs and materials. While there is no guarantee, or even expectation, that whatever training is in place for used aircraft is suitable as is for use by Air Force aircrews and maintenance personnel, a baseline or foundation is available from which to tailor required military programs. Invariably, it is in the Air Force's interest to tap into this in-place expertise through initial contractor provided training. Since the time between initial program direction and delivery of the first aircraft is so reduced, dependence (at least initially) on contractor training is not really a matter of choice.

During this initial period of training the using command and Air Training Command have the time to evaluate the contractor provided training program as well as the required aircrew and maintenance technical data. Unlike the "conventional" development type programs, this affords the Air Force an opportunity to pick and choose as the tailoring process continues. In the cases of the C-18, ANGSA, and C-19 programs (as

SCHEDULE

Another major advantage to the Air Force of buying used aircraft is that critical and/or time-sensitive mission requirements can be met even more quickly than they would be in more conventional acquisition programs. In fact, in many cases used aircraft are ready and waiting for purchase throughout the preliminary phases of the acquisition cycle. Often, the source selection process (for used aircraft averaging four to six months from Request for Proposal (RFP) release to contract award) is the most time consuming phase in the used aircraft program schedule (2:262).

Table 2 illustrates the magnitude of the time savings available by comparing the schedules for the three recent used aircraft programs with three other fairly typical aircraft acquisition efforts. For the purpose of emphasis the table focuses on the time from PMD release to delivery of the first aircraft.

<u>USED PROGRAM</u>	<u>PMD</u>	<u>1ST DEL</u>	<u>CONVENTIONAL PROGRAM</u>	<u>PMD</u>	<u>1ST DEL</u>
C-18	Jun 81	CY82	T-46A	Jul 78	Apr 86
ANGSA	Oct 83	CY85	HH-60D	Jan 79	CY87
*C-19	Jun 83	N/A	C-5B	Mar 82	Dec 85

*Note: C-19 program cancelled prior to first delivery.

Table 2 - Used vs Conventional Program Schedule
(PMD Release to Contract Award)

The quoted values of many models are 20%, 30%, or even 50% below a year ago--Some 600 used airliners are up for sale or lease" (7:23). Similarly, the failure of many carriers during the early 1980s (including such notables as Laker and Braniff International) contributed to the relative glut of used airliner type aircraft on the market.

Much of the rush by the air carriers to rid themselves of their less efficient used aircraft is also motivated by a key EPA deadline. On 1 January 1985, the EPA "grandfather" clause on noise and particulate emissions expired affecting the DC-8 and 707 fleets in the United States. As a direct result, many carriers are re-engining their DC-8s with modern engines that comply with the new EPA standards and provide greater fuel economy. "However, the 707 was not considered to have enough payload capacity to make it worth the cost of re-engining. As a result, every major U.S. carrier with the exception of TWA has parked their 707 fleets and put them up for sale" (14:1). TWA itself is continuing to use only a portion of their fleet while they also attempt to sell the aircraft.

The result of the twin problems of a poor economy and more stringent EPA guidelines has been large numbers of airline type aircraft on the selling blocks at highly competitive prices. While the airlines have suffered, the Air Force is reaping the benefits.

<u>Program</u>	<u>Type A/C</u>	<u>New</u>	<u>Used</u>
C-18	707-300	15-20 Million (est.)	250-350 Thousand
C-19	747-100 747-200	85-90 Million	15-35 Million

Table 1. Aircraft Cost Comparison - New vs Used
(FY84 \$) (11:--)

AVAILABILITY

Intertwined with the cost benefits of purchasing used aircraft is the current availability of large numbers of satisfactory sources for these airframes. The faltering economy of the early 1980s and key Environmental Protection Agency (EPA) deadlines have combined to create a buyer's market for used aircraft.

The depressed economy of the early 1980s, made worse for the world's air carriers by persistently high costs for aviation fuel, resulted in a large percentage of these carriers cutting back their fleets. The 23 August 1982 issue of Aviation Week and Space Technology declared that, "An estimated 550 aircraft, or 9.5% of the current world fleet of 5,900 airline aircraft are for sale or surplus to carrier needs." Specifically, this surplus equated to approximately 300 DC-8s and 707s, some 122 wide body aircraft including 747s, DC-10s and Lockheed L-1011s, and included many later model transports such as 727-200s (6:27). A month later, the Wall Street Journal carried an article that stated, "Used airplanes plunge in price as oversupply worsens.

fact, in those cases where a very small number of aircraft are being procured, the dollar savings are even more manifest. Examples of such unique single aircraft requirements are not that unusual. In 1981, a tri-service Strategic Systems Test Support Study, sponsored by the Office of the Under Secretary of Defense, Research and Engineering (OUSDRE) with contract support from Stanford Research International, recommended that an aircraft be procured as an MX airborne launch control center test bed. Such a "one-of-a-kind" buy for a specialized aircraft was shown early on to be prohibitively expensive if a system were to be designed and fielded solely to meet that one mission requirement. The logical and cost-effective solution eventually adopted was the purchase of an additional used 707-300 aircraft at a fraction of the cost of a new test bed (14:2).

While exact comparisons of costs between new and used aircraft are not possible due to the significant differences in used aircraft prices, Table 1 does provide an overview of the approximate savings available to the buyer of used versus new airframes. While these figures do not include costs other than for the aircraft themselves, they do serve as an indicator of the relative dollar savings available. The aircraft shown represent two of the recent USAF used aircraft programs for which figures are available and are comparably equipped.

Chapter Three

POTENTIAL BENEFITS

COST

Clearly, one of the most attractive and obvious benefits provided by the acquisition of used aircraft is cost. With the cost for new aircraft rising and the competition for defense dollars intensifying, the Air Force now routinely gives serious consideration to satisfying mission needs through the use of relatively inexpensive used airframes and associated systems.

As an example, the PMD for the Air Force's first major used aircraft acquisition, the C-18, concludes its Justification/Requirements section by specifically pointing out that, "To satisfy these requirements the 707-300C/CF series aircraft offers the best low cost alternative since it meets or exceeds all requirements and shares commonality with the C-137 and E-3A aircraft" (10:2). Similarly, the PMD for the ANGSA program calls for the purchase of used aircraft as the most cost effective method of fulfilling mission needs (8:3).

To date, this cost saving of used over new aircraft is even greater because the relatively small number of aircraft being purchased precludes the benefits of large lot buys in which substantial discounts are provided to new aircraft customers. In

including supply and maintenance support. These aircraft are designed to replace the current fuel-inefficient CT-39 fleet. Options exist in both contracts for the Air Force to purchase the C-21As and C-12Fs after five and three years of lease, respectively. Again, after accepting the buy option(s) the program office would be faced with purchasing what are essentially used aircraft (13:--).

each aircraft was to be modified to a freighter configuration and assigned to the 105th Military Airlift Group (MAG), at Stewart Field, New York. Contractor logistics support was to be provided by adding the C-19 aircraft to the current E-4 contract. In addition to their use by the Air National Guard, the C-19 aircraft were to supplement present strategic airlift capabilities (9:l-4).

OTHER USED AIRCRAFT PROGRAMS

Although they are not "pure" used aircraft acquisitions as discussed to this point, several of the Air Force's new lease-buy programs possess many of the same characteristics as previously described for used aircraft acquisitions. Included in this group is the C-20A program through which three Gulfstream III aircraft are being leased from the contractor to provide worldwide air transportation for senior U.S. Government officials and foreign dignitaries. The Air Force will purchase those three leased aircraft in FY85, and an additional eight new C-20s in FY86-88 to replace the aging C-140 fleet currently operated by the Military Airlift Command. The purchase of the three "used" leased aircraft presents the program office with many of the same benefits and pitfalls discussed in this study.

Two other potential lease-buy programs result from the Operational Support Aircraft contracts awarded in September 1983 for military versions of the Learjet 35A, designated C-21A, and the Beech B200C, designated the C-12F. The total acquisition currently includes the lease of eighty C-21As and forty C-12Fs,

aircraft have been selected by the Air Force as a source of hardware for kit fabrication. In addition, a September 1984 House-Senate supplemental appropriation for FY 84-85 provided \$64.2 million for acquisition of 32 more 707 aircraft to be used as engine/hardware sources for Air National Guard and Air Force Reserve KC-135 aircraft (5:132).

AIR NATIONAL GUARD SUPPORT AIRCRAFT (ANGSA) PROGRAM

The ANGSA program office has Air Force direction to acquire four used Boeing 727/737 or DC-9 aircraft for the Air National Guard. These aircraft will be assigned to Andrews AFB, Maryland, and are slated to replace current Air National Guard T-43 team travel aircraft. After source selection the aircraft are to be modified with a designated military avionics package. In addition, the proposed contract calls for full contractor logistics support, delivery of all required data and technical manuals, peculiar support equipment, and initial training of aircrew and maintenance personnel (8:1-4).

C-19 PPROGRAM

Even though the Air Force cancelled it in July of 1984, the C-19 program adds significantly to an understanding of used aircraft programs and will be included as part of the used aircraft acquisition data base. The C-19 program office had Air Force direction to acquire three used Boeing 747 aircraft for the Air National Guard, with one aircraft designated as a space shuttle carrier aircraft. After source selection and purchase

Chapter Two

CURRENT USED AIRCRAFT PROGRAMS

Before examining the potential benefits and potential pitfalls involved with the acquisition of used aircraft, we need to broaden our understanding by briefly overviewing the recent Air Force used aircraft acquisition programs. This overview offers a clearer understanding of the nature of those programs and the operational requirements they were designed to fulfill.

C-18 PROGRAM

The C-18 program was the first Air Force used aircraft acquisition in recent years and is providing seven replacement aircraft for the 4950th Test Wing Advanced Range Instrumentation Aircraft (ARIA) mission. These aircraft are designed to fulfill projected ARIA mission support requirements through the year 2000, since the current KC-135 ARIA fleet cannot satisfy time-on-station, range, payload and operations requirements from remote staging bases. Spare engines and parts for supporting the Boeing 707-300C/CF (Air Force designation, EC-137) aircraft are also included in the program (10:2).

Another objective of the C-18 program is to provide donor 707-100B series aircraft from which kits are fabricated to re-engine special purpose C/KC-135 aircraft. To date, 70 donor

difficulties encountered with technical data. The second problem revolves around the potential costs for support equipment and spares. Next is a review of the difficulties involved with used aircraft condition verification and acceptability. Fourth, the often hidden costs involved with required modifications are highlighted. Fifth, the problem of the time lag between purchase of the used aircraft and set-up of the aircraft support system is emphasized. Finally, some of the potential changes to the source selection process are described that are required simply because we are acquiring used rather than new aircraft.

Chapter Five ties together all that has come before by providing some recommendations in the form of suggested contract features for used aircraft acquisitions. While certainly not intended as a "cookbook" for detailed and specific contract line items, the suggestions are offered primarily from the program manager's point of view in a generic enough form to be tailored to different programs. Again, the focus is on suggested contract features different from those that might be adopted for new aircraft acquisitions.

Chapter Six concludes by summarizing the benefits and pitfalls involved with the current trend toward the acquisition of used aircraft. This, in turn, will lead to a final review of some suggested generic contract features that should be considered when used aircraft systems are being procured.

established business strategies in order to enable the acquisition system to adjust to new circumstances and requirements. Finally, it is the Air Force manager's job to establish guidelines for those managers who will follow with similar programs.

OVERVIEW

This study begins with a review of the recent USAF used aircraft programs. This review highlights the types and status of these used aircraft acquisitions and provides a data base or background from which future programs can be viewed.

Chapter Three examines the primary reasons for the current trend toward increased acquisition of used aircraft. This chapter, which will highlight the potential benefits of acquiring used aircraft for the USAF, focuses first on what is often the prime motivating factor--cost. After cost, this chapter moves to a second crucial factor--availability. Closely related to availability is the important aspect of schedule. Next comes a close look at the advantage of an in-place training program. Finally, Chapter Three examines the inherent value of purchasing a proven system that can be readily and accurately examined before it is bought.

While many of the benefits of purchasing used aircraft have been widely touted and used as rationales for advocating used aircraft procurements, the fourth chapter of the study examines the often much less visible potential pitfalls involved with buying used aircraft. Here the first focus is on the

Chapter Four

POTENTIAL PITFALLS

TECHNICAL DATA

Getting quality technical data is one of the biggest problems associated with the purchase of used aircraft. Complicating the difficulties is that funding for such data, if it exists at all, is often in very short supply. In each of the current used aircraft programs 3010 (Aircraft Procurement) funds for tech orders were initially available only for the "customerization" of existing commercial manuals. In essence, "customerization" means the relatively minor modification of the aircraft manufacturer's commercial manuals to suit customer specific needs or desires. In the early planning and justification stages of a potential used aircraft program it is very tempting to overlook the need for and cost of modifying commercial manuals. Air Force managers often try to help "sell" the program by designing a funding profile that assumes the acceptance and validity of these manuals in their current form. However, purchase of these commercial manuals presents an ironic situation in which they may have been used and proven for years in the commercial environment but remain unacceptable for use by the Air Force.

There are several reasons for the unacceptability of commercial manuals to the Air Force. First, military maintenance

manuals are designed and written to a lower reading and technical skill level than are commercial manuals. While commercial maintenance manuals are designed assuming use by qualified aircraft and power plant mechanics, military maintenance technical orders are written to accommodate a less skilled mechanic and reader. Secondly, commercial manuals do not contain the safety cautions and notes required of military manuals. Finally, commercial manuals simply do not conform to the Military Specification (Mil Spec) formats Air Force personnel are accustomed to working with (3:107-110).

The importance of this final point cannot be overemphasized, particularly in the case of aircrew flight manuals and checklists. Every Air Force "off-the-shelf" commercial aircraft program to date has, sooner or later, evolved away from commercial flight manuals and checklists toward full Mil Spec products. This "down-the-road" recognition of the need for Mil Spec manuals is no small matter for the program manager unmindful of the costs involved. In the case of the C-18 aircraft the Air Force is spending nearly \$4 million dollars to provide a minimally modified set of technical manuals (12:--). These include Mil Spec flight manuals, safety supplements for the maintenance manuals, and Mil Spec checklists. Similarly, the C-20A program is committing \$1.2 million to modify their aircrew flight manuals, checklists, and basic on-equipment maintenance manuals for the 11 ship C-20A fleet (11:--). Though not quite as

far along in the acquisition cycle, the ANGSA program faces similar problems with its requirements for Mil Spec manuals.

The effort required to modify the commercial manuals also includes that needed to either adopt or modify the manufacturer's technical order control process so that a system can be established for support of the Air Force manuals. When buying used aircraft, the Air Force cannot assume that the airframe manufacturer has current control of changes to either the aircraft or the manuals. In most cases the airlines have internal engineering departments which maintain their own manuals and even generate airline unique modifications for the aircraft. Allowances must therefore be made for both the time and the dollars necessary to establish an Air Force oriented control system for the manuals (14:4).

In sum, the costs of technical data modification are often overlooked or ignored during the early stages of used aircraft programs. Experience to date indicates that basic "customerization" of such critical data as the flight crew manuals and checklists may not be an adequate substitute for Mil Spec manuals. It is therefore paramount that modification strategies are developed early in the cycle to ensure adequate emphasis and acceptable manuals by aircraft delivery. The acceptability of commercial aircraft to fulfill mission needs does not necessarily imply the acceptability of the commercial technical data.

SUPPORT EQUIPMENT/SPARES

Potential costs of support equipment and spares are also commonly minimized or overlooked during the early stages of used aircraft buys. Particularly in those cases where only a relatively small number of Air Force unique aircraft are being purchased, the cost of buying unique support equipment can prove sobering.

A case in point is the C-19A program in which three B-747 aircraft were to be added to the Air National Guard inventory. These aircraft were scheduled to be assigned to the 105th MAG at Stewart Field, New York, where there are currently only 0-2 aircraft stationed. There is virtually no commonality between the types of support equipment and spares needed for the two kinds of aircraft, necessitating a ground-up approach to providing both for just three B-747 airframes. Fortunately, the C-19A program office found an affordable way of adapting to this dilemma by "piggybacking" their C-19A requirements onto the E-4 support contract used at Andrews AFB, Maryland. This significantly reduced the quantities and cost of unique support equipment and spares required for the C-19s (9:1-2).

Another option to be considered early in the used aircraft acquisition cycle is to buy support equipment and spares as part of the initial contract. Most commercial carriers offer spares and support equipment proportionate to the number of aircraft being purchased. More importantly, these items are likely to be available at considerable savings over new vendor prices. In the

cases where the equipment is unique to the Air Force this approach has proven the most economical (1:72).

It is also necessary to plan for replacement and repair costs for all unique support equipment and spares. Keep in mind that unique commercial type equipment will most likely require parts and tools not common to the Air Force system. Thus, it is usually most economical to include replacement and repair of unique support equipment and spares as part of the initial support system contract.

CONDITION/ACCEPTABILITY

Another potential pitfall for Air Force purchasers of used aircraft involves the condition and acceptability verification of used airframes. To date, used aircraft have been much like used cars, in that two identical models may be sitting on the ramp in very different conditions. Inspections of B-707 aircraft during the C-18 selection process showed an extreme variation in aircraft condition, even among aircraft operated by the same air carrier. Variations in aircraft condition were even greater between air carriers even though the airlines maintain aircraft to the same FAA requirements. According to Mr. William Yri, C-18 program manager at the time of the inspections described above, the maintenance philosophy of the individual carrier bears heavily on the actual condition of the aircraft. "Some carriers appear to make maintenance decisions based solely on near term cost considerations. It shows! Their aircraft were best suited

for scrap. Other carriers had obviously tried more to maintain a quality asset" (14:4).

The task of accurately evaluating condition and acceptability of commercial used aircraft is made more complex by differences in the ways the Air Force and the airlines measure aircraft age and need for service/overhaul. In the commercial environment aircraft are tracked by both flight hours (as in the Air Force) and by ground-air-ground cycles (GAGS). The GAGS are the primary means of establishing aircraft fatigue life, and are used by the aircraft manufacturer to develop service bulletins that correct maintenance or fatigue problems. Of particular significance to a potential buyer are the life extension and corrosion control bulletins that have been issued against the aircraft series being considered. Knowledge of the bulletins which have been issued and when installation is required (or recommended) gives the potential buyer the ability to decide which of the bulletins should be applied--and to plan for the costs involved (4:82-88).

In the case of engine condition verification the standard airline practice is acceptable, but must be understood by those responsible for inspections during the selection process. The commercial practice is to specify a minimum number of hours remaining before overhaul "across the wing" with a minimum for any given engine. For a four engine jet, 15,000 hours across the wing with not less than 1,500 hours on any one engine is typical. Understanding commercial overhaul practices and knowing how much time is left before overhaul is required permits Air Force

inspection teams to predict useful service life and to accurately rate individual aircraft (1:117-121).

The Air Force buyer must keep in mind that commercial maintenance practices reflect the commercial concern for bottom line profit. Wheel wells, flap, and slat areas in particular, tend to have a great deal of surface corrosion. "The airlines consider such corrosion to be a cosmetic rather than a safety problem, and the military customer may need to invest 1,000 or more manhours per aircraft with an allowance for miscellaneous parts to bring the aircraft up to acceptable military standards" (14:5). Once again, anticipation is the key to developing an acquisition strategy flexible enough to discriminate quality used aircraft from the "lemons."

REQUIRED MODIFICATIONS

Closely related to the many difficulties involved with condition verification are the potential problems presented by required modifications to the used aircraft. Again, both time and dollar costs are involved, so early planning is the key to remaining on track after the aircraft is in Air Force hands.

The most obvious modifications are those required to take the basic commercial aircraft and outfit it to perform its military mission. Depending on the nature of the program this may take a few weeks or many months. It is the program manager's task early on in the acquisition cycle to carefully outline and plan for every detail of modification that will be required on the aircraft.

In the case of the C-19A program the proposed modification effort was relatively modest with plans calling for addition of a military communication/navigation suite (TACAN, VHF & UHF Com/Nav radios, and Mode 4 IFF), ability to carry both commercial and military 463L pallets, and a military paint scheme. However, even this "simple" program's PMD called for designation of one airframe as a Shuttle Carrier Aircraft (SCA). The modifications required to convert one "basic" B-747 to SCA capability would be costly and time consuming (9:1-4).

More insidious are those unplanned modifications that can adversely impact either the used aircraft cost or schedule. If not taken into account early in the program, major problems can develop. One example of this kind of potential modification involves the use of a different hydraulic fluid than normally used by military aircraft. The purchase of some commercial aircraft introduces the need for commercial hydraulic fluid since the military and commercial hydraulic fluids are incompatible and destructive to each other's seals. The commercial type fluid is also caustic and must be kept off the skin and eyes. The cost of modifying a commercial used aircraft by replacing all the commercial hydraulic seals so that military fluid can be used would be prohibitive. Therefore, provisions must be made for separate hydraulic containers and appropriate safety precautions (14:5-6). Great caution must be exercised when considering such unplanned modifications of used aircraft in order to ensure that the basic commercial aircraft type certification is not affected

by the proposed changes. In those cases where the contractor is required to maintain a valid FAA type certification, unilateral modifications by the Air Force can void the basic contract or the warranties on aircraft equipment. Again, these kinds of unplanned modifications highlight the critical need for early recognition of the differences between commercial operations and standard military practices.

RAPID DELIVERY VS SUPPORT SYSTEM SET UP

While the used aircraft market is particularly attractive to those responsible for meeting operational needs because of the ability to get "rubber on the ramp" quickly, this shortened acquisition cycle presents challenges of its own. Specifically, there is a potential problem caused by the time lag between delivery of a used aircraft and the set up of the aircraft support system.

Once again, experience with current commercial programs indicates that aircraft can be delivered rapidly, while the people and parts to keep them flying are longer in coming. In the case of the C-18, aircraft were available for delivery virtually at once, while the stocking of supply facilities lagged considerably (12:--). In fact, it is often more time-consuming to provide spare engines for the aircraft than it is to obtain the basic aircraft itself. This problem of stocking local supply facilities with appropriate commercial parts for newly acquired used aircraft is made even more difficult by the airlines' standard practice of using form, fit and function specifications

for their parts and Line Replaceable Units (LRU's). As a result, various vendors' parts and LRU's may be stocked to satisfy a given function (1:307-309). This will create ordering and delivery problems if not identified and planned for early in the acquisition cycle.

Additionally, in those cases where Government Furnished Equipment (GFE) must be provided as part of the aircraft contract, the lead times required to obtain the GFE and set up a supply control system must be considered. Depending on the GFE involved (type and quantity), a used aircraft can be purchased and modified before the GFE can be delivered.

As discussed in Chapter Four, (Support Equipment and Spares), there is also a tendency during the early planning stages of a used aircraft acquisition to fund for the airframe while overlooking the support equipment requirements. The C-18 program manager provided an illuminating example of the potential planning nightmares that exist in this area. In this case, the Army needed an airborne sensor platform in a hurry. The Army request to the C-18 program manager was basically, "Buy one more just like you're getting--we need an airplane." Once bought and delivered, a joint conference was held with the Army (user), SAC (operator), AFLC (logistics support), and AFSC (aircraft modification). The Army discovered that the cost in dollars and time to support a single unique asset at the end of a long specialized supply line was more than they could afford. Several months were required to work up a trade of the used 707 for an

Air Force KC-135 which could be supported within cost and within a reasonable amount of time (14:2).

Again, the key to successfully tying rapid aircraft delivery with an acceptable support system is to plan carefully for the time and costs involved with the support system set up early in the acquisition cycle. If the aircraft vendor currently holds contracts for supporting the same type aircraft, careful consideration should be given to driving the maintenance concept toward contractor support for all but on-aircraft maintenance. In many cases time and money are simply not available for building a logistics support program from the ground up.

SOURCE SELECTION CHANGES

The final potential pitfall associated with the purchase of used aircraft concerns the changes that are required to the source selection process. The very fact that the used aircraft market is so large (see Chapter Three) may encourage many vendors to attempt to participate in the process. One way to cope with this problem is to carefully establish mission (and therefore, airframe) requirements early and completely, thereby ensuring the competition is between vendors of aircraft of the specific type, class, and series the Air Force needs. However, everyone involved should be aware that this approach is seldom supportable in the more politically sensitive arena of Headquarters USAF, and such direction will be difficult to obtain. Therefore, it may be necessary to plan for a more extensive Pre-Award Survey of the various contractors' facilities and airframes than would normally

be required for a developmental type aircraft source selection. Again, early planning is the key to completing all surveys within the narrow bounds (sometimes only a week or two) available during a time critical source selection.

Chapter Five

SUGGESTED USED AIRCRAFT CONTRACT FEATURES

Having examined in detail the nature of the benefits and pitfalls involved with used aircraft acquisitions, it is possible to use that knowledge to glean desired key contract features for a generic used aircraft program. The purpose is not to lay down a set of immutable rules that will restrict the creativity and flexibility of those responsible for directing future used aircraft acquisitions. Rather, there is a need to derive a baseline contract strategy for these very unique types of acquisitions. Without doubt, individual programs and circumstances will necessitate variations to this model, but the generic contract features will serve as a starting point which reflect the lessons learned to date.

To begin, our generic used aircraft contract should be of the Firm Fixed Price (FFP) type. As seen earlier, the used aircraft market is such that airframe costs are well known and relatively stable. Since there are few, if any, developmental requirements to add to a contractor's element of business risk, it is possible to cost out the entire contract quite accurately, and to bind the vendor to these costs using the FFP contract.

Next, as shown in Chapter Four, data costs can mushroom enormously on used aircraft programs. Even if the program

acquisition concept calls for the purchase of commercial data, it is virtually impossible to fulfill Air Force requirements without resorting to at least a partial rework of key commercial data. Aircrew flight manuals and maintenance technical manuals are good examples of data items which invariably need some modification (if not full Mil Spec revision) to make them acceptable for use by Air Force users. This modification of key technical data is not unprecedented in the commercial environment where individual operators "customize" flight and maintenance manuals provided by the aircraft vendor. The key is to ensure that the modification of these manuals is provided for as part of the overall FFP contract. In the same way, it is critical to plan early on for the significantly greater than normal quantities and types of data required by the Air Force. Once again, all data requirements should be carefully detailed and included as part of the FFP contract. Failure to do so can easily result in a hurried search for data dollars after contract award, either through reprogramming efforts or through a painful dip into any "management reserve" funds available.

Another suggested feature for used aircraft contracts is the inclusion of all required modification efforts as part of the basic contract. As seen earlier, the costs of modifying the basic used airframe to perform the Air Force unique mission can be significant. By pricing the modification effort as part of the FFP contract we can avoid both the time and dollar costs of additional modifications. Even if the prime contractor elects to

subcontract portions of the modification effort, the Air Force is faced with dealing with only one contractor. Cost and schedule worries become the prime contractor's concern. Additionally, in the common case where the prime contractor is also the aircraft manufacturer (or even a major user like a large, well established airline), a prime-sub network of relationships is already in place and operating. The chances of Air Force acquisition managers obtaining "a better deal" for one time type modifications than can be achieved by large scale commercial users are quite remote.

Unique support equipment also should be included in the basic contract price. As shown in Chapter Four, unique support equipment is usually available through the prime contractor at considerable savings over new vendor prices. It simply does not pay for the Air Force to attempt to purchase, stock, and repair support equipment that is unique to the used aircraft and systems being procured. In most cases commercial carriers offer such unique support equipment in quantities proportionate to the number of aircraft being purchased.

Training should also be a feature included in the basic used aircraft contract. At the very least, provisions should be made for initial cadre aircrew and maintenance training. As discussed in Chapter Three, utilizing the contractor's in-house training enables the Air Force to train personnel in time to maintain and operate the used aircraft that will arrive soon after contract award. During this initial training period the using command and

Air Training Command can evaluate the contractor provided training programs and determine how much training the contractor should continue to perform and how much and what types of training can be more effectively accomplished by the Air Force. Clearly, this will also necessitate the inclusion in the basic contract of training options that will permit the Air Force to do some "picking and choosing" after some experience with the contractor's training has been gained. The end result could ultimately be anything from complete contractor provided training (e.g. KC-10 program) for the life of the contract, to contractor provided initial cadre training followed by Air Force provided training.

The final suggested key contract feature that applies to our generic used aircraft program involves the overall support concept for the used system. Whether as a part of the acquisition contract or as a separate FFP contract, the maintenance concept will be driven to Contractor Logistics Support (CLS) for all but organizational and, perhaps, limited intermediate maintenance. With AFLC capabilities for airframe depot overhaul already overtaxed, the burden of providing support for a relatively few Air Force unique used aircraft would likely be very expensive, if not prohibitive. Further, as is the case with contractor provided training, used commercial aircraft invariably have well documented and proven logistics support systems operating on behalf of commercial operators. In essence, the logistics support concept should be designed to minimize Air

Force investment by taking advantage of commercially owned spare parts, facilities, and equipment for the life of the system. Existing commercial services, technical manuals, logistics services and practices, and procedures should be used. The logistics support contractor should perform all depot and off-equipment maintenance and should manage the supply and distribution of contractor furnished spare parts. The Air Force is left with the requirement to provide "blue suiters" only for on-equipment maintenance and overall management of the maintenance effort. In sum, the CLS approach is by far the most practical, easily implemented, and cost effective means of supporting Air Force used aircraft(14:3).

Again, the suggested features are not all inclusive or even applicable in every case. They do, however, represent starting points and lessons learned from an analysis of used aircraft programs to date. Each new program will necessitate adaptations to the generic model to fit its unique requirements and direction. Finally, as experience is gained from further used aircraft buys, the generic contract features should change to reflect that experience.

Chapter Six

FINDINGS AND RECOMMENDATIONS

FINDINGS

The Air Force is continuing to move toward fulfilling mission requirements through used aircraft acquisition programs. Particularly in those cases where a relatively small number of aircraft are contemplated, the low cost of buying used airframes is the most attractive feature enticing planners. The current glut of used aircraft contributes to the relatively stable low prices and helps ensure that aircraft are available through this source much more quickly than through traditional sources. This, in turn, ensures that mission requirements can be fulfilled more expeditiously than would be normally possible. This advantage of a very compressed schedule enables planners in some cases to get "rubber on the ramp" within a year of program direction. As shown earlier, tapping into the commercial market for used aircraft also offers the advantage of an in-place training program for aircrews and maintenance personnel. It also provides the Air Force with the benefits of purchasing a known and proven product that can be objectively evaluated and bought at little developmental risk.

On the potentially negative side of the ledger, the high cost involved with purchasing required technical data can easily be overlooked for used aircraft procurements. Similarly, if not planned for early on, the costs of buying and maintaining unique support equipment and spares can be sobering. Unlike new aircraft, there is also difficulty involved with evaluating condition acceptability since, like used cars, used aircraft vary enormously in quality. While direction for used aircraft programs invariably requires that used airframes comply with FAA condition requirements, Air Force managers are often surprised to discover that the FAA requirements allow for much greater difference in condition than Military Standards. Costs, both monetary and schedule, can also be overlooked for any required modifications needed to make the used aircraft acceptable to fulfill the military mission. There is also the inherent difficulty with used aircraft acquisitions of a potentially rapid buy with a longer period required to set up the support system necessary to sustain the aircraft. Finally, the standard source selection process may change when used aircraft are being bought, primarily because of the potentially expanded Pre-Award Survey.

RECOMMENDATIONS

Since the Air Force's movement toward used aircraft procurements is clearly a new direction from the more familiar development acquisition programs, the differences should be reflected in the used aircraft contract. A generic used aircraft program contract should be Firm Fixed Price. Data should be

priced out as part of the basic contract and all aircraft modifications should be included and scheduled for. Rather than purchased by the Air Force, the unique support equipment needed for the used aircraft should be obtained as part of the basic contract. The compressed schedule from initial program direction to delivery of aircraft makes contractor provided initial training virtually a must, and contractor provided follow-on training a probable cost-saver. Finally, rather than trying to have the Air Force provide support for a unique used aircraft system, the contract should include provisions for Contractor Logistics Support for the life of the system.

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