Col Cotton

TEST REPORT

XB-70A

FLIGHT 1-10

(No. 1 Air Vehicle, No. 10 Flight)

20 April 1965

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XB-70 JOINT TEST FORCE (FTTB)

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AIR FORCE FLIGHT TEST CENTER
EDWARDS AF BASE, CALIFORNIA

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I. SUMMARY:

1. The tenth flight (Flight 1-10) of XB-70, No. 62-001, with Mr. Al White, North American Aviation, Inc (NAA), Pilot and Colonel Joseph F. Cotton, Air Force Flight Test Center (AFFTC), Copilot, was completed on 20 Apr 65. Takeoff from Edwards AFB runway 04 was at 1130 hours PST, and landing on Edwards runway 22 was at 1255 hours PST. The takeoff gross weight was 503,300 pounds. Total flight time was one hour and forty-two minutes. Total supersonic time was seventy-four minutes and total time at Mach 2.0 or greater was fifty minutes. Maximum speed and altitude were Mach 2.29 and 58,500 feet.

2. Prior to, and during flight, the following discrepancies existed:

a. Two fuel pumps inoperative (1 in 6 left, 1 in 8 right).

b. Engine air bypass door manual control wheels inoperative.

c. Right engine air inlet duct unstart indicating system inoperative.

d. Engine air bypass door area counters out of calibration.

e. Minor hydraulic leaks in the right wing tip hinge and the left main gear strut.

3. Although discrepancies were noted during preflight inspec-tion, engine start, and taxi to the runway, no major problems developed. Brake chatter during taxi was not as severe as on previous flights. Military power checks of the engines were very satisfactory.

4. Lift-off, after a ground roll of 10,400 feet, occurred at an estimated speed of 212 KIAS. The left main and nose landing gear retracted normally, but the right main folded and rotated and did not retract. Upon recycling, all three gear retracted normally. Flap retraction was normal and climb to test altitude of 57,500 feet was initiated. After passing through Mach 1, manual control of the bypass doors with the standby electrical switches was established. Hung up and unaccounted for movement of the bypass door area counters became apparent at this time. The windshield was raised to the up position for the first time in flight as the aircraft passed through Mach 1.13 at 34,000 feet. The tips went full down at approximately 500 KIAS. Manual operation of the bypass doors and both manual and automatic shock position control tests continued through the climb. At 57,500 feet, Mach 2.25 stability and control maneuvers and inlet unstart tests were completed.

5. Ram purge tests, conducted during the descent (43,000 feet, Mach 1.75), were satisfactory, but both pilots' altitude tapes locked up during the period of high cabin altitude and remained inoperative for the remainder of the flight. Continued descent, lowering of the windshield, wing tip unfolding, gear and flap extension, approach, and landing were normal. Touchdown speed was 174 KIAS. Again, as in pre-vious flights, only two of the three drag chutes deployed.

II. TEST LOG:

0925	Pilots in cockpit Right bypass area counter 250 later 170 square inches Left bypass area counter 0.
0937	AICS package power - ON.
0953	Utility power on to check AICS.
1006	AICS checks complete.
1008	C/N 56 - all engine starts manual Start Engine No. 3 - EGT 520°C - A_8 67% - all O.K.
1009	Start Engine No. 1 - EGT 490°C - A_8 73% - all O.K.
1010	C/N 177 Start Engine No. 2 - EGT 550°C - A_8 70% - all O.K.
1011	Start Engine No. 4 - EGT 560°C - A_8 71.5% - all O.K.
1013	Start Engine No. 6 - EGT 530°C - A_8 70.5% The No. 6 utility pump indicator went green then to orange U_2 pressure is a little high.
1014	Start Engine No. 5 - EGT 520°C - Master caution light stays on because of pressure light on No. 6 utility status. Engine No. 3 A_8 is 67% - Reset to 70% - 73%.
1015	Generator on - Checks O.K. U_2 - 4350 psi (TM Van reading).
1016	Service hydraulics - U_2 160 psi Master caution light still blinking on and off.
1023	Bleed air check.
1024	A_8 position at idle Engine No. 1 - 73%; No. 2 - 70%; No. 3 - 67.5%; No. 4 - 72%; No. 5 - 73%; and No. 6 - 71%.
1027	Engine No. 1 at military power - A_8 position - 40% Take hydraulic quantity readings (see hydraulic card).
1029	Flight controls check O.K.
1031	Check FACS and trims - O.K.
1034	Tower reports wind at 6 knots from 240° Engine No. 2 - military power; EGT - 900°C; A_8 - 38% - C/N 1658.
1035	Engine No. 3 - military power; EGT - 880°C; A_8 - 39% - C/N 1690.
1036	Engine No. 4 - military power; EGT - 910°C; A_8 - 40% - C/N 1732; nozzle seemed to hang up when EGT was approximately 940° - 950°C.
1037	Engine No. 5 - military power; EGT - 880°C; A_8 - 41%; C/N 1780; high vibe light blinks on with vibe between 40% - 50%.
1038	Engine No. 6 - military power; EGT - 880°C; A_8 - 41%; C/N 1822; Air data, Engine No. 3 nozzle caution, and master caution lights flashing on and off. Cycle circuit breaker one time - lights go out.

Test Log (Cont'd)

1039	A8 for engine No. 3 at idle is 67.5%.
1040	Fuel level tank No. 3 - 23,300 pounds; Tank No. 6 - Auto.
1041	Start flight recorder.
1042	Close cabin door; AUX-COOL and fans - ON.
1043	All engines to military power; C/N 2170, Right hand bypass doors indicator reads 100 square inches; EE bay temperature 68°F; disconnect ground cooling; take hydraulic readings (see hydraulic card).
1045	Take fuel quantities and other readings (see fuel card).
1049	Wind 6 knots at 260°; cleared to taxi to runway 040.
1050	C/N 2578; brake release; start taxi.
1054	Auto brake check; forward and aft; caution lights come on on both systems. System O.K. as long as light is off when auto is selected.
1103	Stop for inspection; Brake chatter not so bad; left hand brake chatters more than the right Data on C/N 3355 Flight controls check; data off C/N 3399.
1104	Flaps down.
1107	Taxi onto runway 040; take quantity readings (see fuel card).
1108	Line up on runway; stop; left hand brake has a lot of chatter; inspect tires; check flight control positions.
1109	Reset data counter; Hydraulic readings: P_1 - 145; P_2 - 140; U_1 - 148; U_2 - 148; Operations vehicle reports the runway is clear.
1111	Two minute warning.
1111:30	Data C/N 124.
1112	Data On.
1113	Advance power to 85% rpm - Refer and coolant circuit turned on. Light afterburners Engine No. 3 and No. 4; Engine No. 2 and No. 5; Engine No. 1 and No. 6 - Tanks 1, 2, 4 and 7 Auto; Tank 8 off.
1113:20	Brake release - advance power to maximum afterburner All engines look good 100% ± .3%; EGT good; A8 good; Rotation 205 KIAS; lift off 212 KIAS.
1115	Data on C/N 322; put gear handle up; nose and left main gear going up O.K.; right main gear folding and rotating but does not retract; all gear doors are open; pull throttles back to 85°; C/N 356 Right strut remains down; U_2 - 180; U_1 - 200 plus Red light remains on in handle; hydraulics look good. Engines look good.

Test Log (Cont'd)

1116	C/N 398; put gear handle down; all gear down and locked; Right gear stayed folded until left gear was down; 3 green gear lights; airspeed 250 KIAS; U_1 - 184; U_2 - 192; P_2 - 200.
1117	C/N 448; put gear handle up; all gear up and locked; red light out in handle; airspeed 255 KIAS; select flaps up;
	Flaps up; advance throttles to maximum afterburner.
1118	Little turbulence.
1119	Airspeed TB-58 - 372 KIAS; XB-70 - 380 KIAS.
1120	Mach .77; all sucker doors are closed
	Airspeed 405 KIAS; altitude 19,000 feet.
	Rumble disappears 21,000 feet; Mach .9; altitude 25,000 feet
	Mach .9; airspeed 400 KIAS; C/N 720.
1122	Wing tips to one-half; hydraulics look good; both wing tips indicate 25° - 28,000 feet.
1124	Coming up on 33,000 feet; little buffet in turn and at low speed.
1125	Come to a 35° heading.
1126	Indicate Mach 1.0 now
	Left hand bypass 200 square inches; hit beep switch about 6 times - indication yet;
	Beep switch - left hand 200, wandering 200-260 square inches.
	Right hand opening - 400 square inches
	50° heading and still turning
	Right hand bypass 400 square inches.
1127	Left hand bypass 220 square inches; FACS On; Engines look good.
1129	Mach 1.14; altitude XB-70 34,950 feet;
	TB-58 indicates 1.13 Mach at 34,150 feet; bypass area holding 190 square inches left hand and 410 square inches right hand.
1130	Bypass area - 170 square inches left hand; 400 square inches right hand.
1131	C/N 1300 - Windshield ramp selected up - ramp up.
1132	Coming up on 500 KIAS - select wing tips to 65° position; in a little turbulence;
	Bypass moved to increase.
1133	Bypass area right hand 500 square inches; left hand 750 square inches
	Shock position in red; bypass area left hand 750 square inches; right hand 500 square inches;
	Left and right shock positions about even;
	Shock position one-fourth inch above yellow.

Test Log (Cont'd)

1134 Engines good; airspeed 490 KIAS; Mach 1.58; Bypass area holding 750 square inches left hand and 500 square inches right hand.

1135 Mach 1.58
Bypass area 750 square inches left hand; 500 square inches right hand; holding steady; water on; Mach 1.65; pitot heat and windshield defog switches off. Left hand throat wheels at Mach 1.72; right hand throat auto; wheel at Mach 1.73; throat follows well; maintain shock position above yellow.

1136 Throats set at Mach 2.0; total temperature XB-70 is 118°F; 120°C indicated by TB-58; XB-70 losing a little speed.

1137 Mach 1.77; airspeed 465 KIAS; some air vehicle turbulence; Mach 1.8; bypass area 740 square inches left hand; 500 square inches right hand; TACAN breaks off then locks on for a while; shock position holding steady one-eighth inch above yellow.

1138 Airspeed 500 KIAS; altitude 50,000 feet; Mach 1.9
Total temperature 166°F.

1139 Auto throat leading 0.02 Mach; turn right 5°.

1140 Mach 2.0; altitude 54,000 feet; total temperature 194°F; lost speed in turn; T_2 cutback O.K.

1141 C/N 1924; open bypass doors; data continuous; left and right shock position indicators proceeding toward bottom of green; needles jumping a little bit; positive movement; left hand 830 square inches; right hand 520 square inches; right needle sensitive, not to much; right hand bypass 520 square inches; right needle oscillating down in white; left hand needle 850 square inches; right hand 520 square inches; left needle steady; right needle oscillating; master caution light on; unstart right hand duct; needle was in the green when unstart occurred; Mach 2.19 reset; in the white on left - needle oscillating heavily; just in white on the right not in cross patch yet; left hand bypass area 850 square inches.

1143 Right hand bypass area 530 square inches; Mach 2.13; throat is 2.15, left and right; air vehicle Mach 2.13; decrease bypass area.

1144

Engine No.	1	2	3	4	5	6
A_8 %	93	92	90	96	96	93
EGT °C	830	830	822	822	820	820

Total temperature 262°F; right hand unstart light is on.

Test Log (Cont'd)

1145 Both needles in cross hatch; both needles oscillating; Mach 2.23; throat is following very well; altitude 57,500 feet; lose a little altitude; apply full power. Right hand duct unstarted; left hand needle oscillating from the white to the cross hatch; right hand duct unstart light on; decrease bypass area to 570 square inches; needle in white and dips to the cross hatch; bypass area 600 square inches; both needles in the cross hatch; left needle more nervous than the right needle.

1148 Bypass area 810 square inches right hand; 840 square inches left hand; engines look good; throat holding well in "AUTO"; needles in cross hatch - holding at 800 square inches; cannot get rid of unstart light.

1149 Total temperature 272°F; altitude 57,000 feet; Mach 2.23; Turn 30° bank angle; bypass area average 820 square inches.

1150 Heading 262°.

1151 Engines looking well; in the turn the left shock position indicator (needle) went to the middle of the green; left needle nervous; hold left needle in top of white; right needle steady in bottom of white.

1152 Cabin altitude 6,000 feet; EE bay temperature 43°F; needles very nervous, very difficult to get in bottom of green; bypass area 820 square inches; needles oscillating full width of green into white; air vehicle getting turbulence; TB-58 reports turbulence at 46,000 feet; practically impossible to hold bottom of green; both needles even-running mid green to cross hatch.

1153 Mach 2.28; altitude 57,200 feet
Bypass area left hand 800 square inches; right hand 500 square inches;
Data on C/N 2660

Eng. No.	1	2	3	4	5	6
AS - %	77	75	75	82	80	79

Data off C/N 2677; throttle angle 84° to 85°.

1154 Mach 2.25; altitude 57,500 feet; throat wheels set at 2.1 Mach; throat holding real fine; hard to hold air vehicle Mach number.
FACS off; Tank 2 off; Data on C/N 2733
Pitch pulse - turbulence - air vehicle wallowing a lot; Data off C/N 2769.

1155 Lost altitude and airspeed during pulse.

1157 Air vehicle heading 290°; C/N 2805
Bypass area left hand 800 square inches; right hand 500 square inches;
Shock position left hand - top of yellow; right hand -

Test Log (Cont'd)

1157	Bottom of yellow; FACS off; Data on C/N 2892; Pitch pulse; right hand duct unstart light on; yaw pulse marker; FACS on; Data off C/N 2927; no such thing as bottom of green, needle jumps around too much; needle will jump to top of green and get stable even though the controls are not being moved.
1158	Data on C/N 2965; turbulence; needles in mid-green for 5 seconds; now mid-white; bypass area left hand 820 square inches; right hand 520 square inches; throat holds fine in AUTO; Data for 5 second C/N 3005; left and right needles oscillate full width of green; bypass area holding steady left hand 820 square inches; right hand 520 square inches; when needles get into top of green or yellow they dampen down and get stable.e
1159	Bypass area left hand 800 square inches; right hand 490 square inches.
1200	Data on C/N 3040; right hand duct needle oscillating from top of yellow to bottom of red, throat holding steady, bypass area 450 square inches; left hand duct needle oscillating from mid-yellow to top of yellow; bypass area 740 square inches; C/N 3062 - Ducts unstart, left and right unstart lights On; pilot could feel unstarts; close both bypass doors simultaneously to 370 square inches right hand and 420 square inches left hand; needles bounce from yellow to red area.
1202	Data C/N 3112; needles do not oscillate as bad high as low; rudder pedal buzz; Data C/N 3145; bypass area left hand 770 square inches; right hand 370 square inches; throat good; right needle in top of yellow; left needle in middle of yellow. Air vehicle lost a little altitude, holding Mach number; Full power C/N 3112.
1203	Altitude 57,000 feet; Mach 2.27; needles top of green; standby switch - AUTO; C/N 3172; airframe buffet disappearing; throat and bypass areas set; full power C/N 3211; Data off C/N 3215.
1204	Data on C/N 3360; duct performance low; throat Auto; throat Mach number 2.1 right, 2.07 left; Shock position forward.
1206	FACS off - Trim air vehicle.
1207	Data on C/N 3485; start wind-up turn; turbulence was rough in turn.
1208	Data off C/N 3530; altitude 58,500 feet; start another turn; Data on C/N 3547; just about to get the required "g" and turbulence starts; Data off; continue turn.
1210	FACS Off; Data on C/N 3665; Pull up and release - slow cycles; Data off C/N 3690; gained about 500 or 600 feet in altitude; heading 150°.

Test Log (Cont'd)

1211	Data on C/N 3752; pitch augmentation off; sideslip full right rudder.
1212	1.5° sideslip; yaw damper working; rudder release; data off; sideslip; data on C/N 3826; FACS off.
1213	Full rudder sideslip and release; Mach 2.29 right duct unstart; start recovery; data off C/N 3879; FACS on.
1215	Come out of afterburner on engines 1 and 6 and 2 and 5; duct performance normal; Mach 2.27; data off C/N 3984.
1216	Four engines at military power; engines 3 and 4 in afterburner; altitude 56,000 feet; LN_2 good; data on C/N 4056; light afterburner on engines 1 and 6; data off; turbulence rough occasionally.
1217	Altitude 52,500 feet; Mach 2.2 flutter pulses (P-R-Y); Cabin record ready; FACS off; data on; pitch pulse; turbulence C/N 4120.
1218	Data on C/N 4169; roll pulse; data off C/N 4180; FACS on; data off C/N 4195.
1219	Data on C/N 4215; flutter pulse; data off C/N 4230; total temperature 273°F; problem slowing air vehicle down, military power; Mach 2.24; altitude 54,000 feet; rate of descent 3,000 feet per minute.
1222	Altitude 50,000 feet; Mach 2.1; total fuel 57,000 pounds.
1223	Light afterburner engines 3 and 4; 2 and 5; and 1 and 6; take engine 1 and 6 out of afterburner.
1224	Data on C/N 4545.
1226	Altitude 49,000 feet; Mach 2.02; bank angle 45°; engines 1 and 6 at military power; other engines at minimum afterburner; data on C/N 4655; FACS off; flutter pulse data off.
1227	Bypass area left hand 740 square inches; right hand 500 square inches.
1228	Data on C/N 4735; FACS off; pitch pulse high in altitude; roll pulse; tank 1 feeding; data off; come out of afterburner; data is on.
1229	Light to moderate turbulence; go below Mach 2.0, heavy turbulence now.
1230	Data on C/N 4850; all kinds of flutter points here; data off C/N 4865.
1232	Bank angle 60°; tank 1 down to 2,500 pounds; sump is holding; needles above bottom of green; data on C/N 5038; light afterburner on engines 2 and 5; Mach 1.8; altitude 45,000 feet; pitch, roll and yaw pulses; Data C/N 5135.
1233	Slow descent.

Test Log (Cont'd)

1234	Tank No. 1 off; come out of afterburner; data on C/N 5145; altitude 43,000 feet; Mach 1.75; dump cabin pressure; altitude tapes locked up on pilot's and co-pilot's panel; cabin 28,000 feet - did not go to purge; altitude 43,500 feet; Mach 1.67.
1235	Data C/N 5182; select cabin repress switch to normal; normal performance on duct; cabin altitude had risen to 29,500 feet; cabin altitude decreasing 26,000 feet now. Pilot's and copilot's altitude tapes locked up.
1236	Cabin altitude 25,500 feet; air vehicle altitude 43,500 feet; repressure now; EE overheat light on; cabin altitude 20,000 feet; release switch; throat normal Auto; EE temperature 43°F; cabin altitude 14,000 feet and decreasing; bypass area left hand 930 square inches; right hand 510 square inches; Mach number decreasing from 1.5 to 1.4.
1237	Wing tips to 25°; release rpm lock-up.
1238	Come back on power engines 1, 2, 5 and 6; standby altitude indicator read 42,000 feet.
1239	Standby altitude 41,000 feet; LN_2 15/16 going subsonic; tank No. 3 fuel 22,900 pounds; heading 165°; close bypass doors with electric switches; left hand zero square inches; right hand 280 square inches.
1240	Altitude 34,000 feet; Mach .95; TB-58 shows less speed and altitude; F-104 indicates 32,000 feet; master caution light is on; left and right throat panel extend lights are on; wing tips 25°; turning left.
1241	Mach .91; 5% data left.
1242	Little rumble - getting heavier now; Mach .80; windshield down; increase in noise level; data off; wing tips up at .78 Mach number; H_2O 3,500 pounds; NH_3 440.
1244	Bypass doors closed left hand zero square inches; right hand 220 square inches; both throats at 1.68 Mach number; tank 8 left 1,000 pounds; 8 right 1,600 pounds; tank No. 8 on.
1245	Tank No. 8 on for 30 seconds; no fuel flow.
1247	Gear down at C/N 5883; U_1 at 130; FACS off; airspeed 230 KIAS; gear down and locked; gear doors closed; flaps down; sump low level light on.
1248	Descending through 8,000 feet; will land on runway 220.
1250	Airspeed XB-70 230 KIAS; TB-58 223 KIAS; final approach airspeed 200 KIAS.
1253	Touchdown; airspeed 174 KIAS; drag chute deploy 170 KIAS; 2 chutes; jettison chute at 60 KIAS; U_1 - 20% and holding; some brake chatter; left wing low (left strut is lower than right strut).

Test Log (Cont'd)

1256 Engine readings at idle power:

Engine Number	1	2	3	4	5	6
Rpm - %	61.8	61.9	61.7	61.5	61.5	61.9
EGT - °C	480	460	450	500	480	460
A8 - %	74	70	68	72	73	71
Vibe - % ADS	5	12	8	12	10	12
Eng	30	8	5	10	11	3

Engine readings at military power; data on C/N 6473:

Engine Number	1	2	3	4	5	6
Rpm - %	100.0	100.0	100.5	100.8	99.8	100.2
EGT - °C	875	900	875	910	880	880
A8 - %	45	40	41	42	---	---

Run stopped because air vehicle started to move; data off.

1257 Take quantity reading (see fuel card).

1258 Make engine speed roll back checks - advance power from idle to military to afterburner then retard to idle; data on; engine No. 1 no roll back; engine No. 2 .2% roll back; engine No. 3 .2% roll back; engine No. 4 .3% roll back; engine No. 5 .2% roll back; engine No. 6 no roll back.

1300 Left strut is lower than right strut but the strut has not "bottomed" out; taxi off of runway; shut down engines 1 and 6; U_1 - 60%; P_2 - 172%; P_1 - 190%; U_2 - 200% plus; bypass area 60 square inches now.

1301 Shut down engine No. 2.

1303 LN_2 - 7/16; strong ammonia smell in cockpit; data on; stop air vehicle from approximately 12 mph.

1304 No digital data remaining; engine No. 4 nozzle closed; engine No. 4 readings A8 - 47%; EGT 540°C; engine No. 3 readings A8 - 67%; EGT 450°C.

1312 Take quantity readings (see fuel card).

1315 Stop at run pad; shut down engines 3, 4 and 5; take hydraulic quantity readings (see hydraulic card).

III. DATA:

1. Fuel Data:

Time	0930	1045	1107	1112	1122	1125	1128	1129	1134
Event	Before Engine Start	Before Taxi	On Runway	Prior to Takeoff	28,000 ft M 0.9	33,000 ft	34,150 ft M 1.14	34,950 ft M 1.14	Tank 4 Stopped
Transfer Condition	None	6 Auto	6 Auto	Tank 6 Auto			Tank 6 Off	Tank 4 Feeding	Tank 2 Feeding
Tank									
1	24,900	25,000	25,200						
2	29,400	29,300	29,500						27,200
3	33,300	33,200	33,200	33,100					
4	36,900	37,000	37,200						20,800
6L	38,000	35,000	32,200	31,000		10,300	4,100		
6R	38,000	32,300	27,400	26,700		5,800	1,500		
7L	10,500	10,500	10,500						
7R	10,500	10,500	10,500						
8L	10,400	10,400	10,500						
8R	9,200	9,300	9,400						
Total	244,000	235,000	228,500	227,000	188,500	183,500	172,500		

Fuel Data (Cont'd)

Time	1138	1139	1146	1155	1203	1214	1215	1217	1222
Event	50,000 ft M 1.9				C/N 3215	7, 6, 4, 2 - Off	C/N 3956	C/N 4120	50,000 ft M 2.1
Transfer Condition		Tank 4 Feeding	Tank 4 Off	Tank 2 Off (1154)	7 Off 8 Auto	8 Auto 1 On			
Tank									
1	-				-	26,600	22,600		
2		18,800							
3	29,800								
4		16,000							
6L									
6R									
7L									
7R									
8L						5,000		4,800	
8R						5,500		6,000	
Total	140,000		121,000	100,500	89,000	70,000	66,000	62,000	57,000

Fuel Data (Cont'd)

Time	1223	1224	1225	1226	1229	1232	1238	1240	1241
Event	C/N 4444	C/N 4545 6 On for 1 Minute		C/N 4655 49,000 ft	C/N 4850 Below M 2.0	C/N 5038		34,000 ft	M 0.91
Transfer Condition	Tank 8 On	Tank 8 Off	6 Off 1 On			Sump Holding	7 Off Sump Feeding	7 On	7 Off
Tank									
1			11,000		8,700	2,500			
2									
3									
4									
6L									
6R									
7L									
7R									
8L	2,500	1,700							
8R	3,000	2,300							
Total				50,000	45,500		36,000		

Fuel Data (Cont'd)

Time	1244	1245	1248	1250	1253	1257	1312		
Event		8 On for 30 seconds No flow	Descent through 8 M	Final Approach	Stopped on Runway	After Engine Runs	Shut Down		
Transfer Condition	8 On	8 On	Sump low level lite On						
Tank									
1						0	100		
2						400	400		
3	21,700	20,800	20,000	18,000	17,000	16,000			
4						600	500		
6L						2,500	2,200		
6R						1,100	1,300		
7L						2,600	2,700		
7R						2,200	2,300		
8L	1,000					500	500		
8R	1,600					800	700		
Total	36,500				30,000	28,000			

2. Hydraulic Quantity Log:

	P_1		P_2		U_1		U_2	
Time	F.L	H.P.	F.L.	H.P.	F.L.	H.P.	F.L.	H.P.
1016 (Hyd. Serviced)								160
1027	165	202	160	175	160	170	160	175
1043	152	210	150	175	158	170	153	180
1315 (Eng. Shutdown)	175	180	200	200	60	170	200	200

F.L. - Fluid Level % (full - 200%)

H.P. - Head Pressure, pounds per square inch

IV. ENGINEERING COMMENTS:

1. Shock Position Indicators:

During the Mach 2 to 2.3 portion of the flight near 57,000 feet, the shock position indicators were over-sensitive when indicating an aft shock position. The needle bounces through an arc approximately one-half the total range of the indicator. This condition, as indicated by the copilot, made control of the shock wave difficult. Instrumentation data substantiated that the shock wave was moving at a faster rate when in the aft position rather than the forward position of the duct, but the shock position indicator overshot and oscillated thus exaggerating the rate change condition. The indicator movement requires dampening to eliminate the overshoots; but yet, appreciable time delay between meter movement and actual shock position cannot be tolerated. Investigation should be made to determine whether a non-linear meter movement could be effectively utilized to compensate for the non-linear characteristics of the actual shock position movement. In any event a more readable and accurate shock position indicator is required.

2. Propulsion:

The engines performed very well during the flight. Engine speed roll back or cave in was not a problem. The maximum speed roll back was approximately .3%. After landing, the nozzle area control (NAC) on engine No. 4 (S/N 170-558) malfunctioned. This malfunction (A_8 going closed) is similar to previous NAC failures. The cause of the malfunction has been attributed to clogged fuel filters in the NAC. Analysis of the filters showed them to be clogged with fiberglas, lint and metal particles. These are the same types of material that were found in the main fuel control and servo fuel filters after Flight 1-9.

3. Strut Leak:

During the landing roll the pilot reported the aircraft to be either low on the left side or high on the right. The left strut was found to be low (but not bottomed out). There was no evidence of a hydraulic leak, therefore the strut nitrogen servicing valve assembly was replaced. However, in the process of servicing a hydraulic leak developed. The strut was then removed and the seals replaced. The leak was at the lower static seal.

4. Utility No. 1 Fluid Level Drop:

Utility No. 1 (U_1) fluid levels varied from 130% just prior to gear down to 20% at landing and back to 60% at engine shutdown. The system was pressurized after the flight, and the quantity then

read 90%. The hydraulic fluid temperature compensating portion of the quantity indicating system was suspected and checked out, but no equipment malfunction was found; however, over-compensation in indicator circuit design for system fluid temperature appears to be causing the erroneous indications. There also appears to be a transfer of utility fluid in the landing gear combination sequence (Ronson) valve during gear sequence operations. A modification to eliminate this flow was planned.

5. Landing Gear Failure to Retract:

A normal gear retraction was attempted a short time after takeoff. The right gear bogie folded and rotated but the strut did not retract. The left gear bogie rotated and folded, the strut retracted but the door did not close. The gear was then extended and a second normal extension was attempted and was successful. Electrical trouble shooting revealed no problems, therefore the right strut control valve was replaced. A series of normal and emergency retractions were then conducted and the problem did not repeat.

6. Ram Air Purge Operations:

With the air vehicle at 42,000 feet and velocity at 1.76 Mach, the cabin dump switch was initiated. Fourteen seconds after cabin dump switch initiation, the cabin pressure fell from 12 to 3.0 psia; and 70 seconds later, when the cabin repressure switch was initiated, the cabin pressure was about 5.2 psia. The cabin was completely repressurized to 12 psia about 120 seconds after repressure switch initiation. This operational test successfully demonstrated the ability of the ram air system to maintain constant cabin pressure (psia) at a higher value than the outside environment and the functional ability of the repressure system.

7. Indicators:

About one hour and ten minutes after takeoff the pilot's and copilot's altitude tape indicators failed. The tapes locked up and the "off" flags appeared and remained up for the remainder of the flight. These malfunctions were caused by failure, during cabin depressurization, of similar diodes in separate altitude vertical speed indicator amplifiers. North American Aviation engineering is planning to install diodes with greater current capacity in an effort to eliminate this difficulty. The brake control caution light that occurred on the runway prior to takeoff was caused by a faulty circuit breaker. This caution light illuminated only when the brake was in the test mode, thus indicating braking capability in the normal mode.

8. Instrumentation:

No major difficulties were encountered in processing the instrumentation data for this flight; in fact, the preliminary data extracted from the editing tapes were of exceptional quality. Of 742 parameters there were 13 parameters inoperative or incorrect prior to flight and seven additional parameters with improper preflight calibration information identified to date.

9. NASA Supersonic Transport Tests and Instrumentation:

a. Landing Gear Instrumentation and Cameras:

The quality of the landing gear photographs was better than on any previous flight. The rate of sink arms and wheel rpm pickups provided good data. Special coating materials had been applied to the main gear rate of sink arm skid pads for this flight in an attempt to alleviate the wear. A postflight examination of the pads revealed that the wear was just as bad as previous flights; therefore, the coating materials will not be used in the future.

b. Cabin and Ballast Bay Microphones:

The cabin recorder was turned on at time 1217 and left on for the remainder of the flight. Internal acoustics measurements were obtained for the high of flight, during the ram purge test and at the time of the noise onset just below Mach .9. When the windshield ramp was lowered the cabin noise increased about 5 decibel.

c. Velocity Acceleration Altitude (VGH) Recorder:

A good VGH record was obtained for the entire flight.

d. Sonic Boom:

The XB-70 flew directly over the sonic boom measurement station located just north of Edwards Air Force Base. The airplane was at approximately Mach 1.8 at 48,000 feet.

10. Pilot's Write-Ups:

a. Landing gear did not retract on first cycle.

b. Altitude tapes failed during purge operation.

c. Left hand strut lower than right hand after landing. Found air valve leaking through core. Replaced and serviced strut left hand.

d. Nozzle (Primary and Secondary) closed during taxi-in on engine No. 4.

e. U_1 fluid level read 60% after landing.

f. Brake control light "ON" during brake check (both systems).

V. OBSERVATIONS AND COMMENTS BY THE COPILOT:

1. Preflight, Engine Start and Taxi:

a. The external and electronic equipment bay inspections were initiated at 0730. There was considerable work going on at this time which necessitated a recheck of many pilot check list items by Max Wells, North American Aviation, and the maintenance crew just prior to engine start. Hydraulic leaks were observed on the right wing tip hinge line and the left main gear strut. I was assured by inspection that they were not of sufficient magnitude to cause trouble. A fuel boost pump was inoperative in each of tanks No. 6 left and No. 8 right. Synchro troubles in the bypass door control system rendered the manual wheels inoperative and necessitated the doors be controlled with the standby electrical switches. The right unstart indicating system was inoperative although I didn't recall being told about it prior to flight. The bypass area counters did not show the correct door opening so calibration data were given me for use to set the desired door open areas. At 0855 I started donning the full pressure suit which required 20 minutes and at 0925 I was seated in the capsule. An additional 10 minutes were required to hook up and check out the suit. Air induction control system (AICS) package power was turned on at 0937. With utility pressure on at 0953 I completed the AICS checks by 1006. All checks of the bypass were accomplished using the standby switches. The left bypass area counter hung up at zero and after break away responded very swiftly and with irregularity. Precise and smooth control was not possible. The right bypass area counter held 250 square inches with the doors closed and later during engine runs and taxiing, jarred loose and closed to 170 and 100 square inches.

b. Engine starts, using the manual technique, required seven minutes. The average peak exhaust gas temperature (EGT) at start was 530°C with a high of 560°C and a low of 490°C. The No. 6 utility pump pressure was high which caused the status indicator to go from green to orange frequently and resulted in the master caution light remaining on most of the time.

c. Hydraulic service, generator, bleed air and flight control checks were completed prior to a military power run on each engine. The No. 5 engine vibration level was 40% to 50% at military. The AIR DATA and SET NOZZLE caution lights flickered on when engines No. 5 and No. 6 were at high power. It appeared to me that these two lights came on when the vibration level in the airframe increased.

d. At 1040 sump tank No. 3 level was 23,300 pounds and I turned tank No. 6 to AUTO. Two minutes later the cabin door was closed and we turned the AUX COOL and FANS on. At 1043, counter number (C/N) 2170, all engines were taken to military power simultaneously and again they looked very good.

e. The tower reported a wind from 260° at 6 knots and with a fuel totalizer reading of 235,000 pounds we started to taxi at 1050 for a downwind takeoff toward the lake bed on runway 040. While taxiing, Al made the required electrical circuit test of the auto brake system and found the BRAKE CONTROL caution light came on with the test switch in both the forward and aft positions. This condition was questioned and it was agreed that the system was O.K. as long as the light remained off when automatic brakes are selected. When stopping, the brakes did transmit vibrations in the airframe but they were not nearly as severe as I had felt on the stops in the early taxi tests or the first five flights. The flight controls were checked and flaps extended prior to entering the runway.

f. At 1108 we were lined up and stopped on runway 040. The left brake appeared to chatter more than the right. The tires were inspected and flight control positions were rechecked. The pre-takeoff check list was accomplished and hydraulic levels were averaging 145%. At 1111 chase was given the two minute warning and at 1111:30 the data C/N was 124. Fuel totalizer was 227,000 pounds with tank No. 3 holding 33,100 pounds.

2. Takeoff and Initial Climb:

a. Takeoff performance was predicted at 77°F and 2,180 foot pressure altitude for a gross weight of 505,000 pounds. Predicted takeoff distance was 8,700 feet at a rotation speed of 190 KIAS and lift-off at 210 KIAS. Al advanced all engines to 85% rpm and I turned REFER and COOLANT CIRC on. Afterburner light offs were made in the order of 3 and 4; 2 and 5, then 1 and 6. Fuel switches were 1, 2, 4, 6, and 7 AUTO and 8 OFF. At 1113:20 brakes were released and power advanced to maximum afterburner. I kept a constant watch on the engines and they all looked perfect throughout the throttle advance and at maximum power. I didn't get the initial rotation speed but observed 205 in rotation and estimated lift-off at 212 KIAS on the tape airspeed. The ground roll distance was 10,400 feet.

b. After a check of the hydraulics and near 250 KIAS the gear handle was placed up. The left main and nose gears retracted normally and although the right one rotated and folded it would not retract. I reduced power to 85° throttle angle (T/A) and checked utility fluid levels at: U_1 - 200+% and U_2 - 180%. The gear handle was placed down at 250 KIAS and although the right gear remained folded until the left one was down they extended and locked with three green lights and no red in the handle. U_1 quantity was 184% and U_2 192%. At 255 KIAS the gear handle was again placed in the up position and a normal retraction was observed. The flaps were retracted and the throttles were advanced to maximum afterburner.

3. Climb and Acceleration:

a. Light turbulence was encountered in the climb. When the XB-70 reported 380 KIAS the TB-58 reported 372 KIAS, which again confirms the generally agreed to 8 knots high airspeed observed on the XB-70 tape indicators. Chase reported all engine sucker doors closed at Mach .77, 405 KIAS and 19,000 feet. A light to moderate rumble was present in the cockpit during the climb and disappeared at approximately 400 KIAS, .9 Mach between 21,000 and 25,000 feet. The wing tips were folded to 25° at 28,000 feet with a fuel totalizer reading of 188,500 pounds. At 1126 we were indicating Mach 1, and using the standby switches I started opening the bypass doors. I beeped the left switch about six times without a change in the area counter before it broke loose and continued to oscillate between 200 and 260 square inches. The right hand bypass area opened with good response and maintained very close to 400 square inches. A fuel totalizer of 172,500 pounds, tank 6 left showed 4,100 and 6 right 1,500 and I turned tank 6 off. At Mach 1.14 with tank 4 feeding, the XB-70 altitude was 34,950 feet and the TB-58 reported 1.13 Mach at 34,150 feet. The bypass areas were holding 190 square inches on the left and 410 square inches on the right without any change in switch position. A minute later the bypass area counters were recorded at 170 square inches on the left and 400 square inches on the right ---- again without any switch movement.

b. The windshield ramp was selected up and I would estimate its time to actuate at approximately 25 seconds. The movement was very smooth and it very rapidly became apparent that we had now lost all reference to the horizon out front. At approximately 500 KIAS the wing tips were selected to the 65° position and extended without delay as we felt some light turbulence. In keeping with the schedule I increased the bypass area to 500 square inches right and 750 square inches on the left (this differential between the bypass area counters was agreed to as a result of a calibration obtained shortly before flight). I observed both shock position indicators moving down in the red band ---- they were just about even. As we continued to climb and accelerate, the shock position needles came on down in the red and were even at approximately one-fourth of an inch above the yellow band. At 490 KIAS, Mach 1.58 I observed tank No. 4 had stopped feeding at 20,800 pounds; tank No. 2 was 27,200 pounds and decreasing. The bypass areas were now holding steady at 750 square inches on the left and 500 square inches on the right. At Mach 1.65 I turned the water switch on and the pitot heat and windshield defog switches off. At 1.72 Mach I placed the throat mode switches in automatic and observed the throat counters following the air vehicle Mach very well and maintained a shock position just above the yellow. At Mach 1.77, 465 KIAS some turbulence was encountered. The shock position needle was holding steady about one-eighth inch above the yellow with the bypass areas 740 square inches left and 500 square inches right. The TACAN

insisted on breaking lock frequently. At 50,000 feet airspeed, 500 KIAS and Mach 1.9 the total temperature was 166°F with a fuel total of 140,000 pounds and a sump level of 28,800 pounds. Tank No. 2 was 18,800 pounds; tank No. 4 was feeding and indicated 16,000 pounds. The throat Mach number in automatic was leading the air vehicle Mach by 0.02.

c. At Mach 2, 54,000 feet, the total temperature was 194°F and I observed engine EGT's all starting to cut back. At C/N 1924 data was turned on continuous and I opened the bypass doors with the standby switches in an attempt to position the shock needles at the bottom of the green. As soon as the needles dropped very far down in the green they started to become erratic and jump up and down. I opened the bypass area counters to 830 square inches on the left and 520 square inches on the right. The right shock position needle was oscillating down in the white; the left needle was somewhat steadier. The master caution light came on due to the right duct unstart light coming on. The right shock position needle was in the green at the time the unstart caution light came on. I assumed that since we were near Mach 2.17 it was because the system had become armed and I hoped eventually the light would go out. The left shock position needle was in the white and oscillating. The right shock position was in the white and much steadier as we held a bypass area of 850 square inches on the left and 530 square inches on the right. The air vehicle Mach number was 2.13 and both throat Mach numbers were 2.15. The total temperature was 262°F when engine nozzle positions were observed and reported between 90% and 96% and EGT's ranged from 820° to 830°. The right unstart light remained on. We continued to increase speed and altitude with a constant bypass area.

d. At 2.23 Mach number, 57,500 feet both shock position needles were oscillating between the cross hatch and white areas as Al reported he was losing a little altitude and applying power to maintain Mach number. At 121,000 pounds total fuel I turned tank No. 4 off. The right duct unstart caution light was still illuminated and the left shock needle continued to oscillate from white to cross hatch. I adjusted the bypass areas in an unsuccessful attempt to place both shock positions in the cross hatch area but both needles were oscillating almost continuously. In an attempt to get rid of the right duct unstart light, which was not properly operational prior to flight, I opened the bypass area to 810 square inches right and 840 square inches left. The engines looked good and the throat was holding very steady on schedule in AUTO.

e. At 57,000 feet and 2.23 Mach, a total temperature of 272°F, a 30° left bank turn was initiated with the bypass areas at an average of 820 square inches. The engines continued to look good and in the turn the left shock position indicator moved up to the middle of the

green. The needle was very nervous and I attempted to hold it in the top of the white while the right shock position needle held fairly steady in the bottom of the white ---- the needle appeared to be bottomed out there. Cabin altitude was 6,000 feet and electronic equipment (EE) bay temperature 43°F. The shock position needles continued to be very nervous and were difficult, if not impossible, to stabilize any place near the bottom of the green. With the bypass areas at 820 square inches both needles were oscillating the full width of the green and at times into the white. We were feeling some turbulence and the TB-58 reported turbulence at 46,000 feet.

f. At Mach 2.28, altitude 57,200 feet, the bypass areas were 800 square inches left and 500 square inches right when data was turned on for 10 seconds data at C/N 2660. Engine nozzles were recorded on engines No. 1, 2 and 3 at 75% and engines Nos. 4, 5 and 6 at 80%. Throttle angles were 84° to 85° and data was turned off at C/N 2677.

4. Level Off and Tests Started:

a. At 57,500 feet and Mach 2.25 the throat wheels were manually positioned at 2.1 Mach and I observed the throat continued to hold very well on schedule in AUTO. Al reported it increasingly difficult to hold air vehicle Mach number as we got set to do flutter pulses. At C/N 2733 Al turned FACS off and I turned tank No. 2 off. We were in some turbulence as Al completed a pitch pulse and we observed air vehicle wallowing considerably and data was turned off at C/N 2769. We lost some altitude and airspeed during the pulse --- fuel total was 100,500 pounds. With a bypass area of 800 left and 500 right the shock positions indicators were at the top of the yellow on left and bottom of the yellow on the right. FACS were again turned off and data on at C/N 2892 to get another set of pitch and yaw pulses. FACS were again turned on.

b. The next test objective was to force the inlets to unstart by closing the bypass doors. By this time I had concluded there was no such thing as controlling the shock position in the bottom of the green since the needles jump around continuously any time they are below the top of the green. In smooth stabilized flight it was possible to move the shock position needles to the top of the green and maintain them at this position. At C/N 2965 we were still in turbulence and I attempted to control the needles in mid-green for 5 seconds of data. The bypass area was 820 left and 520 right and the throat was holding well in AUTO as I opened the doors to move the shock needles in the white for 5 seconds of data. I had very little confidence as both needles were still oscillating the full width of the green band while the bypass areas were steady. At C/N 3040 the right shock position needle was oscillating from the top of the yellow to the bottom of the red. I reduced the left bypass area from 800 to 450 square inches.

At C/N 3062 both duct unstart lights were on and A1 reported he could feel the unstart. I had closed both bypass doors simultaneously to 370 square inches right and 420 square inches left and the shock position needles were bouncing from yellow to red. Airframe buffet progressed from a trace to moderate in intensity. At C/N 3112 A1 reported rudder pedal buzz and at C/N 3145 I increased the bypass area to 770 square inches on the left. We did not observe any buzz caution light illumination while getting these data points. Throat schedule was holding good; the left shock position needle was in the middle of the yellow while the right was in the top of the yellow with a bypass area of 370 square inches. A1 was losing a little altitude but holding Mach number and had full power on at C/N 3112. At 57,500 feet, Mach 2.27, the needles were both in the top of the green and the airframe buffet was disappearing. Total fuel was 89,000 pounds when I turned tank No. 7 off and tank No. 8 to AUTO with data off at C/N 3215. At C/N 3360 I went to low duct performance and the throat Mach numbers went to 2.1 right and 2.07 left as the shock positions moved forward.

c. FACS were turned off and while in some turbulence A1 started a windup turn. The turbulence caused him to terminate this maneuver and at 58,500 feet and at C/N 3547 he attempted to get another point although the air was still turbulent. With FACS off, C/N 3665, he performed a pullup and release and a sideslip with full right rudder. In the full rudder sideslip and release at Mach 2.29 the right duct unstarted. FACS were turned on as I recorded a fuel total of 70,000 pounds with tank No. 8 left 5,000 pounds and tank No. 8 right 5,500 pounds. Tank No. 1 was on with 26,600 pounds remaining and tank No. 8 was in AUTO. Tanks No. 7, 6, 4 and 2 were off. At a fuel total of 66,000 pounds with tank No. 1 at 22,600 pounds we came out of afterburner on engines No. 1 and 6; and 2 and 5 and I went to normal duct performance at Mach 2.27. At 52,500 feet, Mach 2.2 flutter pulses were performed in pitch, roll and yaw, with FACS off and the cabin record switch on ready.

5. Start of Descent:

a. At 54,000 feet, Mach 2.24 and a total temperature of 273°F all engines were placed in military and a rate of descent of approximately 3,000 feet per minute was started. At 50,000 feet, Mach 2.1 the total fuel was 57,000 pounds and tank No. 8 was on with 8 right 3,000 pounds and 8 left 2,500 pounds. I turned tank No. 8 off when 8 right got to 2,300 pounds and 8 left at 1,700 pounds. I turned tank No. 6 on for one minute and selected tank No. 1 on which showed 1,100 pounds. At 49,000 feet, Mach 2.02 flutter data was obtained with FACS off ---- fuel total of 50,000 pounds. The bypass area was 740 square inches left and 500 square inches right. With a total fuel of 45,500 pounds I was sure tank No. 1 was feeding as the individual readout was 8,700 pounds.

b. As we were decelerating through Mach 2.0 we encountered moderate to heavy turbulency and turned data on at C/N 4850. At 45,000 feet, Mach 1.8 the sump was holding at low and tank No. 1 was down to 2,500 pounds. The shock position needles were holding near the bottom of the green as pitch, roll and yaw pulses were completed.

c. At 43,000 feet, Mach 1.75 I turned tank No. 1 off and placed the cabin pressure switch to DUMP. The cabin altitude peaked at 38,000 feet and reduced and held near 28,000 feet as we slowed to 1.67 Mach and 43,500 feet. It was obvious to me that the ram air scoop had extended automatically as A1 had not been required to manually select purge. My pressure suit inflated for a short period. I placed the cabin pressure switch to normal and A1 selected cabin to repressure. The cabin repressurized and during the process we observed an EE temperature of 43°F. During this cabin dump, purge and repressure test, the pilot and copilot altitude tapes locked up and their red off flags appeared continuously for the remainder of the flight.

d. The wing tips were raised to the 25° position near Mach 1.4 and tank No. 7 was turned off. At 41,000 feet, observed on the standby altimeter, I recorded the LN_2 at 15/16th and the sump tank No. 3 fuel at 22,900 pounds when we went subsonic. I closed the bypass doors with the electrical standby switches and the left one went to zero while the right one maintained 280 square inches. At 34,000 feet, Mach .95 the master caution light was triggered on by the left and right throat panel extend lights on the annunciator panel. This was caused by my initial improper movement of the manual throat wheels while opening and cutting power to them in preparation for landing. At Mach .80 we sensed some rumbling in the aircraft, lowered the windshield ramp and the noise level increased. The wing tips were placed up at .78 Mach number with a water quantity of 3,500 pounds and ammonia at 440 pounds. With a total fuel of 36,500 pounds tank No. 3 was 21,700 pounds. Since tank No. 8 left was 1,000 pounds and 8 right 1,600 pounds I turned tank No. 8 switch on for 30 seconds but could not get those values to decrease. Both throat Mach numbers were 1.68 and bypass door positions were now zero square inches left and 220 square inches right.

6. Approach and Landing:

a. At C/N 5883, 230 KIAS and a U_1 quantity at 130 the FACS were turned off and the gear was extended as the SUMP LOW light came on. Gear extension was normal as reported by chase and indicated in the cockpit as we descended through 8,000 feet for a straight in to land on runway 22. On the final approach the XD-70 tape KIAS was 230 and the TD-58 reported 223 KIAS. The final approach airspeed averaged very close to 200 KIAS. I observed a touchdown speed of 174 KIAS with a drag chute deployment at 170 KIAS and chute jettison at 60 KIAS. The U_1 quantity was now down to 20% and holding. The left wing appeared to be lower than the right as we stopped on the

runway with a fuel remaining on the totalizer of 30,000 pounds and a sump reading of 17,000 pounds.

b. Engine data was recorded at idle and military. The nozzles were 68% to 74% at idle and 40% to 45% at military. Afterburner light offs were accomplished to observe rpm roll back, the most of which, was .3% on No. 4 engine. Ground crew reported the left strut was lower than the right but it had not bottomed out so we taxied in. We shut down engines No. 1, 6 and 2 and observed the U_1 system at 60%, with P_2 at 172%, P_1 at 190% and U_2 200+%.

c. As we taxied an ammonia smell was noticeable in the cockpit and although we had only analogue tape remaining we took some brake data on the way in. Mobilcom reported it appeared that No. 4 engine nozzle (the secondary) was closed more than it should be and we observed an A_8 of 47% while No. 3 engine was 67%. I taxied the airplane into the run pad on three engines. The nose wheel steering was very smooth and the general riding qualities excellent at this gross weight with three engine idle thrust.

VI. CONCLUSIONS:

1. (C) Flutter, AICS, stability and control and ram purge tests were satisfactorily conducted with a maximum speed and altitude of 2.29 Mach and 58,500 feet.

2. (U) Nose ramp was satisfactorily extended and retracted in flight for the first time.

3. (U) The aircraft systems, which gave overall satisfactory operation are:

Engines	IFF
Fuel	Environmental
Nose Wheel Steering	Radios
Brakes	Oxygen
Flaps	Flight Controls
Instrumentation	Wing Fold
Electrical	TACAN
Communications	Drag Chute (2 only)
Fire Detector (Eng & ADS)	Nose Ramp

4. The bypass door standby switches were used to control the shock positions and were satisfactory.

5. The shock position indicators are over-sensitive in the normal and low performance ranges (aft shock positions).

6. Engine No. 4 NAC failure was caused by clogged fuel screens in the A_8 and A_9 controls.

7. Utility hydraulic fluid transferred from the No. 1 to the No. 2 system during gear extension.

8. The hydraulic fluid temperature compensating portion of the quantity indicating system appears to be causing erroneous indications.

9. Cause of the failure of the landing gear to retract wasnot specifically defined.

10. The altitude tape malfunctions were caused by failure of diodes in the altitude vertical speed indicator amplifiers.

11. Brake chatter and resultant cockpit vibrations were moderate compared to previous flights.

12. (U) Previous problems experienced with primary pitch trim appear to be corrected since installing greater capacity relays.

13. (U) Cockpit voice tape recording was unintelligible due to distortion.

VII. RECOMMENDATIONS:

1. Continue engineering investigations necessary to provide less erratic needle movement on the shock position indicator while retaining good response and accuracy.

2. Reduce or eliminate the utility hydraulic systems fluid transfer during gear extensions.

3. Reduce or eliminate errors in the hydraulic fluid indicating system.

4. Eliminate the audio distortion in the cockpit voice recorder.