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EO 12958 6.2(c)

COMIREX-D-12.1/1

26 September 1967

MEMORANDUM FOR: Committee on Imagery Requirements and Exploitation

SUBJECT: Comparison of SR-71 and A-12 Aircraft

1. In response to a request from the Chairman, COMIREX the Director, NRO Staff has made available information pertinent to the comparison of the SR-71 and A-12 aircraft. It is requested that members study this information and be prepared to discuss it at the COMIREX meeting on 28 September. Attached are a number of charts and a partial inventory of the assets of each program. NRO notes that:

a. With respect to aircraft performance alone, there is little difference in range between the two aircraft. The A-12 will have an altitude advantage of from 2,000 to 5,000 feet over the SR-71 at the same MACH number since it is a lighter aircraft. On the other hand, the SR-71 is a multi-sensor aircraft capable of integrated photographic, high resolution radar, infrared, and electronic collection while the A-12 carries only a single major sensor package on each mission. With regard to the problem of surveillance of North Vietnam for surface-to-surface missiles, the photographic sensors are the primary and probably the only sensors applicable; it appears to me that both aircraft sensor systems are adequate for this task.

b. Aircraft performance figures shown on page 3 of the attachment were obtained from the program offices and represent best current assessments of maximum capabilities of these aircraft. The actual current operations with these aircraft are at somewhat lower performance because of conservative operational practices with respect to fuel reserves and margins with respect to red-line speed limits. Partly because of the longer period of operational training and experience with the A-12, the operational limits are currently somewhat closer to the maxima. However the current operational limitation of the SR-71 to MACH 3.0 is primarily due to heating limitations on the sealant for the wingtanks.

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c.   In order to provide a basis for comparison of the intrinsic aerodynamic performance of the two configurations, Lockheed was asked to provide data based on their flight tests and extrapolations from such tests. These data are presented on pages 4 to 8 of the attachments. The current levels of performance of both aircraft are somewhat better in range and poorer in altitude than the Lockheed data. Improvements in inlets and inlet controls, propulsion system, fuel management techniques, etc., which have been accomplished or are in process account for the small variations in performance figures which may be obtained from various sources.

d.   The radar cross section of the two aircraft in a clean configuration is relatively low for both the SR-71 and the A-12. The SR-71 in its full sensor configuration is somewhat higher due to its larger size and appreciably larger with the side-looking radar antenna installed, but this will not increase vulnerability to the S-Band, SA-2 significantly, providing installed ECM systems are utilized. Based on simulator test results, it appears that the probability of kill in North Vietnam is nil for either aircraft with presently utilized configurations and flight profiles, as long as the ECM techniques used remain viable. In any event, if it should be concluded that the radar cross section is too high for any particular operation, the side-looking radar can be removed from the SR-71; the same limitations would apply to optional use of a side-looking radar on the A-12.
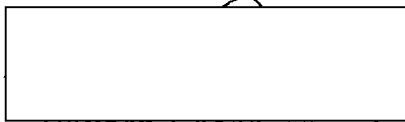
Hayden Channing
Executive Secretary
Committee on Imagery Requirements and Exploitation

Attachments
10 charts

Copies 2, 3	State TCO
4	DIA (Mr. Hughes)
5, 6, 7, 8	DIA TCO
9, 10	OACSI TCO
11, 12	ONI TCO
13, 14, 15, 16	AFNIN TCO
17, 18	NSA TCO
19, 20, 21	NRO TCO

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CURRENT PERFORMANCE COMPARISON

	SR-71	A-12
Range between tankers	3050 NM	3000 NM
Penetration altitude (Initial cruise altitude)	74,000 Ft	76,000 Ft
End cruise altitude	83,000 Ft	85,000 Ft
Speed (MACH)*	3.2	3.2

This above data has been provided by the respective
program offices.

* At the present time it should be noted that the SR-71
is being flown at MACH 3.0 for training and the A-12 is
normally flown at MACH 3.1 with correspondingly lower
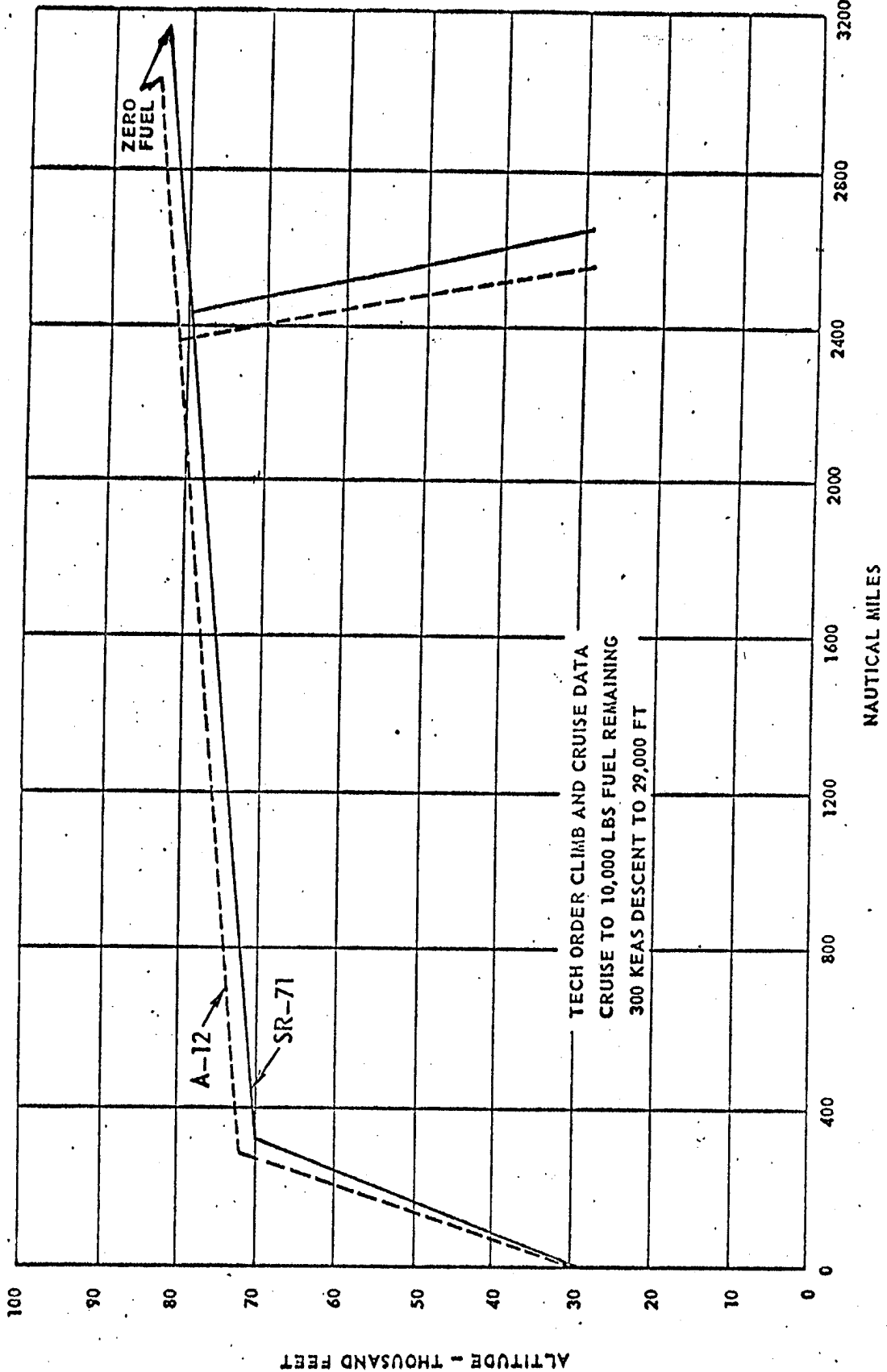figures for other items of performance shown above.

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P E R F O R M A N C E

	Initial Cruise Altitude	to	Maximum Range		Initial Cruise Altitude	to	Maximum Altitude
MACH 3.0							
A-12	72,000		2,558		80,400		89,400
SR-71	70,500		2,648		75,400		84,400
MACH 3.1							
A-12	74,000		2,629		81,450		90,550
SR-71	72,250		2,709		77,400		86,200
MACH 3.2							
A-12	76,000		2,700		82,500		91,700
SR-71	74,000		2,770		79,400		88,000

Above performance has been provided by LOCKHEED based on their flight test data and as such are comparable.

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MAXIMUM RANGE CRUISE — MACH 3.0

	WEIGHT EMPTY	FUEL LOAD	WEIGHT OFF TANKER
SR-71	60,000	78,200	138,200
A-12	55,150	67,300	122,450

ZERO FUEL

A-12

SR-71

TECH ORDER CLIMB AND CRUISE DATA
CRUISE TO 10,000 LBS FUEL REMAINING
300 KEAS DESCENT TO 29,000 FT

NAUTICAL MILES

ALTITUDE — THOUSAND FEET

0   10   20   30   40   50   60   70   80   90   100
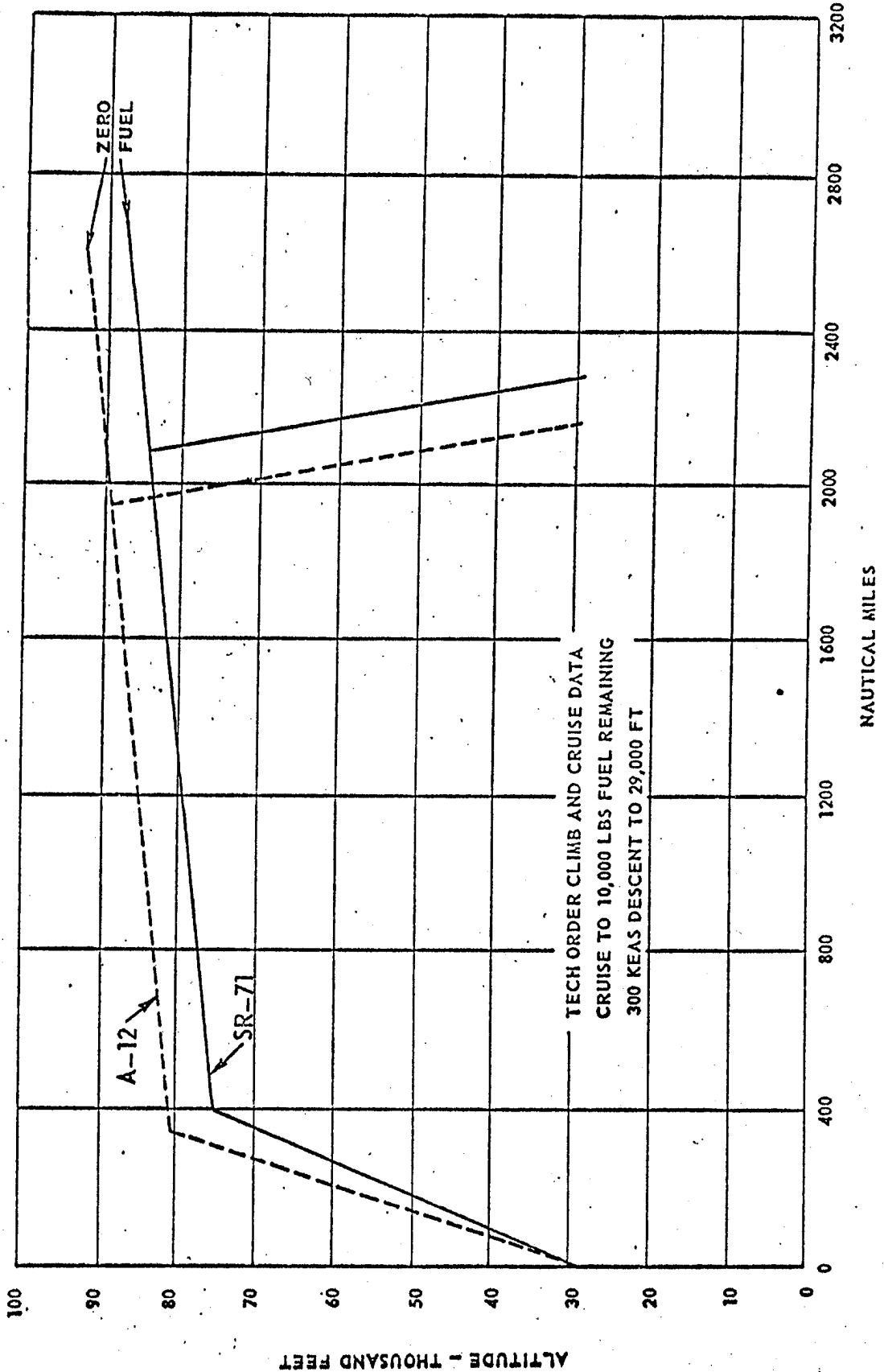
0   400   800   1200   1600   2000   2400   2800   3200

BASED ON LOCKHEED FLIGHT TEST DATA — STANDARD DAY

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MAXIMUM ALTITUDE CRUISE — MACH 3.0

	WEIGHT EMPTY	FUEL LOAD	WEIGHT OFF TANKER
SR-71	60,000	78,200	138,200
A-12	55,150	67,300	122,450

ZERO
FUEL

A-12

SR-71

TECH ORDER CLIMB AND CRUISE DATA
CRUISE TO 10,000 LBS FUEL REMAINING
300 KEAS DESCENT TO 29,000 FT

ALTITUDE – THOUSAND FEET

NAUTICAL MILES

BASED ON LOCKHEED FLIGHT TEST DATA – STANDARD DAY

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COMIREX-D-12.1/1

MAXIMUM RANGE CRUISE — MACH 3.2

	WEIGHT EMPTY	FUEL LOAD	WEIGHT OFF TANKER
SR-71	60,000	78,200	138,200
A-12	55,150	67,300	122,450

ZERO
FUEL

A-12

SR-71

TECH ORDER CLIMB AND CRUISE DATA
CRUISE TO 10,000 LBS FUEL REMAINING
300 KEAS DESCENT TO 29,000 FT

NAUTICAL MILES

ALTITUDE — THOUSAND FEET

BASED ON LOCKHEED FLIGHT TEST DATA — STANDARD DAY

MAXIMUM ALTITUDE CRUISE — MACH 3.2

	WEIGHT EMPTY	FUEL LOAD	WEIGHT OFF TANKER
SR-71	60,000	78,200	138,200
A-12	55,150	67,300	122,450

ZERO FUEL

A-12

SR-71

TECH ORDER CLIMB AND CRUISE DATA
CRUISE TO 10,000 LBS FUEL REMAINING
300 KEAS DESCENT TO 29,000 FT

ALTITUDE — THOUSAND FEET

NAUTICAL MILES

BASED ON LOCKHEED FLIGHT TEST DATA — STANDARD DAY

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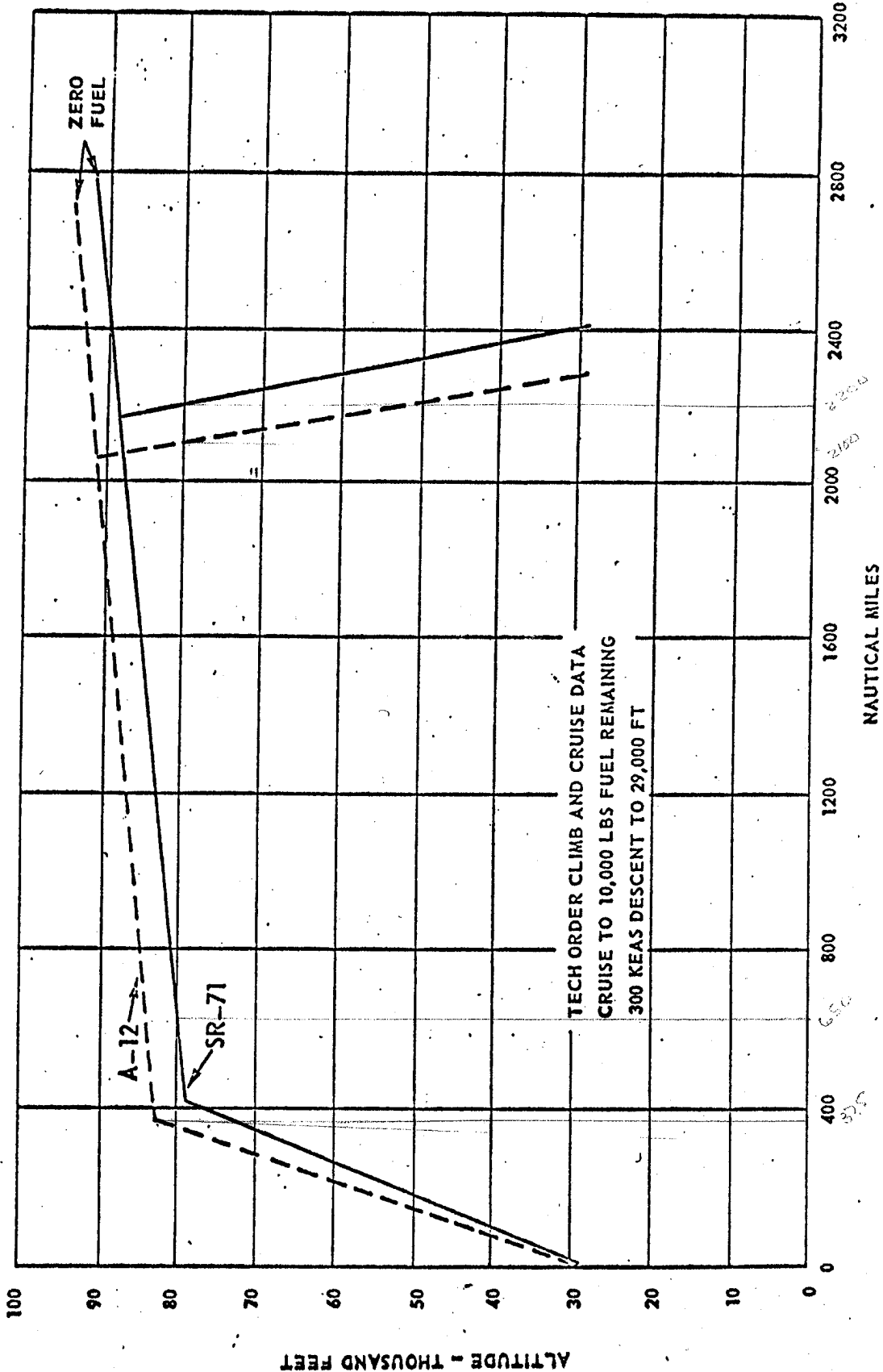
COMPARATIVE CONFIGURATION

Configuration	SR-71	A-12
Technical Objective Camera	2	1*
Operational Objective Camera	2	0
Terrain Objective Camera	1	0
High Resolution Radar SLR	1	1*
Infrared Camera	1	1*
ELINT/COMINT	1	1
EWS	3**	3***

* The SR-71 systems may all be carried and used on a single mission. Either the camera or the infrared system or radar sensor may be carried with the ELINT/COMINT system in the A-12.

** The SR-71 will be equipped with CFAX, APR 27 and System 13C. (See note 3 on "ECM Equipment" chart.)

*** The A-12 is configured with 3 EWS systems (PIN PEG, BLUE DOG and either BIG BLAST or MAD MOTH) without removal of other sensors. Configuration with three systems provides redundancy should failure occur in any system.

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AIRCRAFT SYSTEMS

	SR-71	A-12
Operational Aircraft	19	6
Technical Objective Camera[1]	15	10
Operational Objective Camera	36	-
Terrain Objective Camera	18	-
Infrared Camera[2]	8	1
Side Looking Radar[2]	17	2
Gamma Spectrometer	-	1
ELINT Package[3]	4	9
Mission Recording System	19	-
Birdwatcher	-	13
ECM	20[4]	28[5]

1 In the above table, the different types of A-12 cameras are lumped
   as "technical objective" cameras (Type I - 7; Type IV - 3).

2 Because of the phase-out decision on Oxcart, the testing of the IR
   and SLR was discontinued in July 1967 for monetary savings. Both
   systems are available for reactivation if required.

3 Seven signal intercept packages and two Systems VI comprise the A-12
   equipment.

4 APR-27 - 9
   13C   - 6
   CFAX   - 5

5 PIN PEG   - 8
   BLUE DOG II - 8
   BIG BLAST - 6
   MAD MOTH   - 6

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SENSOR CAPABILITIES

System	Design Reso feet		Achieved Resolution-ft		Linear Coverage Mi		Swath Width Mi	
	A-12	SR-71	A-12	SR-71	A-12	SR-71	A-12	SR-71
Tech Obj		0.63		0.9		2140		2@5*
Type I	1.0		0.9		2500		63**	
Type IV	1.5		1.07		1690-2800		39	
Oper Obj	-	2	-	1.5	-	2000	-	30
Ter Obj	-	16.5	-	16.5	-	8500	-	21
Infrared	40	85	60	90	4250	10,200	20	28
Radar	10X20	50 30	12X21	50 30	1500	4000	20	20*** 10***

NOTE: Achieved resolutions represent the best achieved on a single frame for the sensor concerned.

*Two 5 nm swath widths located up to 19.5 miles on either side of track.

**The Type I camera is currently employed for North Vietnam coverage.

***The 20 mile swath width may be taken out to 80 miles on either side of the aircraft, one side at a time. The 10 mile swath width to 65 miles on either side of the aircraft.

The A-12 currently employed for coverage of North Vietnam is configured with the Type I camera. With this camera the A-12, with one pass over North Vietnam, produces on a single film strip, high resolution optical photography with a 63NM swath width. Resolution, depending on atmospherics, varies from 1.0 foot at NADIR to 2.5 feet at 25NM from NADIR to 3.0+ feet at the outer edge.

With the SR-71, both the Technical Objective (TO) Camera and the SLR can be operated at various range offsets either by pre-programming or under the control of the Reconnaissance Systems Officer on board the aircraft. The A-12 has two 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 the choice will be determined by the particular needs of the mission. The A-12 has the capability of carrying a gamma spectrometer or particulate samplers as auxiliary equipments.
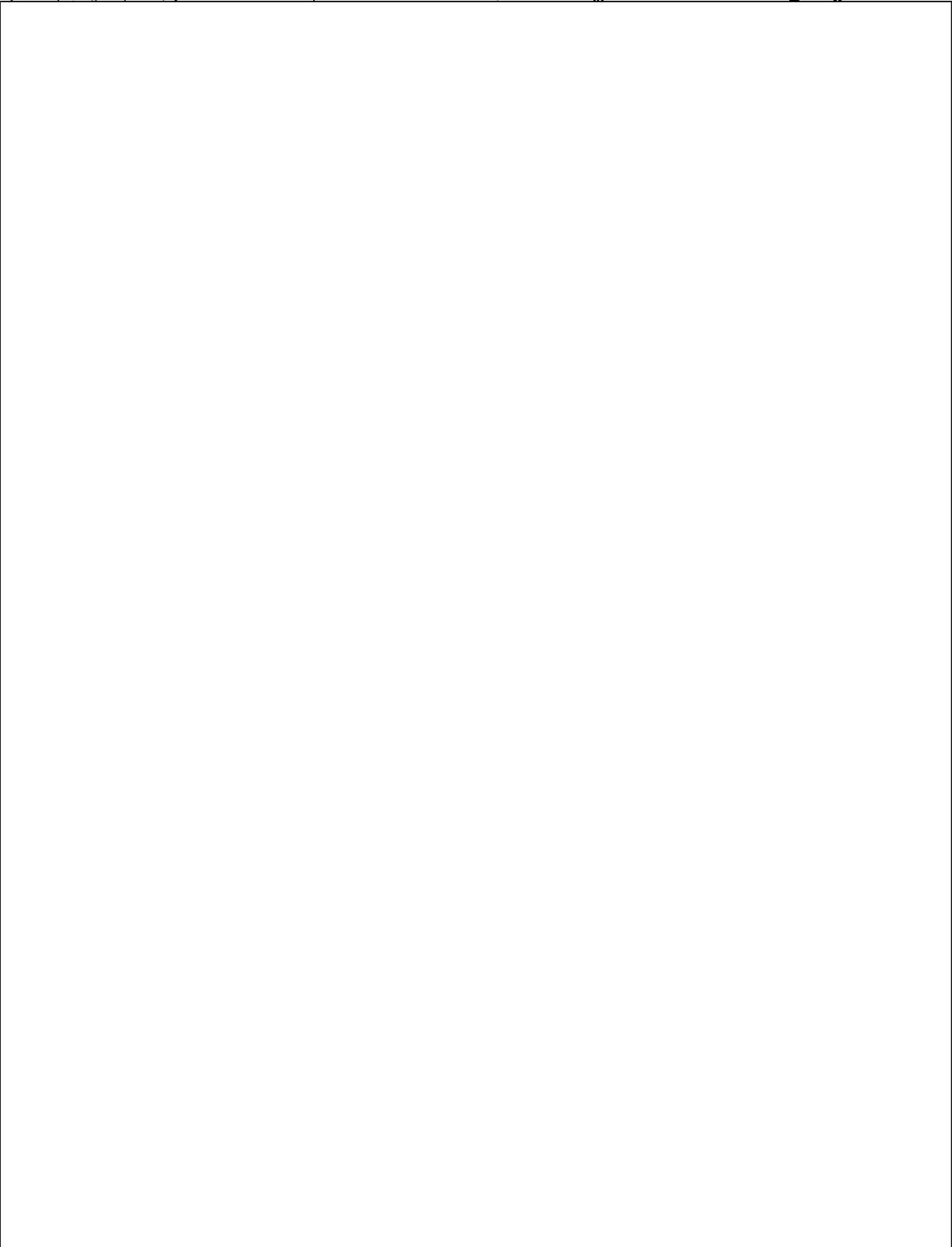
This data has been provided by the respective program offices.

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	22	TCO London
	23	DDP TCO
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	27, 28	C/ICRS
	29	Special Center TCO
	30	IRS ReqBr/RecceGrp
	31-40	Asst Ops/NPIC
	41	COMIREX Staff
	42	D/IAS
	43	TSO CIA
	44	DDS&T
	45	ASA/D/DCI/NIPE
	46	D/OSI
	47	ExSec, SORS/OSI
	48	D/OSP
	49	C/ILSS/DDS&T
	50	D/OEL
	51	D/SA
	52	D/O/OSA
	53	Intel/O/OSA
	54	D/FMSAC
	55-59	SA(COMIREX)/DDI