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DDS&T Historical Paper
No. OSA-1
Vol. XVI of XVI

DIRECTORATE OF SCIENCE & TECHNOLOGY HISTORY

(TITLE OF PAPER)
History of the Office of Special Activities
Appendices I and II
and Index

(PERIOD)
From Inception to 1969

DO NOT DESTROY

Controlled by: DDS&T
Date prepared: 1 April 1969
Written by: Helen Kleyla
Robert O'Hern

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APPENDIX I

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C05492939

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OSA History

A

* Promoted to Dep. C-in-C, CAF, 25 July 1967

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Bye-8725-68

Copy No 21

Report – OXCART A-12 Aircraft Experience Data and Systems Reliability

15 Jan 1968

DIRECTORATE of SCIENCE & TECHNOLOGY

Office of Special Activities

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BYE-8725-68

INTRODUCTION

This document contains experience data of the OXCART A-12 as of 31 December 1967, including its BLACK SHIELD deployment and operations commencing in, and continuing since, May 1967.

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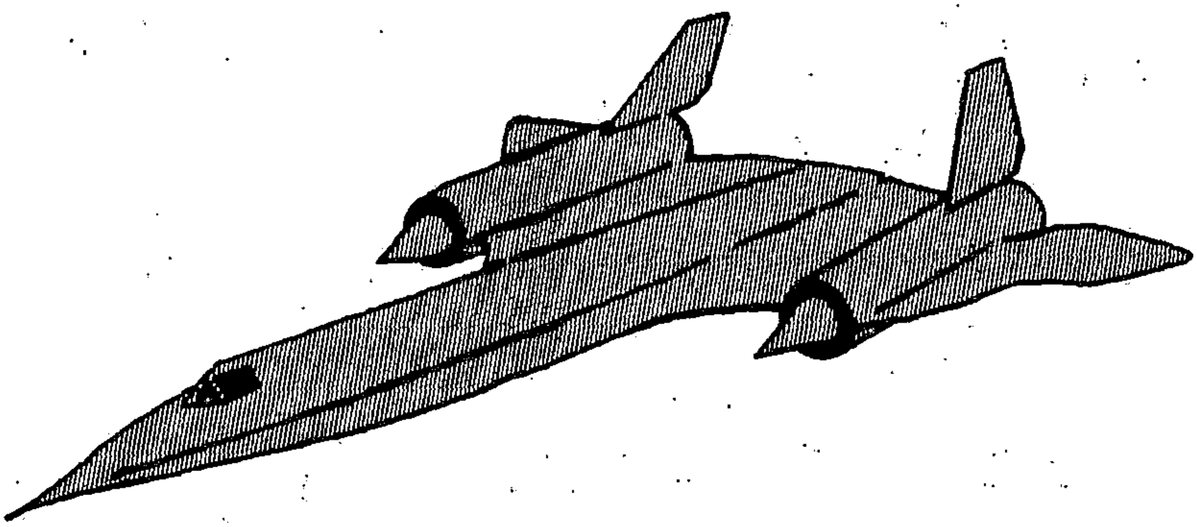
A-12



AIRFRAME DATA	ENGINE DATA	PERFORMANCE
1. LENGTH: 99 FEET 2. SPAN: 56 FEET 3. WEIGHT (BASIC) 52,700 LBS. 4. WEIGHT (FUELED) 122,500 LBS.	1. TWO P&W JT11D20A AFTERBURNING TURBO-JET WITH BYPASS 2. MAX. THRUST: 32,500 LBS. 3. OPERATING LIMIT: MACH 3.2 @ 100,000FT.	(STANDARD DAY) 1. SPEED: MACH 3.2 (1860 KNOTS) 2. ALTITUDE: 87,000+ FT. 3. RANGE: 3600 NM W/O AIR REFUELING, (CURRENT OBJECTIVE)

EXPERIENCE RECORD

AIRCRAFT

First Flight	26 April 1962
Total Flights	2670
Total Hours	4438:00
Total Flights at Mach 3.0	900
Total Hours at Mach 3.0	571:06
Longest Flight at Mach 3.0	3:50 Hours
Longest Mach 3.2 Time on a Single Flight	3:30 Hours
Longest Single Flight Duration	7:40 Hours
Speed - Max	Mach 3.29
Altitude - Max	90,000 Feet

J-58 ENGINES

Total Engine Flights	9412
Total Engine Hours	19,738
Total Engine Flights at Mach 3.0	4294
Total Engine Flight Hours at Mach 3.0	2690
Total Ground Test Hours	26,135
Total Mach 3.0 Environmental Ground Test Hours	6497
Total 150 Hour Qualification Tests	6

INS

Total Flights	1616
Total Flight Operating Hours	3715
Total Operating Time	45,739

SAS - AUTO PILOT

Total Flights	2669
Total Flight Hours	4437
Total Operating Hours	42,850

CAMERAS

	I	IV
Total Flights	262	67
Total Flight Operating Hours	194	37
Total Flights Above Mach 3.0	159	47
Total Hours at Mach 3.0	94	32
Longest Flight at Mach 3.0	1.5	1.3

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PILOTS (6)

Average Pilot Experience	15 Years
Average Total Flight Time (All Aircraft)	4110 Hours
Time in A-12 (Least/Avg/Most)	144/413/483 Hours
Time in Project	1.3/5 Years
Average A-12 Flights	257

LIFE SUPPORT

Total Suit Flights (Detachment)	1751

EWS

Total Flight Tests	110

DETACHMENT

Activated	1 October 1960
Time in Training as a Unit	60 Months*
Average Time in Project (Personnel)	46/50 Months

*Detachment 1, 1129th began training as a unit coincident with delivery of first aircraft (trainer) in January 1963. Prior to that it had been supporting LAC flight test effort.

OXCART A-12 AIRCRAFT INVENTORY

Operational Aircraft	6
Two-Seater Trainer	1
Flight Test Aircraft	1

FLIGHT DEVELOPMENT STAGES

The single most important problem pacing the flight development (opposite page) of the A-12 has been the air inlet and its control system. This system which provides the proper amount of ram air to the engines at all flight conditions must minimize shock expulsions (unstarts), automatically recover (restart) when shock expulsions do occur, and at the same time operate at optimum efficiency in order to maximize engine performance and aircraft range. The notations under development stages I through IV A all refer to problems and components of this system. Resolution of these has lead to a reliability commensurate with the operational readiness established in December 1965.

Fuselage Station 715 Joint Beefup (Stage IV B) involved strengthening fuselage structure at the wing joint because of heavier electronic warfare systems payload weight requirements.

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FLIGHT DEVELOPMENT STAGES

I. Mach 2.35 (To July 1964)

- A. Duct Roughness at Mach 2.4
- B. Unacceptable Restart Capability
- C. Inlet Instability and Unstarts

II. Mach 2.8 (July 1964 - March 1965)

- A. Inlet Mice Corrected IA
- B. Aft Bypass Incorporation Corrected IB
- C. Inlet Instability and Unstarts Still Encountered

III. Mach 3.0 (March 1965 - August 1965)

- A. Spike Static Probe and "J" Cam Inlet Control Improved IIC But Did Not Correct Condition

IV. Mach 3.2 (26 August 1965 - 20 November 1965)

- A. Retrofit to Lockheed Electronic Inlet Control Corrected IIC
- B. Fuselage Station 715 Joint Beefup

V. Operational Alert (December 1965 On)

- A. Operational Capability
- B. Aircraft Performance Optimization and Envelope Extension

VI. Phase Out (December 1966)

- A. On 29 December 1966 a decision was made by higher authority to terminate the OXCART program as of 31 December 1967. An orderly phase-out program was implemented to carry out this decision.

VII. Operational Deployment (May 1967)

VIII. Operational Deployment extended through 30 June 1968 (December 1967).

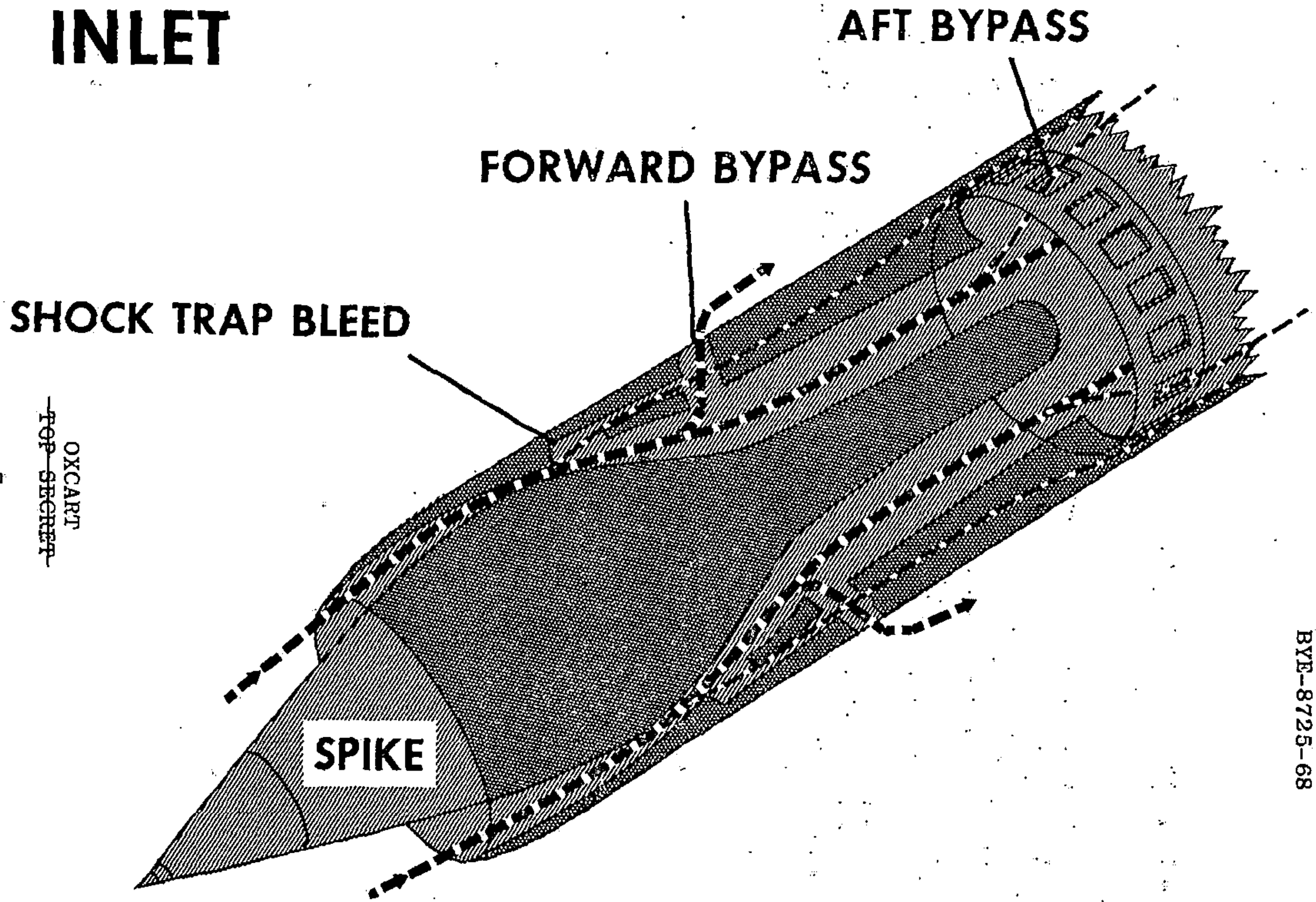
FUNCTION OF THE A-12 INLET

A supersonic inlet or air induction system is designed to provide best possible aerodynamic performance over a range of supersonic Mach numbers with a stable and steady flow of air to the engine. However, due to constraints imposed by supersonic aerodynamics, truly optimum performance with an ideal shock pattern and an inlet airflow exactly matched to the engine airflow requirement can only be provided at one flight condition. Since the OXCART aircraft must cruise for considerable periods of time at a Mach 3 speed, maximum possible range is realized by providing this optimum inlet performance at the Mach 3 cruise condition. The basic geometry and airflow characteristics of the inlet are then varied to provide a minimum compromise of aerodynamic performance and efficiency at lower flight speeds. Some of this needed flexibility is provided by varying the position of the inlet spike. Since the airflow which can be admitted by the inlet is in excess of that which can be accepted by the engine at other than the design condition, this excess airflow is dumped overboard through a series of forward bypass doors or passed down the nacelle airflow passage around the engine through a series of aft bypass doors.

In addition to those airflow passages shown on the accompanying sketch, a system is also provided for bleeding off the low energy boundary layer air which forms along the surface of the spike. This improves inlet efficiency by making the entire main inlet flow passage available to the high energy, high velocity air.

A rather complicated automatic electronic control system senses aerodynamic environment to provide the proper scheduling of spike and forward bypass door positions at all flight conditions. Aft bypass door positions are selected manually by the pilot.

INLET



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A-12 SORTIES/PROFILES ABOVE MACH 3.0 - DETACHMENT AIRCRAFT

This chart depicts a breakout of those Detachment sorties flown from 25 March 1965 through 31 December 1967 wherein the A-12 aircraft flew above Mach 3.0. The profiles column lists the number of times the aircraft accomplished the high/fast operational profile during the sorties flown in the period, i.e., high and fast after takeoff, descend for air refueling, climb back up to high and fast again, etc.

The A-12 major/minimum modification program got underway in the latter part of August 1965. Sorties flown during the period outlined in Section A were in non-modified aircraft.

A-12 SORTIES AND PROFILES ABOVE MACH 3.0 - DETACHMENT ACFT/SORTIES

(Through 31 December 1967)

	Sorties	Profiles
A. 25 Mar 65 - 31 Aug 65:		
Total Sorties	52	
Total Profiles		57
B. 31 Aug 65 - 31 Dec 67:		
Total Sorties	600	
Total Profiles		920
C. Summary (25 Mar 65 - 31 Dec 67):		
Total Sorties	652	
Total Profiles		977

First Detachment A-12 flight above Mach 3.0 on 25 March 1965 by Aircraft 128.

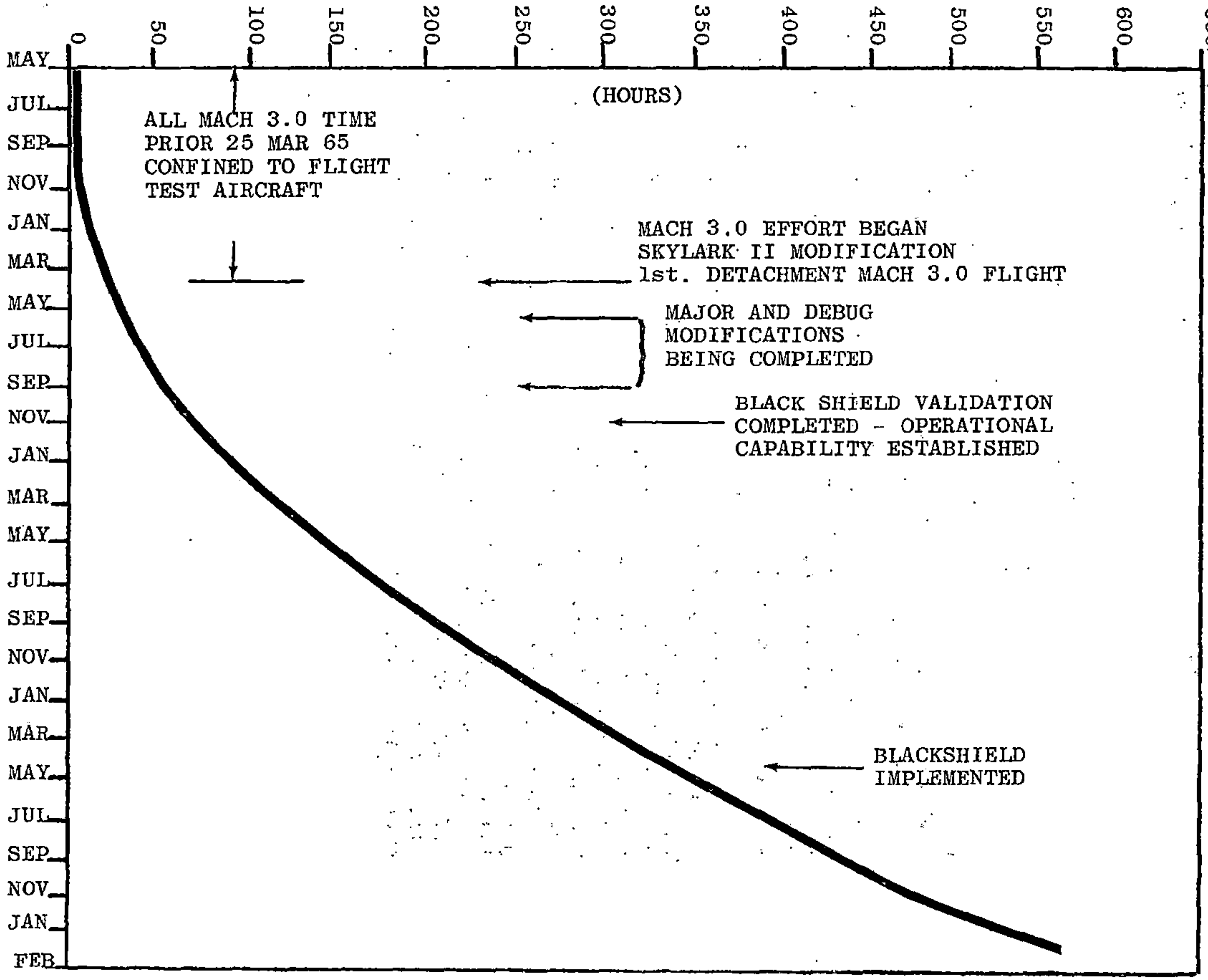
CUMULATIVE TIME AT MACH 3.0 AND ABOVE

The rate of accumulation of Mach 3.0 time as shown by the slope of the curve (opposite page) began to substantially increase in March 1965. Prior to this time, Mach 3.0 flight was confined to the three flight test aircraft only. After March 1965 each of the seven detachment (operational) aircraft as they completed necessary modifications began to fly at Mach 3.0 and above on a routine basis.

The significance of this data is that during the past thirty-three months since 25 March 1965, 571 flight hours at Mach 3.0 and above have been accumulated as compared to only 15 Mach 3.0 hours accumulated during the three years from first flight in April 1962 to 25 March 1965.

CUMULATIVE TIME AT MACH 3.0 AND ABOVE - ALL AIRCRAFT

(THROUGH 31 DECEMBER 1967)



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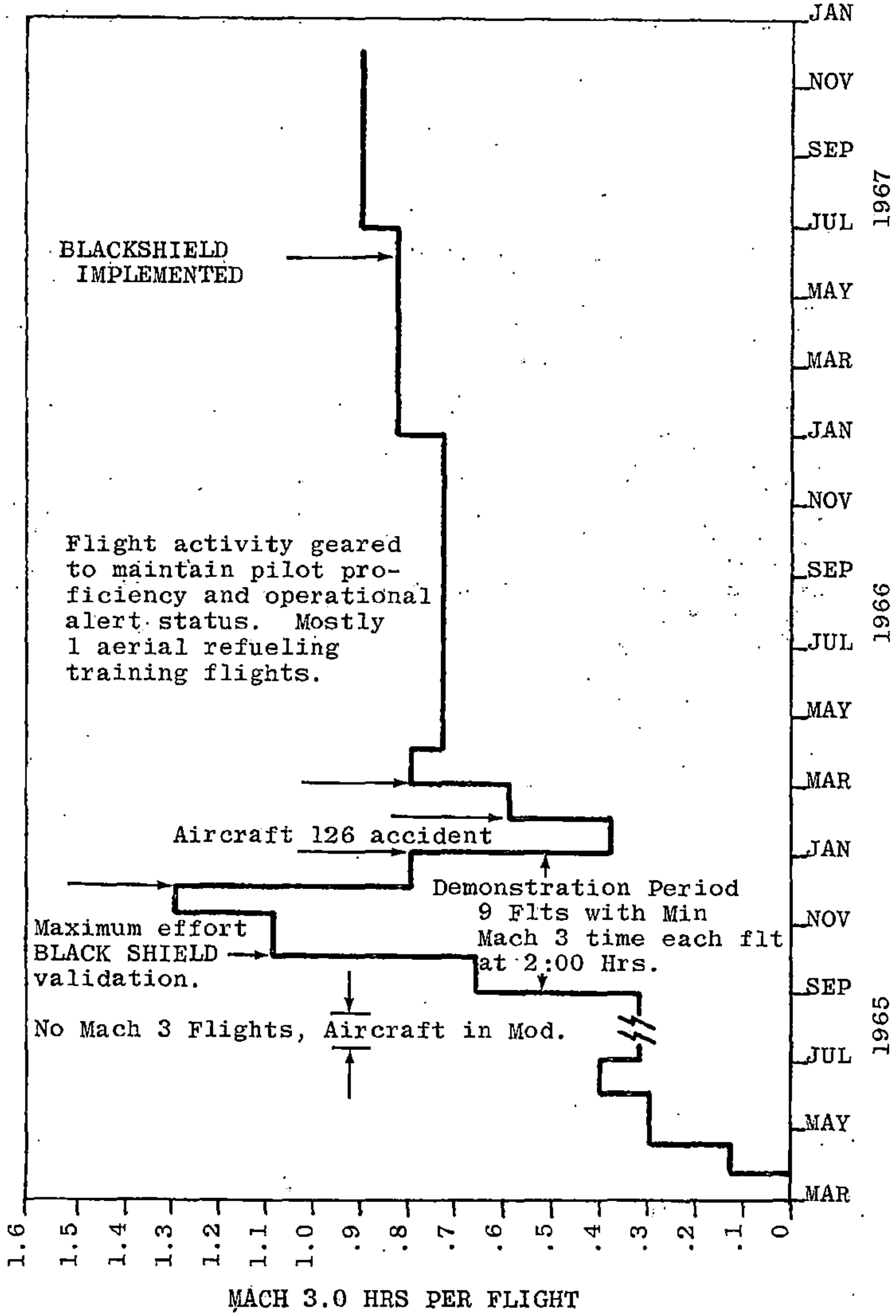
DETACHMENT AIRCRAFT
AVERAGE MACH 3 HOURS PER FLIGHT

The chart opposite shows the average time spent at Mach 3 and above for each flight. It is based upon all Mach 3 flights of detachment aircraft for the period examined including the relatively short Lockheed and detachment operated functional check flights as well as the longer multiple refueling training flights and simulated missions. Prior to 25 March 1965 there were no Mach 3 flights on detachment aircraft. The peak of 1.28 Mach 3 hours per flight during the fall of 1965 reflects the validation or demonstration period wherein three refueling simulated missions were performed. During January 1966 flight activity was substantially curtailed during the investigation of aircraft 126 accident with only some of the short functional check flights lasting a very few minutes at Mach 3. This is normal procedure after a period of inactivity wherein it is necessary to recheck all systems during short periods at Mach 3 prior to resuming the longer Mach 3 training flights. By spring 1966 a normal level of training activity was resumed reflecting about 3/4 hours at Mach 3 per flight. The period between January and July 1967 reflected training flights with usually one or sometimes two refueling(s) rather than the longer and more costly three refueling simulated missions performed during the fall of 1965. The slight increase in average Mach 3 time per flight for the current reporting period reflects the BLACK SHIELD activity.

DETACHMENT AIRCRAFT AVERAGE MACH 3 HOURS PER FLIGHT

(THROUGH 31 DECEMBER 1967)

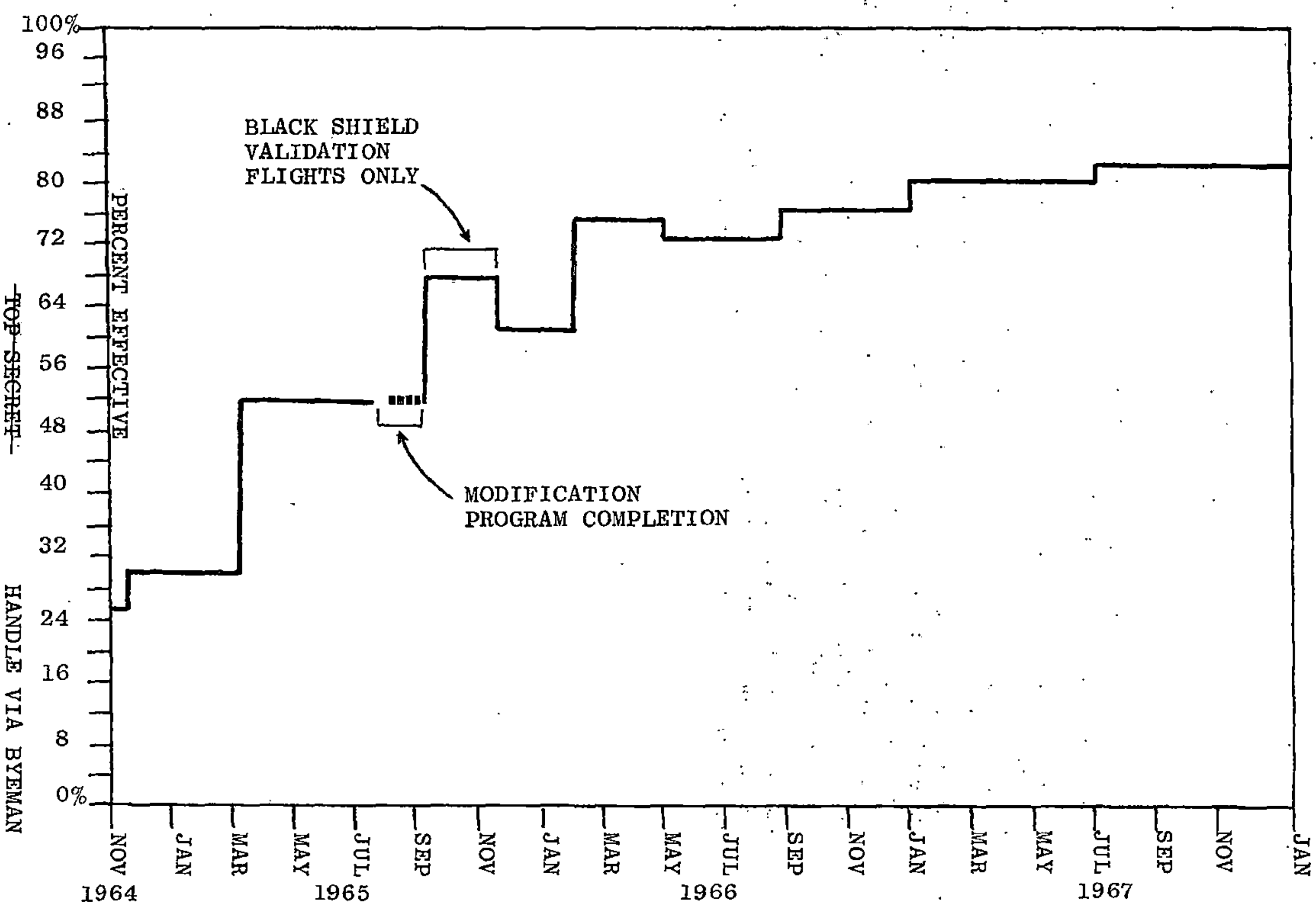


DETACHMENT FLIGHTS
SORTIE EFFECTIVENESS

The chart opposite shows the trend of sortie effectiveness from a low of 25% in 1964 to the low eighties during 1967. Each flight or sortie is rated either effective or not effective on the basis of all subsystems performing properly such that all planned objectives of the sortie were satisfactorily accomplished. The total sorties flown are divided into the number rated effective to arrive at the percent effective figure. The sorties rated not effective do not mean that all such sorties were prematurely terminated or aborted. Certainly all premature terminations or aborts which did occur are included in these data as are those sorties which were fully completed but on which all planned objectives could not be accomplished. Premature terminations assignable to each subsystem are reflected subsequently under Subsystem Sortie Reliability. Hence the difference in Sortie Effectiveness and Sortie Reliability.

DETACHMENT FLIGHTS SORTIE EFFECTIVENESS

(THROUGH 31 DECEMBER 1967)



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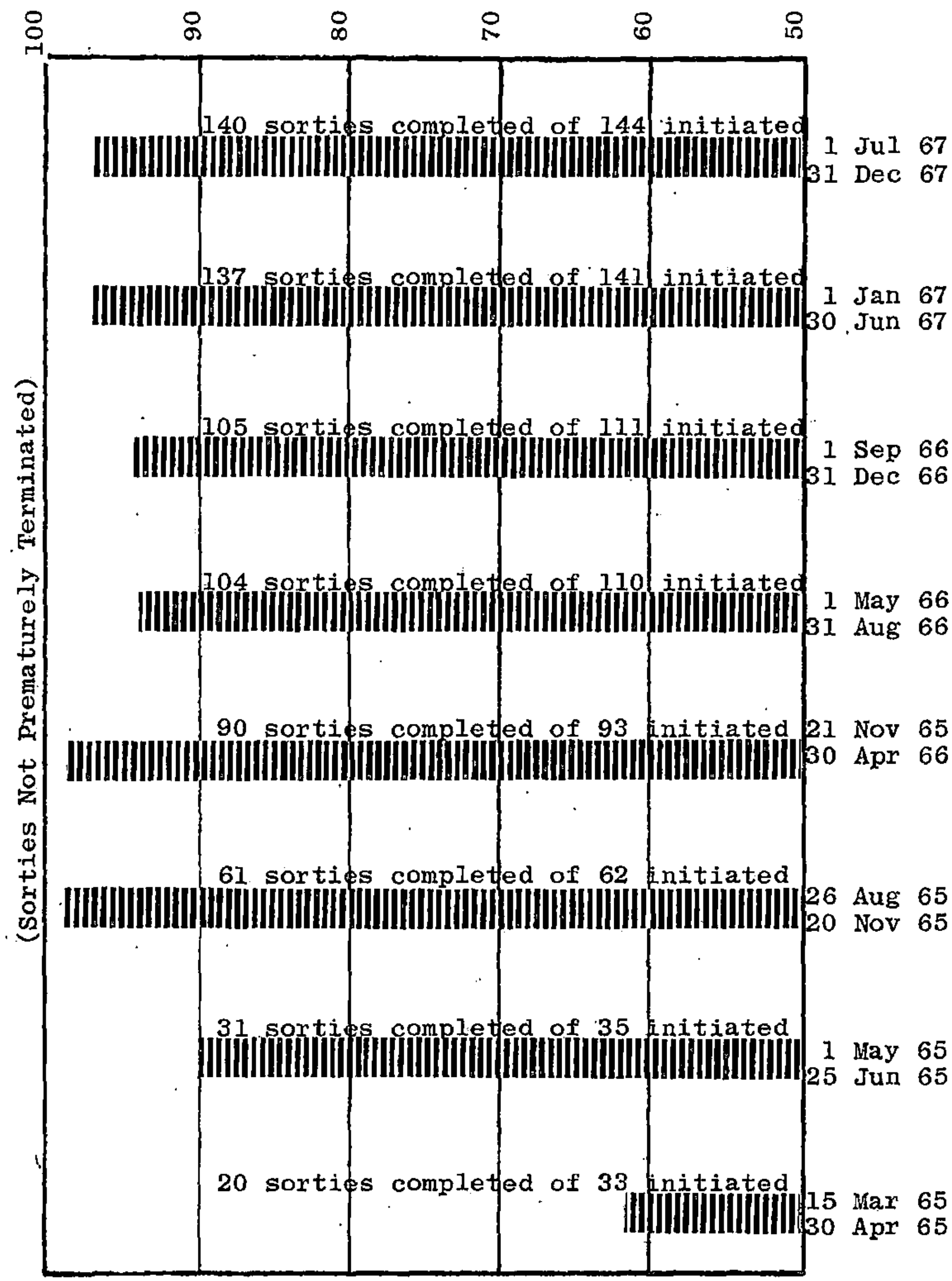
INLET SORTIE RELIABILITY TREND

The chart opposite presents the inlet sortie reliability trend and indicates a general improvement of inlet reliability. For the period 21 November 1965 to 30 April 1966, only three of all attempted sorties were prematurely terminated due to problems with the inlet system. These three flights were prematurely terminated due to inlet unstarts or other problems associated with actuation or scheduling of the inlet spike and/or bypass doors. A slightly less reliable rate obtained over the period 1 May to 31 August 1966 during which six sorties were terminated out of 110 initiated, all for reasons similar to those mentioned for the period 21 November 1965 to 30 April 1966. The rate remained almost constant through the 1 September to 31 December 1966 period when six sorties were terminated out of 111 initiated, again for the same reasons as cited earlier. There was considerable improvement in inlet performance between 1 January 1967 and 31 December 1967 when only eight sorties were terminated out of 285 initiated.

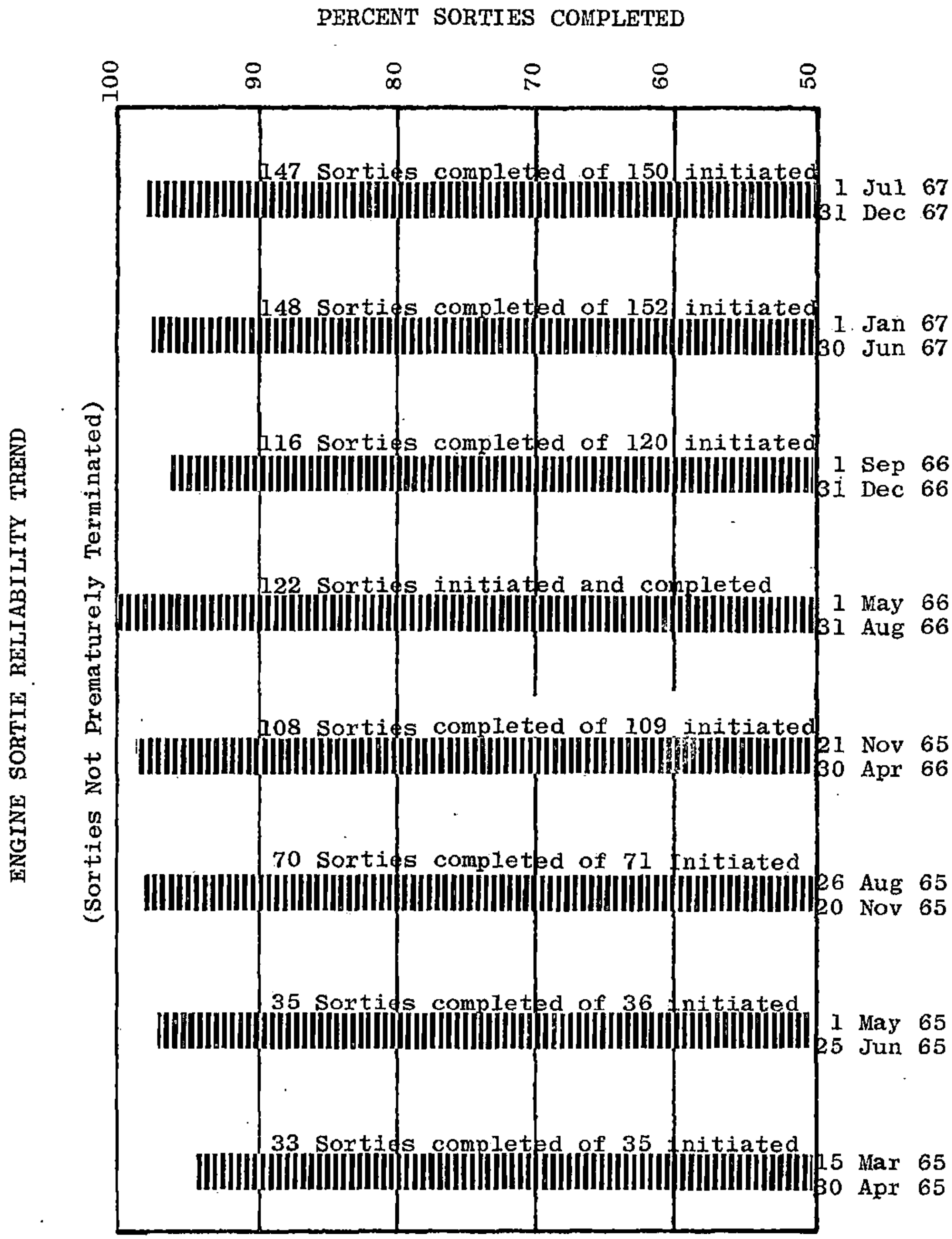
PERCENT SORTIES COMPLETED

INLET SORTIE RELIABILITY TREND



ENGINE SORTIE RELIABILITY TREND

The facing chart presents the engine reliability trend and indicates a generally very high current level of reliability for the engine with an overall average level of reliability for the time period covered on this chart of better than 98% (779 flights successfully completed of 795 initiated). Of 653 sorties attempted in the period 21 November 1965 to 31 December 1967 which represents more than 24 months of operations, only twelve sorties were prematurely terminated due to a problem with the engine. One engine problem occurred as a result of a failure in the system which injects fuel into the afterburner, specifically a loss of an afterburner spraybar threaded-end plug. The other premature terminations due to engine problems were caused by an inlet guide vane failure which caused a compressor inlet temperature sensor failure, an independent compressor inlet temperature sensor failure, exhaust gas temperature and RPM fluctuation, two engine electrical harness deficiencies, lack of ability to trim exhaust gas temperature on an engine due to a burned out trimmer motor, and two afterburner fuel control malfunctions. Design changes have been developed to correct the hardware problems which caused the first six described failures. The other six failures are considered to be of a random nature.


PERCENT SORTIES COMPLETED
100
90
80
70
60
50
ENGINE SORTIE RELIABILITY TREND
(Sorties Not Prematurely Terminated)
147 Sorties completed of 150 initiated
1 Jul 67
31 Dec 67
148 Sorties completed of 152 initiated
1 Jan 67
30 Jun 67
116 Sorties completed of 120 initiated
1 Sep 66
31 Dec 66
122 Sorties initiated and completed
1 May 66
31 Aug 66
108 Sorties completed of 109 initiated
21 Nov 65
30 Apr 66
70 Sorties completed of 71 initiated
26 Aug 65
20 Nov 65
35 Sorties completed of 36 initiated
1 May 65
25 Jun 65
33 Sorties completed of 35 initiated
15 Mar 65
30 Apr 65

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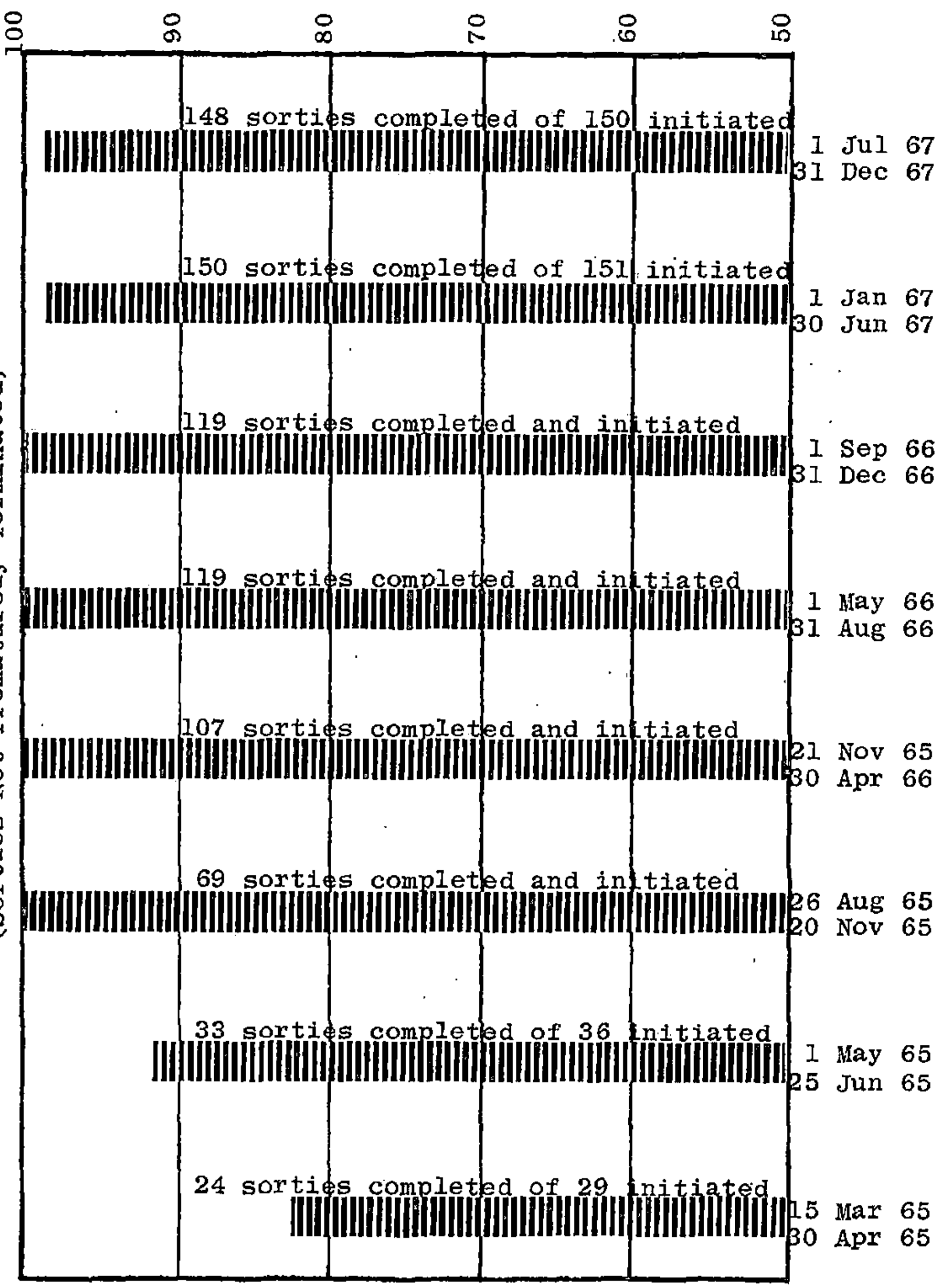
NAVIGATION SYSTEM RELIABILITY TREND

During this reporting period, two sorties were prematurely terminated due to apparent INS malfunctions. One of the terminations resulted from a bad steering motor in the repeater circuit. The other, upon more extensive ground checking, was due to a broken wire on Phase A of the number 3 inverter and was, in fact, an interface malfunction. Although the in-flight reliability of the INS has remained at a very high level, the mean-time-between-failure hours have been decreasing steadily, primarily because of the very large number of operating hours already on the systems. On rare occasions even diligent ground maintenance is unable to prevent an air abort. Under present OXCART phasedown ground rules no funds have been made available for an INS IRAN program which is necessary to raise the mean-time-between-failures up to the original level.

PERCENT SORTIES COMPLETED

NAVIGATION SORTIE RELIABILITY TREND

(Sorties Not Prematurely Terminated)



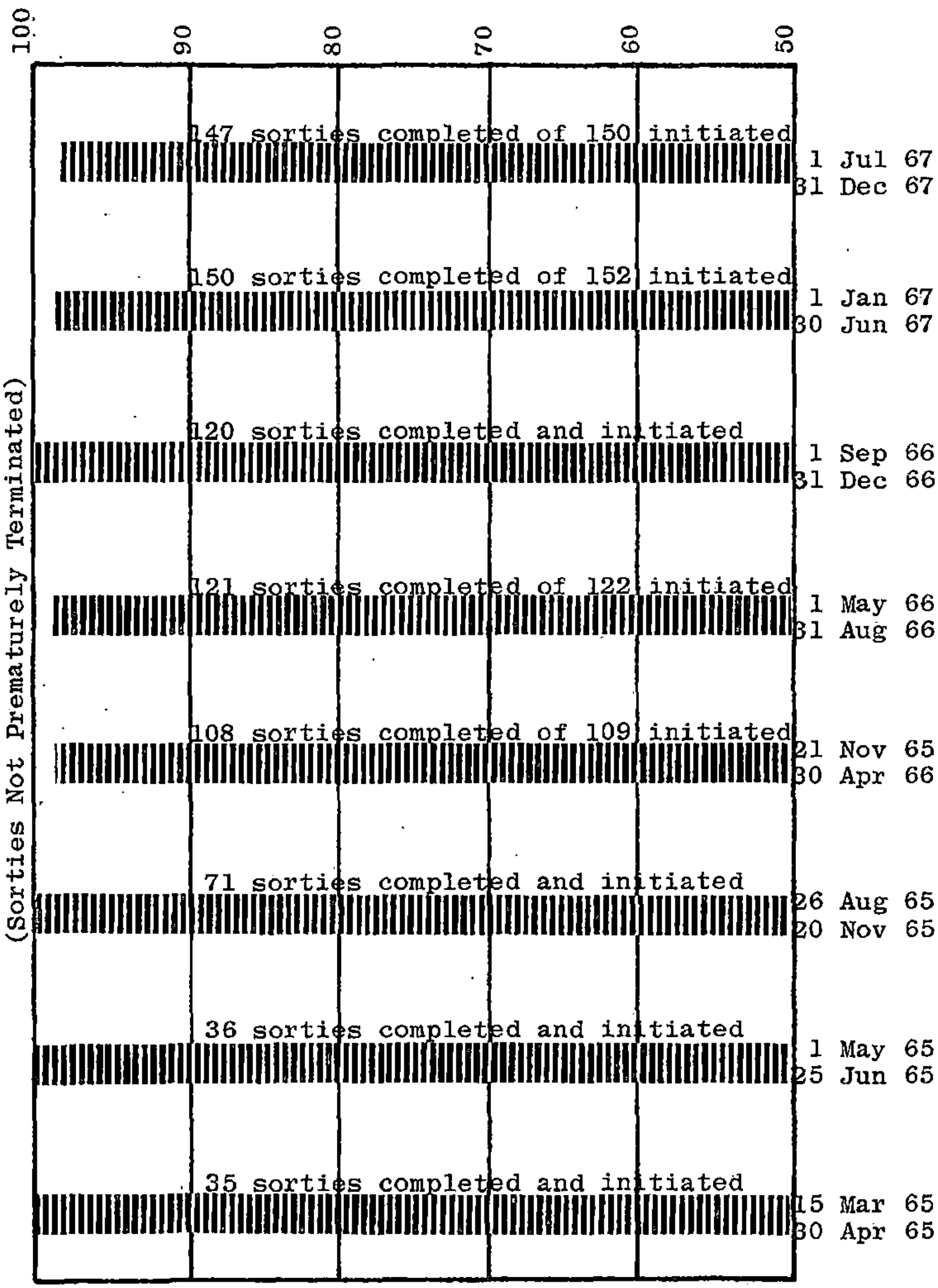
AUTO FLIGHT CONTROL SORTIE RELIABILITY TREND

During this reporting period only one sortie was prematurely terminated due to a flight control system malfunction. Specifically, a roll transfer valve in the roll channel of the stability augmentation system opened intermittently with hot oil applied. This was a random "one of a kind" malfunction.

AUTO FLIGHT CONTROL SORTIE RELIABILITY TREND

(Sorties Not Prematurely Terminated)

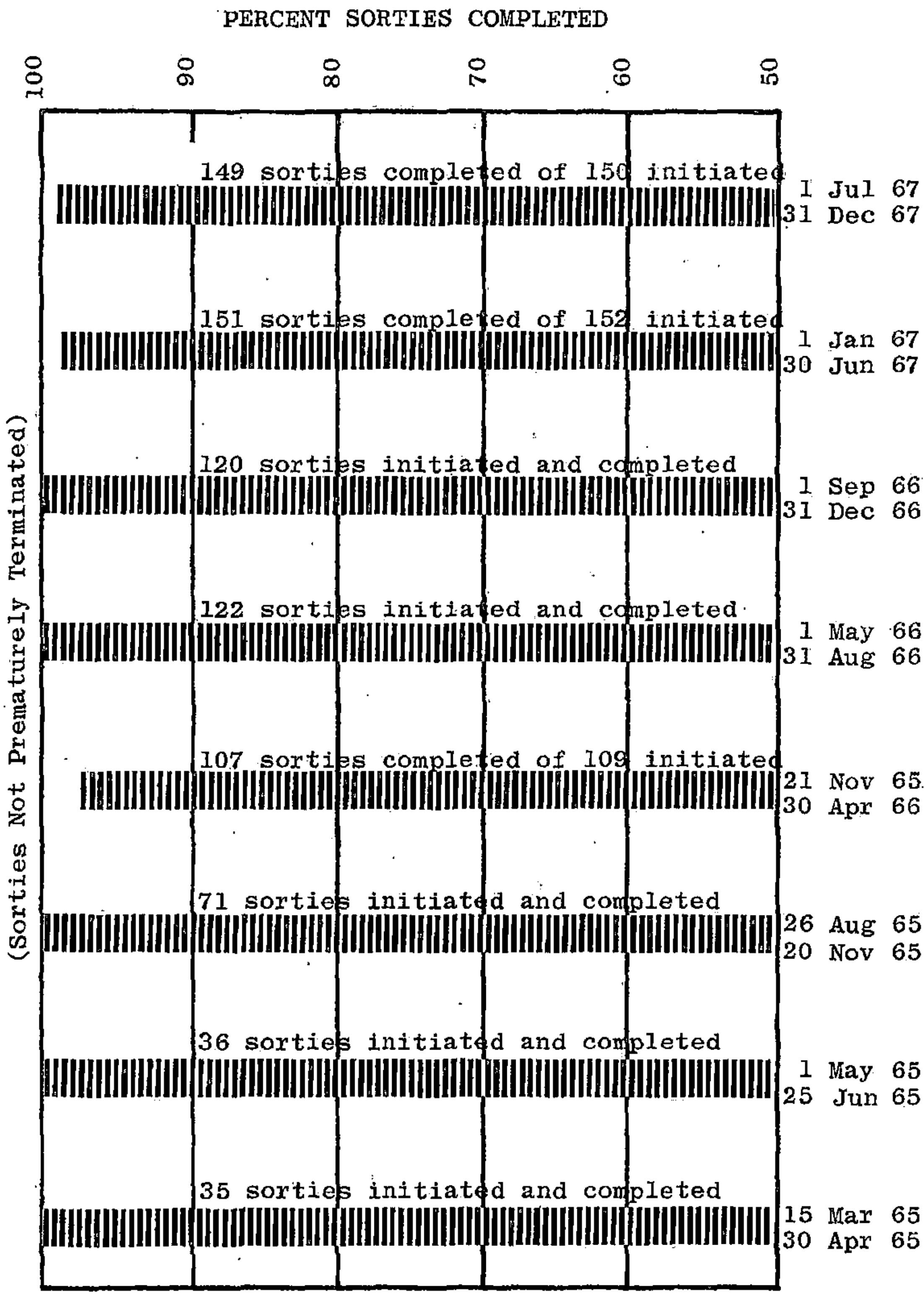
PERCENT SORTIES COMPLETED



HYDRAULIC SYSTEM SORTIE RELIABILITY TREND

The aircraft hydraulic system sortie reliability level has remained steadily high, between 98-100% since March 1965. Four flights were terminated prematurely due to hydraulic system problems during the period 21 November 1965 to 30 December 1967, out of a total of 791 sorties initiated.

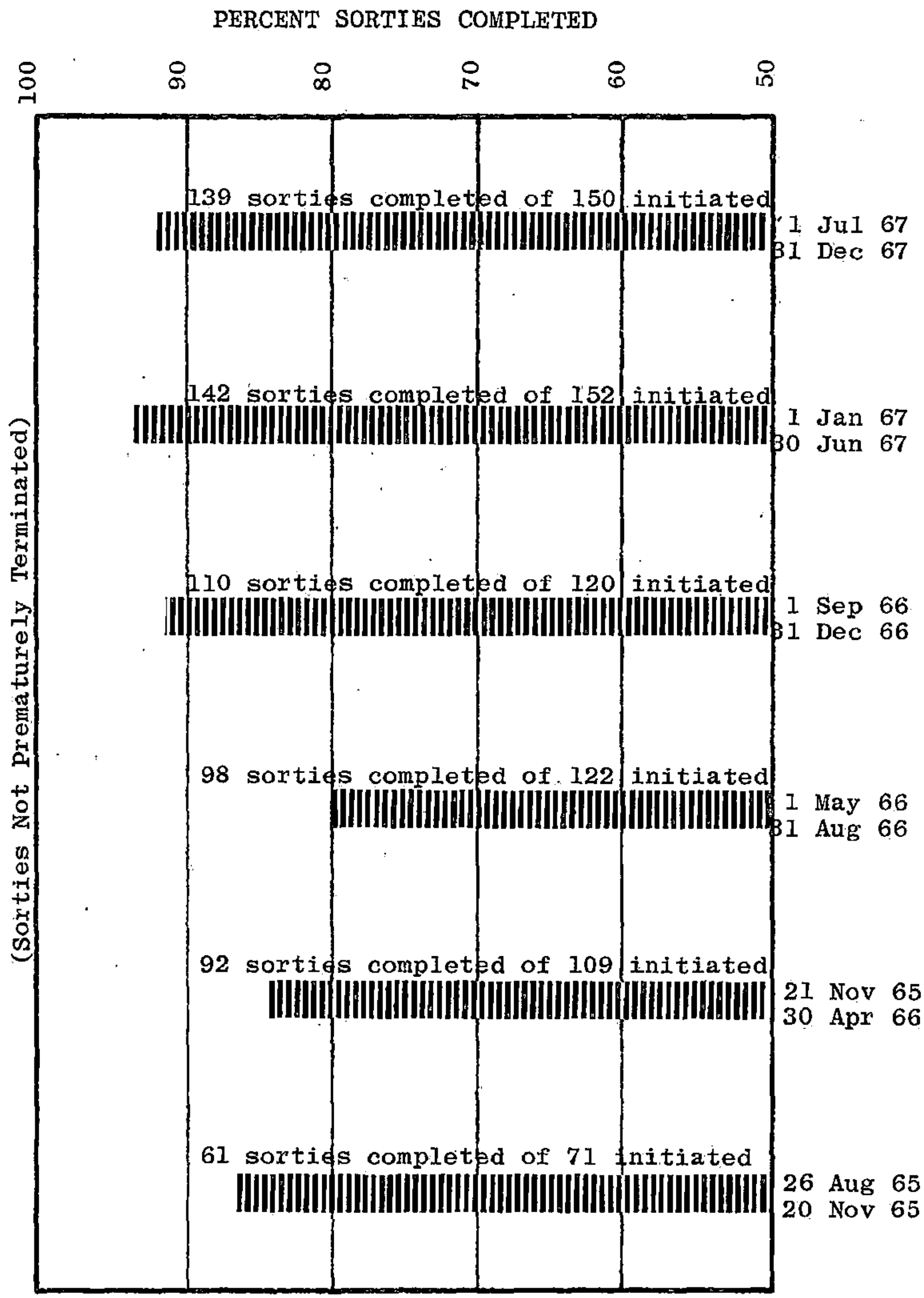
HYDRAULIC SYSTEM SORTIE RELIABILITY TREND



"OTHER" SYSTEMS RELIABILITY

"Other" systems referred to cover a wide variety of systems and events. A detailed listing is contained on the page following the facing chart. There was marked improvement in the number of premature terminations during the period 1 July through 31 December 1967 when only eleven flights out of 150 initiated were terminated for "other" systems or events. Special emphasis is being placed on higher quality control and closer supervision to achieve continued improvement.

"OTHER" SORTIE RELIABILITY



SUMMARY - PREMATURE TERMINATIONS

The opposite table first summarizes the prematurely terminated sorties assignable to each of the foregoing subsystem charts for the latest period examined from 1 July 1967 through 31 December 1967. The number of sorties initiated for each subsystem may differ because only the sorties on which that particular subsystem was used is counted. The engine, being used on every sortie, reflects the total number of 150 sorties initiated during the period.

"Other" includes all other premature terminations assigned to the indicated problems or components which are not part of the foregoing major subsystems examined.

Total premature terminations for the period 1 July 1967 through 31 December 1967 are 24 out of a total of 150 sorties initiated.

SUMMARY - FOREGOING MAJOR SYSTEMS AND OTHER PREMATURE TERMINATIONS OF AIRCRAFT FLIGHTS

1 July Through 31 December 1967

Major Systems:

1.	Inlet :	Unstarts, Spike, Fluctuations	4
2.	Engine :	ENP, Fuel Flow Nozzle Fluctuations and Oil Pressure Fluctuations Due Engine Harness Problem*	3
3.	AFCS :	SAS Pitch Control, SAS Roll	3
4.	Hydraulic:	Left System Failed	1
5.	INS :	Large Terminal Error and Bad Steering	2
			13

"Other"

1.	Faulty Fuel Pressure Indicator	1
2.	Roll SAS Malfunction, Due Faulty Servo's	1
3.	INS Failure, Due #3 Inverter Inoperative	1
4.	Autonav Steering Error, Due Pilot Error	1
5.	HF/SSB Inoperative	1
6.	ARC-50 Failure	1
7.	Camera Failed	1
8.	SAS Yaw Transients and Rudder Oscillations, Due Power Interruption	1
9.	Fillet Panel Loss	1
10.	Pitch Trim Malfunction	1
11.	Fuel Leak	1
		11

*See Para 13, Page 45, BX-6727

CAMERA SYSTEMS

Type I cameras are built by Perkin-Elmer. There are five Type I "C" series in the inventory. With the phase-down of the OXCART program the two Type I "A" series were placed in storage.

Type IV cameras are built by Hycon. There are three of these in the inventory. Two of these have been validated and declared operationally ready. The third is scheduled for prevalidation and validation flights on or about 15 January 1968.

The first summation (opposite page) includes only test flights at Mach 3 and 80,000 feet altitude plus the twenty-two operational missions. The second summation includes all flights including operational missions since the beginning of the program.

CAMERA PERFORMANCE

(As of 31 December 1967)

Test Flight Time at Mach 3 and 80,000 feet

Type I "A" Series	Type I "C" Series
980 Min.	5667 Min.

Type IV

1903 Min.

TOTAL FLIGHT EXPERIENCE

Type I "A" Series	Type I "C" Series
98 Flights	164 Flights
75 Hours	119 Hours
6 Failures	9 Failures

Type IV

67 Flights
37 Hours
11 Failures

ELECTRONIC WARFARE SYSTEM

A brief functional description of the Electronic Warfare Systems follows:

DEFENSIVE:

BIG BLAST - Denies target range from SA-2 radar to force the missile into a three point guidance mode and early arming of the fuze.

BLUE DOG - Recognizes missile guidance activity and actively transmits false commands to the SA-2 missile guidance systems.

PIN PEG - Passively intercepts SA-2 radar frequency signal. Locates and positions SA-2 radar site in azimuth within vulnerable zone.

MAD MOTH - Denies SA-2 tracking radar accurate angle information resulting in large missile miss distances.

A redundancy exists between the recognition and jamming systems employed, thus giving a lower degree of vulnerability to the aircraft and accounting for the high degree (100%) of total system reliability.

ELINT COLLECTION:

SIP - Signal Intercept Package - A small unattended ELINT collection system which covers the frequency spectrum from 50 MH_Z to 11,000 MH_Z. It was used on three operational missions and all were successful.

System 6S - An advanced ELINT collection system capable of signal monitoring over a frequency range of 50 MH_Z to 12,500 MH_Z and providing analog recording of the signals. It was successful on 18 of 19 missions. The one unsuccessful mission was due to a drive belt failure.

ELECTRONIC WARFARE SYSTEM RELIABILITY

BLACK SHIELD OPERATIONAL MISSIONS

TYPE SYSTEM	MISSIONS	SUCCESSES	PERCENT
DEFENSIVE	22	22	100%
ELINT COLLECTION	22	21	95.5%

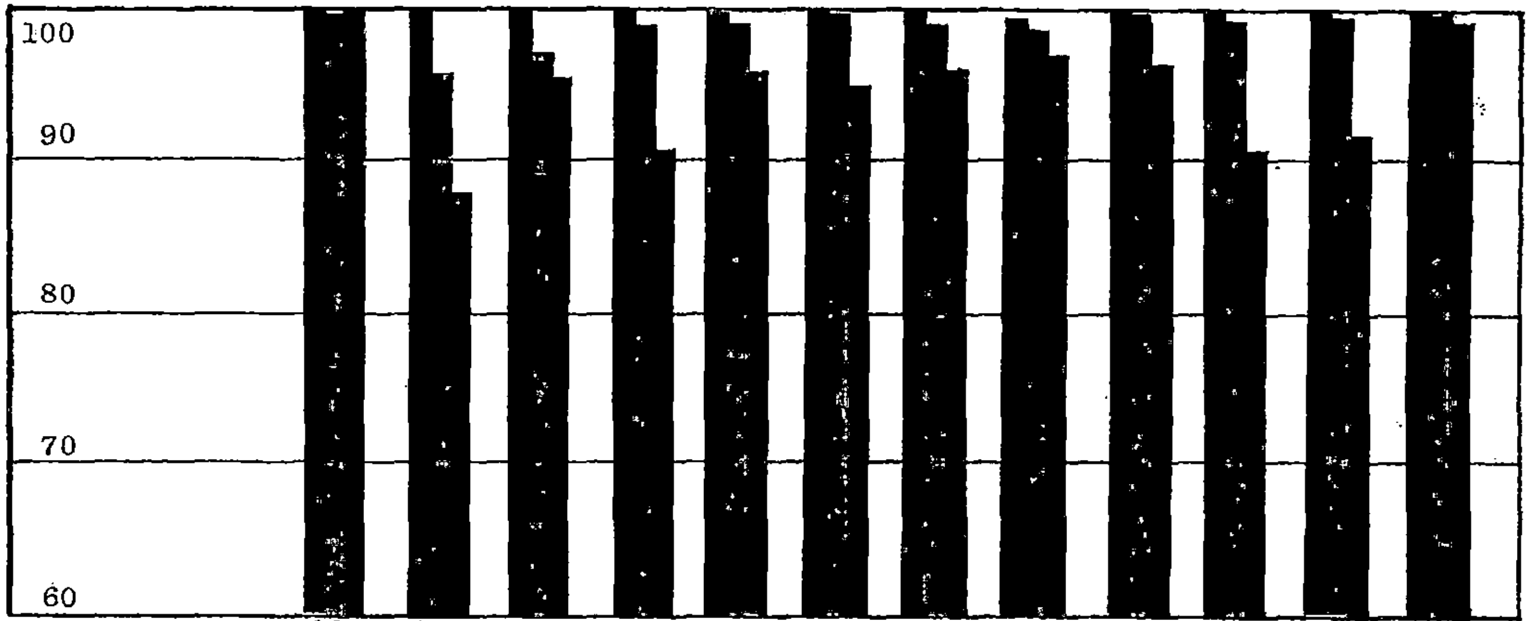
SYSTEM RELIABILITY

The chart opposite summarizes three levels of reliability for each major system from 26 August 1965 through 31 December 1967. The first (red) barometer for each system reflects the percent of sorties completed safely by that system relative to the total sorties initiated for that system. The second or green barometer reflects the percent of the sorties initiated which were not prematurely terminated or aborted because of that system. The third (black) barometer reflects the percent of sorties initiated during which that system operated completely satisfactorily. Numerical figures used in the percentages are shown below each barometer.

"Interface" refers to the system listed to the left of "interface" and accounts for malfunctions which are not assignable as a fault of the system itself but which affected the system's overall operation. Typical examples are aircraft generated electrical power or cooling air interruptions to such systems as the cameras, navigation and stability systems.

SYSTEM RELIABILITY

ALL FLIGHTS SINCE DEBUG MOD WITH DETACHMENT AIRCRAFT 26 AUGUST 1965 - 31 DECEMBER 1967



	LIFE SUPPORT SYSTEM	INLET SYSTEM	ENGINE	NAVIGATION	INERTIAL NAVIGATION SYSTEM	INTERFACE	STABILITY AUGMENTATION SYSTEM	INTERFACE	AUTOPILOT	PHOTOGRAPHIC	CAMERAS I, II, IV	INTERFACE
SORTIES FLOWN	693	661	724	715	715	715	724	725	676	270	270	270
SAFE FLT RETURN	692 *	661	724	715	715	715	724	724 *	676	270	270	270
NOT ABORTED	692	637	711	712	712	715	719	720	676	269	269	270
SYSTEM SATISFACTORY	692	590	690	652	689	678	701	705	660	248	250	268

*See page 40 for Aircraft 125 & 126 Accidents

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BYE-8725-68

SCOPE CROWN "E" (2 AIR REFUELING MISSION)

This mission was developed as a camera package evaluation route. Resolution targets at Phoenix, Arizona, and Area 51 are covered. The route also incorporates an over-water air refueling 450 N.M. off the coast of California. Route was first flown in June 1967.

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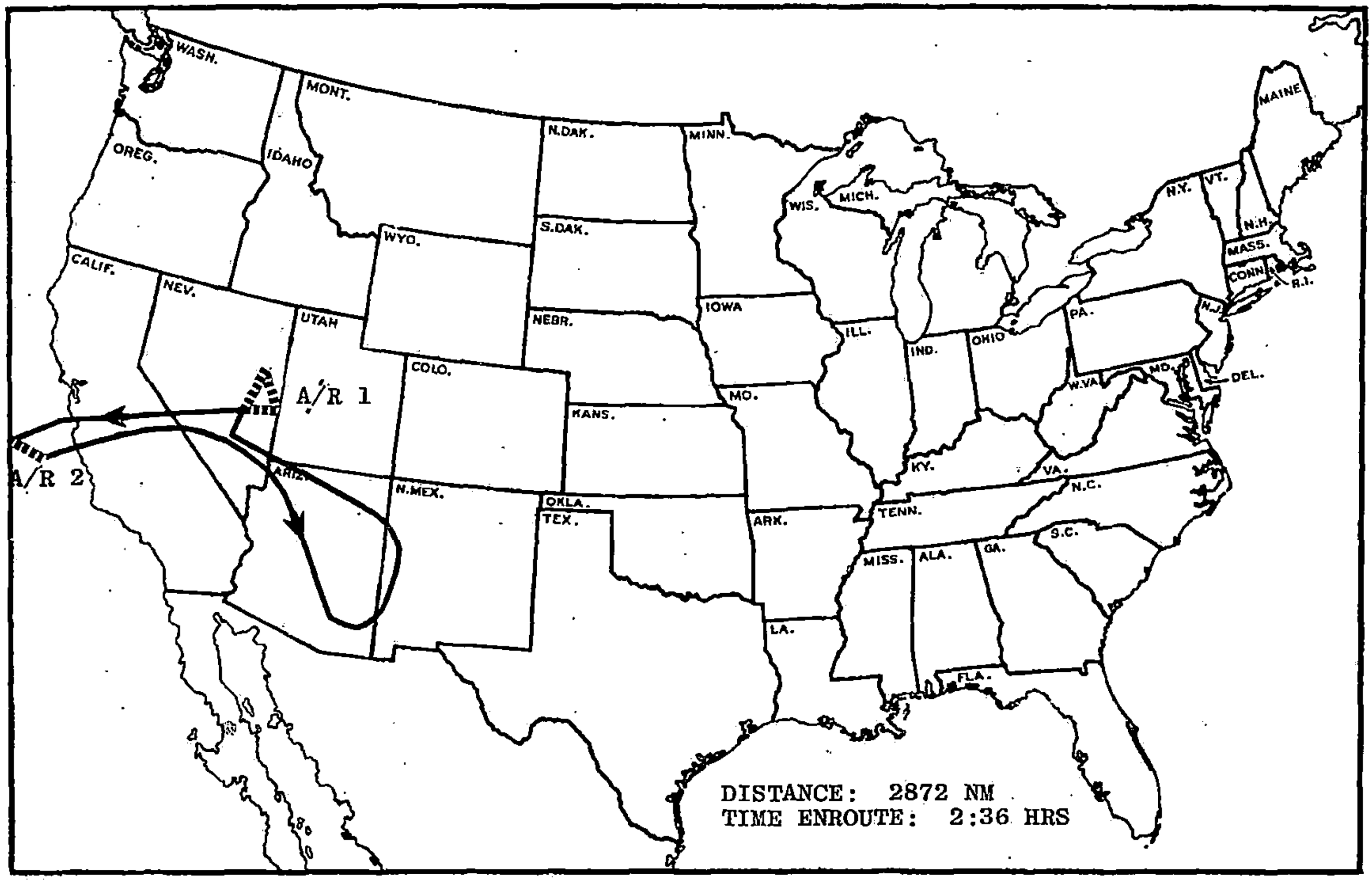
SCOPE CROWN "E" (TWO AIR REFUELING MISSION)



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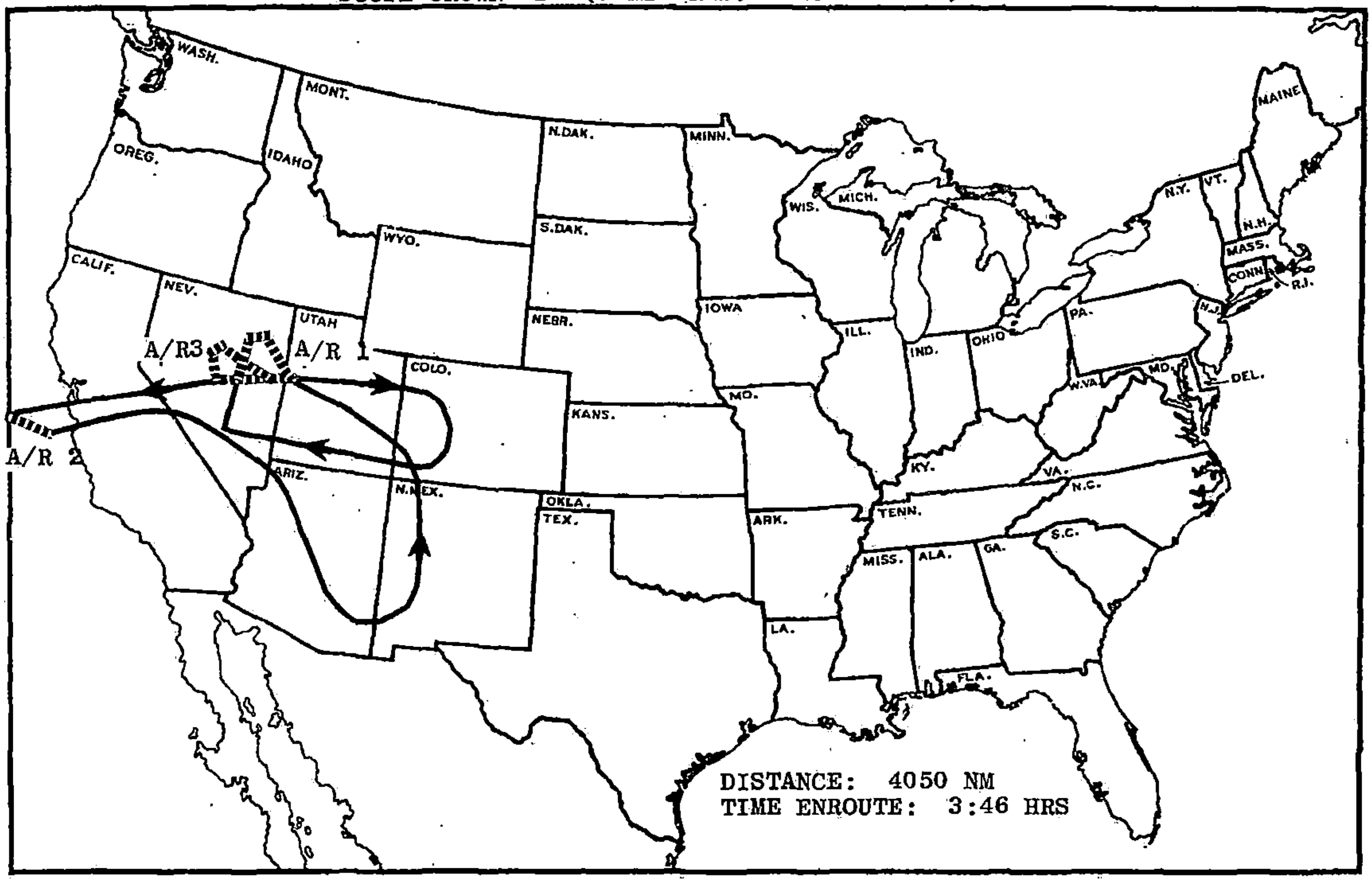
SCOPE CROWN "F" (3 AIR REFUELING MISSION)

This mission was developed from SCOPE CROWN "E". An additional air refueling and cruise climb leg was added to simulate an operational mission for pilot training. Mission was first flown in June 1967.

SCOPE CROWN "F" (3 AIR REFUELING MISSION)



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A-12 AIRCRAFT ACCIDENT RELIABILITY

The chart opposite reflects the four aircraft accidents which have occurred during the program through 31 December 1967.

Of interest is the fact that not any of these accidents involved the high Mach number-high temperature regime of flight in which this program has spearheaded the state-of-the-art. Also of interest is that two of these accidents occurred in the local home base area within feet of the runway. All of these accidents involved traditional problems inherent in any aircraft.

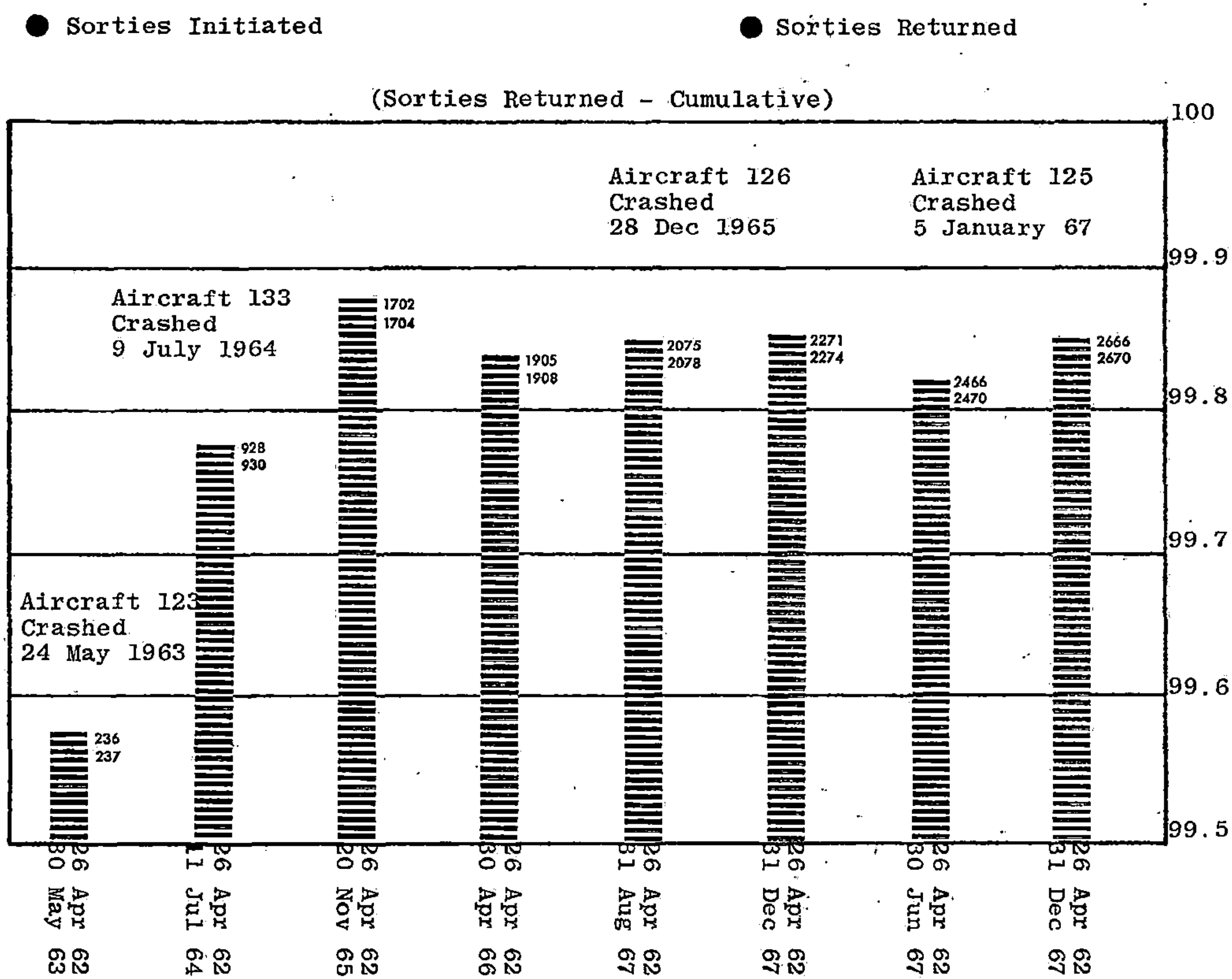
Aircraft 123's accident occurred on 24 May 1963 away from the base on a routine training flight. It involved a plugged pitot static tube during icing conditions resulting in erroneous cockpit instrument indications of air speed. The pilot was ejected safely.

Aircraft 133's accident occurred on 9 July 1964 during landing approach. It involved a malfunction of the flight control surface actuating system resulting in a continuous and uncontrollable roll. The pilot was ejected safely.

Aircraft 126's accident occurred on 28 December 1965 during take-off climb-out. It involved a human error wherein the flight line electrician connected the wiring for the yaw and pitch gyros of the stability system in reverse. This resulted in complete uncontrollability of the aircraft. The pilot was ejected safely.

Aircraft 125's accident occurred on 5 January 1967 during descent about 85 miles from the base. It involved a fuel system gaging malfunction resulting in a higher than actual indicated fuel quantity reading. Because of this, the aircraft was out of fuel before reaching the base. The pilot was killed on impact with the ground because of a malfunction precluding man-seat separation after ejection from the aircraft.

A-12 AIRCRAFT ACCIDENT RELIABILITY



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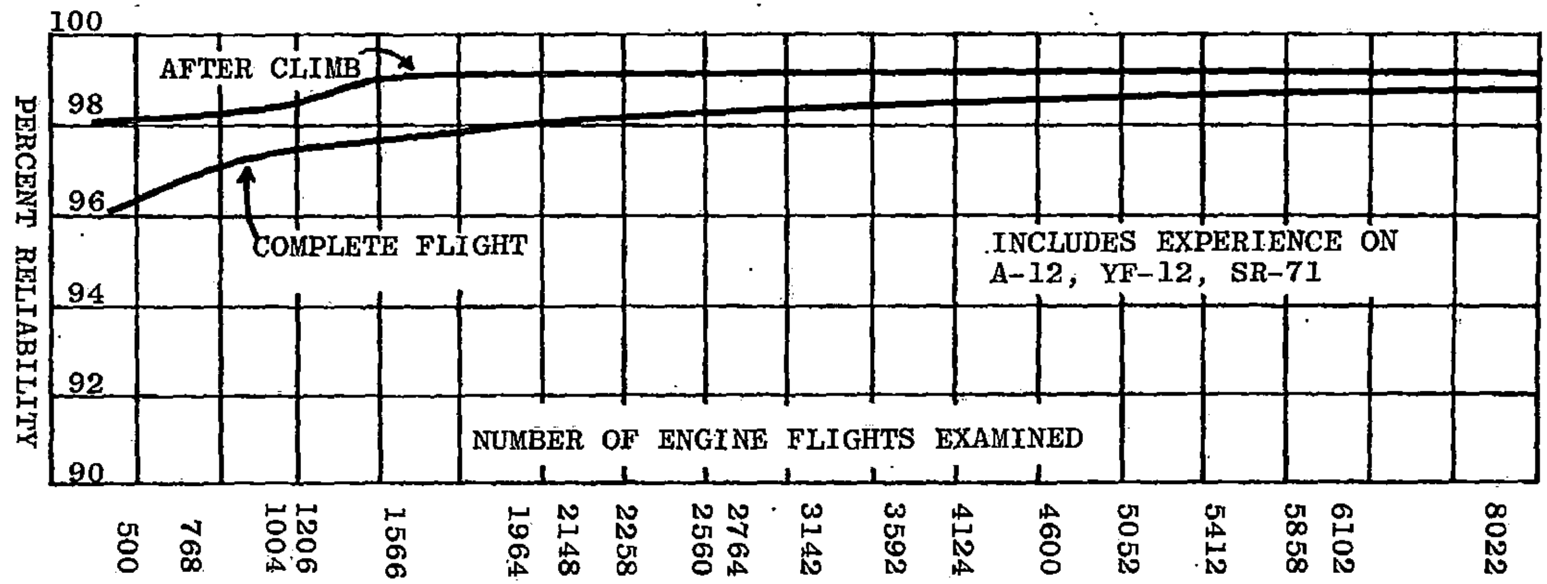
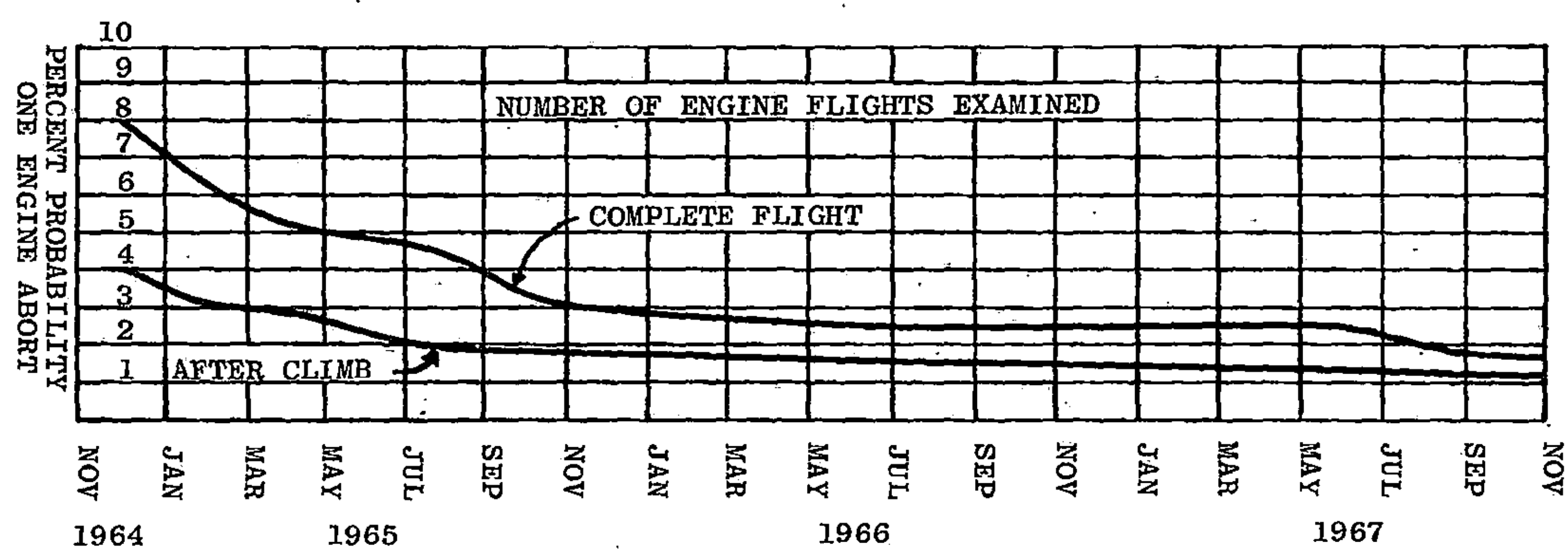
ENGINE RELIABILITY

The accompanying chart presents J-58 engine abort reliability. A differentiation is made between aborts which occurred at any time during a flight (complete flight) and those which occurred after climb. The aborts which occurred after climb are considered to be more representative of those which might occur over denied territory. The abort reliability on an after climb basis is better than 99%. This level of reliability is computed on the basis of 8022 J-58 engine flights which have taken place since the development of an operable aircraft inlet system on all programs including the A-12, YF-12, and SR-71.

J-58 ENGINE (ABORT) RELIABILITY FOR ENGINE CAUSE

CUMULATIVE THROUGH 31 DECEMBER 1967)





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BLACK SHIELD
DEPLOYMENT AND OPERATIONAL SUMMARY

A. DEPLOYMENT

1. 22 May 1967 ACFT NO 131 flew non-stop from Area 51 to Kadena AB, Okinawa in 6:10 hours. The flight required top-off and 3 aerial refuelings and attained 79,000 feet during cruise at Mach 2.9 for two legs and 3.1 for one leg.

2. 24 May 1967 ACFT NO 127 flew non-stop from Area 51 to Kadena AB, Okinawa in 6:00 hours. The flight was similar to that of ACFT NO 131 above except an altitude of 81,000 feet was reached during cruise.

3. 26 May 1967 ACFT NO 129 flew from Area 51 to Wake Island in 4:30 hours. Landing at Wake Island was precautionary due to a malfunctioning navigation system. The flight was made at Mach 2.9 at 76,000 feet altitude. The aircraft proceeded uneventfully to Kadena on 27 May 1967.

B. OPERATIONAL SORTIES

(All missions employed the Type I camera) (altitudes and Mach numbers represent maximum attained during mission).

1. BSX-001, 31 May 1967. Mission was flown at Mach 3.1 and 80,000 feet for a duration of 3:45 hours. Imagery quality: Good.

2. BSX-003, 10 June 1967. Mission was flown at Mach 3.1 and 81,000 feet for a duration of 4:30 hours. Imagery quality: Good.

3. BX-6705, 20 June 1967. Mission was flown at Mach 3.1 and 82,000 feet for a duration of 5:30 hours. Imagery quality: Excellent.

4. BX-6706, 30 June 1967. Mission was flown at Mach 3.1 and 81,000 feet for a duration of 5:00 hours. Imagery quality: Good.

5. BX-6708, 13 July 1967. Mission was flown at Mach 3.15 and 82,100 feet for a duration of 3:40 hours. Imagery quality: Good.

6. BX-6709, 19 July 1967. Mission was flown at Mach 3.17 and 82,000 feet for a duration of 4:58 hours. Imagery quality: Excellent.

7. BX-6710, 20 July 1967. Mission was flown at Mach 3.16 and 82,450 feet for a duration of 4:55 hours. Imagery quality: Good, despite haze problem.

8. BX-6716, 21 August 1967. Mission was flown at Mach 3.2 and 80,000 feet for a duration of 3:55 hours. Imagery quality: Good to Excellent.

9. BX-6718, 31 August 1967. Mission was flown at Mach 3.20 and 81,000 feet for a duration of 5:12 hours. Imagery quality: Good until camera malfunctioned.

10. BX-6722, 16 September 1967. Mission was flown at Mach 3.15 and 80,000 feet for a duration of 4:01 hours. Imagery quality: Good.

11. BX-6723, 17 September 1967. Mission was flown at Mach 3.16 and 81,000 feet for a duration of 4:00 hours. Imagery quality: Excellent.

12. BX-6725, 4 October 1967. Mission was flown at Mach 3.14 and 81,000 feet for a duration of 4:09 hours. Imagery quality: Excellent.

13. BX-6727, 6 October 1967. Mission was flown at Mach 3.19 and 81,000 feet for a duration of 2:20 hours. Imagery quality: Good. Mission was prematurely terminated due to a faulty oil pressure indicator.

14. BX-6728, 15 October 1967. Mission was flown at Mach 3.19 and 81,000 feet for a duration of 3:41 hours. Imagery quality: Good.

15. BX-6729, 18 October 1967. Mission was flown at 3.21 and 81,000 feet for a duration of 4:01 hours. Imagery quality: Good.

16. BX-6732, 28 October 1967. Mission was flown at Mach 3.15 and 83,500 feet for a duration of 3:49 hours. Imagery quality: Good.

17. BX-6733, 29 October 1967. Mission was flown at Mach 3.23 and 82,000 feet for a duration of 3:56 hours. Imagery quality: Good.

18. BX-6734, 30 October 1967. Mission was flown at Mach 3.20 and 85,000 feet for a duration of 3:44 hours. Imagery quality: Good.

19. BX-6737, 8 December 1967. Mission was flown at Mach 3.20 and 82,500 feet for a duration of 3:59 hours. Imagery quality: Good.

20. BX-6738, 10 December 1967. Mission was flown at Mach 3.17 and 81,000 feet for a duration of 3:51 hours. Imagery quality: Good.

21. BX-6739, 15 December 1967. Mission was flown at Mach 3.20 and 86,000 feet for a duration of 4:09 hours. Imagery quality: Good.

22. BX-6740, 16 December 1967. Mission was flown at Mach 3.20 and 86,200 feet for a duration of 3:56 hours. Imagery quality: Good.

ANNEX 2

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ADVANCED RECONNAISSANCE AIRCRAFT STUDY

November 1966

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IDEALIST/OXCART/CORONA
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Introduction

This report is submitted by the study group designated by the Secretary of Defense, the Director of the Central Intelligence Agency and the Director of the Bureau of the Budget to make an appraisal of the A-12 (OXCART) and SR-71 aircraft fleets. The report includes a discussion of: (a) the characteristics and capabilities of these fleets; (b) the requirements for planned and potential missions of the fleets; and (c) five alternative configurations of the two fleets including consolidation of the assets and storing some aircraft.

The report is organized as follows:

The findings of the study group in each of the main sections are summarized in a Highlights section of the report which is supported by the more detailed sections and appendices.

I. HIGHLIGHTS

The purpose of this section of the report is to set out the general findings and conclusions of the report with regard to the

II. Resources

III. Mission Requirements

IV. Evaluation of the need for a separate OXCART fleet

V. Alternatives

These major areas make up the main sections of the more detailed body of the report and are supported by the Appendices.

Resources

This section of the report addresses the relative technology, the operational capabilities, plans and schedules, support facilities and the costs of the A-12 and the SR-71 aircraft. The general conclusions are presented here.

1. The Aircraft Systems

The two aircraft systems, the CIA A-12 and the USAF SR-71 are almost equal insofar as general aircraft performance is concerned. The A-12 flies two or three thousand feet higher at any point along the flight profile for a particular range, although the altitude of both aircraft will vary five to ten thousand feet during the course of flight over denied territory. Intelligence gathering potential is similar in the two systems. The SR-71 has a capability for simultaneous operation of several sensors responding to different parts of the spectrum; the A-12 has a number of interchangeable single-sensor systems. The A-12 is the predecessor program; it is further along, having been declared operationally ready by the CIA in December 1965. The SR-71 is a later model and has the slight advantage of more standardization and slightly greater growth potential. The SR-71 currently offers an interim operational capability for Cuba, with 45 days prior notice, and Southeast Asia from

Kadena, Okinawa with 90 days prior notice. SAC has informally forecasted that the SR-71 fleet of aircraft will be fully operationally ready by August 1967.

2. Costs

This table summarizes the total programmed costs including costs for tanker support, cargo and support aircraft sorties, Air Force supply issue. Figures are in millions of dollars by FY.

	FY65 & prior	FY66	FY67	FY68	FY69	FY70	FY71	FY72
A-12	610	89	97	110	102	95	93	88
SR-71	579	461	147	187	157	148	140	132
Engine R&D	270	64	57	45	35	25	15	5
Total	1,459	614	301	342	294	268	248	225

The total from FY 1966 through FY 1972 for both programs is 2,292

Mission Requirements

This section discusses the requirement for the advanced aircraft and compares current and projected capabilities of the advanced aircraft with those for satellites and unmanned drones. For the purposes of this study, we have found it useful to consider four basic mission requirements:[1]

1. Strategic reconnaissance is peacetime reconnaissance, primarily

(1) This categorization does not have formal approval by either USIB or the Department of Defense.

of the USSR, China, and their allies. It provides routine intelligence on technical, military and economic developments and capabilities. To a much more limited extent, this reconnaissance is also conducted against neutral powers.

2. Force mobilization reconnaissance would be directed primarily against China and the European satellites in case of indications that preparations were under way for attack against other nations. This reconnaissance might also be needed against neutrals.

3. Reconnaissance for general war crisis would be directed against the Soviet Union (and in a number of years against China) in case of a very intense crisis or of intelligence warning that the Soviet Union might be preparing for strategic attacks against the United States or Europe.

4. SIOP reconnaissance would be aimed at the Soviet Union, after a general war broke out, and be against targets that were planned to be struck by U.S. strategic forces.

Although these categorizations are useful for analyzing the role of the advanced aircraft, there is no sharp dividing line between them. Rather each successive mission requirement reflects reconnaissance under increasing international tension, broadening conflict, a growing readiness to take risks, a lessening need for covert reconnaissance, a growing need to cover more targets simultaneously and to provide results more quickly, and an increasing requirement for reconnaissance to support both national decision-making and tactical commanders.

In terms of these four mission requirements we have reached the following conclusions:

1. Strategic Reconnaissance. The advanced aircraft can play at best a minor role in strategic (routine peacetime) reconnaissance of the Soviet Union, China, and their allies. Satellite capabilities now exceed the normally required amount of target coverage for a given time period, and the KH-8 and KH-9 systems can greatly increase this capability. Because of their current acceptability as reconnaissance vehicles, satellites

present the lowest risk of incident. The major weakness of the satellites is their relative inability to provide efficient coverage of a small number of isolated targets or events. After mid-1968, advanced drones will probably provide this capability for well defended areas. At present, losses of unmanned drones are high unless they are limited to use in areas without sophisticated air defenses.

The advanced aircraft would be useful in strategic reconnaissance of areas outside of the Sino-Soviet bloc where SA-2 type defenses had been deployed. Cuba and parts of South America or the Middle East might become such areas. In the absence of sophisticated air defense the U-2 provides some capability.

If the Soviet Union or the Chinese should attempt to neutralize or destroy reconnaissance satellites, then the OXCART and the SR-71 aircraft do not promise to be attractive substitutes. The level of technology and the effort required for anti-satellite operations are greater than would be required against the Mach 3 aircraft. In fact, one of the roles of the Tallinn type defensive system may well be air defense against the advanced aircraft.

In summary, for peacetime strategic reconnaissance, there does not seem to be a strong requirement for the high performance aircraft. A small fleet of less than half a dozen would be sufficient.

2. Reconnaissance of Force Mobilization. For the mission of detecting and reconnoitering mobilization and force buildup, the advanced aircraft can play a much greater role. The aircraft systems can provide intense coverage of large border areas and this intense surveillance can be maintained almost indefinitely. The satellite systems are now very limited in their ability to be launched on short notice, in their effectiveness for reconnoitering small or oddly shaped geographical areas, and in the timeliness of their return. The KH-9 system will provide much greater potential coverage with high resolution but current plans will not provide a capability with rapid response time that endures for more than two months.

A MOL system or a real-time readout for the KH-8 system would provide additional capabilities. For this mission, we have not analyzed the cost tradeoffs between these advanced satellite systems and the OXCART/SR-71 aircraft; however, the need for a large fleet of OXCART and the SR-71 aircraft will be somewhat reduced to the extent that such systems are deployed.

The unmanned drones currently provide useful intelligence but only about 60 percent survive and are recovered. The future drone programs, particularly the TAGBOARD drone, will be significantly less vulnerable than the current drones.

In those situations where conflict has already escalated to the point that tactical reconnaissance is under way (such as in North Vietnam today), then this reconnaissance can go far to supplement the advanced aircraft. Also, there could be situations where the need for extensive reconnaissance would force escalation to tactical reconnaissance (and it would therefore be available for national needs) even before other tactical air operations were undertaken. Cuba was an example.

In summary, we conclude that the force mobilization mission will continue in the early seventies to be an important mission for the advanced aircraft no matter what developments are incorporated in the satellite programs. The size of the fleet should provide for this type of reconnaissance in two theaters and should be able to support the intelligence needs of both national decision authorities and of U.S. and allied tactical commanders in the theater. In the worst case as many as a dozen aircraft could be needed for these missions.

3. Reconnaissance for General War Crisis. For brink-of-war reconnaissance of the Soviet Union in the next several years, the collection capabilities of the advanced aircraft systems are much superior to satellites or drones. Six aircraft could cover hundreds of targets in the Soviet Union and return their product within a day. Current satellites are limited in their response time, and current drones in their range and survivability. In the next several years, satellites will become more competitive for the brink-of-war reconnaissance role if quick readout is developed with the KH-8, or if an enlarged quick reaction capability is

provided for either the KH-8 or the KH-9, or possibly if the MOL is deployed. Similarly, the TAGBOARD drone will have the range of the advanced aircraft and may have somewhat better survivability. Finally, the future of the advanced aircraft and drones is clouded by potential current or future developments in Soviet air defense.

As yet, there has been no thorough analysis or conclusive evidence that indicates how useful or feasible crisis reconnaissance would be against Soviet strategic forces. There is no data base that allows a comprehensive comparison of the normal and crisis appearance of these forces, of the degree to which such changes can be detected photographically, and of the frequency and time urgency of these flights.

Current plans call for six simultaneous sorties over the Soviet Union in a crisis situation. Since these sorties might be interpreted as an attack, they might present a high risk of escalating the crisis. The extent of this risk would depend heavily on the previous conduct of the crisis and on other indications by the United States at the time the aircraft were committed.

In summary, for brink-of-war reconnaissance of the Soviet Union, the aircraft systems have considerable value at present and in the immediate future. This value will become somewhat less as advanced drones become operational, or if quick reaction capabilities are incorporated in advanced satellites, or if it becomes apparent that the Soviet Union or the Chinese have deployed defensive systems that are especially capable of dealing with manned aircraft. Finally, the numbers of aircraft planned for this mission requirement should be conditioned by possible enemy reactions.

4. SIOP Reconnaissance. For the SIOP reconnaissance mission, side-looking radar is the most useful sensor because it is unaffected by weather, lighting conditions, and clouds produced by nuclear detonations or fire storms. The SR-71 fleet carries such a radar; the OXCART will have a three aircraft capability; and the earliest satellite capability could only be available in 1970.

However, a satellite system, with side-looking radar, appears to compete very favorably with the SR-71. Pre-launch and initial penetration capability of the satellites appear significantly higher than for the aircraft system and its tankers. For both the satellites and the aircraft, there would be a serious problem in recovering the data, interpreting results, and transmitting the finished intelligence to decision makers. There needs to be further study of the relative capabilities of satellites, aircraft, and other sensors in assessing SIOP strike effectiveness. If a satellite capability is developed for the SIOP reconnaissance role, then the main value of the advanced aircraft in a general war might be post-attack photographic reconnaissance after diminution of the disrupting effects of the early nuclear exchanges.

In the worst case, three of the above-mentioned requirements might need to be satisfied simultaneously: reconnaissance of force mobilization, crisis reconnaissance of the Soviet Union, and maintenance of the SIOP "hard alert" force. This would require a fleet of about thirty aircraft. However, in a crisis situation, aircraft could be diverted from routine strategic reconnaissance missions. If the fleet of advanced aircraft were reduced (for example, by attrition), some aircraft could be diverted, at a time of crisis, from force mobilization reconnaissance to the crisis reconnaissance of the Soviet Union.

Finally, during the next several years, the advanced aircraft are uniquely capable in all four of these mission areas subject to the deployment of improved Soviet or Chinese air defenses. However, the development of certain satellite and drone capabilities could supplant some of the aircraft capabilities by the late 1960's. In particular, the future satellites and drones may play an increasing role in surveillance of the Soviet Union during crisis or general war.

<u>Evaluation of the Need for a Separate OXCART Fleet</u>

This section considers the need for and value of the special covert and civilian characteristics of the separate OXCART fleet. The most significant aspects of the question are:

1. If the fleet is under military sponsorship the President may be

more reluctant to approve its use initially in peacetime or a potential crisis.

2. One of the greatest potential difficulties of maintaining a separate fleet and dual management is that in an escalating situation, principal advisors to the President may be required to resolve detailed questions of schedules, targeting and support associated with the need to coordinate the resources.

3. If the military sponsorship of a detected overflight is established, the Soviets or Chinese might consider the flight more provocative. These reactions may be minimized by the use of civilian crews and unmarked aircraft, under military sponsorship.

Other relevant considerations are:

4. The value of the covert characteristics of the separate OXCART fleet is limited by the officially exposed SR-71 military aircraft with a very similar configuration so that the risk of incident through public declarations by the Soviets or the Chinese is not reduced to any great extent by maintaining the separate fleet.

5. In the event of an incident using the aircraft, established military sponsorship would probably reduce the ability and disposition of friendly or neutral governments either to avoid comment or to support the United States need for the reconnaissance.

6. The command and communications channels would be equally responsive and rapid under either an all military or a CIA command structure.

7. The CIA intelligence channels for dealing with foreign governments are more rapid and direct in matters of basing and after-the-fact cover stories. However, these probably could be used in arrangements for "black" flights under a military command.

Alternatives

This section discusses a number of alternatives for the future of the OXCART and the SR-71 programs. Specifically, the section provides a general analysis of (1) possible actions to curtail the combined programs; (2) factors affecting the size of both fleets; and (3) costs of alternative fleet structures and sizes (including combined basing). This section also identifies three principal alternatives for decision including: (1) continuing both fleets at the currently approved levels; (2) mothballing the OXCART aircraft but maintaining a separate fleet by sharing SR-71 aircraft between SAC and CIA; and (3) terminating the OXCART program and transferring mission responsibilities to SAC.

Principal conclusions of this section are as follows:

1. The major decision issue is whether or not the projected total number of aircraft in the combined fleets will be needed once the entire SR-71 fleet becomes fully operational in the fall of 1967. Storing all the A-12 aircraft and maintaining only the SR-71 fleet will reduce five-year costs by 26.5 to 18.3 percent or $365 to $252 million, and only slightly reduce the numbers and types of reconnaissance missions that could be conducted simultaneously. The higher savings result from using a single SAC-operated fleet for all missions; and the lower, by allocating eight SR-71 aircraft to the CIA and retaining the separate base and covert characteristics of the OXCART fleet.

2. The four major factors that most affect fleet size are: (1) the attrition rate from normal operations of both aircraft; (2) the need for the types of manned reconnaissance missions for which these aircraft are suited; (3) the probability of having to conduct these missions simultaneously; and (4) the ability of satellites, U-2 aircraft and drones to perform some of the various missions now and in the future. None of these factors can be precisely determined without much more study or experience.

3. If both the OXCART and the SR-71 aircraft types are to be continued, it is very questionable that the size of either or both fleets should be reduced at this time since savings achieved by fleet reduction tend to be small in relation to the resulting reduction in activity.

4. The five-year savings from any form of base consolidation are small -- less than five percent of the five-year costs. Compared to more conventional aircraft programs, base support for the OXCART and SR-71 contributes relatively little to the over-all expense of the program. Also because of current crowding at Beale, consolidation there at this time would incur high one-time costs.

5. If the size of the combined fleet is to be reduced at this time it would be wise to store rather than to destroy aircraft. As pointed out in (2), there is still significant uncertainty as to the factors affecting fleet size. Mothballing costs little and provides an important hedge during the next several years at least.

6. Five alternatives with variations were considered by the study group and are described in the detailed narrative, but due to the findings stated above, the group has identified three principal alternatives for decision:

(1) Maintain the status quo and continue both fleets at the currently approved levels. This provides for two bases and:

Total approved aircraft	41
Less: Training and test aircraft	-6
Aircraft under major overhaul	-3
Assumed attrition through 1970	-3
Available operational aircraft through the end of 1970	29

Costs: ($ in millions)	FY 1968	FY 1969	FY 1968-72
	$341	$295	$1,377

Possible Mission Coverage	Operational Aircraft OXCART	SR-71	Total
A. Strategic Reconnaissance	3*	2*	5
B. Force Mobilization Reconnaissance	4*	5*	9
C. General War Crisis/Brink		7*	7
D. SIOP		8	8
	7	22	29

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

(2) Mothball all A-12 aircraft but maintain OXCART capability by sharing SR-71 aircraft between SAC and CIA; make primary assignments of missions A and B to the OXCART fleet and missions C and D to the SR-71 fleet. This provides for two bases and:

Total approved aircraft	41
Less: Mothballed A-12's	-11
Training and test aircraft	-4
Aircraft under major overhaul	-2
Assumed attrition through 1970	-2
Available operational aircraft through the end of 1970	22

Cost Savings: ($ in millions)	FY 1968	FY 1969	FY 1968-72
	-$28	-$64	-$252

Percent reduction of costs - 18% Percent reduction of activity - 26%

Possible Mission Coverage	Operational Aircraft OXCART (SR-71's)	SR-71	Total
A. Strategic Reconnaissance	3*	-0-	3
B. Force Mobilization Reconnaissance	5*	-0-	5
C. General War Crisis/Brink	-0-*	6*	6
D. SIOP	-0-	8	8
	8	14	22

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

(3) Terminate the OXCART fleet in January 1968 four months after the SR-71 fleet becomes fully operational, and assign all missions to the SR-71 fleet. This provides for a single base and:

Total approved aircraft	41
Less: Mothballed A-12's	-11
Training and test aircraft	-4
Aircraft under major overhaul	-2
Assumed attrition through 1970	-2
Available operational aircraft through the end of 1970.	22

Cost savings ($ in millions)	FY 1968	FY 1969	FY 1968-72
	-$45	-$88	-$365

Percent reduction of costs - 27% Percent reduction of activity - 26%

Possible Mission Coverage	Operational Aircraft SR-71
A. Strategic Reconnaissance	3*
B. Force Mobilization Reconnaissance	5*
C. General War Crisis/Brink	6*
D. SIOP	8
	22

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

Although it is difficult to equate sortie rates to numbers of aircraft, the following table displays possible rates for the three decision alternatives. The rates shown assume: (1) one to two sorties per week for a three aircraft deployment; (2) one sortie per day for a four to five aircraft deployment; and (3) one to one and a half sorties per day for a six to eight aircraft deployment.

Possible Sortie Rates

	I - Status Quo		II - Share SR-71		III - Terminate OXCART	
	A/C	Sorties	A/C	Sorties	A/C	Sorties
A. Strategic Reconnaissance	5	1 per day	3	1 - 2 per week	3	1 - 2 per week
B. Force Mobilization Reconnaissance	9	2 per day	5	1 per day	5	1 per day
C. General War Crisis/Brink	7	1.5 per day	6	1 - 1.5 per day	6	1 - 1.5 per day
D. SIOP	8	6 one time	8	6 one time	8	6 one time

II. RESOURCES

This section of the paper addresses the relative technology, operational capabilities, plans and schedules, support facilities, and the costs of the A-12 and the SR-71 aircraft.

The two aircraft systems, the CIA A-12 and the USAF SR-71 are almost equal insofar as general aircraft performance is concerned. The A-12 flies two or three thousand feet higher at any point along the flight profile for a particular range, although the altitude of both aircraft will vary five to ten thousand feet during the course of flight over denied territory. Intelligence gathering potential is similar in the two systems. The SR-71 has a capability for simultaneous operation of several sensors responding to different parts of the spectrum; the A-12 has a number of interchangeable single-sensor systems. Finally, the A-12 is the predecessor program; it is somewhat further along, having been declared operationally ready in December 1965. The SR-71 currently offers an interim operational capability for Cuba, with 45 days prior notice, and SEA, from Kadena, Okinawa with 90 days prior notice. SAC forecasts that the SR-71 fleet of aircraft will be fully operationally ready by August 1967.

BACKGROUND

The A-12 (OXCART) was conceived and designed as a successor to the U-2. Developed, procured and operated by the CIA, it is a single seat aircraft. The SR-71 is a successor aircraft designed and procured for SAC. It is a heavier, two-seat aircraft which carries a pilot and a reconnaissance systems operator. The programmed flight capabilities of the two aircraft are so similar that they can be treated as interchangeable.

In a typical flight profile, the aircraft would enter denied territory at an altitude of over 76,000 feet, flying at Mach 3.1. It would cruise at this speed, steadily climbing until exiting at maximum altitude, above 84,000 feet.

The SR-71 is based at Beale Air Force Base in California. The A-12 is based at Area 51, a classified facility in Nevada. Kadena Air Base, Okinawa has been provisioned for the A-12, for use in operations against Southeast Asia; some of this provisioning would be usable by the SR-71 if it were to be deployed to Kadena. Common fuel dumps have been established at five U.S.

and five overseas locations for operational and emergency use. There is about 60% commonality in AGE and base facilities.

AVAILABILITY

Readiness of the A-12 for reconnaissance operations with defensive EWS for operations over Cuba (from Nevada) and over Southeast Asia (from Okinawa) has been established. The SR-71 also can accomplish such missions with an interim operational capability for Cuba, with 45 days prior notice and Southeast Asia, from Kadena, Okinawa with 90 days prior notice. Specially developed EWS equipment for the SR-71 is scheduled for test within six months and forecast ready for operational use in about a year. Meanwhile, if a decision is made to use A-12 or U-2 EWS on an interim basis, a limited number of SR-71 aircraft probably could be so equipped within two to six months. An Okinawa deployment of the SR-71 would partially use pre-positioned assets of the A-12 program. The table below indicates the current status of the various equipments:

AIRCRAFT SYSTEMS

	Planned		Ready 10/1/66		Ready 5/1/67	Ready 8/1/67
	A-12	SR-71	A-12	SR-71	SR-71	SR-71
Operational Aircraft	8	26	7	8	18	23
Technical Objective Camera	13	18	7	0 (1)	9	18
Operational Obj. Camera	0	18	-	11	18	18
Terrain Objective Camera	0	18	-	16	18	18
Infrared Sensor	1	8	0 (2)	2	7	8
Side Looking Radar	3	24	0 (2)	9	19	24
50X1, E.O.13526	1	0	1	-	-	-
	1	0	0 (3)	-	-	-
Electro-Magnetic Recording or Signal Intercept Package	8	8	8	0	3	6
Maintenance Recording System or Birdwatcher	14	35	14	8	12	23
Electronic Warfare System	8	not estab	8	-	-	-
System XVII	2	-	0 (4)	-	-	-

In the above table, the three different types of A-12 cameras are lumped as "technical objective" cameras.

(1) Available Apr. 1967
(2) Available Jan. 1967
(3) Available Mar. 1967
(4) Available Oct. 1967

Capabilities

1. Sensor Systems: The A-12 is essentially a single sensor technical reconnaissance system; the SR-71 is a multi-sensor system with capability for simultaneous collection of photographic, high resolution radar, and infrared intelligence. Both aircraft can carry auxiliary ELINT/COMINT collection systems.

Sensor Parameters

System	Specif Reso feet		Achieved Resolution-ft		Linear Coverage Mi		Lateral Coverage Mi	
	A-12	SR-71	A-12	SR-71	A-12	SR-71	A-12	SR-71
Tech Obj	1.0-1.5	0.63ft	0.9-1.25 (3 diff Sys.)	*1.64	1600 to 3400	2140	39-63	2@5**
Oper Obj	-	1.75	-	3.0	-	4000	-	26
Ter Obj	-	16.5	-	16.5	-	8500	-	21
Infrared	40	85	60	not meas	4250	10,200	20	28
Radar	10x20	50 30	12x21	50 30	1500	4000	20	20 10

*Expect 0.63 ft. resolution by April 1967
**Two 5 nm swath widths located up to 19.5 nm on either side of track.

With the SR-71, both the Technical Objective (TO) Camera and the SLR can be operated at various range offsets, under the control of the Sensor Officer on board the aircraft. The A-12 has three different cameras, equivalent in mission to the TO camera, any one only of which can be carried on a photographic mission as needed. Detailed performances and modes of operation and interpretation of the photography from these cameras are different, and the choice will need be made on the particular needs of the mission. The A-12 has the capability of carrying a gamma spectrometer and particulate samplers as auxiliary equipments.

2. Range: Planned original objective range for the A-12/SR-71 aircraft was about 4000 nautical miles. Both aircraft are expected to achieve, in near term (within 12 months), an unrefueled range of 3200 nautical miles, with an eventual (2-3 years) extension of 3600 to 3750 nautical miles, extrapolated from a range of about 3000 nautical miles currently demonstrated in both programs with flight test aircraft. The extrapolation considers improvements planned in equipments and flight techniques. The A-12 has demonstrated a range of 2580 nautical miles on a simulated operational mission profile; the SR-71 has not yet attempted such demonstration in operational aircraft, but is expected to have a similar capability whenever operational mission simulations are exercised. The total range of both aircraft can be extended by aerial refueling. The A-12 has a capability for five refuelings and has currently demonstrated four. The SR-71 has an equivalent potential capability but currently is being limited temporarily to three refuelings because of nitrogen depletion and wing fuel tank sealant problems. The A-12 aircraft does not have wing fuel tanks. A new sealant is under development and is to be tested between now and June 1967. Tentatively, it is planned to incorporate the improved tank sealant in the SR-71 during IRAN's, expected to commence in the second half of 1967.

3. Altitude: At the current maximum-range flight operational mission profiles for the A-12, the altitude varies from 76,000 feet to 84,500 feet during the Mach 3.1 cruise. With higher gross weight, the SR-71 generally will be about 2,000 to 3,000 feet lower in altitude during a similar range profile. It is expected that long-term developments will give the A-12 a maximum altitude capability of about 94,000 feet at the end of cruise and the SR-71 about 91,000 feet. The maximum altitude demonstrated on flight test aircraft to date has been 90,000 feet.

VULNERABILITY

1. Non-Soviet Areas of Operations: Both the A-12 and the SR-71 aircraft are considered to be virtually invulnerable to current, known deployed fighters, AAA, and the S-band SA-2. The more advanced C-band SA-2 has a very low probability of success against the A-12 equipped with its current EWS and a limited capability against the SR-71 or A-12 aircraft without

its EWS. It is expected that the SR-71 will have at least an equivalent EWS for operations by the end of 1967 unless a decision is made to use A-12 or U-2 EWS sooner on an interim basis.

2. Soviet Union Area of Operation: With developing improved SA-2 and advanced fighter systems within the Soviet Union, it is expected that the Soviets have a higher but as yet undefined probability of success against both the A-12 and the SR-71 in case of attempted overflight. As hard evidence becomes available, particularly about improved SA-2, vulnerability assessments will be updated.

COSTS

This table summarizes the total programmed costs including costs for tanker support cargo and support aircraft sorties and Air Force supply issue. Figures are in millions of dollars by FY.

	FY 65 & Prior	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71	FY 72
A-12	610	89	97	110	102	95	93	88
SR-71	579	461	147	187	157	148	140	132
Engine R&D	270	64	57	45	35	25	15	5
Total Program	1459	614	301	342	294	268	248	225

SUPPORT

1. Base facilities: About 1500 persons, including military and CIA civilian employees, support the OXCART project at Area 51, Nevada. Of these, 650 are in direct support of launching operations and 850 are in indirect support such as logistics, fire-fighting, guards, etc. A total of twenty-one million dollars has been invested in Area 51 for runways, buildings, housing, navigational aids, water supply, etc. This base is now self-sufficient and no further investment is planned.

The SR-71 aircraft are assigned to the 9th Strategic Reconnaissance Wing at Beale Air Force Base, California. This wing has 1,300 persons assigned for direct support of the aircraft. Indirect support consists of 400 personnel at Edwards Air Force Base and 333 in base support augmentation at Beale AFB with activation of the SR-71 program there. Fifteen million dollars has been invested in construction of additional facilities to support the SR-71 wing.

Aerospace Ground Equipment (AGE) investment is $47 million for the SR-71 and $30 million for the A-12. Approximately 60% of AGE and base facilities are common or interchangeable.

2. Training: The A-12 pilot is fully responsible for operation of aircraft, sensors, and navigation. His basic training consists of a ground school course and 21 sorties in the A-12 for a total of 56 hours. Continuation training in the A-12 consists of 18 sorties per quarter; collateral training is in a F-101 aircraft. He also has 148 hours of academic and field training annually.

The SR-71 is operated by two officers: a pilot operates the aircraft, and a reconnaissance systems operator is responsible for navigation and systems operation. Training consists of 13 weeks of ground school, nine simulator rides, and 13 SR-71 sorties. Aircrew proficiency training continues with a minimum of 12 SR-71 sorties per quarter. Collateral flight training for the pilot is in a T-38. Simulator training is available at Beale AFB for both A-12 and SR-71 aircrews.

3. Tanker Support: The 903rd Air Refueling Squadron with 20 UE KC-135 modified aircraft stationed at Beale AFB is responsible for tanker support to both the SR-71 and the A-12. Each aircraft requires the support of one tanker for each training refueling. Deployment to Kadena, by either aircraft, would require three refuelings enroute. Each deployment of operational air refueling is supported by a primary and an air-spare tanker.

Fifty-two tanker sorties per month are required for A-12 training, 283 tanker sorties per month for SR-71 training. Each tanker aircraft is capable of 11 refueling sorties per month.

The planned tanker complement:

Beale AFB, Calif.	20 UE aircraft - 15 for support of A-12 and 5 UE for support of SR-71
McCoy AFB, Fla.	20 UE aircraft primarily for support of the SR-71
Little Rock AFB, Ark.	15 UE aircraft primarily for support of the SR-71

4. Film Processing and Interpretation Support: A-12 sensor films would be processed at Eastman Kodak Company in Rochester, New York. This facility is staffed with 211 people and is presently being used for other NRO programs; readout would be at NPIC.

The SR-71 program has a processing and interpretation squadron attached and in-place at Beale AFB. Manned with 400 personnel, it has a capability of deploying detachments to overseas bases. Coverage can be provided in six hours and initial photo interpretation reports can be provided by this unit 12 hours after a landing at Beale AFB. Similar timing capability is available for the A-12 at Eastman Kodak Company or the 67 Recce Tech Squadron Unit at Yakota AFB, if deployed to Kadena.

In general, photographic product from either program could be processed at the SR-71 facility (at Beale or where deployed), at Eastman Kodak or at the 67 Recce Tech Squadron. Timing for initial and final readout is dependent upon location of the SR-71 facility, operational aircraft landing base and/or flying time to transmit product to Eastman Kodak Company and to Washington, D.C.

5. Support Aircraft: The A-12 program uses eight F-101 aircraft for pilot proficiency training and A-12 chase. A C-130 aircraft is provided for personnel movement and classified cargo such as cameras, etc. An H-43B aircraft is used at Area 51 for search and rescue and paramedic jump training. There are two T-33 aircraft for rapid transportation and jet qualification of pilots. One U-3B aircraft is available for emergency air evacuation, search and security patrol of the area.

The SR-71 wing has six T-38 aircraft in direct support of pilot proficiency training. Two T-29 and two T-33 aircraft plus base assigned aircraft are shared by the SR-71 program. Both programs use MAC aircraft as needed for additional logistic support.

6. Kadena Support: The A-12 program has pre-positioned 1,000,000 pounds of equipment at Kadena Air Base. Construction necessary to support operational missions is completed. Nineteen persons are in place to maintain equipment and facilities for immediate use.

A-12 operations from Kadena would be commanded and controlled from Headquarters in Washington. Operational missions can be flown from Kadena ten days after mission approval.

The A-12 program plans 225 persons deployed to Kadena during operations. The A-12 program can support ~~twelve~~ NINE operational missions per month with three deployed aircraft. Use of these facilities by the SR-71 would require small extension to the hangar and pre-positioning of some additional supplies and AGE. The SR-71 program would have one sortie per day with 4 aircraft or one sortie per week with 2 aircraft. SAC estimates an operational capability about 90 days after notice to deploy. The SR-71 is programming 363 persons to Kadena (for one sortie per day rate of operation) for support of the SR-71 and photo lab.

III. MISSION REQUIREMENTS

This section discusses the requirement for the advanced aircraft and compares current and projected capabilities of the advanced aircraft with those for satellites and unmanned drones. For the purposes of this study, we have found it useful to consider four basic mission requirements:

1. Strategic reconnaissance is peacetime reconnaissance, primarily of the USSR, China, and their allies. It provides routine intelligence on technical, military and economic developments and capabilities. To a much more limited extent, this reconnaissance is also conducted against neutral powers.

2. Force mobilization reconnaissance would be directed primarily against China and the European satellites in case of indications that preparations were under way for attack against other nations. This reconnaissance might also be needed against neutrals.

3. Reconnaissance for general war crisis would be directed against the Soviet Union (and in a number of years against China) in case of a very intense crisis or of intelligence warning that the Soviet Union might be preparing for strategic attacks against the United States or Europe.

4. SIOP reconnaissance would be aimed at the Soviet Union, after a general war broke out, and be against targets that were to be struck by U. S. strategic forces.

A. Strategic Reconnaissance

Strategic reconnaissance is the routine collection of intelligence data during peacetime on technical progress; industrial and urban development, military force deployment, and military readiness of foreign nations. The principal target areas for this mission are the Soviet Union, China, and their allies. Currently, the strategic reconnaissance mission against these areas is being conducted primarily by satellites with unmanned drones and U-2's being used against China.

In the table below, we compare the relative capabilities of the advanced aircraft to conduct strategic reconnaissance against central China. The USSR is the other primary area where there is an extensive strategic reconnaissance requirement. A comparison for the Soviet Union between the high performance aircraft and satellite and drone capabilities is essentially the same except that the following additional factors favor satellites over the aircraft:

1. The area of the Soviet Union is almost twice that of China.

2. The more northerly location of the Soviet Union favors more rapid coverage from satellites in polar orbits.

3. There are currently more than ten times as many intelligence targets in the Soviet Union as in China.

4. Soviet air defenses are a generation ahead of the Chinese.

5. The risk of incident through loss of an aircraft over the Soviet Union is high.

6. The USSR has tacitly acquiesced to satellite overflights.

At Present, USIB has established 340 high resolution targets in central China to be covered yearly with 50% coverage required every 6 months. On a monthly basis, the requirement and current and projected coverage are as follows:

	Target Looks/Month	Targets Accessible
Current USIB requirement	28	-
Current satellites (normal operation)	32	100%
Current drones (10 flights/month using 147H)	260	about 80%
Current U-2 (4 flights/month)	400	100%
Advanced satellites (normal operations in 1969)	300	100%
Advanced drones (5 flights/month in late 1968)	280	80-90%
OXCART/SR-71 (4 flights/month)	240	70-80%

For current drones and the U-2, the above represent estimated capabilities, not the results of actual operations.

Use of the OXCART or SR-71 aircraft over China for strategic reconnaissance in the next several years seems to be contingent upon:

1. A many-fold increase in the required rate of target reconnaissance; or

2. An unwillingness to use the more vulnerable 147H series drones or the U-2 aircraft over the Chinese Mainland; or

3. The need for the spot targeting capability of the aircraft to cover small areas and special events; or

4. Confidence that the advanced aircraft are almost invulnerable against current defenses.

Beyond 1969, additional factors will probably argue against use of the aircraft:

1. Satellites with improved coverage and resolution;

2. Drones with increased range and survivability;

3. Improved Chinese air defenses.

Accordingly, the requirement for using the aircraft for strategic reconnaissance seems limited to two situations:

1. Reconnaissance of Communist or neutral nations outside of the Soviet or Chinese Bloc (such as Cuba or, for example, in the Middle East.)

2. High priority spot targeting in China.

Neither of these uses creates a high demand for sorties.

B. Force Mobilization Reconnaissance

This requirement is to detect and survey the mobilization and the build-up of conventional or nuclear forces in major areas other than the Soviet Union itself. Areas and situations that might be targeted include:

1. South China and North Vietnam if there were indications that a massive intervention were under way by the Chinese;

2. Manchurian China and North Korea if a threat seemed to be developing against South Korea and U. S. forces stationed there;

3. Cuba if current reconnaissance indicated that the Soviets were introducing new weapons;

4. East Germany, Poland and Czechoslovakia if there were indications of a Warsaw Pact build-up, or if there were an East German uprising and Soviet intervention;

5. Sino-Indian border at the request of the Indian Government for both warning and tactical intelligence;

6. Middle East or South America.

A requirement for such reconnaissance could be characterized as follows:

1. In the early phases of the reconnaissance, the collection would be targeted against national needs for broad situation assessment and strategic warning. If the conflict continued or escalated, the tactical intelligence requirements of U. S. or allied commanders would be added so that coverage would need to become more frequent, to be directed at additional targets, and to produce more detailed data on most targets. For example, after the initial detection of offensive missiles in Cuba, the preponderance of reconnaissance in Cuba (from high level U-2's and from low level TAC and Navy aircraft) supported planning of air

interdiction and invasion. Similarly, most of the current reconnaissance in Southeast Asia is used by MACV, CINCPAC and SAC. In short, a situation requiring CIA missions for national intelligence such as BLACK SHIELD using three aircraft for nine sorties a month could develop into one requiring a six aircraft SAC effort for both national and tactical needs providing 30 sorties a month.

2. The area to be covered is liable to be oddly shaped and smaller than continental areas for which satellites are most efficient.

3. Reconnaissance may be needed suddenly (initial coverage in a day or two), frequently (daily), and up-to-date (only several days at most from an event to an informed decision maker).

4. The target system will be ill-defined at first and dynamic throughout the period. There will be a constant need for both search and spotting.

5. The area may be defended by quite sophisticated air defenses that would argue against using U-2's or current unmanned drones. It may be very much in the U.S. interest to avoid losses of reconnaissance vehicles.

6. In the early stages of the crisis, tactical intelligence might be necessary but use of the advanced aircraft to satisfy this need might be preferable to tactical aircraft which might disclose U.S. intentions.

One typical situation is the South China - North Vietnamese area. The following table compares the advanced systems, satellites and drones against the current USIB list of 178 targets with respect to three criteria:

	Target Looks/ Day	Endurance (Mos)	Minimum Response Time (Days)*
OXCART/SR-71 (one sortie/day)	32	indefinite	1
Current Satellites (one KH-4 and one KH-8 continuously aloft)	4	1 - 2	3 - 7
Current Drones (one sortie/day)	30	6+	1
Future Satellites (one KH-9 continuously aloft)	15	2	2 - 3
Future Drones (Whitehawk, 1 sortie/day; TAGBOARD, 1 sortie/week)	20	12+	1

*Time from order to national intelligence product. Assumes that the aircraft and drones are deployed and satellites have 20 days of warning before order.

For the other areas against which this type of reconnaissance might be needed, the numerical comparisons are somewhat different since weather, latitude, target composition and area all vary. However, the major conclusions are about the same:

1. Today, the advanced aircraft are unique because of their high survivability, short response time, and long endurance. The drones come next closest to meeting the needs but are currently very vulnerable against sophisticated defenses.

2. The future drones will match or exceed the aircraft in survivability. At that point, the main disadvantages of the drones will be less reliable

recovery and somewhat shorter range (although this is not a major problem in peripheral areas).

3. In those situations where conflict has already escalated to the point that reconnaissance by tactical aircraft is underway (such as in North Vietnam today), then this capability can go far to supplement the advanced aircraft.

4. Current satellites fall far short of the manned aircraft except for survivability. The future satellites will provide much improved target coverage at high resolution. If additional quick reaction capability is provided in the KH-8 and KH-9 programs, or if a real-time readout is developed for the KH-8 system, or if MOL is developed, the satellites will be more competitive but still fall short of the flexible, intense, rapid, and enduring capabilities of the advanced aircraft.

C. General War Crisis and Brink

This is that requirement situation in which there is an intense international crisis or strong warning that the Soviets (or later the Chinese) are alerting their strategic forces for a possible attack.

A major justification of the SR-71 fleet at the currently approved level has been its capability to overfly the Soviet Union in such a situation with six or more aircraft simultaneously and on very short notice. The Cuban missile crisis could have become an outstanding example of such a situation if escalation had proceeded several more steps. Although our information on activities within Cuba and adjacent waters was almost complete, we were virtually ignorant at the time of the posture of Soviet strategic offensive and defensive forces, ground forces, nuclear weapons, and in-port naval activities.

The specific targets to be reconnoitered in such brink-of-war situations would depend upon the particular cause and nature of the crisis. If at a time of relative calm intelligence indicated the strong possibility that the Soviets were preparing to launch a "bolt out of the blue" attack, then the reconnaissance targets would probably be limited to long-range air staging bases, fighter dispersal bases, submarine ports, nuclear storage sites, soft missile sites, and similar targets. However, if the need for crisis reconnaissance of the Soviet Union stemmed from a major international crisis, such as a Berlin crisis accompanied by threats of Warsaw Pact aggression against NATO, then some overflight reconnaissance capabilities would be diverted from the strategic target system and applied to tactical air, ground forces, and transportation and marshalling centers. The value of such reconnaissance would depend on many conventional factors such as weather and survivability. Most important, for many of the targets, the value of cloud free, high resolution photography would depend on developing beforehand a data base that correctly predicted the existence and meaning of different activity indicators for different classes of targets.

In one representative SAC analysis of this type of crisis reconnaissance, 87 targets in the Soviet Union are used. Six SR-71 sorties launched simultaneously from Beale have access to about 80 percent of these targets using their photographic and IR systems. These missions use three aerial refuelings (assuming a 3300-3600 mile tanker-to-tanker range) and require about 10 hours. After completion of the mission, first complete readout can be available 12 hours after landing. This yields a national intelligence product in about 38 hours or 1 1/2 days after the order to "go" is given.

Because of the somewhat limited range of the SR-71's, some areas of the Soviet Union are not readily covered. The area west of the Urals can be covered by north/south flights that are refueled on entering and departing the Soviet land mass. The eastern quarter of the country can be reached by aircraft refueling over Alaska which then either penetrate and return or continue on to the Sea of Japan for additional refueling. The central third of the Soviet Union is not practicably accessible. However, the primary crisis targets in this sector are ICBM sites and heavy bomber bases and these can be sampled with overflights of the east and west USSR.

Brink-of-war reconnaissance of the Soviet Union by the OXCART or in conjunction with the SR-71 is possible. High resolution photography would be the major product of such sorties (COMINT and ELINT would be less valuable; side-looking radar would be much less useful except in providing a view of undamaged targets for comparison in case of general war). The important point is that the OXCART possesses the brink-of-war capability without any developments other than those currently planned.

SAC has estimated that it will have a limited operational capability to generate six brink-of-war sorties by May 1967. This estimate assumes that SR-71 aircraft are not being maintained on SIOP alert and it provides a limited recycle capability. By late 1967 these limitations should be eliminated.

With regard to the availability of other means of overhead reconnaissance for the crisis or brink situation, the following points should be noted:

The limited range, high vulnerability and uncertain recoverability of current drones virtually disqualified them for this role. However, the future TAGBOARD will have a range almost equal to that of the advanced aircraft and a somewhat higher survivability. Accordingly, this vehicle can play a useful role in brink reconnaissance if reliable recovery can be achieved.

Using current satellites; the most competitive capability would be achieved by launching one or two KH-8 satellites in orbit such that each satellite covered the entire Soviet Union in two days. If one satellite were used, it could sample half the targets in one day and return its casette. (After the KH-8 has a two bucket capability, the second half of the target could be covered on the second day.) If two satellites were used, all targets could be covered within one day. However, development of a two-satellite, quick reaction capability for the KH-8 would require more than a year since an additional pad is necessary and ground station capacity must be increased. Resolutions of 3-4 feet should be possible.

With current KH-8 capability using one satellite and one bucket for example, half the SAC targets would be covered and intelligence produced in 48-60 hours versus the SR-71 covering about 80 percent of the targets in less than 24 hours. If two satellites were used, all of the SAC targets could be covered in about 30 hours.

Future satellite capabilities can be improved by:

1. Obtaining two-bucket, two launch-pad capability for the KH-8.

2. Putting real-time readout on the KH-8 so that response time is reduced to 2-10 hours (assuming favorable lighting conditions) for one hundred targets per day.

3. Using the MOL.

We have not performed the trade off studies that support the development or adaptation of any of these capabilities for brink-of-war reconnaissance. The investment has been made in the OXCART and SR-71 aircraft--it has not been made in these additional capabilities. However, the size of the fleet of the advanced aircraft that is needed in the future will depend on the extent to which these capabilities are developed.

A potential added advantage of the satellites relates to vulnerability and lower provocation in the current political environment of satellite acceptability. Depending on the particular history of the crisis including the role of reconnaissance and the use of signals, the simultaneous penetration of six aircraft would probably be extremely provocative and risk much greater escalation. Sudden launching of one or two satellites should be less provocative. Similarly, the aircraft may well be more vulnerable.

D. <u>SIOP or General War</u>

A major role planned for the SR-71 is reconnaissance during a general war with the Soviet Union. Operational concepts for this role are currently being developed in detail and being reviewed by the Air Force and the Joint Chiefs of Staff. In addition, operational capabilities must be developed and tested for maintaining these aircraft on a "hard" alert (ready for take off within fifteen minutes) and for operating with tanker aircraft at dispersed bases also on a "hard" alert. Accordingly, the capabilities detailed below represent best estimates at this time. The feasibility of providing a "hard" alert capability has not yet been demonstrated.

The specific targets and timing of the SR-71 fleet during and after execution of SIOP forces will depend upon a number of factors. Under current plans, a basic force of six aircraft will be maintained on "hard" alert at Beale with 18 tankers supporting this force on alert at four overseas bases. If strategic warning is received and if additional SR-71 aircraft are available at Beale, then these aircraft will be dispersed to Edwards, Palmdale and Area 51 as a back up force; 18 associated tankers will be dispersed to up to eighteen secondary bases overseas.

The post-SIOP reconnaissance by the SR-71 serves both national and tactical needs. It might provide national authorities with the only hard intelligence on how well the SIOP is being executed, how well weapons systems are performing, how effective are Soviet defenses, what damage is being inflicted. As such, the SR-71 can validate other indirect forms of situation and system assessment. Tactically, the SR-71 data would primarily be used for retargeting.

[redacted]

50X5, E.O.13526

Almost 80 percent of these are accessible to six SR-71 sorties (even though, as discussed above, the central third of the Soviet Union is not reconnoitered). The optimum use of the six primary alert aircraft is launch under positive control upon receipt of tactical warning or in case of pre-emptive execution. The SR-71 would then overfly the Soviet Union from the third to the sixth hour after execution. This tactic provides the earliest possible reconnaissance and places the hard alert force over the Soviet Union at a time when [redacted] 50X5, E.O.13526 [redacted] (Even this level of activity presents some threat to the SR-71.)

If the primary alert force is used in this way, the side-looking radar will provide the most valuable intelligence. This radar can provide intelligence independent of lighting and weather conditions and it would be only slightly affected by the heavy clouds caused by nuclear explosions and fires. Its 50' resolution would be adequate to pinpoint to within 150' actual ground zero of surface burst weapons. This resolution should also be adequate to indicate major damage to soft installations that have been attacked with airburst weapons. The photographic camera would provide much less information during this first wave of reconnaissance; the value of the COMINT and ELINT collection would be somewhat greater.

The information collected would be returned to the ZI with the aircraft landing at one of a number of pre-planned bases. A number of processing centers might be used. The Air Force is currently considering a proposal for a survivable reconnaissance data processing center to be located in a hardened TITAN missile complex near Denver. Also SAC's current operational concept calls for dispersal [redacted] upon receipt of a strategic warning (assuming these centers have not been deployed overseas during a preliminary crisis). Finally, it is possible that a number of soft processing and interpretation centers will survive Soviet strikes.

50X5, E.O.13526

The time required to process and transmit finished intelligence from first wave aircraft will depend on where the aircraft are recovered and what processing capability survives. In the best case, this time is probably about 12 hours after initiation of the SIOP for first flash reports.

If the secondary back up SR-71 force had survived, it could be used either on pre-planned missions reconnoitering targets not covered by the first force or it could fill in for those first wave aircraft that had aborted or not survived. Six to fifteen aircraft might be available at Beale or the three dispersal bases.

With regard to other means of collecting SIOP intelligence data, the following points should be noted:

Although there is general agreement that a satellite-borne side-looking radar is technologically feasible today, no satellite system is under development. There have been numerous studies that define such a system, describe its performance, and establish its likely cost. There have been no detailed studies that compare satellite radar systems with the SR-71; that analyze the cost-effectiveness of different levels of SIOP reconnaissance; that compare radar reconnaissance with other systems such as 266, TAPS and MSR; or that evaluate different satellite systems including ground-launch-on-tactical-warning, sea-based launch after initial exchanges, or launch 50X1, E.O.13526 during crisis. Satellite side-looking radar will not be operational before 1970.

Those studies that have been made of satellite capabilities suggest several factors.

1. The satellites would be somewhat more survivable than the aircraft assuming no concerted anti-satellite defense aimed at these vehicles (rather than at other satellites used for reconnaissance, communications, navigation and weather). The aircraft have support tankers which must survive. In both cases, there are similar problems in recovering data, processing it, and transmitting finished intelligence to decision makers.

2. The satellite system could cost a billion dollars over five years. After a large initial investment yearly operating costs would still be significant in order that training and proficiency launches could be made yearly.

3. The response time for significant target coverage in the satellite system would be several hours faster than the aircraft.

4. The satellite could provide a dual capability for strike assessment against both the Soviet Union and the United States. The domestic capability would be virtually free--only improved ground handling would be required.

IV. NEED FOR A SEPARATE OXCART FLEET

One of the principal questions that must be considered as a part of this study is the present and future need for the special covert and civilian characteristics of the separate OXCART fleet. As the analysis of alternatives demonstrates, termination of that fleet and closing its base would produce the greatest cost reduction both absolutely and relative to the decrease in possible mission coverage.

The special civilian and covert characteristics of the OXCART fleet affect:

(A) the foreign relations of the United States;

(B) the management of fleet operations.

The study group does not presume to have the overview necessary for a full analysis of the value of these characteristics of their effects. However, in the course of this study these matters have been discussed with persons who have been closely associated with both the OXCART and the U-2 programs and the following material has been gathered. It is presented to identify the question and to provide whatever assistance it may in the decision process.

A. Characteristics Affecting Foreign Relations

The covert characteristics of the OXCART fleet are those which have the major affect on the foreign relations of the United States with friendly, neutral or hostile nations.

In order to discuss the need for a covert fleet of manned reconnaissance aircraft, that covert capability must be defined by its present characteristics. The characteristics of the present capability are:

(1) An unknown operational aircraft reconnaissance capability at a highly secret and secure desert base. This must be qualified as follows:

(a) The presence of the base is probably known to the Soviets through their reconnaissance satellites as well as the purpose of the base as an operational site;

(b) The fact that the U.S. has a substantial number of aircraft with the necessary speed and altitude capabilities for reconnaissance under a military command is a matter of publicly confirmed record;

(c) The "exposed" military aircraft and the "covert" aircraft are of essentially the same configuration, especially at the level of public discernment (except for the single versus dual cockpits);

(d) Overseas deployment of the "covert" fleet at Okinawa (planned deployment site) would generate press inquiries and increase the number of individuals who would learn about the existence of the special aircraft fleet.

(2) Civilian sponsorship of the aircraft fleet which minimizes the chance of an overflight being labelled as an aggressive military act and permits:

(a) The pilot and the Government to legitimately maintain an assertion of civilian status and character in the event of capture (as in the Powers/U-2 case);

(b) The U.S. Government to maintain "plausible denial" in the event of an accident or "shoot-down" in which there is no survivor; and

(c) Friendly or neutral governments to assume a "no comment" posture.

The plausibility of denial is seriously limited by the fact that if the general configuration of the offending aircraft becomes known, the system will probably be identified as the latest known U.S. military aircraft asset. Also, in the Powers case, the fact that the CIA pilots are converted Air Force officers was a matter of public declaration by the Soviets.

These same conditions limit the "no comment" option for U.S. response to a foreign charge. However, civilian sponsorship does provide a better basis for friendly and neutral nations to maintain a "no comment" posture or to support the activity if it becomes a matter of serious international debate.

Other Covert Possibilities - Short of a Separate Fleet and Base. Under the alternative fleet structures, the characteristics discussed above would be lost or compromised by either: transferring some of the OXCART fleet to Beale Air Force Base; or assigning the SR-71 aircraft to perform covert peacetime reconnaissance missions.

There are some steps which could be taken to maintain as much of the existing cover as possible. For example, it would be desirable to retain some of the civilian crews as flight test crews to fly the covert missions.

The key factor in weighing the value of (and, hence the need for) the existing covert characteristics of a separate fleet and base is to decide what will be lost in:

(a) Penetrability of the existing cover;

(b) The ability of the opponent to exploit politically U.S. sponsorship (military or civilian);

(c) The likelihood that the Soviet or Chinese leadership would subjectively react with more alarm to a military pilot than to a civilian pilot in the event of capture; and

(d) The ability and disposition of friendly or neutral nations to avoid reacting publicly to an incident or to support the activity by the United States.

The probable loss in these areas of foreign relationships through terminating the OXCART fleet is limited by the following factors:

(1) The general aircraft configuration is reasonably attributable to the U.S. military alone;

(2) The deployment of the covert fleet to advanced bases (as planned for some missions) exposes and establishes the use of a military base and involves many more people;

(3) Civilian pilots reporting to military superiors could be used (as has been true in the case of the U-2). This should minimize, to the extent possible, subjective reactions of alarm on the part of Soviet or Chinese leadership. However, it would not be plausible in this case for the U.S. to assert that the operation was a civilian undertaking.

B. Characteristics Affecting the Management of Fleet Operations

The civilian management and control of the OXCART fleet has the major effect on fleet operations both outside and inside the United States. The civilian character of the OXCART fleet management structure must be qualified by the fact that many of the key personnel in the OXCART operating program are military, although on detail to a civilian agency.

1. The CIA has a unique ability to deal with foreign governments through intelligence channels in matters such as basing arrangements and after-the-fact cover stories. For example, in the event of foreign deployments certain foreign governments would be apprised of CIA sponsorship. There is little reason to think that the CIA could not exercise its unique abilities to arrange for the use of aircraft under a military command if the covert nature of the mission was retained through the use of civilian pilots in unmarked aircraft. However, it would be more difficult to secure foreign basing for a program under military sponsorship.

2. The degree of command authority and control by national leadership may be more direct and less diffused in the case of the civilian management structure.

3. The channels for the flow of intelligence to the decision-makers may be more direct and timely in the case of a civilian command structure.

Concerning the last two points, the relative degree of control and timely communication between the highest national authorities and the two military and civilian command structures in question (CIA and SAC) can only be assessed by persons who have been directly involved in those processes. However, the "303" committee would probably be the approval channel for clearing the use of both of these aircraft. Once the Presidential approval has been granted, either command structure would be equally responsive.

4. <u>The CIA-contractor management relationship</u> is reportedly more capable of responding quickly and with greater flexibility to the need for "quick fixes" and design changes which have been legion on what has been a development aircraft in an operating deployment. Military command structures are usually more "standards" bound. This "quick reaction capability" should not be as necessary in the future as the fleets become more operational. Also, the fact that the reconnaissance satellite programs, which have the same development/operational characteristics, have been placed under military management and control indicates that the military are capable of unusual administrative arrangements.

5. <u>The CIA-contractor management techniques</u> have permitted the maintenance of the aircraft with contractor crews which have the value of a high level of experience and continuity on experimental-type aircraft in general and with specific flight vehicles in particular. This could be achieved to a large extent in the unique SAC Wing through the selection and retention of Air Force maintenance crews with the highest qualifications. This would take exceptional orders from the normal military personnel system in the fact of other operational demands. However, some special arrangements have been made already.

V. ALTERNATIVES

In considering the possible alternatives for merging the assets and/or reducing the programs of the two aircraft fleets, this section of the report provides:

A General Analysis of:

1. Actions to Curtail the Combined Programs
2. Factors Affecting Fleet Size
3. Costs of Alternative Fleet Structures

Alternatives for Decision including:

1. Continue the Currently Approved Structure
2. Mothball OXCART Aircraft and Share SR-71 Fleet
3. Terminate the OXCART Fleet

General Analysis

Actions to Curtail the Combined Programs

Three approaches to curtailing the programs have been considered.

1. The fleets can be consolidated at one base. They can be operated under separate management, or with varying degrees of common management, or all aircraft can be assigned to SAC to serve both covert and military requirements.

With regard to the economic advantages of consolidating the full or reduced OXCART fleet at Beale, estimated savings are small--$30 to $40 million over five years. Three factors contribute:

a. In moving to Beale, there are one-time construction and moving costs of $15 to $20 million. Beale is currently overcrowded and growing.

b. Savings are not achieved in tanker operations since tanker support is already consolidated at Beale.

c. The OXCART and SR-71 aircraft are sufficiently different so that only minor savings are realized in consolidating maintenance; extensive costs are required to train blue-suit personnel and a high turnover of these personnel is assumed.

2. <u>The tempo of the program can be slackened.</u> Flying hours can be decreased. Flying at high mach numbers can be curtailed. Flight test activities can be reduced with concomitant reduction in aircraft modification and overhaul frequency. Development and supporting programs (such as sensors, navigation systems, or processing) can be reduced. And, in the case of the SR-71, the crew-to-aircraft ratio can be reduced.

The economic advantages of these steps are very questionable since the programmed flying hours are reduced by 28% while costs are reduced only 9%. Also, reliability, proficiency, and endurance would suffer since the aircraft are modernized at a slower rate and since there are fewer trained crews.

3. <u>The size of the fleets can be reduced.</u> Aircraft can be destroyed and cannibalized, or stored in "mothballs", or grounded and maintained in near flyable condition, or assigned to other programs.

We have considered four ways of reducing the size of the fleet.

a. <u>Dispose of aircraft.</u> There does not seem to be any requirement to utilize OXCART or SR-71 aircraft in the YF-12 program or to reconfigure some of the aircraft as manned bombers. NASA and FAA have shown some interest in utilizing one or two of the aircraft but this use would have a very minor effect on costs. A strong disadvantage in destroying aircraft at this stage of the program is the uncertainty as to future needs and attrition and the possible political repercussions in Congress or in the press.

b. Cannibalize aircraft and utilize spare parts. We estimate that about $3 million one-time savings could be achieved per aircraft if they were used as a source of spare parts. These savings are low because of two factors. First, spare parts for the aircraft are already very expensive since there is low demand for these rare parts. If additional spares are generated by cannibalizing aircraft, then the already high unit costs would increase even more due to the reduced volume. Second, the operational aircraft and engines are still undergoing fairly high rates of modification since the programs are still in an early stage and are on the forefront of the state-of-the-art. Many of the spare parts made available through disposal of aircraft become obsolete.

Considering the small savings in utilizing the aircraft for spare parts, and the low cost of "mothballing" aircraft, we recommend against either destruction or spare parts use and have not included aircraft destruction in any of the specific alternatives below.

c. Maintain aircraft in a "grounded-but-flyable" status. Under this alternative, some aircraft would be maintained at a near operational capability but not flown. Savings would be realized in fuel, spares, and overhaul costs. Modification kits and occasional overhauls would be needed to keep these aircraft abreast of the flying fleet. The grounded aircraft would be converted to flying status if attrition of the flying fleet became excessive or if requirements grew. The savings per aircraft year average 12-14 percent; for example, cost of one SR-71 plane-year is $5.08 million and this is reduced by $.72 million if the aircraft is maintained in a grounded-but-flyable status. Since comparable savings can be achieved by flying all aircraft at a lower utilization rate, none of the alternatives below include reductions by placing aircraft in the grounded-but-flyable status.

d. Store aircraft. The cost of storing aircraft (including security and inspection) is small. For example, the five-year cost of mothballing ten aircraft is less than $1 million per year. On the other hand, the cost of removing one aircraft from storage and making it operational increases at about $1-1 1/2 million per year (at least initially) so that by 1972 it costs about $7 million to restore a mothballed aircraft to the fleet. This cost assumes that the other aircraft are being flown, that modifications are being developed, and that the operating fleet is being improved so that at the time of demothballing, the removed aircraft must be extensively overhauled and updated.

There is a risk associated with mothballing that the aircraft and parts will deteriorate over time so that demothballing may prove much more expensive than anticipated. Also, if a block of aircraft are demothballed, it will become increasingly difficult over time to assemble engineers and technicians to update and check out the aircraft.

In the alternatives below where we reduce the size of the fleet, we have mothballed aircraft rather than destroying them or maintaining them in a "grounded-but-flyable" status. However, considering the costs and risks of removing the aircraft from storage, particularly in the out years, we conclude that mothballing makes sense only if there is reasonably high probability that the mothballed aircraft will not be brought back into the fleet. In other words, mothballing is a hedge against unanticipated increases in requirements or unexpectedly high attrition.

Factors Affecting Fleet Size

By July 1967, the combined fleet assets will be 11 OXCART aircraft (including 1 test aircraft and 1 trainer) and 30 SR-71 aircraft (including 2 test aircraft and 2 trainers). This estimate assumes no attrition between now and July 1967. According to an informal Air Force and SAC estimate, all SR-71 aircraft and sensor systems will be fully operational by August 1967.

There are four major factors that determine the size of the fleet required: (1) attrition; (2) requirements; (3) feasibility of satisfying requirements with other vehicles and (4) advantages and inefficiencies related to maintaining separate fleets.

1. Attrition. It is impossible to project with certainty the attrition to either fleet during the next five years. The initial aircraft have been operational for only a year and the program represents an extremely advanced and unique technology. Current plans assume that three SR-71 and two OXCART aircraft will be lost by 1972 so that the total fleet of operationally configured aircraft will be reduced from 35 to 30 at that time. These estimates assume an attrition rate that is about the same as that experienced by Air Force fighter aircraft over the past ten years. If attrition should unexpectedly double or triple, then the SR-71 fleet might drop from 26 to 14-18 operational aircraft and the OXCART fleet might drop from nine to five. However, we consider it very unlikely that these high losses will occur.

2. Requirements. Obviously, the size of the fleet depends on the number of different types of missions that must be flown, the number of operationally configured aircraft that must be available to support each mission, and the probability that a number of these missions would have to be simultaneously conducted under the worst case. These factors are discussed in the Requirements section and under Alternatives for Decision below.

3. The Use of Other Vehicles. As pointed out in the requirements section, satellites and drones can perform some reconnaissance in place of the OXCART and the SR-71. We expect that the ability of the satellites to substitute for the advanced aircraft will increase during the early seventies as new systems are introduced. For example, any one of the following systems could have a significant effect on the need for the advanced aircraft in situations short of general war: increased numbers of satellites and launchers maintained for quick reaction, real time readout of photographic intelligence, the MOL, quick reaction capability with the KH-9, or TAGBOARD. For SIOP reconnaissance, satellites with side-looking radar appear especially attractive.

4. Maintaining a Separate Fleet. The advantages of a separate, civilian, and covert fleet are discussed in Section IV. If a separately managed covert capability is maintained, then the total number of available aircraft will probably be less effective than if the fleet had been operated under a single management. This would be particularly true in an escalating situation where reconnaissance targets and procedures were changing rapidly. OXCART aircraft and crews can be turned over to SAC under a condition of high tension or war. But if the OXCART capability is really going to be effective, the OXCART pilots must have trained for their missions before the crisis arises. And even with good coordination and planning, when the fleet is turned over, it will still possess some specialized capabilities and have been trained for some unique functions. Accordingly, in order to make the best coordinated use of both fleets at that time, there will probably have to be some readjustment of aircraft assignments and concomitant degradation in fleet effectiveness.

Costs Comparison of Alternative Fleet Structures

We have costed five basic alternatives:

Table 1 compares the costs and activity levels for each of these alternatives. The costs include estimates of cost for support aircraft, tanker support and basing. The activity levels are based on numbers of operationally configured aircraft except in Alternative V where flying hours are used. In cases where aircraft are mothballed, the costs include security and inspection costs for the stored aircraft but do not include any costs for removing the aircraft and updating them. This cost is estimated to be about $4 million per aircraft if the aircraft is removed in three years and about $7 million per aircraft if removed in five years.

Table 1 compares percent cost reduction with percent fleet reduction. These reductions are commensurate in Alternatives III and IV, where the OXCART aircraft are stored. In the other cases, the cost reductions are relatively small for two reasons:

1. The ratio of fixed costs in both programs is high; and

TABLE I

COMPARISON OF ALTERNATIVES

Alternative	No. of Stored A/C	No. of Operational A/C 2/	Costs ($ Millions) 1/ FY68	FY69	FY68-72	Diff. in 5-Yr Costs	Percent Reduction of Costs	Percent Reduction of Activity
I.- Status Quo								
a. Separate Basing	0	35	341	295	1377	-0	-	-
b. Consolidate at Beale	0	35	346	287	1335	-42	3.1	0.0
II.-Reduce OXCART								
a. Separate Basing	5	30	323	276	1302	-75	5.4	14.3
b. Consolidate at Beale	5	30	339	270	1272	-105	7.6	14.3
III.-Mothball all OXCART	11 3/	26	296	207	1012	-365	26.5	25.7
IV.-Mothball OXCART and Share SR-71's	11 3/	26	313	231	1125	-252	18.3	25.7
V.-Tighten Belt	0	35	314	264	1247	-130	9.4	28.3 4/

1/ Costs include estimates of support aircraft, tankers, and mothballing. They do not include costs for removing from mothballs.
2/ As of 1 July 1967 assuming no aircraft lost before then. Numbers do not include 1 OXCART trainer, 1 OXCART test, 2 SR-71 trainers and 2 SR-71 test.
3/ Include OXCART test and trainer aircraft.
4/ Based on flying hour reduction.

2. The volumes entailed in variable costs are so small and the items so unique in the industry that a reduction in volume of purchase is substantially offset by an increase in unit cost.

Alternative I - The status quo. Under this alternative, both fleets would be maintained so that by July 1967 there would be about 35 operationally configured aircraft; and, assuming planned attrition, about 30 in 1972. Two variations of this alternative have been developed.

I-a. Current basing arrangements are continued at Area 51 and Beale.

I-b. Area 51 is closed in July 1968, at which time all OXCART aircraft are transferred to Beale. As soon as possible thereafter, the OXCART is placed under SAC management and some aircraft maintenance becomes "blue suit". All major airframe and engine overhaul for the SR-71 and the OXCART continue to be contracted.

If the OXCART were placed under SAC management at Beale, it would still be possible, at little difference in cost, to train and use civilian flight crews for "covert" missions.

Alternative II - Reduce the size of the OXCART fleet. Under this alternative, five OXCART aircraft would be stored by July 1968. During FY 1968 flight activity would be reduced by almost one-fourth. Two variations of this alternative, similar to those for Alternative I, have been developed. Under Alternative II-a, separate basing would continue for the OXCART. Under Alternative II-b, Area 51 would be closed by July 1968 and the remaining operational OXCART aircraft would be transferred to Beale and consolidated under SAC management. Similar to Alternative I-b, under Alternative II-b it would be possible to maintain civilian crews for the OXCART aircraft at little difference in cost.

Under this alternative, the SR-71 fleet would be maintained as currently planned.

The major reason for selecting Alternative II would be to maintain an austere option for employing "covert" reconnaissance. If only one or two of the remaining OXCART aircraft were lost before 1970, then the mothballed aircraft would not be withdrawn. If the attrition of the remaining OXCART aircraft should be much higher than planned, for example, if three or four of the remaining aircraft were lost, then the mothballed aircraft would be withdrawn. As indicated above, this cost would depend on when it was incurred. In 1970 it would be about $14 million for three aircraft; in 1972 this cost would be $21 million. However, we estimate that the likelihood of such demothballing is less than 10-15 percent.

Alternative III - Store the OXCART fleet. Under this alternative, by January 1968 all of the OXCART aircraft would be stored and Area 51 would be closed. The OXCART capability would start being reduced in July of 1967 so that by October 1, 1967, the capability would be reduced to five operational aircraft with termination of the program by January 1, 1968. This would produce the maximum net savings of $365 million including $45 million in FY 1968.

The rationale behind Alternative III - store the OXCART fleet follows the analysis in the requirements section and assumes that aircraft will only be removed from mothballs in large blocks--say five aircraft--in one of the following cases:

1. The requirement for SR-71 capabilities remains about the same as today but the fleet suffers high attrition so that, by 1972, more than six aircraft have been lost and less than 20 operationally configured aircraft remain.

2. The attrition of the SR-71 fleet remains as currently projected (with 3 aircraft lost by 1972) but the number of aircraft available to perform currently defined or newly assigned missions is judged inadequate. If it were planned that one OXCART aircraft would be removed from storage for every SR-71 aircraft lost, it would probably be preferable to mothball only about half of the OXCART fleet, to transfer the remaining aircraft to Beale under SAC's command, and to fly the transferred aircraft as little as possible until anticipated attrition of other aircraft developed.

This alternative is a hedge against high SR-71 losses or increased requirements. Under these conditions, the expected cost of demothballing six aircraft is $24-40 million but we estimate that the likelihood of incurring this cost is only 10-15 percent.

Alternative IV - Mothball OXCART Aircraft and Share SR-71 Aircraft. Alternative IV is a variation of Alternative III. Under this alternative the operational SR-71 fleet would consist of 21 aircraft (including two test aircraft and one trainer). Instead of closing Area 51 in Fiscal Year 1968, eight operational SR-71's and one SR-71/B trainer are transferred to CIA control and maintained at Area 51. The total flying time on all SR-71's was assumed to be approximately 6,000 hours per year (4,500 hours per year at Beale AFB and 1,500 hours per year at Area 51). It was further assumed that the SR-71 test program would be maintained at Beale AFB under SAC management. Modifications resulting from this program would apply to all SR-71 aircraft.

Under this alternative, a separate fleet would be maintained at Area 51 with the principal advantage being related to the retention of the separate fleet. (See Section IV.)

Alternative V - Maintain both fleets but reduce the tempo of the program. Under this alternative, all OXCART and SR-71 aircraft would be retained and flown but the program would be curtailed by such means as:

1. Reduce SR-71 flying hours by 30 percent and reduce the crew-to-aircraft ratio from 2:1 to 1.5:1.

2. Reduce the flying hours for the OXCART program by 20 percent.

3. For both programs, reduce the level of flight testing and consequently the frequency and extent of major overhauls.

4. For both programs, do not procure additional sensors. Under this alternative, the aircraft would remain separately based at Area 51 and Beale.

A major motivation for developing Alternative V was to indicate that, as long as both fleets are maintained, savings achieved by reducing activity levels are as great as the savings achieved by mothballing aircraft.

The operational impact of this alternative is much more difficult to express. Since the number of aircraft would remain as high as in Alternative I, The status quo, it can be argued that the four basic missions could still be undertaken simultaneously during the time of crisis or general war. However, reliability, proficiency, and endurance would surely suffer since the aircraft are modernized at a slower rate and since there are fewer trained crews.

Alternatives for Decision

In light of the general analysis above, the following three alternatives emerge as the most relevant options in the major policy decision to be made at this time.

I. Continue both fleets at the currently approved levels.

II. Mothball the OXCART aircraft and share the SR-71 fleet at separate bases. (In the general analysis this is discussed as Alternative IV.)

III. Terminate the OXCART fleet at the time the SR-71 fleet becomes fully operational.

Each alternative with its costs and possible mission coverage is described below. General arguments for and against continuing the presently approved levels of aircraft are presented first followed by the two reduced fleet alternatives with arguments for each.

Alternative I

Maintain the status quo and continue both fleets at the currently approved levels. This provides for two bases and:

Total approved aircraft	41
Less: Training and test aircraft	-6
Aircraft under major overhaul	-3
Assumed attrition through 1970	-3
Available operational aircraft through the end of 1970	29

Costs: ($ in millions)	FY 1968	FY 1969	FY 1968-72
	$341	$295	$1,377

Possible Mission Coverage	Operational Aircraft		
	OXCART	SR-71	Total
A. Strategic Reconnaissance	3*	2*	5
B. Force Mobilization Reconnaissance	4*	5*	9
C. General War Crisis/Brink		7*	7
D. SIOP		8	8
	7	22	29

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

For the SR-71 fleet, some variations on the mission assignment above are possible.

1. Deploy six aircraft to a third theater with the result that the crisis or SIOP-alert capabilities are significantly degraded.

2. In order to generate more crisis sorties, use the strategic reconnaissance, force mobilization or SIOP fleets for a second wave of crisis reconnaissance with the possible result that a SIOP posture could not be resumed until the crisis aircraft were recycled.

3. Generate a second-wave, dispersed SIOP capability by dispersing the crisis alert aircraft or by recalling the theater deployed aircraft. If the combined capabilities of the OXCART and the SR-71 are included, then any one of these three additional capabilities can be achieved without the full restrictions or degradations that are indicated.

The major arguments in favor of the currently approved fleet size are:

1. The presently planned fleet will insure a simultaneous capability for:

a. Strategic, force mobilization and tactical reconnaissance in at least two theaters.

b. Crisis reconnaissance of the Soviet Union with at least six simultaneous sorties every three or four days for at least several weeks.

c. At least six aircraft continuously on SIOP hard alert for SIOP access.

We feel that the strongest argument in favor of a larger fleet is that if both the Soviet Union and the U. S. continue to preserve their capabilities for assured destruction, then crises can become more intense and prolonged (as there is less inclination to escalate to a general war). The global, prolonged, intense crisis may require simultaneous reconnaissance capabilities of the kind indicated above.

2. The presently planned fleet presents a more readily available hedge against sudden, unexpectedly high attrition. If such attrition should develop, and if the requirement for manned reconnaissance by advanced aircraft is still high, the additional aircraft will be needed to compensate for losses only after three years. (This argument assumes that aircraft stored as a hedge against high attrition would take too much time to reconstitute.)

Fleet Reduction Alternatives

The two fleet reduction alternatives which follow are both supported by the following general arguments in favor of reducing the total number of operational aircraft. In the first part of this section, we examined ways in which the fleet size could be decreased. In the two alternatives which decrease fleet size the aircraft removed from the operating fleet are mothballed rather than destroyed. Also, in both alternatives a five month overlap is provided between estimated full operational capability of the SR-71 fleet and mothballing of the last five A-12 aircraft.

The general arguments in favor of decreasing the fleet size are:

1. At present, and increasingly in the coming years, satellites and unmanned drones, U-2's and tactical aircraft will be able to perform many of the strategic, force mobilization and tactical support missions as well as being able to provide a more limited capability in the crisis reconnaissance functions for which the OXCART and the SR-71 were developed.

2. While some advanced aircraft capability is needed for the purpose of crisis or brink reconnaissance, it is very questionable whether six aircraft would ever be launched against the Soviet Union at a time of intense crisis. Such a launch would be extremely provocative and might be interpreted as an attack. Also, there has been no conclusive demonstration that such reconnaissance would produce meaningful intelligence.

3. Interchangeability of aircraft between missions A, B and C is possible so that it cannot be argued that it is necessary to provide maximum possible aircraft for coverage of all missions simultaneously. There is no need for an expensive capability for simultaneously conducting covert and military reconnaissance. If a crisis or a conflict becomes sufficiently intense so that most of the SR-71 capabilities are needed, then covert missions will no longer be required. Conversely, if covert missions are required at a lesser level of crisis, then SR-71 resources could be used for these missions.

Alternative II (Discussed as Alternative IV in the General Analysis)

Mothball the OXCART aircraft and share the SR-71 fleet by transferring eight operational aircraft and one trainer to Area 51 under CIA management. This provides for two bases and:

Total approved aircraft	41
Less: Mothballed A-12's	-11
Training and test aircraft	-4
Aircraft under major overhaul	-2
Assumed attrition through 1970	-2
Available operational aircraft through the end of 1970	22

Cost Savings: ($ in millions)	FY 1968	FY 1969	FY 1968-72
	-$28	-$64	-$252

Percent reduction of costs - 18%. Reduction of activity - 26%

Possible Mission Coverage	Operational Aircraft		
	OXCART	SR-71	Total
A. Strategic Reconnaissance	3*	-0-	3
B. Force Mobilization Reconnaissance	5*	-0-*	5
C. General War Crisis/Brink	-0-*	6*	6
D. SIOP	-0-	8	8
	8	14	22

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

Arguments for Alternative II

1. The covert and civilian characteristics of a separate fleet would be retained.

2. The proposed division of primary mission responsibilities would be essentially in line with the planning and use patterns as they now exist.

3. This would provide flexibility of use between SAC and CIA due to essentially single aircraft configuration.

Alternative III

Terminate the OXCART fleet at the time the SR-71 fleet becomes fully operational and assign all missions to the SR-71 fleet. This provides for a single base and:

Total approved aircraft	41
Less: Mothballed A-12's	-11
Training and test aircraft	-4
Aircraft under major overhaul	-2
Assumed attrition through 1970	-2
Available operational aircraft through the end of 1970	22

Cost Savings: ($ in millions)	FY 1968	FY 1969	FY 1968-72
	-$46	-$88	-$366

Percent reduction of costs - 27% Percent reduction of activity - 26%

Possible Mission Coverage	Operational Aircraft SR-71
A. Strategic Reconnaissance	3*
B. Force Mobilization Reconnaissance	5*
C. General War Crisis/Brink	6*
D. SIOP	8
	22

*These aircraft could be used interchangeably between the three missions (A, B and C) as priorities dictate.

Arguments for Alternative III

1. The cost savings are higher than Alternative II. ($365 million as against $252 million.)

2. The operational flexibility of switching aircraft between missions should be somewhat higher under a single command.

Appendix A

Fleet Characteristics

I. Introduction

II. Airborne System Characteristics
- A. Range and Altitude (Table 1)
- B. Fuel Load
- C. Engine Thrust
- D. Crew Size
- E. Navigation Aids
- F. Payload Capacity
- G. Sensor Systems (Table 2)

III. Experience and Status
- A. Milestones
- B. Component Availability (Table 3)
- C. Flight Experience
  - 1. Supersonic Time
  - 2. Mach 3.0 + Sorties
- D. Aerial Refuelings
- E. Attrition
- F. Reliability

IV. Support
- A. Base Facilities
- B. Maintenance
- C. Engines
- D. Crews
- E. Tanker Support
- F. AGE Equipment
- G. Command Control and Communications
- H. Fuel Storage
- I. Sensor Processing
- J. Support Aircraft
- K. Kadena Support
- L. Commonality and Interchangeability

FACT ANNEX

I. Introduction to Annex

This Annex is intended to present factual data about the A-12 and SR-71 programs. Only areas in which the two programs or their respective vehicles are significantly different will be highlighted. No attempt is made in this Annex to discuss the relevance of these differences; for this discussion the reader is referred to the summary of this Annex contained in the main section of this report.

II. Airborne System Characteristics

A. Range and Altitude.

Table 1 gives altitude and range parameters for various profiles. Ranges are given in nautical miles and are unrefueled range from tanker to tanker in a refueling mission. Two altitude figures are given in thousands of feet. The first altitude figure indicates the beginning of the cruise climb while the second figure indicates the end of the cruise climb. The figures in columns entitled "long range" are for profiles designed to maximize range. The figures in columns entitled "high altitude" are for profiles designed to maximize altitude. All of the data are based on an assumed fuel reserve of 6000 pounds at second refueling.

B. Fuel Load.

A-12	69,800 lbs.
SR-71	78,200 lbs.

C. Engine Thrust.

A-12	32,000 lbs. or 32,500 lbs.
SR-71	32,500 lbs. or 34,000 lbs.

Table 1

	Demonstrated as of 1 Oct 1966				Future Objectives	
	Test Conditions		Operational Cond.		Operational Cond.	
	Long Range	High Alt.	Long Range	High Alt.	Long Range	High Alt.
A-12						
Range (nm)	3080**	N.A.	2690	2450	3750	3200
Altitude (000 ft)	75.4-81.3	N.A.	76-84.5	79-85	76.7-87	84.8-94.0
SR-71						
Range (nm)	3031**	2880	*	*	3725	3048
Altitude (000 ft)	74-84.5	80-85	*	*	74-85	81-91

*Not presently flying missions which can be categorized as "operational".

**Corrected for no turns and standard day conditions.

D. Crew Size.

A-12	One (1); pilot
SR-71	Two (2); pilot and reconnaissance systems operator

E. Navigation Aids.

A-12	Inertial navigation with demonstrated error of 1 nm/hour
SR-71	Inertial and Stellar updatable with average performance of: .75 nm Stellar-Inertial Mode; 2.0 nm/hour Inertial Mode

F. Payload Capacity.

A-12	2500 lbs. and 84 cubic ft.
SR-71	3400 lbs. and 98 cubic ft.

G. Sensor Systems.

Table 2 gives the sensor systems and their specifications for each of the two programs.

The A-12 is essentially a single sensor technical reconnaissance system having the capability to carry on a mission one of three high resolution cameras, or a side looking radar, or an infrared sensor.

The SR-71 is a multiple sensor reconnaissance system having the capability to carry on a mission simultaneously the following sensors: three photographic cameras of varying resolution, a side looking radar, an infrared sensor and an electromagnetic recorder for COMINT and ELINT collection.

III. Experience

A. Milestones.

Below are milestone dates for both programs:

Sensor System	Linear Coverage in Nautical Miles	Lateral Coverage in Nautical Miles	Resolution Specification in Feet	Resolution Achieved in Feet
Tech Intell Camera I (A-12)	2500	63	1.0	0.9
Tech Intell Camera II (A-12)	3400	56	1.5	1.25
Tech Intell Camera IV (A-12)	1687	39	1.5	1.07
Tech Objective Camera (SR-71)	2140	10	.63	1.64
Operation Obj Camera (SR-71)	4000	26 1/	1.75	3.0
Terrain Obj Camera (SR-71)	8500	21	16.5	16.5
Infrared Camera (A-12)	2.5 hours	20	40	60
Infrared Camera (SR-71)	6.0 hours	28	85	2/
Side Looking Radar (A-12)	1500	20	10-20	12-21
Side Looking Radar (SR-71)	4000	10-20 3/ 4/	30-50	30-50
Signal Intercept Package (A-12)				
[redacted] (A-12)				
[redacted] (A-12)				

50X1, E.O.13526

System XVII (A-12) - ELINT - Covers 50 MCS to 12 GC

Electromagnetic Recording (SR-71) - COMINT - Records 100-400 MCS
ELINT - Collect and record 30-40,000 MCS
Location Find 116-12,400 MCS

1/ Two 5 nm swath widths located up to 19.5 nm on either side of track.
2/ No targets tested to date.
3/ Located up to 40 nm outboard left side of track.
4/ Located up to 80 nm outboard either side of track.

	A-12	SR-71
First Test Flight	Apr 62	Dec 64
First Supersonic Test Flight	May 62	Dec 64
First Mach 2.0 Test Flight	Nov 62	Jan 65
First Mach 3.0 Test Flight	Jul 63	Feb 65
First Mach 3.2 Test Flight	Nov 63	Feb 65
First Detachment Mach 3.0 Flight	Mar 65	Jul 66
Validation Operational Capability	Dec 65	----

B. Availability of Components.

Table 3 gives the number of components planned and the number of components rated as operationally ready as of 1 October 1966 for both programs.

C. Flight Experience.

1. Supersonic Time.

Below are the number of hours as of September 1966 at or above various supersonic points for both programs.

Time, in Hours, at or above Various Mach Numbers

Mach	2.0	2.6	2.8	3.0
A-12	832	531	416	269*
SR-71	453	289	249	179*

*	Total	Test a/c	Operational a/c
A-12	269	39	230
SR-71	179	147	32

2. Supersonic Sorties.

Below are the number of sorties for each program with a given duration at or above Mach 3.0. These data are as of September 1966.

Table 3

Availability

	Planned		Operational	
	A-12	SR-71	A-12	SR-71
Test Aircraft	1	3	2	6
Training Aircraft	1	2	1	2
Operational Aircraft	8	26	7	8
Flight Crews	8	50	6	10
Cameras				
Type I	8	–	5	–
Type II	2	–	2	–
Type IV	3	–	0	–
Technical Objective	–	36*	–	0
Operational Objective	–	36*	–	21*
Terrain Objective	–	18*	–	16
Infrared	1	8	0	2
Side Looking Radar	3	23*	0	9
[redacted] 50X1, E.O.13526	1	–	1	–
[redacted]	1	–	0	–
EWS/ECM Systems	8	**	8	**
Electromagnetic Recorder	–	8	–	0
Signal Intercept Package	8	–	8	–
Maintenance Recorder System	–	35	–	8
Birdwatcher	14	–	14	–
System XVII	2		–	

* 2 cameras = 1 set

** Numbers not established.

Sorties above Mach 3.0 by Duration

Duration in Hours	A-12 Sorties	SR-71 Sorties
0 - 1.0	374	200
1.0 - 2.0	55	43
2.0 - 3.0	9	0
3.0 - 4.0	1	0

D. Aerial Refuelings.

Below are the total number of sorties flown by each program. This total is then displayed as number of sorties having 1, 2, 3 or 4 aerial refuelings.

The data for the A-12 are for the time period from January 1963 through August 1966. The data for the SR-71 are for the time period from April 1965 through September 1966.

	Total Sorties	1-AR* Sorties	2-AR Sorties	3-AR Sorties	4-AR Sorties
A-12**	1872	549	71	18	4
SR-71	624	275	40	1	0

*AR - Aerial Refueling
**Since August 1966 the A-12 has flown two sorties with four (4) aerial refuelings

E. Attrition.

To date the A-12 program has lost 3 vehicles: Numbers 123, 126 and 133. To date the SR-71 has lost 1 vehicle: Number 2003.

The planning factor attrition rate for the A-12 and the SR-71 is .1 aircraft per 1000 flying hours.

F. Reliability.

Based on 373 A-12 operational type sorties rated from March 1965 through August 1966, all systems examined indicate satisfactory performance on 85% or more of the sorties. Data not available for the SR-71.

IV. Support

A. Base Facilities.

The OXCART aircraft program is based at Area 51, a restricted area in the Nevada Test Site, which has the necessary facilities and staffing to support the test, training operations and operational deployment of the A-12. There is an average of 1500 persons, including military and CIA civilian employees, on station to support the OXCART and TAGBOARD projects. About 650 of these are in direct support of launching operations and approximately 611 are involved in indirect support such as logistics, firefighting, guards, etc. Most of these people are under contract to Lockheed Aircraft Company or its sub-contractors, and are on permanent duty at this area. The military personnel and CIA civilian employees are on a basic three year tour.

The SR-71 aircraft are assigned to the 9th Strategic Reconnaissance Wing at Beale Air Force Base, California. This wing has 1,278 persons assigned for direct support of the aircraft and 56 contractor representatives to aid in their systems maintenance. Indirect support consists of 400 personnel at Edwards Air Force Base, and 333 additional persons specially authorized at Beale AFB with the activation of the SR-71 there to augment normal base support.

A total of $21 million has been invested in Area 51 for runways, buildings, housing, navigational aids, water supply, etc. This base is now self-sufficient and no further investment is planned. Base support and maintenance is supervised by CIA personnel. Reynolds Engineering and Electrical Company, a contracting company from Las Vegas, has 239 persons engaged in base maintenance work. Total cost per year for salaries and necessary equipment is 5.5M.

At Beale AFB approximately $15M dollars has been invested in constructing additional facilities to support the SR-71 wing. There were also 333 additional base operating support personnel assigned upon activation of the wing, in addition to the normal base facilities and services.

B. Maintenance.

OXCART aircraft are maintained by contract personnel who follow the maintenance philosophy expressed in Air Force Manual 66-1. They are supervised by military maintenance officers who are detailed to CIA and who are directly responsible to the Commander, Area 51.

The SR-71 is maintained under similar organizational and field maintenance concepts by Air Force enlisted men. Their training is acquired through a course held at Lockheed Aircraft Company with continued on-the-job training at Beale AFB.

C. Engines.

The A-12 is powered by a J-58 engine, with 32,500 lbs. of thrust. It is presently rated at 100 hours (military time) between overhauls and has a growth potential to 150 hours between overhauls.

The SR-71 engine is an improved J-58 with 34,000 lbs. of thrust. It is presently rated at 100 hours (military time) and has a growth potential to 200 hours between overhauls. It should be noted that these are effective TBO's based on assumed flight time for return to overhaul for all causes whereas scheduled TBO's would be expected to be somewhat better.

D. Crews.

The A-12 is operated by one pilot who is responsible for piloting the aircraft, using sensor & EWS equipment and navigating to his destination. His training consists of a ground school course at Lockheed Aircraft, followed by 21 missions in the A-12, for a total of 56 hours. This gives him an operational readiness status. His continuation training in the A-12 consists of 18 sorties per quarter and includes a minimum of seven aerial refuelings. His collateral training is accomplished in a F-101 aircraft. He also has 148 hours of academic and field training annually.

The SR-71 is operated by two officers. A pilot operates the aircraft, and a reconnaissance systems operator is responsible for navigation and reconnaissance systems operation. The crew's training consists of 13 weeks of ground school, nine simulator rides, and 13 SR-71 sorties. Aircrew proficiency training continues with a minimum of 12 SR-71 missions per quarter. Collateral flight training is in a T-38. Simulator training is available at Beale AFB for both A-12 and SR-71 aircrews.

E. Tanker Support.

The 903rd Air Refueling Squadron with 23 KC-135 modified aircraft stationed at Beale AFB is responsible for tanker support to both the SR-71 and the A-12. Basically, each aircraft requires the support of one tanker for each refueling in the ZI. A deployment to Kadena, by either aircraft, would require three air refuelings enroute. Each deployment or operational air refueling is supported by a primary and an air-spare tanker. During operational periods, the tanker support would be dictated by mission frequency.

There are 52 tanker sorties per month required for A-12 aircrews. The SR-71 plans 283 tanker sorties per month for training, plus necessary tankers for deployment and operational missions. Each tanker aircraft is capable of 11 refueling sorties per month, but maintenance and varied mission assignments preclude a division of sorties required, by 11, to determine numbers of aircraft required.

The ultimate plan for tanker support is as follows:

<u>Beale AFB, Calif.</u> 20 UE aircraft - 15 for support of A-12 and 5 for support of SR-71.

<u>McCoy AFB, Fla.</u> 20 UE aircraft primarily for support of the SR-71.

<u>Little Rock AFB, Ark.</u> 15 UE aircraft primarily for support of the SR-71.

F. AGE Equipment.

Each project requires a myriad of AGE support equipment for the aircraft, the sensors and the pilots. Estimate of the dollar value of this equipment is $47 million for the SR-71 and $30 million for the A-12. This equipment is in being, and approximately 60% of it is interchangeable.

G. Command, Control and Communications.

Targeting, flight planning and command of the OXCART vehicle is centered at CIA Headquarters in Washington, D. C.

Flight plans are prepared at Headquarters and transmitted via the 1004 high-speed secure digital data circuit to Area 51 or Kadena, as required. Coordination with the necessary ground facilities and tanker aircraft is accomplished through high frequency single sideband radio, UHF radio links, KW-26 secure teletype circuit and secure telephone and hot line telephone. While airborne, the A-12 is monitored by a high frequency BIRDWATCHER system with the capability of flight following and recall if desired.

Mission preparation time allows for aircraft, sensor and crew generation and requires approximately 24 hours. If a canned mission were pre-planned, and aircraft and crews were in the countdown stage, a shorter generation time would be required.

The SR-71 has a similar command and control system. The Joint Reconnaissance Center and the SAC Reconnaissance Center command and control the aircraft through their land and radio facilities. Flight plans are prepared at Headquarters SAC and transmitted via high speed data lines. Current planning calls for a 16½ hour generation period to launch a mission. If canned routes are used a shorter generation period is envisioned.

H. Fuel Storage.

Storage facilities for PF-1 fuel, which is used by both the A-12 and the SR-71, have been established at selected points in the ZI and overseas. U.S. facilities are at Beale AFB in California, McCoy AFB in Florida, Edwards AFB in California, Area 51 in Nevada, and Palmdale, California. Overseas storage facilities are located at Eielson AB in Alaska, Kadena AB on Okinawa, Thule AB in Greenland, and Adana AB in Turkey. These sites are stocked with fuel and facilities adequate to support either training or operational missions.

I. Sensor Processing.

Present planning is that OXCART sensor processing will be accomplished at Eastman Kodak Company in Rochester, New York. This facility is staffed with 211 people and is presently being used for other NRO programs.

The 9th SRW has a Recce Tech squadron attached and in-place at Beale AFB. It is manned with 400 personnel. It also has a capability of deploying detachments to overseas bases. An initial photo interpretation report can be provided by this unit 6 hours after a landing at Beale AFB and final readout in 12 hours. In general, take from both programs could be processed either at the Recce Tech squadron or Eastman Kodak, with the timing for IPIR and final readout being dependent upon location of the Recce Tech squadron, on flying time to Eastman Kodak Company and NPIC in Washington, D.C.

The Recce Tech Squadron presently at Beale has a complete automatic system in operation with the following capabilities:

1. Fixed and mobile facilities - 10 aircraft - 24 hour operation

2. Fixed only - 6 aircraft - 24 hour operation

3. Mobile only - 4 aircraft - 24 hour operation

J. Support Aircraft.

The OXCART program uses eight F-101 support aircraft for pilot proficiency training and chase of the A-12. A C-130 is provided for personnel movement and classified cargo such as cameras, etc. An H-43B is used at Area 51 for search and rescue and paramedic jump training. There are two T-33s for rapid transportation and jet qualification of pilots. One U-3B is available for emergency air evacuation, search and security patrol of the area.

The SR-71 wing has six T-38s in direct support of pilot proficiency training. Two T-29s and two T-33s, plus base assigned aircraft, are shared by the SR-71 program. Both programs use MAC as needed for additional logistic support.

K. Kadena Support.

The OXCART Project has prepositioned 1,000,000 pounds of equipment at Kadena Air Base. Construction of the operations buildings, hangars, and the POL fuel farm necessary to support operational missions is completed. There are 19 persons in place to maintain equipment and facilities for immediate use.

OXCART operations from Kadena would be commanded and controlled from Headquarters in Washington. Operational missions can be flown from Kadena ten days after mission approval.

These facilities are available for use by the SR-71. A small extension to the hangar and prepositioning of peculiar pieces of supplies and AGE to support the SR-71 will be required. The OXCART program can support nine operational missions per month with three deployed aircraft. The SR-71 concept envisions one sortie per day with 4 aircraft or one sortie per week with 2 aircraft. SAC estimates an operational capability about 90 days after notice to deploy. The OXCART plans 225 persons deployed while the SR-71 is programming 363 persons per 1 sortie per day and 231 for 1 sortie per week, for support of the SR-71 and photo lab. Tanker support for both Projects would be as required. OXCART communications facilities are in being and include a 1004 computer which could be used by the SR-71 program. Sensor processing for the OXCART would be at Eastman Kodak or the Recce Tech Squadron if deployed.

APPENDIX B

COSTS

Introduction

This Annex is intended to provide more detailed costing data than are available in the main body of the report.

The Annex contains three major sections and five attachments. Section One discusses the cost of the currently planned programs. Section Two discusses various actions that could be taken and how they would affect program costs. Section Three discusses specific program alternatives. The attachments provide more detailed costs for the various alternatives.

SECTION ONE:

Attachment 1 to this Annex gives FY 1968, FY 1969, and five year total costs by major cost category for both programs. These data are the approved programmed amounts except for allocated categories. The allocated categories are best estimates.

The table below indicates the total cost of each program as presently planned in millions of dollars.

FY	68	69	70	71	72	Total
SR-71	186.7	157.1	148.4	140.2	132.4	764.8
OXCART	109.5	102.4	95.3	92.7	87.5	487.4
Total	296.2	259.5	243.7	232.9	219.9	1252.2

These costs are to support the following aircraft inventories.

FY	68	69	70	71	72	Total Aircraft Years
SR-71/1	29	29	28	27	27	140
OXCART/2	11	11	10	10	9	51

/1 Includes 2 trainers and 2 test vehicles.
/2 Includes 1 trainer and 1 test vehicle.

The above costs and Attachment 1 assume separate basing of the two programs.

A major cost not included in the above totals is the J-58 Engine development program. The development program supports both the SR-71 and the A-12. The programmed amounts for the J-58 Engine development are:

FY	68	69	70	71	72	Total
Millions	45	35	25	15	5	125 (Alternatives I and II)
of	41	31	23	13	5	113 (Alternatives III and IV)
Dollars	40	30	20	12	4	106 (Alternative V)

It was decided that because these funds support both programs no attempt should be made to allocate them separately. Thus, all attachments to this Annex show the J-58 costs separately.

SECTION TWO:

Using these status-quo programs as a base-line case, various areas were investigated for their affect on costs. The following areas will be discussed briefly: reduction in fleet size, consolidated basing, and reduction of flying hours.

REDUCTION IN FLEET SIZE

Three methods of reducing fleet size are discussed: "Cannibalize" planes, mothball planes, and ground planes.

Cannibalization

Below is the estimated savings to be realized over a five year period resulting from salvaged parts of one OXCART vehicle. It is estimated that similar figures would result from analysis of an SR-71.

Engines	$ 705,000
Airframe	1,840,000
Other	400,000
Total	$2,945,000

Mothballing

The following estimates were developed in connection with mothballing:

Approximate cost to place vehicle into mothballs in thousands of dollars.

SR-71	$300/plane
OXCART	$200 - $400/plane

Cost of inspection and preventive maintenance while in mothballs in thousands of dollars.

SR-71	$60/plane/year
OXCART	$60/plane/year

Cost in millions of dollars to remove from mothballs and update to current configuration.

Time Stored	6-9 months	2.5-3 years	4.5-5 years
OXCART SR-71	1.2	3.8	6.7

Grounded

The concept of grounding vehicles was costed on the following assumptions:

(1) All grounded vehicles would be periodically overhauled and modified to current configuration.

(2) All grounded planes would be warmed-up periodically but not flown.

Several operational concepts were developed which included grounded vehicles.

For the SR-71 it was determined that grounding 12 vehicles reduced the five year costs by approximately $96 million from the status-quo.

For the OXCART it was determined that grounding 5 vehicles reduced the five year costs by approximately $36 million from the status-quo.

The following comparison was made of grounding versus mothballing: The cost of operating an OXCART fleet with five mothballed planes was subtracted from the cost of operating an OXCART fleet with five grounded flyable planes. The difference was divided by five to indicate the cost of maintaining a grounded flyable vehicle.

FY	68	69	70	71	72	Total
Difference (in millions of $)	9.8	10.6	7.8	9.3	7.9	45.4
Cost/aircraft grounded	1.96	2.12	1.56	1.86	1.98	*

*Average yearly cost for five year period:

$$\frac{45.4}{25} = \$1.8 \text{ million per aircraft.}$$

CONSOLIDATION

All estimates of consolidation costs were made under the assumption that Area 51 would be closed and the programs consolidated at Beale AFB.

Two general comments can be made about Consolidation:

(1) Significant costs were incurred to construct additional facilities for OXCART vehicles and personnel. The table below indicates estimates of construction costs and one time moving costs under various types of moves.

Type of OXCART Program Moved	Construction Costs in Millions	Transportation Costs in Millions
6 flying vehicles & 5 grounded	12.9	7.2
6 flying vehicles & 5 mothballed	10.2	5.5
11 vehicles mothballed	5.4	1.6
6 grounded vehicles & 5 mothballed	5.4	1.6

(2) In the five year period operating savings offset this initial one time cost but by a small amount. Thus, total savings relative to the status-quo programs were small.

REDUCTION OF FLYING HOURS

Cost savings were anticipated in the following major categories if flying hours were reduced: airframe support, engine support, and fuel.

Below is a table indicating the status-quo costs of the SR-71 program and the costs of SR-71 programs where the flying hours were reduced by 10, 20, and 30 percent.

FY	68	69	70	71	72	Total
Planned	176.0	146.3	136.9	129.6	122.4	711.2
10% Reduction	173.1	142.8	132.8	125.7	118.6	693.0
20% Reduction	170.6	139.4	129.0	122.1	114.5	675.6
30% Reduction	168.1	136.6	125.1	118.0	110.8	658.6

SECTION THREE:

Several alternatives were developed and total program costs were determined for these alternatives.

Alternative I was the status-quo. The yearly costs for this alternative are presented on page 1 of this Annex and a more detailed costing of this alternative is shown in Attachment 1. This alternative provided for an eleven aircraft OXCART program operating from Area 51 and a thirty aircraft SR-71 program operating from Beale. Attrition for the SR-71 was assumed to be .1 aircraft per 1000 flying hours and a flying program of approximately 6000 hours/year was assumed. The OXCART attrition rate was assumed to be 1 aircraft every two years and a flying program of 1760 hours per year was assumed.

The table below compares the status-quo program with separate basing to the status-quo with consolidated basing at Beale AFB. It was assumed that the move was made at the beginning of FY69 and both programs would be managed by SAC from that date on. Also, Air Force personnel would perform field maintenance on both programs, however, contractors were maintained for major airframe and engine overhaul and for modifications. These figures do not include engine development costs nor some of the allocated costs.

FY	68	69	70	71	72	Total
Separate	285.6	248.7	232.1	222.5	209.9	1198.8
Consolidated	291.0	241.0	217.0	209.0	199.0	1157.0
Difference	+5.4	-7.7	-15.0	-13.5	-10.9	-41.8

Alternative number IIa called for mothballing five OXCART vehicles but maintaining separate bases for the two programs. Alternative IIb called for mothballing five OXCART vehicles and consolidating both programs at Beale AFB under SAC management. Attachment 2 gives cost details on Alternative IIa and Attachment 3 gives cost details on Alternative IIb. Neither attachment includes cost of demothballing aircraft, since this cost is a function of when vehicles are removed.

In both of these alternatives the SR-71 program was assumed to be the same as the status-quo.

In Alternative IIa it was assumed that the four remaining operational vehicles, the test vehicle, and the trainer would fly 960 hours per year. Attrition vehicles were not replaced but the remaining flyable vehicles maintained the 960 hour program. It was assumed that this reduced program would begin in July 1967.

The same flying program was assumed for Alternative IIb, however the mothballing costs were incurred at the beginning of FY 1969 when the move to Beale was accomplished. During FY68 it was assumed that the five planes to be mothballed would not be flown.

Alternative III called for mothballing the entire OXCART fleet. The detailed costing for this alternative is shown in Attachment 4. In this alternative it was assumed that the OXCART program would be cut from 1760 hours to 420 hours in FY 1968. The schedule for this decrease is as follows:

First Quarter FY 1968

1. Mothball five operational vehicles.
2. Fly remaining four operational vehicles 45 hours each.
3. Fly test and trainer 30 hours each.

Second Quarter FY 1968

1. Mothball test and trainer vehicle. (2 vehicles)
2. Fly remaining four operational vehicles 45 hours each.

Third Quarter FY 1968

1. Mothball remaining operational vehicles.
2. Close Area 51.
3. Move useful assets to Beale.

It was further assumed that this major reduction in the OXCART program would cause the unit price of spares and overhauls to increase in the SR-71 program. This cost increase in the SR-71 was assumed to be approximately $75 million over the five years. It was assumed that with the elimination of the entire OXCART fleet the J-58 Engine development costs would be reduced by ten percent.

Alternative IV is a variation of Alternative III. The assumptions mentioned in the above paragraph hold for Alternative IV; however, instead of closing Area 51 in Fiscal Year 1968, eight operational SR-71's and one SR-71/B trainer are transferred to CIA control and maintained at Area 51. The total flying time on all SR-71's was assumed to be approximately 6000 hours per year. Approximately 4500 hours per year at Beale AFB and 1500 hours per year at Area 51. It was further assumed that the SR-71 test program would be maintained at Beale AFB under SAC management. Modifications resulting from this program would apply to all SR-71 aircraft.

Alternative V was considered a reduction in tempo of the current program, but no reduction in number of vehicles. No detailed attachment was developed for this alternative, however, the table below indicates the reduced program costs by year.

FY	68	69	70	71	72	Total
SR-71	178.8	147.4	136.6	128.6	120.8	712.2
OXCART	95.9	86.4	85.7	83.3	78.1	429.4
J-58 Engine	40.0	30.0	20.0	12.0	4.0	106.0
Total	314.7	263.8	242.3	223.9	202.9	1247.6

The reduced SR-71 costs were developed by assuming a reduction of 30% in status-quo flying hours. The OXCART reduced costs were developed by assuming a 20% reduction in status-quo flying hours. It was assumed that for both programs additional sensor purchases were eliminated and the level of flight testing was reduced.

Attachment 1

Alternative I; Status Quo - Separate Basing

	SR-71			A-12		
Fiscal Year	68	69	68-72	68	69	68-72
Flying Hours	5233	5920	30,423	1760	1760	8800
Airframe	55.4	54.2	258.2	37.9	35.2	168.0
Engine	72.2	45.9	221.4	21.5	19.2	90.4
Fuel	15.6	17.1	88.3	6.8	6.8	34.0
Guidance / Cameras	11.0	10.0	45.0			
Guidance				4.9	3.4	17.7
Cameras				8.6	8.3	33.7
A/B Elec	4.3	0.7	7.1	5.6	5.5	26.4
Anti-Radar	0.0	0.0	0.0	1.8	1.6	7.4
Others	3.7	2.4	13.4	1.2	1.2	5.6
Base Op.	18.8	18.8	93.7	8.4	8.4	40.2
Support a/c*	0.7	1.0	4.7	2.2	2.2	11.0
Tanker*	5.0	7.0	33.0	1.9	1.9	9.5
Air Force Issue*	0.0	0.0	0.0	2.2	2.2	11.0
Admin. Overhead*	0.0	0.0	0.0	6.5	6.5	32.5
Total	186.7	157.1	764.8	109.5	102.4	487.4

Totals:	FY68	FY69	FY68-72
SR-71	186.7	157.1	764.8
A-12	109.5	102.4	487.4
J-58 Engine	45.0	35.0	125.0
	341.2	294.5	1377.2

*Allocated costs
Costs in millions of dollars.

Attachment 2

Alternative IIa; Mothball 5 A-12's - Separate Basing

	SR-71			A-12		
Fiscal Year	68	69	68-72	68	69	68-72
Flying Hours	5233	5920	30,423	960	960	4800
Airframe				30.3	27.8	141.2
Engine				18.7	17.4	82.3
Fuel				3.7	3.7	18.5
Guidance				4.2	3.0	15.9
Cameras				7.7	7.7	30.3
A/B Elec				4.8	4.8	22.8
Anti-Radar				1.8	1.6	7.4
Other				0.9	0.8	4.1
Base Op.				7.8	7.3	37.6
Support a/c*				1.2	1.2	6.0
Tankers*				1.0	1.0	5.0
Air Force Issue*				1.2	1.2	6.0
Admin. Overhead*				6.5	6.5	32.5
Subtotal	186.7	157.1	764.8	89.8	84.0	409.6
Mothballing	0.0	0.0	0.0	1.0	0.0	1.0
Inspection	0.0	0.0	0.0	0.2	0.3	1.4
Total	186.7	157.1	764.8	91.0	84.3	412.0

Totals:	FY68	FY69	FY68-72
SR-71	186.7	157.1	764.8
A-12	91.0	84.3	412.0
J-58 Engine	45.0	35.0	125.0
	322.7	276.4	1301.8

*Allocated costs
Costs in millions of dollars

~~TOP SECRET~~

Handle via BYEMAN, TALENT-KEYHOLE, COMINT Controls | IDEALIST/OXCART/CORONA HEXAGON/GAMBIT/DORIAN | BYE 2856-66

Attachment 3

Alternative IIb; Mothball 5 A-12's - Consolidated Basing

	SR-71			A-12		
Fiscal Year	68	69	68-72	68	69	68-72
Flying Hours	5233	5920	30,423	960	960	4800
Airframe				34.4	26.5	130.6
Engine				16.9	15.8	73.3
Fuel				4.0	3.7	18.8
Guidance				4.9	3.4	17.7
Cameras				6.1	6.1	28.1
A/B Elec				5.6	5.5	26.4
Anti-Radar				1.8	0.0	1.8
Other				0.6	0.6	3.0
Base Op.				8.5	8.4	40.3
Support a/c*				1.2	1.2	6.0
Tankers*				1.0	1.0	5.0
Air Force Issue*				1.2	1.2	6.0
Admin. Overhead*				6.5	0.0	6.5
Subtotal	186.7	157.1	764.8	92.7	73.4	363.5
Close Area 51	0.0	0.0	0.0	0.0	1.5	1.5
Moving Costs	0.0	0.0	0.0	2.8	2.8	5.6
Const. at Beale	0.0	0.0	0.0	10.2**	0.0	10.2**
Mothballing	0.0	0.0	0.0	1.0	0.0	1.0
Inspection	0.0	0.0	0.0	0.2	0.3	1.4
Total	186.7	157.1	764.8	106.9	78.0	383.2

Totals:

	FY68	FY69	FY68-72
SR-71	186.7	157.1	764.2
A-12	106.9	78.0	383.2
J-58 Engine	45.0	35.0	125.0
	338.6	270.1	1272.4

*Allocated costs
**Includes $3.0 million for TAGBOARD
Costs in millions of dollars

IDEALIST/OXCART/CORONA HEXAGON/GAMBIT/DORIAN | Handle via BYEMAN, TALENT-KEYHOLE, COMINT Controls

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Attachment 4

Alternative III; Mothball all A-12's

	SR-71			A-12		
Fiscal Year	68	69	68-72	68	69	68-72
Flying Hours	5233	5920	30,423	420	0	420
Airframe				11.6	0.0	11.6
Engine				17.8	0.0	17.8**
Fuel				1.6	0.0	1.6
Guidance				1.9	0.0	1.9
Cameras				2.1	0.0	2.1
A/B Elec				2.0	0.0	2.0
Anti-Radar				0.7	0.0	0.7
Others				0.4	0.0	0.4
Base Op.				3.9	0.0	3.9
Support a/c*				0.6	0.0	0.6
Tankers*				0.5	0.0	0.5
Air Force Issue*				0.0	0.0	0.0
Admin. Overhead*				2.0	0.0	2.0
Subtotal	186.7	157.1	764.8	45.1	0.0	45.1
Const. at Beale	0.0	0.0	0.0	3.0	0.0	3.6***
Mothballing	0.0	0.0	0.0	4.4	0.0	4.4
Inspection	0.0	0.0	0.0	0.2	0.6	2.6
Area Closing	0.0	0.0	0.0	1.5	0.0	1.5
Movement	0.0	0.0	0.0	3.6	0.0	3.6
Add-ons due to Volume Reduction	10.0	17.9	73.6	0.0	0.0	0.0
Total	196.7	175.0	838.4	57.8	0.6	60.8

Totals:

	FY68	FY69	FY68-72
SR-71	196.7	175.0	838.4
A-12	57.8	0.6	60.8
J-58 Engine	41.0	31.0	113.0
	295.5	206.6	1012.2

*Allocated costs
**Includes approximately $10 million in unbudgeted termination costs.
***TAGBOARD program
Costs in millions of dollars

~~TOP SECRET~~

Handle via BYEMAN,
TALENT-KEYHOLE,
COMINT Controls

IDEALIST/OXCART/CORONA
HEXAGON/GAMBIT/DORIAN

BYE 2856-66

Attachment 5

Alternative IV; Mothball A-12's and Share SR-71's at Separate Bases

	SR-71			A-12		
Fiscal Year	68	69	68-72	68	69	68-72
Flying Hours	5233	5920	30,423	420	0	420
Airframe	74.1	74.7	354.4	11.6	0.0	11.6
Engine	81.4	53.8	258.8	17.8	0.0	17.8**
Fuel	15.6	17.1	88.3	1.6	0.0	1.6
Guidance				1.9	0.0	1.9
Cameras	11.0	10.0	45.0	2.1	0.0	2.1
AB/Elec	4.3	0.7	7.1	2.0	0.0	2.0
Others	3.8	2.4	13.5	1.1	0.0	1.1
Base Op.	20.0	24.3	115.0	3.9	0.0	3.9
Support a/c*	2.3	3.2	14.7	0.6	0.0	0.6
Tankers*	5.0	7.0	33.0	0.5	0.0	0.5
Admin. Overhead*	4.5	6.5	30.5	2.0	0.0	2.0
Subtotal	222.0	199.7	960.3	45.1	0.0	45.1
Mothballing				4.4	0.0	4.4
Inspection				0.2	0.6	2.6
Total	222.0	199.7	960.3	49.7	0.6	52.1

Totals:

	FY68	FY69	FY68-72
SR-71	222.0	199.7	960.3/1
A-12	49.7	0.6	52.1
J-58 Engine	41.0	31.0	113.0
	312.7	231.3	1125.4
/1 SAC SR-71	169.1	126.6	636.2
Agency SR-71	52.9	73.1	324.1

*Allocated costs.
**Includes approximately $10 million in unbudgeted termination cost

Costs in millions of dollars.

IDEALIST/OXCART/CORONA
HEXAGON/GAMBIT/DORIAN

Handle via BYEMAN
TALENT-KEYHOLE
COMINT Controls

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BYE-8888-69
31 March 1969

Copy 1 of 2

HISTORY

OF THE

OFFICE OF SPECIAL ACTIVITIES

DD/S&T

Prepared by:

Helen H. Kleyla
Helen Hill Kleyla

Robert D. O'Hern
Robert D. O'Hern

GROUP 1
Excluded from automatic downgrading and declassification

Handle via BYEMAN
Control System

Annex 2, a report by Lockheed on the CL-282 High Altitude Aircraft, is printed on an 8-1/2 X 11 inch format. Therefore, for ease of binding this history, it has been included with the Appendices at the end of the study.

MEMORANDUM FOR: Dr. Weber

Initial specs for what the Air Force later named the U-2 was for what Lockheed called the "CL-282" and the initial specs were dated early in 1954. The specs which are attached to copy of the OSA History, dated January 10, 1955, and signed by Kelly Johnson and Dick Boehme, were the revised specs produced at the time CIA contract with Lockheed was negotiated (Mr. Houston did the negotiating with Robert Bias of Lockheed in Dec 53-Jan. 54).

OSA's copy (copy 2) of the history has the 1954 CL-282 specs attached.

Helen Kleyla

11/14/72
(DATE)

FORM NO. [redacted] REPLACES FORM 10-101
1 AUG 54 WHICH MAY BE USED. (47)