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National Aeronautics And  
Space Administration's  
Acquisition And Utilization  
Of T-38 Jet Aircraft B-172177

Manned Spacecraft Center

BY THE COMPTROLLER GENERAL  
OF THE UNITED STATES

MAY 28, 1971

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COMPTROLLER GENERAL'S REPORT ON NATIONAL  
AERONAUTICS AND SPACE ADMINISTRATION'S  
ACQUISITION AND UTILIZATION OF T-38 JET  
AIRCRAFT  
Manned Spacecraft Center B-172171

D I G E S T

SLG 01947

WHY THE REVIEW WAS MADE

The General Accounting Office (GAO) noted that the National Aeronautics and Space Administration's (NASA) Manned Spacecraft Center at Houston, Texas, planned to purchase eight T-38 jet aircraft, costing about \$6.7 million, to replace 10 T-33 aircraft. The last of the eight aircraft was delivered in March 1971. NASA now has a fleet of 31 T-38 aircraft.

The aircraft are used to provide astronauts with space flight readiness training and to allow staff pilots to maintain their flying proficiency. This review was undertaken because it appeared to GAO that some of the eight aircraft might not be needed in view of NASA's announced mission cutbacks and excess astronauts, which could result in reduced astronaut flying requirements.

FINDINGS AND CONCLUSIONS

GAO's review of NASA's computation of aircraft requirements indicated that NASA might have purchased more aircraft than needed to meet its flying requirements. (See p. 9.)

Aircraft requirements are computed by dividing the flying requirements by the aircraft utilization rate. Flying requirements are the hours of flying time which will satisfy NASA training and proficiency goals. The aircraft utilization rate is the average number of hours each aircraft is flown during a month. NASA computed a requirement for 31 T-38 aircraft on the basis of a flying requirement of 976 hours and a utilization rate of 31.5 hours. (See p. 9.)

Flying requirements

NASA estimated that its future flying requirements would average 976 hours a month, computed as follows:

<u>Number of pilots</u>	<u>Minimum flying standards</u>	<u>Monthly flying requirements</u>
49 astronauts	16 hours a month	784 hours
24 staff pilots	8 hours a month	<u>192</u> hours
		<u>976</u> hours

Tear Sheet

MAY 28, 1971

NASA stated that the astronauts' minimum flying time of 16 hours a month was based upon conclusions contained in a joint U.S. Air Force-NASA report dated February 1968 on astronaut flying time and that these standards were considered to be valid. GAO examined this report and found that the flight proficiency requirement was 10 hours a month and not 16. NASA officials subsequently stated that, although they had considered the report, the 16-hour requirement was based largely on military experience and judgment as to what a reasonable flight proficiency requirement should be. (See p. 10.)

The staff pilots' minimum flying time of 8 hours a month was based upon the proficiency requirement contained in the Center's Standard Operation Procedures manual of 100 hours of first-pilot time a year, or an average 8.3 hours a month--slightly more than the 8 hours used by NASA in its computations. (See p. 10.)

Based upon the minimum flying requirements of 10 hours for astronauts, as shown in the joint study report, and of 8.3 hours for staff pilots, the average monthly flying requirement for 1971 would be 690 hours--490 hours for astronauts and 200 hours for staff pilots.

In addition to the above flying requirement, GAO was informed that for 6 to 8 months prior to a space mission both the prime spacecraft crew and the backup crew members should achieve an absolute minimum of 20 hours of flying a month as first pilot. This would increase the monthly flying requirements by a maximum of 80 hours monthly, resulting in a total flying requirement of 770 hours a month. (See p. 11.)

The flying logs for the astronauts and staff pilots for fiscal year 1970 revealed that they had flown an average 861 hours a month. The astronauts' average flying hours fell below the 16-hour requirement used by NASA. The staff pilots' average flying hours exceeded the 8.3 hour requirement. (See p. 12.)

GAO found indications that the number of astronauts was likely to decrease. This should result in a corresponding decrease in NASA's flying requirements. NASA has reported, on a number of occasions, that the number of astronauts is excess by about one third. (See pp. 13 and 14.)

#### Aircraft utilization rates

NASA computed its aircraft requirements by using an aircraft utilization rate of 31.5 hours a month. If this rate were too low, it would result in NASA's purchasing more aircraft than needed. If the rate were too high, it would result in NASA's purchasing fewer aircraft than needed. (See p. 15.)

GAO found that the utilization rate was affected by the number of aircraft idle at the Center and at cross-country temporary duty stations.

There was an average 3.7 operationally ready aircraft idle at the Center on each workday during fiscal year 1970. In addition, an average five operationally ready aircraft were idle at locations other than at the Center--a total of 8.7 idle aircraft. An operationally ready aircraft is one that is in commission and can be flown and is not undergoing or awaiting either maintenance or inspection procedures. (See pp. 15 and 16.)

During fiscal year 1970 the 33 aircraft were flown an average 861 hours a month, which resulted in an average aircraft utilization rate of 26 hours a month. Since the equivalent of 8.7 aircraft were not used for any of the 861 hours flown, including them in computing the utilization rate resulted in too low a rate.

Eliminating the 3.7 aircraft idle at the Center would increase the utilization rate to 29.4 hours, and eliminating the five aircraft idle at cross-country destinations would further increase the rate to 35.4 hours. It appears that, in some cases, it may be practicable to retrieve the aircraft idle at cross-country locations for use at the Center if they were needed. (See pp. 17 and 18.)

GAO believes that its computations of idle aircraft are very conservative, since an aircraft was counted as being utilized if it was flown any part of a 24-hour workday and many of the aircraft were actually flown for only a small portion of the day. (See p. 18.)

Computation of aircraft requirements

Aircraft requirements are computed by dividing flying requirements by the aircraft utilization rate. GAO identified several values for each of these factors. (See p. 19.)

	<u>Average hours each month</u>
Flying requirements for pilots:	
NASA's estimate based on established flying standards	976
Hours flown during fiscal year 1970	861
Hours based on minimum NASA requirements	770
Utilization rates for aircraft:	
Actual during fiscal year 1970	26.0
Adjusted for aircraft idle at MSC	29.4
Adjusted for all idle aircraft	35.4
As computed by NASA	31.5

NASA computed the requirement by dividing 31.5 hours into 976 hours, which resulted in a need for 31 aircraft.

The following table shows NASA's aircraft requirements, using every possible combination of the above values in the formula for computing requirements.

Monthly flying requirements	Aircraft Requirements			
	Utilization rates			
	26.0 hrs.	29.4 hrs.	31.5 hrs.	35.4 hrs.
	(aircraft)			
976 hours	37.5	33.2	31.0 <sup>a</sup>	27.6
861 "	33.1	29.3	27.3	24.3
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<sup>a</sup>NASA's computed aircraft requirement.

RECOMMENDATIONS OR SUGGESTIONS

Because of the possibility that the purchase of some of the undelivered aircraft could be canceled if NASA concurred with GAO's conclusions, GAO, in a letter to the Director of the Manned Spacecraft Center on August 26, 1970, requested a reassessment of the reasonableness of the procurement action. In a second letter dated October 2, 1970, to the Acting Administrator of NASA, GAO pointed out that it continued to have a question as to the need for acquiring all eight aircraft and requested that NASA reassess its requirements on the basis of a consideration of past flying experience as an indication of future flying requirements.

AGENCY ACTIONS AND UNRESOLVED ISSUES

GAO was subsequently advised by Center officials that, in their opinion, the procurement of the eight aircraft was justified.

On December 14, 1970, the Associate Administrator for Organization and Management advised GAO that the Office of Manned Space Flight also had reassessed the procurement action and had concluded that the aircraft were needed to meet the requirements of the astronaut training program. GAO's letter to the acting NASA Administrator and NASA's comments are included as appendixes I and II.

MATTERS FOR CONSIDERATION BY THE APPROPRIATE COMMITTEES

This report is being submitted to the appropriate committees of the Congress for their information and consideration because of GAO's reservations about the data that NASA used to compute aircraft requirements.

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ABBREVIATIONS

GAO	General Accounting Office
MSC	Manned Spacecraft Center
NASA	National Aeronautics and Space Administration
NORS	not operationally ready--supply

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The following table shows NASA's aircraft requirements, using every possible combination of the above values in the formula for computing requirements.

Monthly flying requirements	Aircraft Requirements			
	Utilization rates			
	26.0 hrs.	29.4 hrs.	31.5 hrs.	35.4 hrs.
	(aircraft)			
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#### MATTERS FOR CONSIDERATION BY THE APPROPRIATE COMMITTEES

This report is being submitted to the appropriate committees of the Congress for their information and consideration because of GAO's reservations about the data that NASA used to compute aircraft requirements.

## CHAPTER 1

### INTRODUCTION

The National Aeronautics and Space Administration's Manned Spacecraft Center (MSC) at Houston, Texas, has the responsibility of providing aircraft for astronaut space flight readiness training. To support this program in recent years, MSC has used 23 T-38 and 10 T-33 fixed-wing jet aircraft and several helicopters.

The T-33 is a single-engine, two-place, subsonic aircraft which was manufactured between 1949 and 1959. At one time it was the basic jet trainer used by the U.S. Air Force. The T-38 is a twin-engine, two-place, supersonic aircraft which still is being produced and used as a secondary jet aircraft trainer for the Air Force.

Astronaut flying is accomplished during the normal duty day and also after duty hours, on weekends, and while traveling to various training facilities in the United States. The astronaut training schedule, however, makes no provision for local flying during the normal duty day, and a majority of the astronauts' annual flying requirements are met while flying cross-country.

In January 1968 a joint Air Force-NASA study group was formed to review, evaluate, and provide recommendations on the flight activities associated with the space flight readiness training provided to astronauts. In a report dated February 6, 1968, the study group recommended that NASA phase out the 10 T-33 aircraft and replace them with 10 T-38 aircraft. Because of budgetary reasons NASA did not immediately comply with the recommendation.

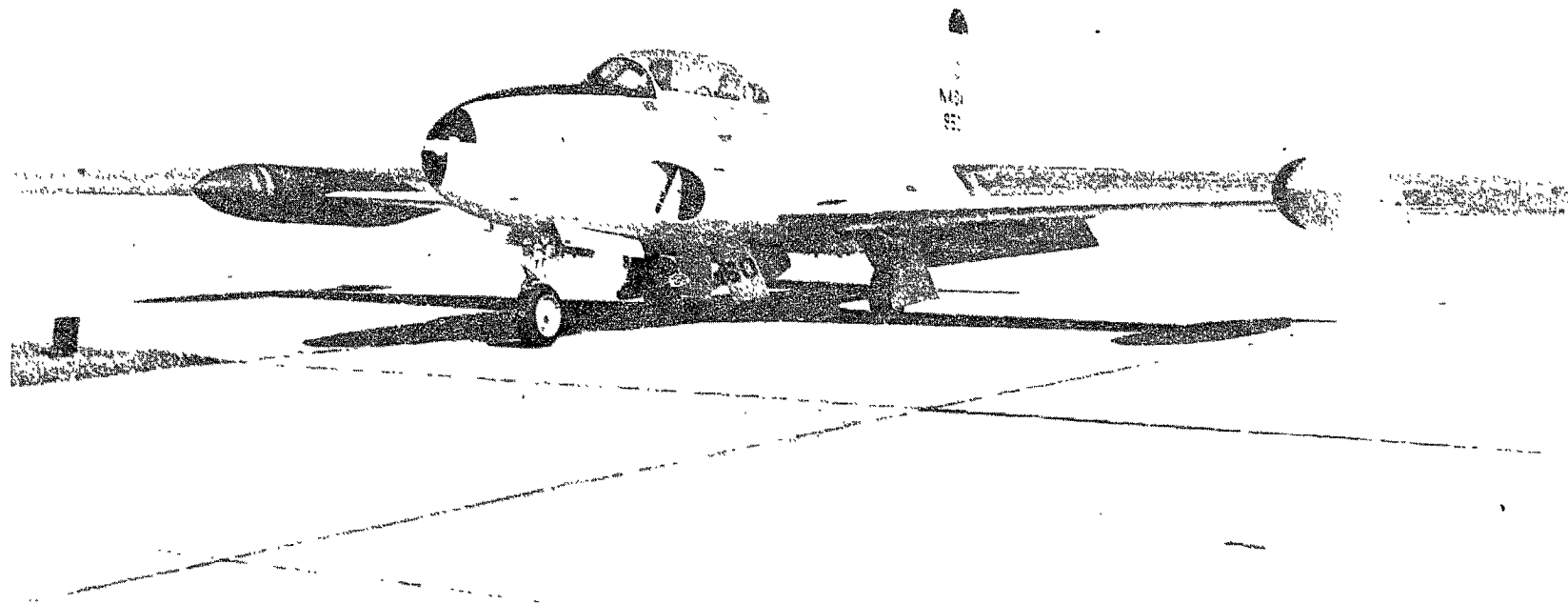
In December 1969 NASA authorized MSC to purchase eight T-38's with an option for two more remaining in effect through February 28, 1970. On January 8, 1970, MSC placed an order with the Air Force for eight T-38's at an estimated cost of \$6,256,000 plus \$420,000 for aerospace ground-support equipment and technical data. The aircraft were to be supplied by the Air Force under its contract with the

Northrop Corporation. MSC did not exercise the option. Apollo research and development funds were used to purchase the eight T-38's.

The aircraft were scheduled for delivery from the manufacturer during the period from November 1971 through January 1972. The Air Force agreed, however, to divert eight T-38's from its production program during the period from August 1970 through March 1971 and to accept instead the eight aircraft from production during the period from November 1971 through January 1972.

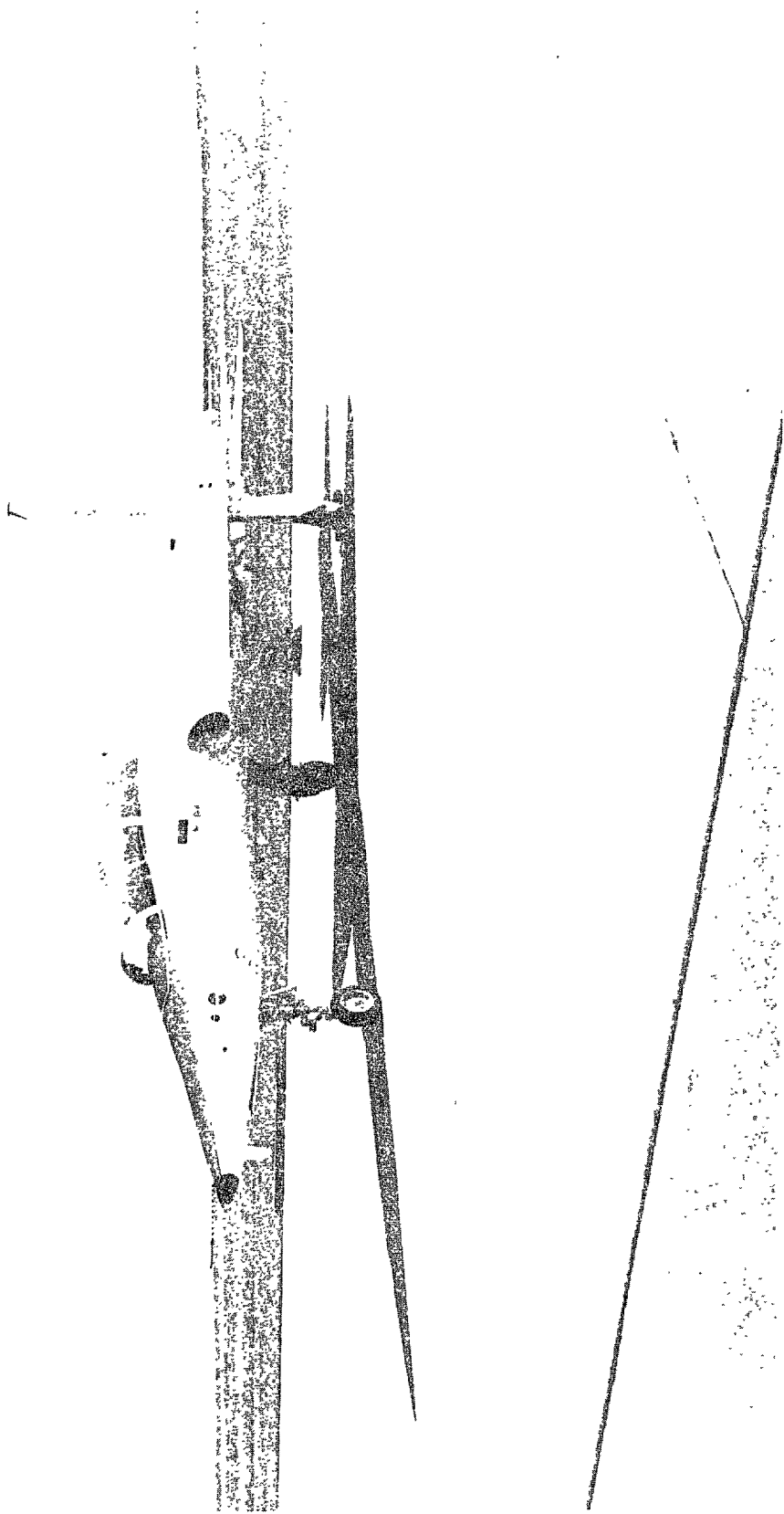
The last of the eight aircraft was delivered to NASA in March 1971. NASA now has a fleet of 31 T-38 aircraft.

T-33 AIRCRAFT WHICH NASA IS DISPOSING



PHOTOGRAPH FURNISHED BY NASA

T-38 AIRCRAFT WHICH NASA IS PURCHASING



PHOTOGRAPH FURNISHED BY NASA

## CHAPTER 2

### REVIEW OF T-38 AIRCRAFT REQUIREMENTS

Our review of NASA's computation of T-38 aircraft requirements indicated that NASA might be purchasing more aircraft than it needed to meet astronaut and staff pilot flying requirements. We therefore requested MSC and NASA Headquarters to reassess the propriety of the aircraft acquisition program which was in process.

NASA advised us on December 14, 1970, that the Office of Manned Space Flight had concluded that all the aircraft being purchased were needed to meet the flying requirements of the astronaut training program. Because of the reservations we continue to have on this matter, we are reporting the results of our review to the appropriate committees of the Congress for their information and consideration.

The term "aircraft requirement," as used in this report, refers to the number of aircraft needed to accomplish NASA's astronaut and staff pilot flying program. Two factors are involved in computing aircraft requirements. These factors are (1) flying requirements and (2) aircraft utilization rates, which are explained below.

--Flying requirements are the number of hours that NASA astronauts and staff pilots should fly each month to meet NASA's training or proficiency goals.

--Aircraft utilization rates are the average number of hours that each aircraft is flown during a month.

Aircraft requirements are computed by dividing the flying requirements by the aircraft utilization rates. For example, if the combined total flying time that should be accomplished each month is 600 hours and if each aircraft can be expected to fly an average 30 hours each month, then 20 aircraft would be needed ( $600 \div 30 = 20$ ) to accomplish the flying requirements.

NASA's flying requirements and aircraft utilization rates are discussed in the next two sections.

## FLYING REQUIREMENTS

### NASA's estimate

NASA estimated that its future flying requirements would average 976 hours a month, computed as follows:

<u>Number of pilots</u>	<u>Minimum flying standards</u>	<u>Monthly flying requirements</u>
49 astronauts	16 hours a month	784 hours
24 staff pilots	8 hours a month	<u>192 hours</u>
		<u>976 hours</u>

Using the formula for computing aircraft requirements, NASA estimated that, to accomplish the flying requirement of 976 hours on the basis of an aircraft utilization rate of 31.5 hours a month, 31 aircraft would be needed ( $976 \div 31.5 = 31$ ).

NASA advised us that the astronauts' minimum flying time of 16 hours a month was based upon conclusions contained in a joint Air Force-NASA report dated February 1968 on astronaut flying time and that these standards still were considered to be valid.

Our review of this report revealed that the monthly astronaut first-pilot flying requirement was a minimum of 10 hours and not 16 hours. In additional discussions, NASA officials agreed that the report cited a 10-hour flying requirement. They emphasized, however, that the 10-hour requirement was to be considered a minimum time. They said that, although they had considered the report, the 16-hour requirement was based largely on military experience and judgment as to what a reasonable flight proficiency requirement should be.

The staff pilots' minimum flying time of 8 hours a month was based on the proficiency requirement, contained in MSC's Standard Operation Procedures manual, of 100 hours of first-pilot time a year, an average 8.3 hours a month, or slightly more than the 8 hours used by NASA in its computations.



Based upon the minimum flying requirements of 10 hours for astronauts, as shown in the joint study report, and of 8.3 hours for staff pilots, the monthly flying requirement would be 690 hours, computed as follows:

<u>Number of pilots</u>	<u>Minimum flying standards</u>	<u>Monthly flying requirements</u>
49 astronauts	10 hours	490 hours
24 staff pilots	8.3 hours	<u>200</u> hours
		<u>690</u> hours

In addition to the above documented flying requirements, we were advised of other factors that were considered by various offices to have an effect on flying requirements. For example, the Chief of the Astronaut Office at MSC advised us that for 6 to 8 months prior to a space mission both the prime spacecraft crew and the backup crew members should achieve an absolute minimum of 20 hours of flying a month as first pilot.

This increase in monthly flying requirements during the 8 months preceding a mission is equivalent to a maximum of 960 additional hours annually, or 80 hours monthly (12 astronauts x 10 hours of extra flying a month x 8 months = 960 hours annually, or 80 hours monthly). The actual hours would vary depending on the time between Apollo missions. If the flying requirement of 770 hours--690 hours plus 80 hours--were used to compute aircraft requirements, only 24.4 aircraft would be needed.

We reviewed the flying hours logged by the prime crews and backup crews for the Apollo 12 and 13 missions to see whether the 20-hour flying requirement had been met. We found that none of the 12 prime and backup crew members had met this requirement in more than 4 of the 8 months preceding the missions and that four of the prime crew members had not met this requirement in any of the 8 months. The average first-pilot flying time of the 12 crew members during the 8 months preceding the mission was 14.8 hours, or only about 74 percent of the 20-hour requirement.

The average hours flown each month by the Apollo 12 and 13 crew members during the 8 months preceding their missions are shown below.

<u>Missions</u>	<u>Crew members</u>	<u>Average flying hours a month</u>
12	Prime	11.4
	Backup	14.4
13	Prime	13.9
	Backup	19.7

Flying performed during fiscal year 1970

The flying logs for the astronauts and staff pilots for fiscal year 1970 showed that they had flown an average 861 hours a month as first pilot. The astronauts' average flying hours exceeded the 10-hour requirement in the joint Air Force-NASA report but fell below the 16-hour requirement. The staff pilots' average flying hours exceeded the 8.3-hour requirement.

During the year the astronauts flew a total of 8,154 hours of first-pilot flying time, or an average 14.1 hours a month. The average flying time for each astronaut ranged from a low of 4 hours to a high of 46 hours a month, as shown below.

<u>Number of astronauts</u>	<u>Average hours flown each month</u>
10	4 to 9
25	10 to 15
12	16 to 19
2	20 to 23
<u>1</u>	46
<u>50</u>	14.1 average

The staff pilots flew a total of 2,458 hours of first-pilot time during the year, or an average 9.9 hours a month. The average flying time for each staff pilot ranged from a low of 4 hours to a high of 26 hours, as shown below.

<u>Number of staff pilots</u>	<u>Average hours flown each month</u>
7	4 to 7
13	8 to 13
2	16 to 17
<u>1</u>	26
<u>23</u>	9.9 average

The recorded first-pilot flying time for astronauts and staff pilots in fiscal year 1970 totaled 10,612 hours, or an average 884 hours a month. MSC's 33 aircraft, however, were flown a total of only 10,332 hours, or an average 861 hours a month. The difference of 280 hours is primarily due to the fact that a pilot on an instrument training flight is accompanied by a second pilot for reasons of safety and that both pilots record first-pilot time for such flights. A secondary reason is that about 65 hours of first-pilot flying time was on other than the 33 MSC aircraft.

An estimate of fiscal year 1971 aircraft requirements, based on the average monthly 861 hours of flying time by astronaut and staff pilots in fiscal year 1970 rather than on the monthly established flying requirements of 976 hours (see p. 10), would have shown that 27 aircraft, rather than 31, would be needed.

Regardless of which method is used to compute aircraft requirements, however, we believe that some consideration should be given to the possibility that the number of astronauts in the manned space flight program may decrease during 1971 and subsequent years. This possibility is discussed in the following section.

#### Other factors which may affect future flying requirements

NASA has reported, on a number of occasions, that about one third of the number of astronauts in the program are excess to its needs. Although NASA has indicated that it will not force any astronauts to leave the program, it has

announced that it will not discourage astronauts from leaving voluntarily. This fact, together with the number of Apollo astronauts who have recently left the program after completing their missions, indicates that the number of astronauts will continue to decrease in the near future. We noted, for example, that two of the backup crewmen for Apollo 10 and all of the Apollo 11 prime crewmen and one of the backup crewmen had left the astronaut program. All Apollo 12 and 13 crewmen are still active astronauts.

NASA's aircraft requirements would be reduced by one aircraft for every two astronauts that leave the program ( $16 \text{ hours} \div 31.5 \text{ utilization rate} = 0.5 \text{ aircraft}$ ). If all astronauts excess to NASA's needs left the program (one third of the 49), aircraft requirements would be reduced by eight aircraft.

In view of NASA's announced surplus of astronauts and the recent number of astronauts' resignations, we believe that the potential decrease in flying requirements should have been considered prior to initiating the procurement of the eight aircraft.

## AIRCRAFT UTILIZATION RATES

The aircraft utilization rate is the second of the two factors involved in computing aircraft requirements and represents the average number of hours each aircraft is flown during a month.

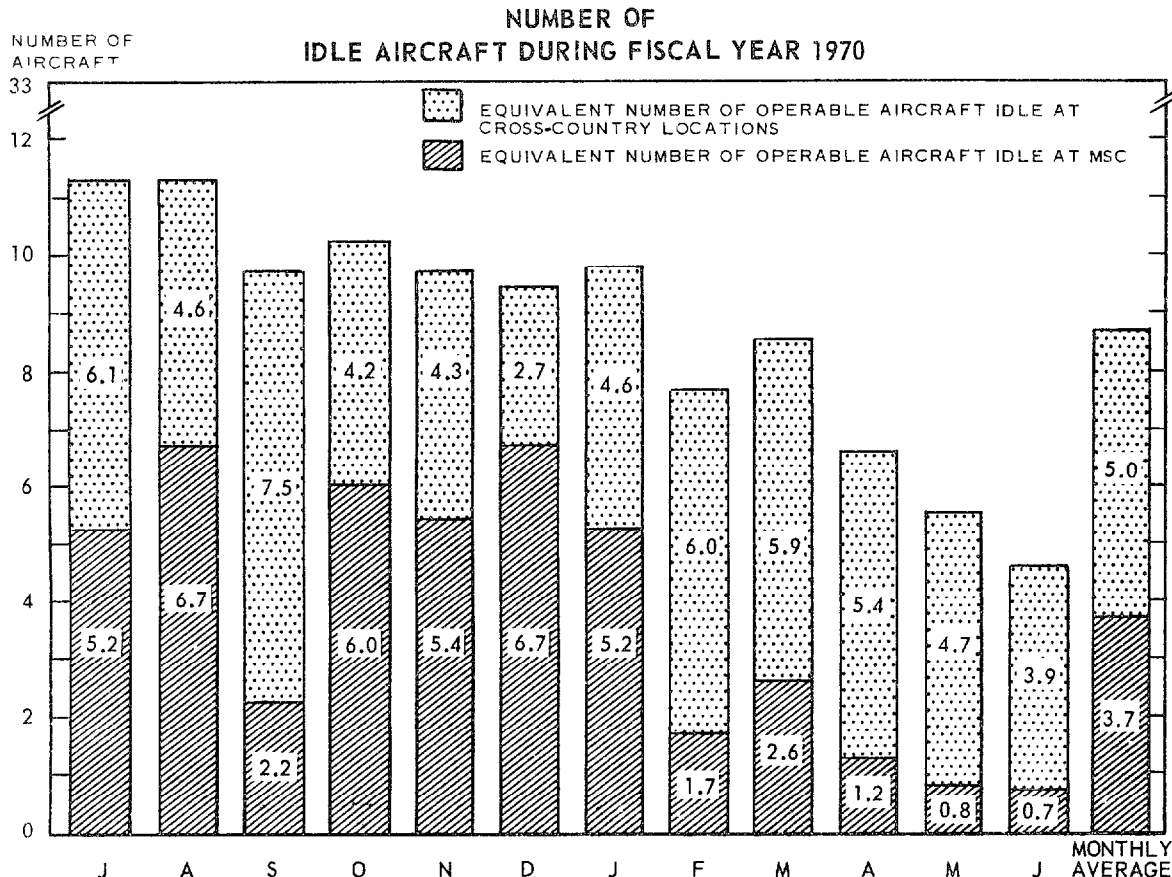
NASA computed its aircraft requirements by using an aircraft utilization rate of 31.5 hours a month. If this rate were too low, it would result in NASA's purchasing more aircraft than needed. If it were too high, it would result in NASA's purchasing fewer aircraft than needed. Therefore we examined into the reasonableness of the 31.5-hour rate used by NASA.

The utilization rate is affected by the number of aircraft idle at MSC and at cross-country temporary duty stations. Each of these factors, and its effect on aircraft requirements, is discussed below.

### Idle aircraft

We analyzed the status of each of the 33 planes during fiscal year 1970 to determine the number of operationally ready idle aircraft. If a plane was flown at any time during a 24-hour period, we counted that plane as being utilized. Accordingly, an idle aircraft, as used in this report, is one that was operationally ready but not flown during any part of a 24-hour period of a workday. An operationally ready aircraft is one that is in commission and can be flown and is not undergoing or awaiting either maintenance or inspection procedures.

We added the number of aircraft that were idle for each workday of the month and divided the total by the number of workdays in that month to obtain the equivalent number of aircraft idle for the entire month. The following graph shows the average equivalent number of operationally ready aircraft which were idle each month at MSC and at the astronauts' temporary duty stations.



An average 3.7 aircraft were idle at MSC throughout fiscal year 1970. In addition, an average five aircraft were idle at locations other than MSC--a total of 8.7 idle aircraft. Furthermore, on the weekend we noted that the total number of idle aircraft was even higher.

Astronauts usually achieve their proficiency flying as an adjunct to their other training and often fly the aircraft to temporary duty stations for training and park them for considerable periods of time. Although these aircraft are usually operationally ready, they are often not used because the astronauts are fully occupied with other duties.

It appears to us that, in some cases, it may be practicable to retrieve these aircraft for use at MSC if they are needed. Since the T-38 is a two-place aircraft, a staff pilot could accompany an astronaut to his temporary duty station and return the aircraft to MSC, accomplishing a portion of his own required flying time in the process. The reverse procedure could be followed when the astronaut was ready to return to MSC.

The following is an illustration of the typical use of one aircraft which experienced considerable idle time while away from its MSC location.

T-38 aircraft number 908 was flown on August 1, 1969, after which it sat idle at MSC through August 5 and was flown on August 6 and 7. It was idle on August 8 and 9 and was dispatched on a cross-country flight on Sunday, August 10. The aircraft was idle on August 11 through 14 and was flown back to MSC on August 15, after working hours. It was idle over the weekend of August 16 and 17 and was flown cross-country on Monday, August 18. The aircraft was idle at the cross-country location until after duty hours on Friday, August 22, when it was flown to MSC. The aircraft was inoperable on August 23 through 26 and was flown on August 27, 28, and 29. It was idle over the weekend of August 30 and 31. In summary, during the month the aircraft was flown on 10 days, was inoperable on 4 days, and was idle on 17 days--10 of which were at MSC and 7 at cross-country locations.

#### Effect of idle aircraft on utilization rates

During fiscal year 1970 the 33 aircraft were flown an average 861 hours a month, which resulted in an average aircraft utilization rate of 26 hours a month. We believe, however, that this rate may not be appropriate for computing future aircraft requirements for the following reason. Of the 33 aircraft, an average 8.7 aircraft, although operationally ready, were idle each workday of the year. Since the equivalent of 8.7 aircraft were not used for any of the 861 hours flown, including them in computing the utilization rate will result in too low a rate. We therefore believe that it may be appropriate to compute the utilization rate on the basis of only the number of aircraft that were used to accomplish the flying program.

Based on the use of 29.3 aircraft--33 less 3.7 aircraft idle at MSC--the utilization rate would be 29.4 hours--861 hours divided by 29.3 aircraft used.

In addition to the 3.7 aircraft idle at MSC, an average five aircraft were idle at cross-country destinations. As

stated on page 16, it appears to us that it may have been practicable to return some of these aircraft to MSC for use. Based on the use of 24.3 aircraft--33 less 8.7 idle aircraft--the utilization rate would be 35.4 hours--861 hours divided by 24.3 aircraft. As shown on page 10, NASA computed an average utilization rate of 31.5 hours, based on the established monthly flying requirements of 976 hours and the use of 31 aircraft--976 hours divided by 31 aircraft.

To summarize, aircraft requirements might be computed using monthly utilization rates of 26 hours, 29.4 hours, 31.5 hours, or 35.4 hours.

We believe that our computations of idle aircraft are conservative since we counted an aircraft as being utilized if it was flown during any part of a 24-hour workday. Many of the aircraft which we counted as utilized were actually flown for only a small portion of the day.



COMPUTATION OF AIRCRAFT REQUIREMENTS

Aircraft requirements are computed by dividing flying requirements by the aircraft utilization rate. In the preceding sections we have identified several values for each of these factors.

	<u>Average hours each month</u>
Flying requirements for pilots:	
NASA's estimate based on established flying standards	976
Hours flown during fiscal year 1970	861
Hours based on minimum NASA requirements	770
Utilization rates for aircraft:	
Actual during fiscal year 1970	26.0
Adjusted for aircraft idle at MSC	29.4
Adjusted for all idle aircraft	35.4
As computed by NASA	31.5

The following table shows the aircraft requirements, using every possible combination of the above values in the formula for computing the requirements.

$$\text{Aircraft requirements} = \frac{\text{Flying requirement}}{\text{Utilization rate}}$$

<u>Monthly flying requirements</u>	<u>Aircraft Requirements</u>			
	<u>Utilization rates</u>			
	<u>26.0 hrs.</u>	<u>29.4 hrs.</u>	<u>31.5 hrs.</u>	<u>35.4 hrs.</u>
	----- (aircraft) -----			
976 hours	37.5	33.2	31.0 <sup>a</sup>	27.6
861 hours	33.1	29.3	27.3	24.3
770 hours	29.6	26.2	24.4	21.8

<sup>a</sup>NASA's computed aircraft requirement.

## CHAPTER 3

### CONCLUSIONS AND AGENCY COMMENTS

#### CONCLUSIONS

On the basis of information developed during the early phases of our review of MSC's plans to purchase eight T-38 aircraft for use in the astronaut training program, it appeared that the purchase of some of the aircraft might not be needed. We found that the flying requirements used by MSC in computing aircraft requirements were higher than the hours actually flown during fiscal year 1970. In addition, NASA's announcement that it had an excess of astronauts indicated that future flying requirements were likely to decrease.

Because of the possibility that the purchase of some of the undelivered aircraft could be canceled if NASA concurred with our tentative conclusions, we informed MSC officials of our preliminary findings on August 26, 1970, and requested them to reassess the need for purchasing the eight aircraft. Subsequently MSC officials advised us that, in their opinion, the procurement of the eight aircraft was justified.

In a letter dated October 2, 1970, to the Acting Administrator of NASA, we pointed out that we continued to believe that there was a question as to whether NASA should acquire all eight of the aircraft and requested that NASA reassess its requirements on the basis of a consideration of its past flying experience as an indication of future flying requirements. (See app. I.)

#### AGENCY COMMENTS AND OUR EVALUATION

On December 14, 1970, the Associate Administrator for Organization and Management advised us that the Office of Manned Space Flight had reassessed the procurement action and had concluded that 31 aircraft were needed to meet the requirements of the astronaut training program.

## Flying requirements

NASA stated that the monthly flying requirement of 976 hours provided for in MSC's flight training program was based on the minimum standards established in the 1967 joint Air Force-NASA Report on Astronaut Flying Time--16 hours first-pilot time for each astronaut and 8 hours first-pilot time for each staff pilot.

NASA subsequently advised us that the study report referred to was actually dated February 1968. Our review of this report revealed that the monthly astronaut first-pilot flying requirement was a minimum of 10 hours and not 16 hours. In additional discussions, NASA officials agreed that the report cited a 10-hour flying requirement. They emphasized, however, that the 10-hour requirement was to be considered a minimum time. They said that, although they had considered the report, the 16-hour requirement was based largely on military experience and judgment as to what a reasonable flight proficiency requirement should be.

We noted also that the report did not establish a flying requirement for staff pilots. NASA, however, had established a minimum monthly requirement of 8.3 hours. On the basis of the 10 hours and the 8.3 hours, NASA's total flying requirements are overstated by 286 hours which, based on a utilization rate of 31.5 hours an aircraft, represents an overstatement of aircraft requirements by nine aircraft.

Although the average monthly flying time during fiscal year 1970 was 861 hours due to the fact that the astronauts were not meeting the 16-hour requirement, NASA stated that this showed a need for more careful management attention to ensure that the minimum flying requirements were met.

In response to our suggestions that future aircraft needs might be lower due to canceled Apollo flights and an excess number of astronauts, NASA advised us that the cancellations would not cause a decrease in astronaut flying for the remaining missions. NASA made no comment on the effect that the excess of astronauts might have on future aircraft requirements. NASA stated, however, that, as it proceeded with the remaining Apollo flights, it would examine

its continuing requirements to make certain that mission success was in no way compromised and to ensure that all elements of the program were in balance at an effective cost level.

#### Aircraft utilization rate

NASA stated that, to achieve the 976 flying hours each month, a monthly aircraft utilization rate of 31.5 hours must be obtained by the fleet of 31 T-38 aircraft, which was higher than the average 29 hours a month during fiscal year 1970 for the 23 T-38 aircraft.

In response to our observations in our letters to MSC and to NASA Headquarters that idle aircraft time on cross-country flights might be reduced, that aircraft availability could be further improved by improving operationally ready aircraft rates and decreasing awaiting dock time, and that utilization rates could be increased to compare with Air Force achievements, NASA stated that the suggested solutions were not available to NASA.

NASA cited the dissimilarities between the Air Force and NASA flying operations, including insufficient NASA personnel to retrieve idle aircraft on cross-country flights, the difference in mission of NASA and the Air Force, the more widespread resources of the Air Force, and the lower priority allowed NASA for obtaining aircraft repair parts. NASA also pointed out that its T-38 requirement computation did not provide for attrition, even though in the past NASA had lost several aircraft in accidents.

We did not identify specific times at which MSC staff pilots could have retrieved aircraft idle at cross-country locations. We believe, however, that the existing staff pilots could have done some of this type of work if it had been necessary. We believe further that the alternative of hiring additional \$20,000-a-year staff pilots for a limited time period, if necessary, might have been more prudent than purchasing additional aircraft at a cost of \$780,000 each.

We confirmed that NASA's aircraft maintenance resources were different from the Air Force's and that the Air Force flying program was different from NASA's. We could not

confirm, however, that these differences were of such magnitude that NASA could not achieve a monthly utilization rate for T-38's that would more closely approach the 45- to 50-hour monthly T-38 utilization rate normally achieved by the Air Force.

In regard to NASA's observations that its supply-support priority for the T-38's was lower than that of the Air Force, we were advised by an official of the Air Material Area which provided spare parts for NASA's T-38's that the difference in priorities between NASA and the major Air Force user of T-38 aircraft was negligible. The small effect of the difference in priorities was confirmed largely by the nearly identical "not operationally ready--supply" (NORS) rate<sup>1</sup> achieved by NASA and the Air Training Command. For example, both the Air Force Air Training Command and NASA-MSC experienced about a 1.2 average NORS rate for the 12-month period ended March 1969.

- - - -

NASA concluded in its response to our inquiry that historical performance was not a proper basis for changing its astronaut training requirements which were based upon the reasoned conclusion of the Air Force-NASA report cited above. It resolved, therefore, to devote greater management attention to ensuring that the required minimum flying time would be met in the future.

We could not determine the importance of astronauts' achieving a particular level of flying time. We found, however, that the minimum flying time suggested by NASA was not supported by the authoritative report as NASA indicated, and we therefore continue to have reservations regarding the factors used to compute the aircraft requirements.

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<sup>1</sup>NORS rate is the percentage of time aircraft cannot be flown because of delays in obtaining an item of supply.

## CHAPTER 4

### SCOPE OF REVIEW

We have reviewed NASA's computation of requirements for the T-38 aircraft which are located at the Manned Spacecraft Center at Houston, Texas, to determine whether NASA Headquarters and MSC considered all pertinent information relating to aircraft requirements before deciding to acquire eight T-38 aircraft to replace 10 T-33 aircraft for use by the astronauts and staff pilots to maintain their flying proficiency.

We analyzed records maintained by MSC officials for fiscal year 1970 pertaining to (1) astronaut and staff pilot flying time and (2) aircraft utilization and operational status. We also discussed with NASA officials those matters pertinent to our review which might affect the need for training aircraft and with Air Force Air Training Command logistics systems officials those matters relating to supply support for the NASA aircraft.

APPENDIXES

COPY



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

CIVIL DIVISION

OCT 2 1970

Dear Dr. Low:

The General Accounting Office is currently making a survey of the Manned Spacecraft Center's plans to purchase eight T-38 airplanes to replace ten T-33 airplanes for the astronaut training program. When the replacement program is completed in March 1971, MSC will have a fleet of 31 T-38 airplanes.

Based on our survey, it appears that the purchase of at least four of the new T-38 airplanes could possibly be cancelled. During the 14-month period through August 1970, MSC has operated its astronaut flying program with the equivalent of about 27 airplanes. During the survey we attempted to determine whether there were any foreseeable future circumstances which would tend to make MSC's previous experience with such airplanes invalid as a basis for predicting future needs. We found that predicted future circumstances tended to indicate a reduced rather than an increased training requirement. These matters are discussed more fully in the enclosed copies of correspondence and other documents between our office and MSC officials.

Because of the urgency of the matter we addressed our preliminary findings to MSC officials, requesting them to reassess the reasonableness of the T-38 airplane procurement action. We were advised by MSC officials that in their opinion the procurement of the eight airplanes is justified.

We continue to believe that there is a serious question as to the need to purchase all eight airplanes and are therefore requesting that NASA reassess the procurement action, considering past flying experience as an indication of future program needs.



APPENDIX I

Since MSC is currently taking delivery of the T-38 replacement airplanes, we request that you give this matter your attention as soon as possible. We will be pleased to discuss this matter with you or your representatives in greater detail at your convenience.

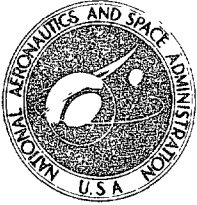
Sincerely yours,

/s/ Klein Spencer  
Klein Spencer  
Assistant Director

Enclosures - 2

Dr. George M. Low  
Acting Administrator  
National Aeronautics and  
Space Administration

cc: Walter C. Shupe



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
WASHINGTON, D.C. 20546

REPLY TO  
ATTN OF

DEC 14 1970

Mr. Klein Spencer  
Assistant Director  
Civil Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Spencer:

This is in response to your letter of October 2, 1970, to the Administrator concerning NASA's plans to purchase eight T-38 airplanes to replace ten T-33 airplanes for the astronaut training program.

As suggested in your letter, we have reassessed the procurement action concerning these aircraft. The Office of Manned Space Flight has concluded that the aircraft are needed to meet the requirements of the astronaut training program, as indicated by the enclosed comments which were developed in response to the information furnished in your October 2 letter.

Thank you for your interest in this matter.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Richard C. McGurdy".

Richard C. McGurdy  
Associate Administrator for  
Organization and Management

Enclosure

## APPENDIX II

### NASA COMMENTS ON GENERAL ACCOUNTING OFFICE LETTER TO THE ADMINISTRATOR CONCERNING THEIR SURVEY OF THE ACQUISITION AND UTILIZATION OF T-38 AIR- CRAFT BY THE MANNED SPACECRAFT CENTER

#### GAO FINDING

Based on GAO's analysis of aircraft utilization for the period July 1, 1969, through July 31, 1970, GAO believes that the Manned Spacecraft Center (MSC) can and has accomplished its flying training program with an equivalent of 27 aircraft. GAO has asked NASA to reconsider its proposed purchase of eight T-38 aircraft which would bring the total needed to support the astronaut training program to 31 T-38 aircraft.

#### NASA COMMENT

We disagree with the GAO position that past performance is a valid criterion for computing current aircraft requirements for the astronaut training program and that MSC can accomplish its flight training program with an equivalent of 27 aircraft.

Flying time in MSC's flight training program is programmed on the basis of 16 hours first pilot time per astronaut and eight hours first pilot time per MSC staff pilot. These minimum flying times are based upon conclusions contained in the 1967 joint USAF-NASA Report on Astronaut Flying Time. These standards are still considered to be valid. This report indicated that astronauts are valuable national resources, and therefore NASA should take steps to insure the availability of an optimum flying program.

To meet the minimum standards established in this authoritative report, 976 hours must be flown each month. To achieve the 976 flight hours each month, a monthly aircraft utilization rate of 31.5 hours must be obtained from the proposed fleet of 31 T-38 aircraft. As indicated in the GAO statistics, during Fiscal Year (FY) 1970 MSC's T-38 aircraft were flown on an average of 29.0 hours per month. The monthly rate of 29.0 hours for T-38's in FY-70 multiplied by the planned inventory of 31 T-38's results in a total of 899 hours per month - 77 hours less than the programmed requirement of 976 hours.

A breakdown of T-38 aircraft utilization at MSC reveals that the proposed number of 31 aircraft for this program is extremely austere. Using the Air Force operational readiness rate of 75 percent in determining aircraft requirements, and assuming that our maintenance capability were equal to that of the Air Force, we would expect to have 23 of the 31 T-38's available at any time. Eight aircraft have been reserved for the 18 astronauts assigned to Apollo 14 and 15 (three prime crew, three backup crew, and three support astronauts per mission). The 15 remaining aircraft are required to meet the minimum flight time recommended in the 1967 USAF-NASA Report cited above.

GAO FINDING

GAO believes that there is existing potential for increasing aircraft availability through (1) a decrease in aircraft idle time while on cross-country flights, (2) improved operationally ready rates to compare with rates being achieved by the United States Air Force on the same aircraft type, (3) decrease in awaiting dock time through more systematic maintenance scheduling, and (4) increase in per-aircraft flying hours to more nearly compare with Air Force achievements.

NASA COMMENT

The solutions offered by GAO regarding increasing aircraft availability are not available to NASA, as they are to the Air Force. We do not have sufficient personnel to transport pilots to cross-country locations in order to fly aircraft which otherwise would be temporarily idle. NASA does not have facilities comparable to those available to the Air Force for use in achieving higher operationally ready rates. It is important to realize also that the mission of the Air Force differs significantly from that of NASA. The Air Force has essentially local flights by pilots whose primary job is flying aircraft; NASA's flying is typically cross-country by astronauts whose primary job is to train for space flights as well as providing flight crew inputs into the development and testing of spacecraft hardware and space missions. The astronauts accomplish the dynamic training in high performance aircraft at the same time they are moving TDY from one geographical point to another. The only Air Force operation comparable to NASA's was the Manned Orbital Laboratory (MOL); the numbers were similar, but cancellation of the MOL Program has eliminated this comparison.

The resources for maintenance which are available to the Air Force are not available to MSC. The Air Force has over 1,000 T-38's, ten bases, unlimited facilities and thousands of personnel, aircraft available exclusively to fly critical spares from base to base as required, a completely defined flying hour program (based solely on student flying output), and no aircraft modifications except Time Compliance Technical Orders (TCTO). The flexibility available to the Air Force is not possible at MSC. MSC has 31 T-38's, limited personnel, maintenance capacity is not structured for quick turn-around, low priority in obtaining parts, an unscheduled flying program due to changing mission requirements, and extensive aircraft modifications which are independent of TCTO's.

In addition, we have not allowed for attrition in our planning, even though we have lost several aircraft through accidents in the past and realize that attrition must be given some weight in determining requirements. Although we expect to achieve efficiencies in maintenance through

## APPENDIX II

the use of all T-38's, rather than a combination of T-33's and T-38's, we consider our T-38 requirements marginal to support our activities, not excessive.

### GAO FINDING


GAO found that (1) two Apollo space flights have been cancelled which will tend to decrease the additional flying prior to a space flight, and (2) documentation is available indicating that the current astronaut strength is excess by about one-third. These factors caused GAO to conclude that, if anything, future flying requirements are likely to decrease, further reducing the need for training aircraft.

### NASA COMMENT

Cancellation of two Apollo Space Flights, with the attendant adjustment in the Apollo schedule, will in no way decrease the additional flying prior to the remaining Apollo launches. However, as we proceed with the remaining flights we plan to examine the requirements for T-38 aircraft along with other critical elements of the Apollo program to make certain that: (1) mission success is in no way compromised, and (2) all elements of the program are in balance at an effective cost level.

### NASA CONCLUSION

Historical performance is not a proper basis for changing the astronaut aircraft flight training requirements, which are based upon the reasoned conclusion of the aforementioned NASA-USAF Study Report. If the astronauts have failed to meet these requirements, it shows a need for more careful management attention to insuring that minimum flying time is met, not that the basic judgment was in error. MSC will continue to place emphasis on having all staff pilots and astronauts meet their flying hour requirements, recognizing that aircraft flight training schedules must be in consonance with their other program requirements.

  
Dale D. Myers  
Associate Administrator  
for Manned Space Flight

PRINCIPAL OFFICIALS OF THE  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESPONSIBLE FOR THE ACTIVITIES  
DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
ADMINISTRATOR:		
James C. Fletcher	Apr. 1971	Present
George M. Low (acting)	Sept. 1970	Apr. 1971
Thomas O. Paine	Oct. 1968	Sept. 1970
DEPUTY ADMINISTRATOR:		
George M. Low	Dec. 1969	Present
Thomas O. Paine	Mar. 1968	Oct. 1968
ASSOCIATE ADMINISTRATOR FOR MANNED SPACE FLIGHT:		
Dale D. Myers	Jan. 1970	Present
Charles W. Mathews (acting)	Dec. 1969	Jan. 1970
ASSOCIATE ADMINISTRATOR FOR ORGA- NIZATION AND MANAGEMENT:		
Richard C. McCurdy	Oct. 1970	Present
Bernard Moritz (acting)	May 1969	Oct. 1970
ASSISTANT ADMINISTRATOR FOR IN- DUSTRY AFFAIRS AND TECHNOLOGY UTILIZATION (note a):		
Daniel J. Harnett	Oct. 1969	Present
George J. Vecchietti (acting)	May 1969	Sept. 1969
DIRECTOR, MANNED SPACECRAFT CENTER:		
Robert R. Gilruth	Nov. 1961	Present

<sup>a</sup>In October 1970 the title of this position changed from Assistant Administrator, Office of Industry Affairs, to Assistant Administrator, Office of Industry Affairs and Technology Utilization.