FLIGHT NO. : 1-19-32 PILOT: NEIL ARMSTRONG (2-2)

DATE : 12-9-60 FLIGHT TIME: :10:49.0

LAUNCH LAKE : PALMDALE OMNI LANDING LAKE: EDWARDS

LAUNCH TIME : 11:52:40.0 LANDING TIME: 12:03:29.0

ABORTS : NONE

CHASE : F-100 MAJ. DANIELS

F-104 LCDR. PETERSEN

F-104 MAJ. WHITE

B-52 : 008 CAPT. ALLAVIE

MAJ. COLE

M_{max} : 1.80

V_{max} : 1743

H_{max} : 50.1 K

$\bar{q}_{max}$: 736

ENGINE NO. : -11(2)

BURN TIME : 260.1 TO 270.1 SEC (B.O.)

THRUST-% : 8 CHAM.

CONFIG. : VENT. ON, -11 ENG., BALL NOSE (1ST FLT)

PURPOSE : BALL NOSE EVAL.

RESULTS :

X-15 FLIGHT REQUEST

Flight No. 1-~~18~~ 19-32

Date of Flight Request 12-6-60
Scheduled date of flight 12-8-60

Pilot: Neil A. Armstrong

Subject of test: Evaluation of "hot nose" and alternate airspeed sources; additional stability and control data.

Airplane configuration: Two XLR-11 engines; nose boom replaced with "hot nose"; pilot's airspeed and altitude on alternate system.

Launch: M = 0.82, h_p = 45,000 feet, SAS 4-4-8 over Palmdale OMNI on magnetic heading 030°.

NO.	ALT.	M	M'	α	EVENT
1	45	0.82		8°	Launch, light 8 chambers, initiate 8° α climb.
2	44	1.2	1.05	3°	Pushover to 1/2 g for roundout at 50K.
3	50	1.4	1.23	5°	Obtain calibrate while accelerating.
4	50	1.5	1.33	5°	Perform 4-0-0 rudder pulse - reset SAS 4-4-8.
5	50	1.6	1.41	10°	Initiate 2.5g left turn. Perform following pulses: Stabilizer (0-4-8), aileron (4-0-8), rudder (4-0-0), reset SAS 4-4-8.
6	50	1.6	1.41	3°	Roll out on heading of 260°M, obtain calibrate.
7	50	1.8	1.60	3°	Extend speed brakes, perform full deflection sideslip; 4-0-0 release; and 0-4-8 pitch pulse. Reset SAS 4-4-8.
8	50	1.8	1.60	3°	Close speed brakes, 5/8 thrust, accelerate to "turn" line.
9	50	1.9	1.70	-	Initiate 2.0g left turn.
10	48	1.4	1.23	11°	Obtain 4-0-0 rudder pulse - reset 4-4-8.
11	42	1.0	0.9	6°	Roll out on 100°M, establish 240 knot glide to high key.
12	≈20	≈0.6	-	2°-8°	On downwind leg, perform pushover - pullup.
13	Check ventral armed, pressurize tanks.				

Flight No. 1-18-32 (Continued)

14. 300 Knot landing approach, jettison ventral 3 miles from touchdown, flaps and gear down -- intended touchdown is 2 - mile marker.

15. After touchdown, apply roll and yaw control to evaluate ground directional control.

16. Before APU shutdown, cycle controls, retract flaps and set stabilizer trim to zero. DATA OFF

NOTES: 1. Duration of flight approximately 9 minutes.

2. Emergency lake --- Rogers

ALTERNATE SITUATIONS:

1. Pitch SAS malfunction before launch will constitute an abort.

2. With 3 or less chambers operating, shutdown, jettison, and land.

3. With 4, 5, or 6 chambers operating, a constant turn should be maintained within 10 to 12 nautical miles of the base at or above 35K

4. With 7 chambers operating, continue with original flight plan.

Launch Wt.	33,800#	Landing Wt.	14,400#
Launch C.G.	21.1%	Landing C.G.	18.7%

INSTRUMENTATION PARAMETER LIST

Basic (Altitude, airspeed, α, β, a_n)

Handling Qualities

Landing Gear

Horizontal Tail Loads (Strain Gages)

Fuselage Side-Fairing Vibration and Flutter

Upper and Lower Vertical Tail, Wing and Fuselage Pressure Distribution

Environmental Temperatures

Structural Temperatures

Free-Skin Temperatures

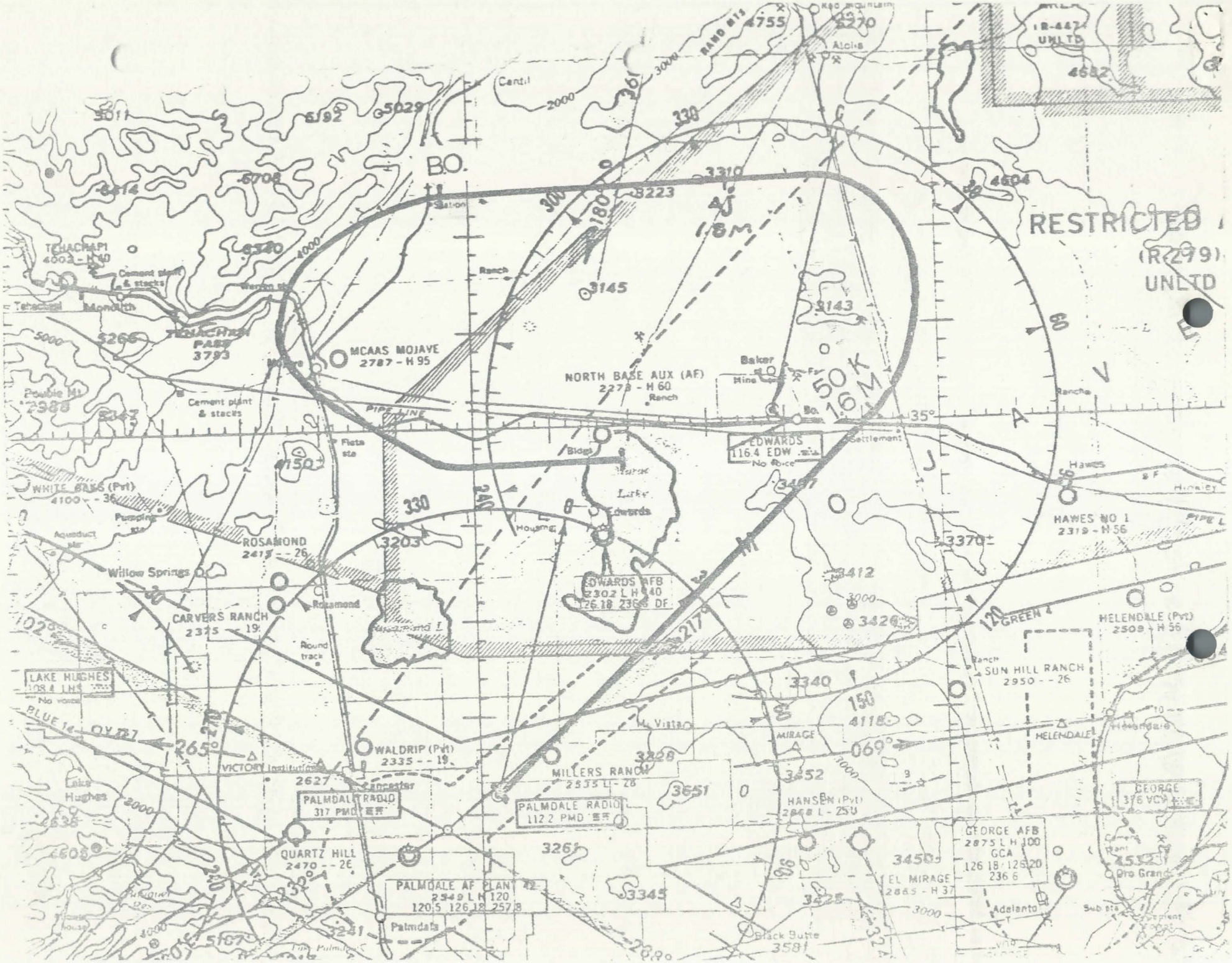
Wing Loads (Strain Gages)

Vertical Tail Hinge Moments

Lift and Drag (Including Base Pressure Measurements)

Inertial Attitude and Component Velocity (Stable Platform)

Physiological Package Measurements


RESTRICTED
(R-299)
UNLTD
R-4477
UNLTD
B.O.
TEHACHAPI
4003 - H 40
TEHACHAPI PASS
3793
MCAAS MOJAVE
2787 - H 95
NORTH BASE AUX (AF)
2278 - H 60
EDWARDS
116.4 EDW
EDWARDS AFB
2302 L H 140
126.18 236.6 DF
ROSAMOND
2413 - - 26
CARVERS RANCH
2375 - 19
WHITE BASE (Pvt)
4100 - - 36
LAKE HUGHES
108.4 LHS
WALDRIP (Pvt)
2335 - - 19
PALMDALE RADIO
317 PMD
PALMDALE RADIO
112.2 PMD
QUARTZ HILL
2470 - - 26
PALMDALE AF PLANT 42
2349 L H 120
120.5 126.18 257.8
MILLERS RANCH
2535 L - 28
HANSEN (Pvt)
2868 L - 25U
EL MIRAGE
2865 - H 37
GEORGE AFB
2875 L H 100
GCA
126.18 126.20
236.6
GEORGE
376 VCV
HAWES NO 1
2319 - H 56
HELENDALE (Pvt)
2509 - H 56
SUN HILL RANCH
2950 - - 26
50 K
16 M
18 M
4J
GREEN 4
BLUE 14
Willow Springs
Rosamond
Lake Hughes
Palmdale
Adelanto
Pro Grande
Black Butte
Mirage
Helendale
Hawes
Edwards
Baker
Mojave
Tehachapi
Cement plant & stacks
Pipe line
Round track
Housing
Ranch
Station
Settlement
Aqueduct
Pumping sta
Fiesta sta
Sub sta
Cantil
Alois
Red Mountain
Rand Mts
Double Mt
Lake Edwards
Rosamond L
Vista
Victory Institution
Lancaster
Hinkley
Hesperia
Cement plant
Tehachapi
Monolith
Warren sta
Mojave
Bo.
Hine
Fr
Rancho
Blogs
Mirage
Lake Hughes
Palmdale
Tun Palmdale
Sub sta
Cement plant
Pro Grande
Adelanto
Vrd
Gc
5011
5092
5029
5314
5708
5340
5266
5000
2988
2147
4750
3203
3145
3143
3223
3310
4755
4270
4604
4682
3487
3370
3412
3426
3340
4118
3228
3652
3651
3261
3345
3428
3581
3450
4532
2627
2538
2605
2507
3281
2880
3000
2000
4000
1000
330
300
180
240
217
265
069
120
150
102
107
232
320
361
35°

Flight: 1-19-32
Plane: X-15 #1
Pilot: N. A. Armstrong

Date: Dec. 9, 1960
T.O.:
Launch:
Land:
Total:

2 minutes to launch

Neil: Platform internal, ventral is armed.
NASA 1: What is your cabin source Neil?
Neil: 3500 on cabin source, I'm on lower antenna and X-15 radio how do you read?
NASA 1: Roger read you 5 square.
Neil: Rog. No peeling points, good.
B-52: We're rolling out on the final heading now with a minute and 20 seconds to go.
Neil: Okay.
NASA 1: Your sources looking good 008?
Neil: Bleeds all look OK, tanks are 49 on both tanks.
B-52: 1 minute.
Neil: Rog 1 minute. I got one preheat coming on, on the upper.
B-52: 50 seconds.
Neil: Master's on.
B-52: 40 seconds Neil.
Neil:β Rog, both primes are on.
B-52: One has blossomed, prime.
Neil: OK, I got 40° on #1 APU bearing and 105° on #2.
B-52: 25 seconds and master switch is on Neil.
Neil: Rog, launch lite coming on.
B-52: 20 seconds, launch lite is on, 15, 10, 5, 4, 3, 2, 1 launch.
Chase: OK, bottom 3 is not lit, now it is.
Neil: OK Bob.
Chase: All 8 are lit and you look very good.
Neil: Roger, got 8° on the ball.
NASA 1: Neil on upper #1, we have no indication.
Neil: Roger, I got it. I got no buffet up to 13°.
NASA 1: What was your run at that altitude?
B-52: 39
Neil: OK, I'm indicating about 365 on the bottom which is about what I expected.
NASA 1: Now you're bragging.
Neil: OK, I'm holding it in 8°.
NASA 1: Your course is looking good Neil.
Neil: OK. 41,500 pushover at the burn ..... equals 0 amperage.
NASA 1: We have you at 47 Neil.
Neil: OK, that's about right, I got 44.
NASA 1: Neil, swing it about 5° to the left.
Neil: OK, calibrate, I got 45.5 on pressure and 53,000 on inertial, want to give me a readout?

NASA 1: Roger, 395.
Neil: OK, roll and yaw, and a pulse.
NASA 1: We have you dropping a little in altitude now, and 10 seconds to turn.
Neil: And 53 inertial.
NASA 1: 5 seconds to turn Neil.
Neil: 5 to turn ..... SAS is all reset.
NASA 1: Looking good.
Neil: OK, pitchout, pitch pulse and amp speed, pulse is 7 and amp speed is .....
NASA 1: Roger.
Neil: Control off, roll pulse.
NASA 1: And your turn is looking very good.
Neil: OK, yaw and a yaw pulse. I got 53 inertial. 46 on pressure.
NASA 1: We have you at 50 even.
Neil: SAS and a calibrate. OK, sideslip.
Chase: Looks like 48,000 to me Neil.
Neil: ..... pitch come up.
NASA 1: We got you at 49 Neil and you're just in the inside of your turn.
Neil: OK.
NASA 1: Pitch ; is looking pretty good.
Neil: I'm getting a burnout.
NASA 1: We have you about 50,000 on the button Neil.
Neil: Pitch pulse 14, brakes out ..... brakes coming in.
NASA 1: Start your turn in Neil.
Neil: .....I'm starting my turn now Jack.
Chase: What's your indicating speed?
Neil: OK, I got about 240 indicated, 50,000 inertial, little buffet at 230, master and all the chambers are on, ready to go to jettison, when you're ready Bob.
Chase: Yes, anytime.
Neil: OK, we'll skip that 4004 pitch pulse and I'll try to setup on about 250 indicated on the way back.
Chase: What is your indicated speed?
Neil: I got 230 now Bob.
Chase: You can jettison whenever you want to.
Neil: Go to jettison.
NASA 1: Neil, will you straighten out, you can push a test on that hot nose.
Neil: Rog, push to test now.
Chase: You said you want to jettison?
Neil: Yes I did Bob.
Chase: I haven't seen anything.
Neil: OK, I can cycle it once.
Chase: Have you seen anything Pete, that I might have missed on the turn?
Chase: Negative, I was on a different angle, I don't think he has gotten rid of anything yet.
.... Chase 1, going to jettison.
Neil: OK, I'm still on the jettison position, got about 255 now and a 10° bank, master and chamber switches are off.

NASA 1: Roger, we have no indication that you're jettisoning down here.
Neil: OK, I got 0 fuel indicated on my quantity.
NASA 1: Roger, And your pass is looking very good.
Chase: I'm having a hard time slowing up here, but I'll get it, a compass stick a little more.
Neil: OK, I got 250 indicated now Bob.
Chase: OK, I got 255 and I get a very slight overtake, wait a second and I'll get in formation with you.
NASA 1: Neil, check your jettison test switches.
Neil: Rog.
Chase: There they go, now you got it. OK, I'm reading 252 knots, 27,000 now.
Neil: OK, I got 250 right now too.
NASA 1: We've got you 27 radar Neil.
Neil: OK, couldn't hold this speed around the turn, I'm going to do a pushdown-pullup now Bob.
Chase: Yes, go ahead. 258.
Neil: OK, I got 250.
NASA 1: Neil could you give us inertial height?
Neil: OK, inertial height still stuck at 53,000 about 54 now.
NASA 1: Roger.
Neil: Prime source scale in the up direction.
Chase: 260 at 20,000 feet now.
Neil: Rog, I still got 250, going to pressurize.
NASA 1: Roger, you say your speed brakes are in, is that correct?
Chase: 17,000 we passed through, I'm reading now 270.
Neil: OK, I got 260.
Chase: Coming pretty close on your right here Bob.
Chase: OK..... helped a little bit when he launched the jettison tho. Now I'm at 280.
Neil: OK, I got 275.
Chase: Now 290.
Neil: OK, I got 285.
Chase: Roger, 9500 and 295.
Neil: OK Bob. ..... little brakes.
Chase: OK, you got brakes, 3010 and I'm going to go by you.
Neil: OK, say when.
Chase: Please standby, jettison on the count - 3, 2, 1 - go.
Neil: Release.
Chase: It's gone. Read 280, you're still up there about 60 feet, flaps coming down, there's the skids, gear brake ..... that's nice.
Neil: And right stick, right rudder, feels pretty noisy out here. Slow deflection.
NASA 1: Any ice out there Neil?
Neil: No I didn't see any as I went by, but it sure felt like it.
NASA 1: Real nice flight Boy!
Neil: OK, ready for flaps to come up, speed brakes out.

Landing.

Aircraft: X-15 #670
Configuration: Ball Nose Installed
Cockpit Presentation From
Alternate Airspeed System.
Flight: 1-19-32
Pilot: N. A. Armstrong
Chase: F-100F Maj. Daniel
F-104A Maj. White
F104D LCDR Petersen
Launch Aircraft: B-52 #008
Capt. Allavie
Maj. Cole
J. Russell

Date: 12/9/60
Takeoff: 11:21
Launch: 11:53
Land: 12:04
Total: :11

Subject: Ball Nose Evaluation, Alternate Airspeed Evaluation.

1. The launch occurred over the Palmdale VOR station at 45,000 feet, 0.82 Mach number, on a heading of 030 magnetic. The separation was smooth with a small right roll and no pitching. Standard control positions and trim were used. 8 chambers were ignited without difficulty and an indicated 8° angle of attack round out initiated. 13° α was reached without buffet, but the aircraft may have been slightly supersonic at this time. The pitch vernier was set for 25.0 degrees and nulled correctly at an indicated 25° pitch angle on the 3-axis ball. A 1/2 g pushover was initiated at an indicated pressure altitude of 41,500 ft. (44,000 inertial). Altimeter correlations while level at 50,000 feet showed the pressure altitude from the alternate airspeed system to agree quite well with the predicted value.

2. A directional pulse with roll and yaw SAS modes de-energized was obtained at approximately 1.4 Mach number. A 2.5 g turn was initiated at approximately 1.65 M. Angle of attack readout was only 7° as opposed to the 11° expected. The aircraft was trimmed in the turn and the following pulses recorded:

Pitch pulse - pitch SAS mode out
Roll pulse - roll SAS mode out
Yaw pulse - roll and yaw SAS modes out

No specific variations from the simulator dynamics were noted. Additional altitude correlation after rolling out of the turn at 1.7 M indicated that the pressure altitude continued to follow the predictions.

3. A left sideslip with abrupt release (roll-yaw SAS off) was performed at 1.6 M_1 (1.8 M), 45,500. Burnout immediately followed full speed brake extension. A pitch pulse with SAS pitch mode disengaged was recorded at M_1 = 1.40 prior to initiation of a space positioning turn. During the decelerating 2 g turn, angles of attack as high as 14° were observed on the indicator as opposed to the 10° expected.

4. During the glide back to the lake, 250 KIAS (260 KCAS) was maintained to improve subsonic ranging information. The early part of the glide was flown at 10° bank angle followed by an extended wings level period. An airspeed calibration pushdown-pullup was recorded at 250 KIAS at approximately 20,000 feet. The angle of attack range was 0 - 11° (indicated).