BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Secretary Of The Air Force

The Air Force Can Improve Its Forecasts Of Aircraft Spare Parts Requirements

The Air Force forecasts its aircraft spare parts requirements by calculating a ratio of future flying hours to past flying hours for the aircraft using a specific part and then applying this ratio to the historical demand for the part. GAO found that the process resulted in overstated estimates for some parts and understated estimates for others because:

--The computer file which identifies the aircraft on which the individual parts are used contained inaccurate data.

--The requirements were not computed on the basis of all the unique combinations of aircraft which use each part.

--The time period used in calculating the ratios does not correspond to the time needed to obtain the part.

GAO makes recommendations designed to correct these problems and improve the Air Force's forecasting process for aircraft spare parts.

GAO/NSIAD-85-2
NOVEMBER 19, 1984

Request for copies of GAO reports should be sent to:

U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are $3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are $1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

B-216363

The Honorable Verne Orr
The Secretary of the Air Force

Dear Mr. Secretary:

This report discusses the Department of the Air Force's efforts to forecast consumable spare parts requirements. Our objective was to evaluate the Air Force's methods for developing and applying aircraft flying hour program ratios in estimating future requirements for these aircraft parts.

This report contains recommendations to you on page 9. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the above committees as well as the Chairmen of the House and Senate Committees on Armed Services. We are also sending copies of this report to the Secretary of Defense and the Director, Office of Management and Budget.

Sincerely yours,

Frank C Conahan

Frank C. Conahan
Director

GENERAL ACCOUNTING OFFICE
REPORT TO THE SECRETARY
OF THE AIR FORCE

THE AIR FORCE CAN IMPROVE ITS FORECASTS OF AIRCRAFT SPARE PARTS REQUIREMENTS

D I G E S T

The Air Force Logistics Command, through its five logistics centers, buys and stocks spare parts needed to support Air Force weapons systems. The centers need to estimate as precisely as possible the quantities of individual parts that will be used in the future to avoid buying too many or too few. GAO conducted this review to determine how well the Air Force forecasts its spare parts requirements.

The Air Force forecasts spare parts requirements by calculating the ratio of future flying hours to past flying hours for the aircraft using a specific part and then applying this ratio to the historical demand for the part. If the programmed flying hours for the future period are the same as for the past period, the computed flying hour ratio would be 1.000. The ratio would be greater or less than 1.000 depending on whether the future flying hours are expected to increase or decrease. The use of such ratios is based on the theory that any change in flying hours will cause a correlating increase or decrease in the use of spare parts.

The Air Force computes the ratios using standard time periods

--for ascending programs (ratio greater than 1.000) by dividing the projected flying hours for the next year by the average for the last 2 years and

--for descending programs (ratio less than 1.000) by dividing the total projected flying hours for the next 2 years by the total flying hours for the past 2 years.

GAO reviewed the Air Force's method for applying these ratios at the Oklahoma City and San Antonio air logistics centers.

FORECASTS OF SPARE PARTS REQUIREMENTS NEED TO BE IMPROVED

The two logistics centers overstated their need for some parts for aircraft being phased down or

phased out. Based on its sample, GAO projected the overstatement to be $31.1 million. At the same time, the centers understated their parts need for aircraft with expected increases in flying hours and for new aircraft entering the inventory. GAO projected the understatement to be $28.8 million. (See p. 3.)

Thus, the Air Force could spend millions of dollars to buy parts before they are needed or that may not be needed, while not purchasing millions of dollars worth of needed parts. Readiness could be adversely affected by not having the needed parts.

GAO believes that errors in requirements determinations occurred partly because the computer file did not always identify all the aircraft on which a particular part is used. GAO believes this information is essential in determining accurate flying hour ratios. Errors also resulted because the flying hour ratios are not computed correctly. Specifically:

--The requirements were not computed on the basis of all the unique combinations of aircraft which use each part.

--The standard time period used in calculating the ratios which is based on a projection of flying hours did not correspond to the procurement lead time needed to obtain the part.

Of the 375 items in GAO's sample, the Air Force overstated or understated parts needs projections on 270 (72 percent). The following examples illustrate the causes and impact of inaccurate ratios applied at the two logistics centers.

--One spare part in GAO's sample of Oklahoma City items is used on 2 of 3 active B-52 aircraft series and on 8 of the 28 active C-135 aircraft series. The Air Force, however, calculated a flying hour ratio of 0.849 which included flying hour data for all three B-52 series but excluded flying hour data for the C-135 aircraft. GAO computed a composite ratio of 0.746 that was based on the flying hours for the 10 different aircraft series (B-52 and C-135) which actually use the part and on the quantity used on each aircraft. By using the 0.849 ratio, the Air Force

overstated the requirement for this part by $97,372. (See p. 6.)

--A part in GAO's sample of San Antonio items is used on 12 different series of aircraft. The center assigned a ratio of 1.000 for this part. When none of the aircraft series account for more than half of the parts usage, the Air Force system does not compute a composite ratio nor does it assign a ratio based on one of the aircraft using the part. Instead the system assigns a ratio of 1.000. GAO calculated a ratio of 1.022 based on the actual composite flying hours for all aircraft using this part and the quantity used on each aircraft series. As a result of not computing a composite ratio, the Air Force understated requirements for this part by $53,749. (See p. 6.)

--The procurement lead time required to obtain an A-7 aircraft part in GAO's sample of Oklahoma City items was 3-1/2 years. The Air Force system used a standard of dividing the total flying hours projected for the next 2 years by the total flying hours for the past 2 years to calculate a ratio of 0.974. Using planned flying hours for the 3-1/2 year procurement lead time needed to obtain the part, GAO computed a ratio of 0.964. The reason why GAO computed a smaller ratio was that planned flying hours were projected to decline in the additional 1-1/2 year period. GAO concluded that as a result of not considering the procurement lead time, the Air Force overstated requirements for this part by $20,658. (See p. 8.)

--The lead time required to obtain a selected F-15 aircraft part in GAO's sample of San Antonio items is 3-1/4 years. The Air Force system used average flying hour data for a standard 2 years in the past and 1 year in the future in computing a program ratio for this part. Using 1 year of data, the Air Force computed a ratio of 1.211. Using planned flying hours for the 3-1/4 year period needed to procure the part, GAO computed a ratio of 1.346. The reason why GAO computed a larger ratio was that planned flying hours were projected to continue to increase in the additional 2-1/4 year period. GAO concluded that as a result of not considering the procurement lead time, the Air Force understated

requirements for this part by $13,639. (See p. 8.)

RECOMMENDATIONS

GAO recommends that the Secretary of the Air Force direct the Commander, Air Force Logistics Command, to implement improved procedures and controls for estimating future spare parts requirements. Specifically, such procedures and controls should:

--Require appropriate management review to insure that equipment specialists correct and then maintain current, accurate data to compute flying hour ratios. The equipment specialists should verify on a reasonable periodic basis the accuracy of the computer file which identifies aircraft using specific parts.

--Revise the forecasting system so that the computed flying hour ratio takes into account (1) the flying hours on the actual aircraft model and series using the part and (2) the estimated lead time needed to obtain the part.

AGENCY COMMENTS

The Department of Defense and the Air Force agreed with GAO's recommendations to improve and periodically verify the accuracy of the parts application files, and to revise the forecasting system to include the flying hours on the actual aircraft using the parts. (See app. II for detailed comments.) The Air Force has already initiated some actions and plans to take others to implement these recommendations. GAO is encouraged by the Air Force's actions and believes full implementation of the recommendations should result in better Air Force forecasts of spare parts requirements.

The Department of Defense and the Air Force did not agree with GAO's recommendation that the time period used in calculating flying hour ratios correspond to the procurement lead time needed to obtain the part. The Air Force believes the use of procurement lead time in program ratios increases the risk of buying excess inventory for items applicable to aircraft with rapidly increasing flying hour programs. The Air Force further believes the standard time frames currently used minimizes

the risk by computing smaller spare parts requirements for these aircraft.

GAO is concerned that computing smaller spare parts requirements for aircraft with increasing flying hour programs could adversely impact on future aircraft readiness. GAO believes that if the Air Force is planning to increase the flying hour programs for certain aircraft, it should also plan to provide increased support for those aircraft. Using procurement lead time data for aircraft with increasing flying hours rather than the standard 1 year time period for parts with lead times above 1 year could result in increased support and readiness.

GAO is also concerned that using a standard 2 year period rather than procurement lead time to project spare part requirements for aircraft with decreasing flying hour programs could result in overstated requirements and excesses. GAO believes that if the Air Force is planning to reduce the flying hour programs for certain aircraft, it should also plan to reduce the level of support that will be required. The resources saved could be used to provide the increased support needed for the aircraft with increasing flying hour programs.

Given the above considerations, GAO still believes that the Air Force should use procurement lead time data in forecasting spare parts requirements where the procurement lead times are above current program factors--1 year for aircraft with increasing flying hour programs and 2 years for aircraft with decreasing flying hour programs. This approach should result in more effective and efficient Air Force investment of support resources.

Contents

ABBREVIATIONS

AFLC	Air Force Logistics Command
DOD	Department of Defense
GAO	General Accounting Office

CHAPTER 1

INTRODUCTION

The Air Force Logistics Command (AFLC), through its five air logistics centers, manages about 400,000 system support stock fund items with inventories valued at about $3 billion. These items are consumable replacement parts that generally cannot be repaired and reused after failing. In carrying out inventory management functions of buying, retaining, issuing, and disposing of stocks, the air logistic centers compute stock levels and requirements four times a month. The computerized D062 Economic Order Quantity Requirements Computation System is the Air Force's key system for managing these items.

For several years, AFLC has used flying hour ratios in forecasting the demand for consumable spare parts. Use of such ratios, also called program ratios, is based on the theory that any change in flying hours will cause a correlating increase or decrease in spare parts use. The system starts with an average monthly demand for each part which is based on the average number of parts issued per month over the past 2 years. Using this past demand data as a base, the intent is to estimate future needs for each part based on the degree to which the future demand for the part will be more or less than it was in the past. An adjustment is made by applying the flying hour or program ratio to the average historical demand. AFLC calculates this ratio by dividing future flying hours for an aircraft by past flying hours for the aircraft. For example, if the flying hours programmed for the future period are the same as the program for the past period, the computed ratio would be 1.000. The ratio would be greater or less than 1.000 depending on whether the future program is increasing or decreasing. AFLC furnishes the computed ratios to the air logistics centers quarterly. The program ratio is one factor used in the requirements determination process to determine when and how many items should be bought.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objective was to evaluate the Air Force's methods for developing and applying flying hour program ratios in estimating future demands for stock fund items.

We reviewed policies, procedures, and practices used at the Oklahoma City and San Antonio air logistics centers for updating and using program ratios. We interviewed AFLC and center officials responsible for carrying out these activities and made computer analyses to select random samples.

We selected aircraft with increasing and decreasing flying hours. Some of these aircraft are being phased out and others are new aircraft being added to the inventory. Next, we obtained computer tapes covering the requirements for all system

support stock fund items being managed at the Oklahoma City and San Antonio centers as of the beginning of 1982 to identify spare parts applicable to these aircraft. We updated the data as of September and December 1982, respectively. We analyzed the tapes and identified 12,127 Oklahoma City items and 8,442 San Antonio items with annual demands of $1,000 or more having application to the selected aircraft. We randomly selected 200 Oklahoma City items and 175 San Antonio items for detailed review.

To determine which aircraft used the parts in our samples, we obtained computer printouts showing the applications and quantity per application currently listed in the computer system for the selected parts. We submitted these printouts to equipment specialists at the centers. They referred to various technical manuals and orders to validate and update the applications. The equipment specialists annotated corrections or changes (additions or deletions of aircraft applications) on the forms and returned them to us. We used the updated application lists in our calculations of program ratios for each part.

Using these lists and the flying hour data available in the requirements computation system, we calculated a program ratio for each part. We then recalculated requirements for the parts and compared the requirements we had calculated with those the Air Force had calculated. We then multiplied the difference in requirements by the unit cost for the item to determine the dollar impacts of the revised calculation process.

Our review was made between October 1982 and July 1983, and was performed in accordance with generally accepted government auditing standards. Because the system for computing requirements for system support stock fund items automatically receives input from several subsystems, we did not analyze each interfacing subsystem to determine the reliability of data we obtained from the system. However, we took steps to insure that we used the same data the Air Force uses to manage the parts.

The total impact AFLC-wide of inaccurate ratios could be substantially greater than what is shown in this report. The overstated and understated needs relate only to 20,569 parts managed by the San Antonio and Oklahoma City centers. The AFLC developed program ratios are used by all five AFLC logistics centers to forecast needs.

CHAPTER 2

FORECASTS OF SPARE PARTS REQUIREMENTS NEED TO BE IMPROVED

The Air Force could be spending millions of dollars for unneeded spare parts for aircraft being phased down or out of the Air Force inventory. Also, for aircraft with expected increases in flying hours and for new aircraft entering the inventory, the Air Force may not be buying millions of dollars worth of needed spare parts. This occurs because the Air Force system for estimating future requirements does not consider all the aircraft using each part and the time needed to resupply it. Of the 375 items in our sample, the Air Force overstated or understated parts needs projections on 270 (72 percent).

For 138 of the items, erroneous program ratios resulted in overstating the need for parts by about $567,000. Projecting our sample results (see app. I), we estimate that the two centers overstated their parts needs projections by $31.1 million. Overstated projections result in the Air Force buying parts before they are required. Since the Air Force is phasing out some of these aircraft, overstatements could also result in the Air Force buying parts that it may not need.

Our samples also included 132 items that had erroneous program ratios which understated parts needs by about $536,000. Projecting these sample results, we estimate that the two logistics centers could have shortages in spare parts totaling $28.8 million. Understated projections can result in the Air Force not buying enough parts. This could reduce the readiness of units needing the items, or result in costly expedited deliveries.

These errors resulted because:

--The computer file used to identify the aircraft on which the individual parts are used contained inaccurate data.

--The requirements were not computed on the basis of all the unique combinations of aircraft which use each part.

--The standard time period used in calculating these ratios which is based on a projection of flying hours did not correspond to the procurement lead time needed to obtain the part.

APPLICATION DATA FILE CONTAINED NUMEROUS ERRORS

The application data file--used to identify each aircraft using a specific part--contained numerous errors. Equipment specialists who reviewed the file at our request made changes to the application data for 132 of the 375 items (35 percent) in

our sample. Inaccurate application data causes inaccurate flying hour ratios and related parts requirements.

Identifying the aircraft to which each part applies is the first step in calculating the program ratio. Therefore, we validated the computer file of application data the Air Force maintains. Equipment specialists at the centers referred to various technical manuals and orders to validate and update the applications for the parts in our sample. We used the updated application listings in our calculations of program ratios for each part.

In 89 of the cases in our sample, the equipment specialists added aircraft not previously listed, and in 19 of the cases, they deleted at least 1 of the applications listed. In 24 other cases, they had to both add and delete some aircraft applications.

PROGRAM RATIOS DID NOT RELATE TO THE SPECIFIC AIRCRAFT ON WHICH EACH PART IS USED

For 212 of the 375 items in our sample, the ratios the Air Force computed were not based on the flying hour programs for the actual combinations of aircraft using each part. Instead

- --when a part was used on more than one aircraft model, the program ratio was determined by using the predominant aircraft (the one with 50 percent or more of the flying hours);
- --if no aircraft series was predominant, the Air Force arbitrarily assigned a factor of 1.000; and
- --the Air Force established program ratios based on the general model of the aircraft rather than the specific series of the model.

Predominant aircraft used instead of composite of all aircraft

In 74 of the 375 cases in our sample, the Air Force applied a ratio calculated only for the predominant aircraft series. The fact that several aircraft actually used the part caused the ratio to be inaccurate.

Once each quarter, AFLC computes program ratios and provides them to the air logistics centers. According to AFLC regulations, assignment of program ratios is based on the predominant aircraft application if that application constitutes 50 percent or more of the item's usage. Because this system ignores the flying-hour trends for the other aircraft, the calculation of the number of parts needed would be inaccurate, as shown by the following examples.

--Stock No. 2840-00-672-6003 RT. This J75 engine plug assembly in our Oklahoma City sample is used on F-105 and F-106 aircraft. Although both these aircraft are being phased out, the F-105 is being phased out earlier than the F-106. Because the F-106 is predominant, the F-106 program ratio (0.884) was assigned to this part. We computed a composite ratio of 0.673 which was based on the combined flying hours of both the F-105 and F-106. The difference in ratios (0.884 - 0.673) resulted in an Air Force overstatement of requirements for this part of $3,126.

--Stock No. 2840-00-799-6320 RV. The predominant use of this TF-33 engine blade in our sample at the Oklahoma City center is on the C-141 aircraft, which had no change in flying hours. Therefore, the center used the C-141 program ratio of 1.000 in computing requirements for this part. We computed a composite ratio which included not only the C-141 flying hours and quantity per application, but also the flying hours and quantity per application for the other aircraft the part is used on, (various series of B-52, B-57, C-18, C-135, and E-3 aircraft). The composite ratio was 1.056. Using the 1.000 ratio instead of the 1.056 ratio resulted in an Air Force understatement of requirements for this part totaling $4,440.

Ratio showing no change in flying program was used arbitrarily

In 35 of our 375 sample cases, the Air Force made inaccurate projections, because it arbitrarily assigned a program ratio of 1.000 to the part. This occurred when no aircraft was shown as the predominant user.

As discussed in the previous section, AFLC regulations require that the ratio for an individual part be based on the predominant aircraft. However, when no aircraft accounts for more than 50 percent of the part's usage, the regulations require that a ratio of 1.000 be assigned. In most cases (when based on a composite of all aircraft using the part), the actual ratio will be either greater or less than 1.000. Thus, the requirements generated are usually inaccurate, as shown by the following examples.

--Stock No. 2995-01-037-5671. This fan in our sample at the Oklahoma City center is used on certain series of B-52 and F-4 aircraft. The Air Force assigned a program ratio of 1,000 to this part. On the basis of the composite flying hours of the specific aircraft which actually use this part and the quantity per application of each, we calculated a program ratio of 0.955. Based on this difference in ratios, the Air Force requirements for this part were overstated by $26,063.

--Stock No. 1670-00-943-3024 LS. This harness in our sample at the San Antonio center is used on certain series of 12 different models of aircraft. The Air Force assigned a program ratio of 1.000 to this part because it believed no one aircraft accounted for 50 percent or more of the part's usage. On the basis of the composite flying hours of the specific aircraft which actually use this part and the quantity per application of each, we calculated a program ratio of 1.022. Based on this difference in ratios, the Air Force requirements for this part were understated by $53,749.

Specific aircraft model and series were not considered

The inaccurate Air Force projections we found in 154 of our sample cases were also caused partly because AFLC usually computes the ratio only on the general model of the aircraft (such as F-4 or C-135) rather than on each series within the model (such as F-4C, F-4D, KC-135A, and KC-135B). Only for the B-52 aircraft does AFLC compute a ratio for each series within the model. For all other aircraft, AFLC computes only one across-the-board ratio for each model.

This approach causes inaccuracies in two ways, (1) when a series within a model is being phased down or out while other series may be increasing or remaining constant and (2) when specific parts are not used on all series of aircraft within the general model. Thus, as shown by the following examples, the ratios do not accurately reflect the usage trends of the individual parts.

--Stock No. 2995-00-438-9919. The program ratio assigned to this kit in our Oklahoma City sample was for the A-7 aircraft. There are two active series of the A-7 model --the A-7D and the A-7K. The Air Force projects a reduction of flying hours for the A-7D and an increase of flying hours for the A-7K. The kit in our sample is used only on the A-7D series. The ratio AFLC computed for the A-7 model was 0.976. We computed a ratio for the A-7D series of 0.908. Because the Air Force used the general ratio for the A-7 rather than precise ratio for the A-7D, it overstated requirements for this part by $22,411.

--Stock No. 2915-00-694-9107 RU. This part in our Oklahoma City sample is used on 2 of the 3 active B-52 series and 8 of the 28 active C-135 series aircraft. The Air Force assigned a program ratio of 0.849 which is based on the B-52 model (all 3 series). We computed a ratio of 0.746 which was based on the actual series of both B-52 and C-135 aircraft using the part and the quantity used on each aircraft. Because the Air Force applied the 0.849 ratio instead of the 0.746 composite ratio, the requirements for this part were overstated by $97,372.

--Stock No. 6615-00-056-3173. In this case, the program ratio assigned the F-4 model is based on that model's flying hours as predominant over the other models that also use the part. This rotor is used on four of seven active F-4 series aircraft and three other aircraft--F-105F, AC-130A, and E-3A. Using the flying hours for all F-4 series aircraft, AFLC computed a ratio of 1.000. We computed a ratio based on the flying hours of the four series of the F-4 and the three other aircraft series that use this part and the quantity used by each. Using the 1.066 ratio we computed, instead of the 1.000 used by the Air Force, shows that the Air Force understated requirements for this part by $36,610.

--Stock No. 1680-01-060-2244. This control panel in our San Antonio sample is used on two series of the F-15 aircraft (the F-15C and F-15D). However, this part is not used on the other two series of the F-15 model. AFLC computed a ratio of 1.197 based on the flying hours for all four series of the F-15 model. We computed a ratio of 1.696 based on only the two F-15 series using this part. Using the precise ratio for the combined F-15C and F-15D instead of the general ratio for the F-15 model shows that the Air Force understated requirements for this part by $29,411.

When the Air Force reengined 74 C-135 aircraft, a situation arose which illustrates the problems caused by not assigning a precise program ratio for each series of aircraft. During fiscal years 1981 and 1982, the Air Force reengined 46 C-135 aircraft by replacing the J-57-59 engines with the JT3D-3B engine purchased from commercial airlines. The Air Force contracted for 28 more aircraft to be reengined in fiscal year 1983. By using one program ratio for all series of the C-135 model aircraft, the Air Force was not properly considering the reduction of the flying hours for the J57-59 engine that was being removed from the C-135 aircraft being reengined. It would have continued ordering parts for these engines as though the number of engines operating was not being reduced.

We informed the Oklahoma City Air Logistics Center of this situation and it was corrected. However, without changes to the overall system of calculating ratios, similar problems could occur whenever certain series of an aircraft are being phased out while other series are increasing or staying the same.

The problem of adjusting stock fund procurements to respond to major program decreases was noted in a Department of Defense (DOD) Stockage Policy Analysis Final Report, dated August 31, 1980. The report stated that phaseout and significant phasedown of weapons systems were the primary causes of long supply. Over one-third of the $320 million in long supply in DOD's study sample could be attributed to weapons systems being phased out.

TIME PERIOD USED BY THE AIR FORCE DID NOT CORRELATE TO TIME NEEDED TO OBTAIN THE PART

In computing program ratios, the Air Force does not use future flying hour data for the time period needed to obtain the individual parts. As a result, in 167 of the cases, the Air Force calculation was based on using a time period shorter than the time needed to obtain the part. In 72 cases, the Air Force calculation was based on using a period longer than that needed to obtain the part.

AFLC computes the program ratios using standard time periods

--for ascending programs (ratio greater than 1.000) by dividing the projected flying hours for the next year by the average for the past 2 years and

--for descending programs (ratio less than 1.000) by dividing the total flying hours for the next 2 years by the total flying hours for the past 2 years.

Times required to obtain the parts vary, therefore, AFLC's use of standard time periods may not be appropriate in many cases. When major declines or increases in the flying hour program take place outside the period used by the Air Force but within the period of time needed to obtain the part, the Air Force will calculate inaccurate requirements for the parts. For example:

--Stock No. 2840-01-071-8392 CN. In this case, using 2 years of data, AFLC calculated a ratio of 0.974 for the A-7 aircraft. Because of a decline in flying hours, the ratio we calculated using 3-1/2 years of data (the time required to obtain the part) was 0.964. The reason for the smaller ratio was that planned flying hours continued to decline during the additional 1-1/2 year period. The difference in program ratios resulted in an Air Force overstatement of requirements for this part of $20,658.

--Stock No. 2835-01-098-2766. The total time required for procurement of this F-15 seal rotor in our San Antonio sample is 3-1/4 years. The Air Force, using 1 year of data, computed a ratio of 1.211 for this part. Using flying hours for the 3-1/4-year period needed to obtain the part, we calculated a ratio of 1.346. The higher ratio resulted because F-15 flying hours are projected to continue to increase during the additional 2-1/4 year period. We concluded that the Air Force understated requirements for this part by $13,639.

In our calculations, we used flying-hour data which is readily available at the centers in the D041 requirements

computation system for reparable parts. For each aircraft series and model, the D041 system computation uses historical flying-hour data for the past 2 years and projected flying-hour data by quarter for the next 6-1/4 years.

CONCLUSIONS

The Air Force is overestimating its need for parts for some aircraft being phased down or phased out and, at the same time, underestimating its need for parts for some aircraft with increasing flying hour programs. These errors can result in the Air Force (1) spending millions of dollars for parts before they are needed or for parts that may not be needed and (2) not purchasing parts needed for other aircraft. This occurs because the computer application data file used to identify which aircraft uses each part contains errors. Also, the Air Force system for estimating future requirements does not consider the specific aircraft each part is used on and the time needed to obtain it. The equipment specialists at the centers need to correct the application data file and verify the accuracy of the data. Also, the method for calculating program ratios needs to be revised to take into account the actual aircraft model and series using the part and the estimated procurement lead time needed to obtain it.

RECOMMENDATIONS

We recommend that the Secretary of the Air Force direct the Commander, AFLC, to implement improved procedures and controls for estimating future requirements for system support stock fund items. Such procedures and controls should:

--Require appropriate management review to insure that equipment specialists correct and maintain current, accurate application data to compute flying hour ratios. The equipment specialists should verify the accuracy of the application data at a reasonable time interval.

--Revise the forecasting system so that the computed flying hour ratio takes into account (1) the flying hours on the actual aircraft model and series using the part and (2) the estimated lead time needed to obtain the part.

AGENCY COMMENTS

The Department of Defense and the Air Force agreed with our recommendations to improve and periodically verify the accuracy of the parts application files, and to revise the forecasting system to include the flying hours on the actual aircraft using the parts. (See app. II for detailed comments.) The Air Force has already initiated some actions and plans to take others to implement these recommendations. We are encouraged by the Air Force's actions and believe full implementation of the

recommendations should result in better Air Force forecasts of spare parts requirements.

The Department of Defense and the Air Force did not agree with our recommendation that the time period used in calculating flying hour ratios correspond to the procurement lead time. The Air Force believes the use of procurement lead time in program ratios could increase the risk of buying excess inventory for items applicable to aircraft with rapidly increasing flying hour programs. The Air Force further believes that the standard time frames currently used minimizes the risk by computing smaller spare parts requirements for these aircraft.

We are concerned that computing smaller spare parts requirements for aircraft with increasing flying hour programs could adversely impact on future aircraft readiness. We believe that if the Air Force is planning an increase in the flying hour programs for certain aircraft, it should also plan to provide increased support for those aircraft. Using procurement lead time data for aircraft with increasing flying hours rather than the standard 1 year time period for parts with lead times above 1 year could result in increased support and readiness.

We are also concerned that using a standard 2 year period rather than procurement lead time to project spare part requirements for aircraft with decreasing flying hour programs could result in overstated requirements and excesses. We believe that if the Air Force is planning to reduce the flying hour programs for certain aircraft, it should also plan to reduce the level of support that will be required. The resources saved could be used to provide the increased support needed for the aircraft with increasing flying hour programs.

Given the above considerations, we still believe that the Air Force should use procurement lead time data in forecasting spare parts requirements where the procurement lead times are above current program factors--1 year for aircraft with increasing flying hour programs and 2 years for aircraft with decreasing flying hour programs. This approach should result in more effective and efficient Air Force investment of support resources.

ESTIMATED EFFECT OF

OVERSTATED AND UNDERSTATED

PROGRAM RATIOS

Type of effect	Sample	Projected to universe	Estimated range at 95 percent confidence level	
			Low	High
Requirements overstated	$566,882	$31,100,972	$11,837,958	$50,363,986
Requirements understated	536,102	28,783,946	8,512,498	49,055,374

APPENDIX II

THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

SR
MANPOWER,
INSTALLATIONS
AND LOGISTICS

9 MAR 1984

Mr. Frank C. Conahan
Director, National Security and
International Affairs Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is in response to your draft audit report, dated December 9, 1983, entitled "Improvements Needed In Air Force Forecasts of Spare Parts Requirements," (GAO Code No. 943529; OSD Case #6419).

Comments received from the Air Force have been used in preparing the enclosed response which addresses the findings and recommendations contained in the draft report.

Sincerely,

Jerry L. Calhoun
Principal Deputy Assistant Secretary of Defense
(Manpower, Installations & Logistics)

Enclosure
As stated

GAO note 1: The page numbers have been changed to reflect their current position in the final report.

2: The data referred to in these comments have been deleted from the final report.

APPENDIX II

DEPARTMENT OF DEFENSE
RESPONSE TO GAO DRAFT REPORT
"IMPROVEMENTS NEEDED IN AIR FORCE FORECASTS
OF SPARE PARTS REQUIREMENTS"
(GAO CODE No. 943529; OSD CASE #6419)

FINDINGS

FINDING A: Air Force Forecasts of Spare Parts Were Inaccurate. GAO identified 12,127 Oklahoma City Air Logistics Center (OCALC) and 8,442 San Antonio Air Logistics Center (SAALC) managed system support stock fund items (having annual demands of $1000.00 or more) with application to aircraft having increasing or decreasing flying hour programs. From these populations, GAO randomly selected 200 OCALC and 175 SAALC items for detailed review. Using Air Force updated specific aircraft applications and the associated aircraft flying hour program (taken from the reparable items requirements computation system - D041), GAO calculated a flying hour program ratio and requirements for each item. GAO found, of the 375 items in the sample, the Air Force made inaccurate projections for 270 (72 percent). Comparing the extended costs from Air Force calculations to its own and projecting the sample results, GAO concluded that the two Air Logistics Centers (ALCs) could have spare parts shortages totaling $28.8 million and excess spare parts totaling $31.1 million. (See pp. 2, 3, and 11.) (See GAO note 1, p. 12.)

DOD RESPONSE: Concur partially.

a. The Department agrees, intuitively, that the new derivation of the flying hour program ratio by GAO should provide a more precise forecast of requirements. As discussed below in the response to Finding C, Air Force is taking action to revise their system to utilize the GAO approach.

b. The Department disagrees with the statement that Air Force spare parts forecasts are inaccurate. No evidence has been presented which compares the relative accuracy of either the GAO or Air Force forecasts to actual requirements. Accordingly, no definitive statements regarding the accuracy of either approach can be made.

FINDING B: The Aircraft Application Data File Contains Numerous Errors. GAO noted as a result of its requested update of the sample item aircraft application data that 132 of the 375 items (35 percent) required changes. Specifically, GAO found in 89 cases, aircraft applications were added; in 19 cases at least one application was deleted; and, in 24 other cases some aircraft were added and others deleted. Noting that incorrect application data causes inaccurate flying hour rates and related parts requirements, GAO concluded that the ALCs need to correct the application data file and to continue to verify the accuracy of the data. (See p. 3.)

DOD RESPONSE: Concur: AFLCR 57-6, Paragraph 1-27, states that "Valid application data must be maintained on all items except where precluded for security reasons." Paragraph 11-6 prescribes how the equipment specialist (ES) must review items to verify the accuracy of application data. All items

APPENDIX II

must be reviewed when they enter the inventory to make sure the D062 master record contains all of the item's weapon system applications and all next higher indenture D041 and D039 stock number applications. After the initial review, the ES must review every item when it comes into a buy position unless it was reviewed during the previous 12 months. This position should ensure that all items with active demands are reviewed at least every three years and that high dollar demand items are reviewed even more frequently. In view of the application errors found by the GAO, HQ AFLC will direct the ALCs to take the necessary action to ensure compliance with the above policies.

FINDING C: Program Ratios Did Not Relate To The Specific Aircraft on which Each Part is Used. Noting that the Air Force Logistics Command (AFLC) computes program ratios quarterly for the ALCs, GAO found for 212 of the 375 sample items (57 percent) the computed program ratios were not based on the flying hour programs of the actual aircraft using each part. GAO found that when a part has multiple aircraft application, the program ratio reflected only the predominant aircraft if its usage was greater than 50 percent (74 items - 20 percent). If no aircraft had greater than 50 percent of the usage, GAO found that a factor of 1.000 was used (35 items - 9 percent). Finally, GAO found 154 cases (41 percent) where the program ratio was calculated based upon the general model of the aircraft rather than the specific series of the model. Presenting several examples of each instance, GAO concluded that ratios calculated using these methods did not accurately reflect item usage trends, and the requirements calculation was incorrect. Further, GAO concluded that the program ratio calculation methodology needs to be revised, to take into consideration the actual aircraft mix and series. (See p. 4.)

DOD RESPONSE: Concur. Air Force is revising the D062 system so that the program ratios will be based upon the flying hours of the actual aircraft model and series using the part. The target date for completion of the Data Automation Requirement (DAR) for this revision is 30 June 1984. A target date for implementing the revision cannot be provided until the DAR has been evaluated by data automation personnel.

FINDING D: The Air Force Does Not Use the Flying Hour Data For The Time Period Needed To Obtain The Individual Parts. GAO found that the Air Force uses standard time periods in computing program ratios. GAO further found that the Air Force did not (in 239 cases, 64 percent) use flying hour data for the time period needed to obtain the individual parts; in 167 cases the Air Force calculation was based on a time period shorter than needed to obtain the part, and in 72 cases the time period was longer than needed to obtain the part. Since the time required to obtain parts varies, GAO concluded that in many cases it is inappropriate to use standard time periods in computing flying hour program ratios. GAO further concluded that when major changes in the flying hour program occur outside the Air Force standard time period, but within the time needed to obtain the part, the Air Force will calculate inaccurate requirements. Hence, GAO concluded that the method for calculating program ratios needs to be revised to take into account the estimated lead time to obtain the part. (GAO noted that AFLC officials agreed with the need for more precise program ratios, that they said they would emphasize to the ALCs the need to correct the application file before implementing changes to the system, and that they intend to update the application file for items with annual demand over $5,000.) (pp. (See p. 8.)

DOD RESPONSE: Nonconcur. When the Air Force implemented the use of program ratios, it was recognized that the method chosen to compute the ratios had certain drawbacks, the primary one being that it was not totally responsive to rapidly increasing programs. However, it was also recognized that there were problems with making the system too responsive to increasing programs, i.e., premature buys and excesses. In view of these potential problems, Air Force chose a conservative method which was vastly better than using no program data but which minimized the risks. The Department believes the current method is better than the GAO proposal because it minimizes the risk of buying excess or long supply for items applicable to aircraft with rapidly increasing programs. Additionally, since the average leadtime for EOQ items is eleven months, using a base period of program data equal to the leadtime would result in overstating requirements when the program is decreasing in the second year. The current Air Force method compensates for this by computing smaller requirements.

FINDING E: At SAALC Contractor Furnished Spare Parts Requirements Are Often Incorrect. GAO noted the Air Force Audit Agency, in 1982, had found excess contractor-calculated additional spare parts requirements totaling over $6.6 million due to the use of erroneous expected wear-out rates, and Air Force managers are not reviewing contractor computations for correctness. GAO also noted that SAALC officials had concurred with the Air Force audit findings and agreed to work toward correction of the problem. GAO selected 50 items with the highest dollar value in contractor-calculated additional requirements for review (not a statistical sample). GAO requested that equipment specialists review the 50 items and found that the equipment specialists disagreed with 14 (28 percent) of the contractor-projected wear-out rates. GAO further found that contractors were, either not subtracting serviceable returns from issues, or were adding them to issues; in either case historical demands, wear-out rates, and projected spare parts requirements are overstated. (See GAO note 2, p. 12.)

DOD RESPONSE: Concur with intent. As a result of an Air Force Audit Agency Report, Project #818015, 25 April 1983, Air Force discontinued use of the contractor-provided data. Current computations use data already located in AFLC files and subject to periodic review by item managers and equipment management specialists. Wear-out rates, for example, are now computed by the D049 system, Master Material Support Record, based on the actual usage of parts.

FINDING F: SAALC Provided Unrealistic Projected Overhaul Data To the Contractor. GAO found that, based on information provided by the Air Force, the contractor's computation consistently overstated depot overhaul programs. GAO found that the SAALC F-100 engine manager computes projected overhaul programs based on projected flying hours, and, except for the first quarter of each computation year, disregards the number of overhauls that maintenance personnel expect to complete. As a result, GAO concluded that a substantial difference exists between actual overhauls and the projected overhauls used by the engine contractor in estimating parts requirements. Using an example - Stock No. 2840-01-088-7649PT, GAO noted that SAALC had on-hand and on-order 18,735 items (costing $2,180,000), and that past actual overhaul programs for this item amounted to 534 items per quarter as opposed to an estimated overhaul program rate of 4000 items per quarter. As a result of its efforts

in exposing this problem, GAO reported that the Item Manager requested termination of contracts totaling $1,086,493. GAO concluded that, in some cases, requirements computations were based on inaccurate wearout rates, overstated depot overhaul programs and inaccurate demand histories, and that SAALC had not adequately assured the accuracy of spare parts requirements furnished by a contractor.

DOD RESPONSE: Concur. As discussed in the response to Finding E, Air Force has discontinued the practice of relying on a contractor to determine spare parts requirements. Consequently, the Department believes that the problem cited by the GAO is resolved. (See GAO note 2, p. 12.)

FINDING G: SAALC Contractor Computations Were not Validated Or Retained. SAALC Item Managers, GAO found, did not know the contractor's computational methodology or how they could validate the accuracy of the data used. Additionally, GAO found contractor data to be usually 3 months and sometimes up to 6 months old before the Air Force received the computations, making data validation difficult. (GAO reported that subsequent to its inquiry, the contractor conducted training sessions for SAALC Item Managers and Equipment Specialists in the computational methodology used.) Also, GAO found that past contractor computation worksheets were not being retained (even though corresponding Air Force documents are retained from 6 months to 2 years), but were being discarded upon receipt of a new computation, making review of past projections to evaluate estimated future requirements difficult. GAO concluded that SAALC Item Managers were not validating the data used in the contractor's computations, and hence were unaware of contractor errors. (pp. 23 to 25, GAO Draft Report)

DOD RESPONSE: Concur. As noted in the response to Finding E, Air Force no longer authorizes the use of spare parts computations developed by a contractor. Consequently, the Department believes that the problem cited by the GAO is resolved. (See GAO note 2, p. 12.)

FINDING H: AFLC Has Instructed San Antonio ALC To Use A New Air Force Depot Level Maintenance Computation. In March 1983, GAO met with AFLC officials responsible for system support stock fund policies and systems and discussed SAALC's reliance on contractor-generated forecasts for F-100 engine items. GAO reported that AFLC officials agreed that Air Force should make its own forecasts. On June 2, 1983, AFLC instructed SAALC to (1) stop using contractor provided additive requirements and (2) complete the conversion from the contractor system by September 30, 1983; however, GAO pointed out, the new Air Force system uses the same type data which caused errors in the contractor's computations. GAO concluded, because the new system uses the same type data as the contractor's computations, it could be subject to the same problems.

DOD RESPONSE: Concur. Although the new system uses the same type data as was used in the contractor's computations, the data is not from the same sources. The new system uses the negotiated overhaul programs from the G072ER system, Depot Level Maintenance Requirements and Program Management System. The wear-out rates used are the rates computed by the D049 system, Master Material Support Record, based upon the actual usage of parts. Demand history is not used to compute depot level maintenance requirements. The item manager can file maintain the wear-out rate if no rate has been established in D049 or if

the equipment specialist must review the wear-out rates for all items with annual demands of $5,000 or more when a buy is made. Since the data being used in the new system is timely, accurate, and updated according to changing conditions, the resulting computations should be more accurate than those obtained previously from the contractor's system. (See GAO note 2, p. 12.)

APPENDIX II

RECOMMENDATIONS

RECOMMENDATION 1: GAO recommended that the Secretary of the Air Force direct the Commander, AFLC to implement improved procedures and controls for estimating future demands for system support stock fund items. Such procedures and controls should:

— Require appropriate management review to insure that equipment specialists correct and maintain current accurate application data to compute flying hour ratios. The equipment specialists should verify the accuracy of the application data at a reasonable time interval, such as every 3 years, for items having annual demands of over $5,000 and at least every 5 years for the remaining items which have active demands.

— Revise the D062 system so that a program ratio takes into account the flying hours of the actual aircraft model using the part and the estimated lead time needed to obtain it. (See p. 9.)

DOD RESPONSE:

a. Concur. Existing regulations (AFLCR 57-6) currently require periodic review of the information to ensure correct application data. However, in view of the application errors found by the GAO, HQ AFLC will direct the ALCs to take necessary action to insure compliance with existing AFLC policies.

b. Concur in part. The Department concurs with revising the D062 system so that program ratios will be based upon the flying hours of the actual aircraft model and series using the part. The Target date for completion of the Data Automation Requirement (DAR) for this revision is 30 June 1984. The Department cannot provide a target date for the revision until the DAR has been evaluated by data automation personnel. The Department nonconcurs with the recommendation to base the amount of projected program data on the item leadtime. The Department believes the use of this technique could lead to possible inventory excesses. The existing timeframes minimize such risks.

RECOMMENDATION 2: GAO recommended that the Secretary of the Air Force direct the Commander, AFLC, to require the Air Logistics Centers to insure that data such as wear-out rates, overhaul programs, and demand history used in the computations are accurate. (p. 25, GAO Draft Report)

DOD RESPONSE: Concur with intent. The Department is already in compliance with this recommendation. The current Air Force system provides data that is timely, accurate, and updated according to changing conditions. Further, recent efforts by HQ AFLC have resulted in increased management emphasis on the data management to ensure valid information. Instructions and procedures have been reviewed and updated, and additional intensive quality reviews have been implemented where necessary. These actions are the result of Air Force Audit Agency Report #827537, entitled "Review of Procedures for Managing Consumable Supply Assets within AFLC." (See GAO note 2, p. 12.)

(943529)

A7804

AN EQUAL OPPORTUNITY EMPLOYER

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE,$300

POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE

THIRD CLASS