

THE GREAT STS-48 ZIG-ZAG UFO

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Mission Description:

'Discovery' 13th flight

Deploy UARS -- Upper Atmosphere Research Satellite

Launch 1991 Sep 12 at 23:11 GMT

Inclination 57 degrees, altitude 570 km

Duration 5 days 8 hrs 27 min

Crew: Creighton, Reightler, Gemar, Brown, Buchli

Famous Videotape of "Zig-zag"

Event occurred about half an hour after crew wakeup, during "post-sleep activities" (stow sleeping bags, line up for the head, read overnight faxes and email, eat breakfast, shave, wash, etc.)

Videotaped by Donald Ratsch, UFO buff in Maryland

Ratsch sent letters (Oct 18) to his congressmen demanding investigation
Congressmen forwarded request to NASA (Oct 22)

NASA replied (November 1991): "The objects seen are Orbiter-generated debris, illuminated by the sun.... The flicker of light is the result of the firing of the attitude thrusters on the Orbiter, and the abrupt motions of the particles result from the impact of gas jets from the thrusters."

- Subsequently appeared on numerous television shows (Sightings, Hard copy, NBC)
- Technical studies by Dr. Jack Kasher and Dr. Mark Carlotto
- Videotape for sale by Richard Hoagland, others
- At least two dozen web sites devoted to the event
- Endorsed in numerous books (Strieber, Randle, etc.)
- Ignored by 'National Enquirer'
- Broad consensus that event is unexplainable; no dissent within UFO community
- NASA explanations derided ('Urine dump', ha! Coverup, aha! Saucer-shaped!!!)

BTOL OF BYBLICRE WOLJON12

FROM DR. JACK KASHER'S STUDY (1994)

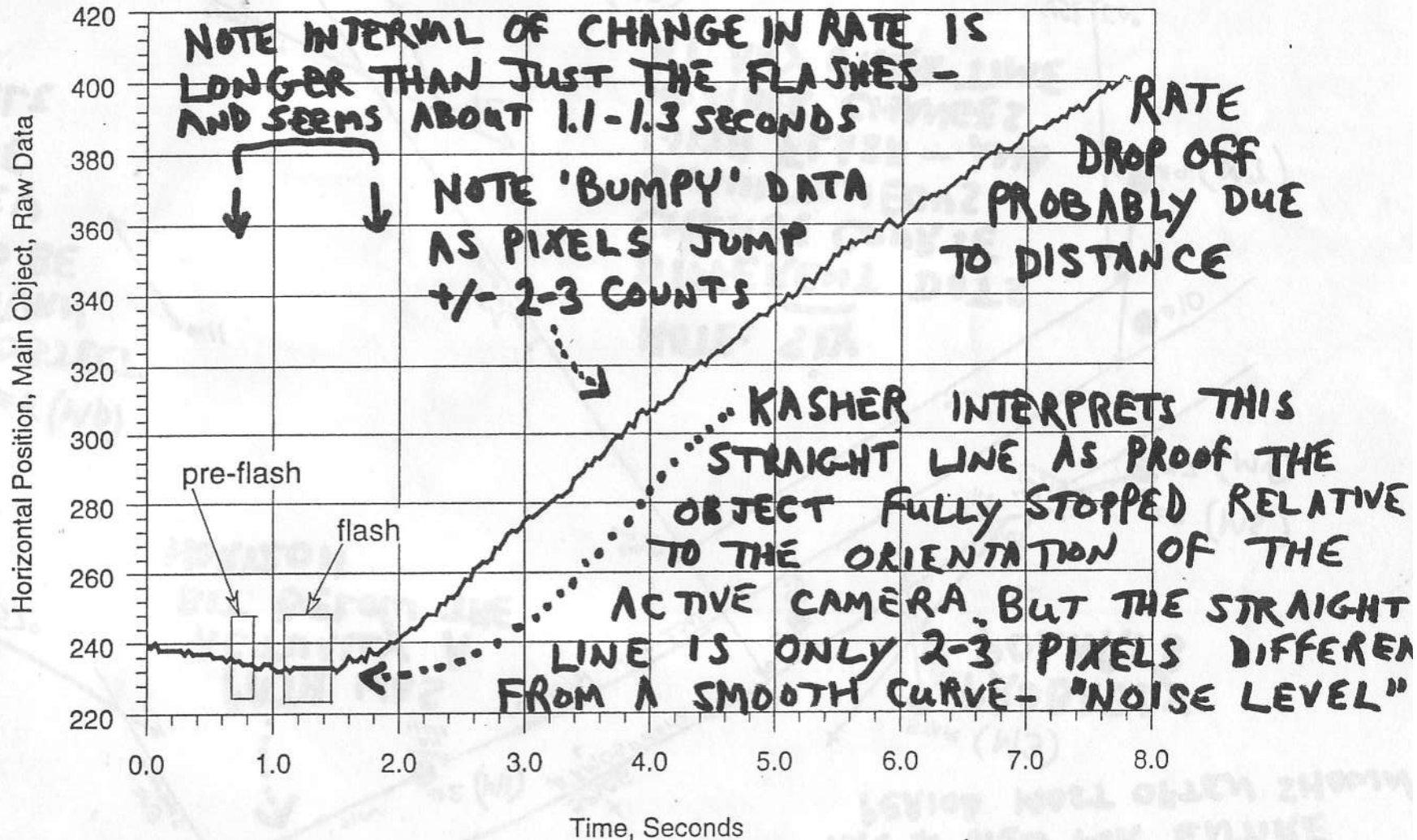


Figure 6: Horizontal position, main object, raw data, with flash and pre-flash.

AS PRESENTED, A GENUINELY AMAZING & UNEXPLAINABLE EVENT.

Source of mystery and fascination:

Unique combination of events each known to often occur singly

White Dots in B&W (Low-Light) Camera --

Can be lit by sun or by payload bay lights (if on, e.g., during rendezvous)

Most often seen with iris wide open

Sudden appearance of one (near horizon)

Dots often appear at sunrise when some drift out of shuttle shadow

Dots can appear randomly against Earth or black sky

Flash and change of direction -- more rare

Streaks by particles exiting thrusters -- fairly common

Each known to occur in shuttle videos, but combination unique

SO SEQUENCE IS HIGHLY UNUSUAL, BUT
ARE EACH INDIVIDUAL FEATURE EXPLAINABLE OR NOT?
05

Eyewitness Testimony

NASA reply to congressman's letter (November 1991), after review by Bill Pitts, Joe Loftus, and astronaut Karl Henize: "The objects seen are Orbiter-generated debris, illuminated by the sun.... The flicker of light is the result of the firing of the attitude thrusters on the Orbiter, and the abrupt motions of the particles result from the impact of gas jets from the thrusters."

Otha "Skeet" Vaughan, principal investigator of lightning observation experiment, who has collected and studied more than 500 hours of low-light night views of Earth: "They're an ordinary part of space flight," he says. "It's obviously just more shuttle debris."

STS-48 astronaut Mark Brown says ice formed on the shuttle's main engine bells after the remaining fuel was dumped in space. "These crystals would break free of the engines and float around the shuttle," he says. "When illuminated by sunlight they looked like small diamonds floating in space, disturbed only when the maneuvering rockets fired — the plumes from the rockets would hit them and send them off in different directions."

STS-48 co-pilot Ken Reightler says: "We saw a lot of this on STS-48 because we had a dump nozzle that was leaking." The same nozzle leaked on the shuttle's next mission and "created the same shower of ice particles — but this time apparently no one misinterpreted them as UFOs."

As a rule, to give appearance of balance, TV shows use uninformed "NASA spokesmen" who are unfamiliar with the event to present off-the-cuff suggestions that wind up sounding lame and silly (e.g., Buzz Aldrin on NBC)

* POINT: UFO PROGRAMS AVOID PRIMARY
WITNESSES, QUOTE OFF-THE-CUFF GUESSES
IN ORDER TO DISCREDIT EXPLANATIONS

06

SPACE FLIGHT VERY DIFFERENT FROM AIR FLIGHT

Particles (usually ice) near manned spacecraft common

- * 1962 John Glenn's "fireflies" (ice from flash evaporator)
- * 1960s X-15 flights (ice from outside of LOX tank)
- * 1965 Frank Borman's "bogies" (Gemini-7), booster debris
- * 1969 Flashing lights on way to moon (SLA panels)
- * 1970 "Moon Pigeons" report to assess particles as indicators of spacecraft anomalies (venting, insulation flaking, pyro sep debris)
- * 1980s Space Shuttle (flash evaporator ice, waste/supply water dumps, thruster propellant leakage, main engine LO2/LH2 dumps, payload bay debris, tile liner strips, insulation blanket fragments, dropped EVA tools, debris from payload deployments, etc.)

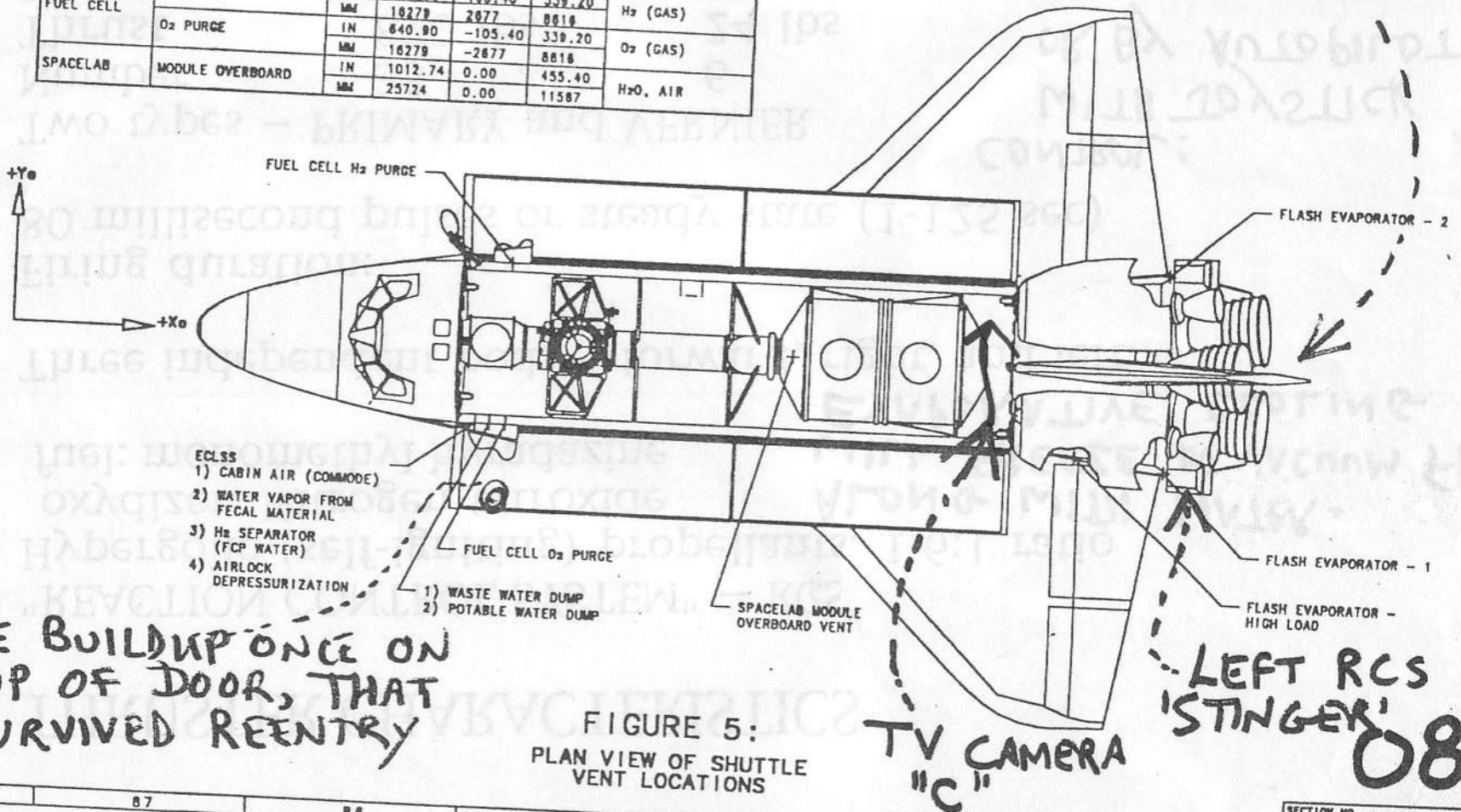
Not widely appreciated by public that objects near spacecraft will drift along with them in orbit at more-or-less same velocity and flight path

MOTION IS COUNTER-INTUITIVE, UNEARTHLY 07

SHUTTLE VENTS						
SOURCE	UNITS	LOCATION			EFFLUENT	
		X ₀	Y ₀	Z ₀		
ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS (ECLSS)	CABIN AIR (COMMUNE)	IN	802.00	-105.50	335.97	AIR
		MM	15291	-2880	8534	
	WATER VAPOR FROM FECAL MATERIAL	IN	802.00	-105.50	335.97	H ₂ O
		MM	15291	-2880	8534	
	H ₂ SEPARATOR (FCP WATER)	IN	802.00	-105.50	335.97	H ₂ (GAS)
		MM	15291	-2880	8534	
	AIRLOCK DEPRESSURIZATION	IN	802.00	-105.50	335.97	AIR
		MM	15291	-2880	8534	
	WASTE WATER DUMP	IN	820.00	-105.50	335.97	URINE, HUMIDITY CONDENSATE
		MM	15748	-2880	8534	
POTABLE WATER DUMP	IN	820.00	-105.50	342.40	WATER	
	MM	15748	-2880	8897		
FLASH EVAPORATOR - 1 AND 2	IN	1505.70	±128.40	304.80	H ₂ O (STEAM)	
	MM	38245	±3291	7742		
FLASH EVAPORATOR - HIGH LOAD	IN	1390.30	-113.80	328.80	H ₂ O (STEAM)	
	MM	35314	-2891	8301		
FUEL CELL	H ₂ PURGE	IN	640.90	105.40	339.20	H ₂ (GAS)
		MM	18279	2877	8818	
	O ₂ PURGE	IN	640.90	-105.40	339.20	O ₂ (GAS)
		MM	18279	-2877	8818	
SPACELAB	MODULE OVERBOARD	IN	1012.74	0.00	455.40	H ₂ O, AIR
		MM	25724	0.00	11587	

44 "RCS JETS",
TWO VALVES IN EACH

MAIN ENGINES DUMP
EXCESS LOX & LH₂
AFTER REACHING ORBIT



ICE BUILDUP ONCE ON
TOP OF DOOR, THAT
SURVIVED REENTRY

FIGURE 5:
PLAN VIEW OF SHUTTLE
VENT LOCATIONS

TV CAMERA
"C"

LEFT RCS
'STINGER'
08

THRUSTER CHARACTERISTICS

"REACTION CONTROL SYSTEM" -- RCS

Hypergolic (self-igniting) propellants, 1.6:1 ratio

oxydizer: Nitrogen tetroxide

fuel: monomethyl hydrazine

ALONG WITH WATER.
WILL FREEZE IN VACUUM FROM
EVAPORATIVE COOLING

Three independent pods -- forward, right, and left.

Firing duration:

80 millisecond pulses or steady state (1-125 sec)

Two types -- PRIMARY and VERNIER

Number	38	6
Thrust	870 lbs	24 lbs
Prop P	238 psia	246 psia
Isp	280 sec	265 sec
Exhaust V	9000 ft/sec	8500 ft/sec
Prop Flow	3.1 lbs/sec	0.09 lbs/sec
Chamber P	152 psia	110 psia
Chamber temp	both 2000-2400 deg F	

CONTROL:

WITH JOYSTICK
OR BY AUTOPILOT

→ CAN EITHER GO TO
DEFINED ATTITUDE
OR HOLD CURRENT
ATTITUDE WITHIN
ALLOWABLE ERROR
("DEADBAND")

"POWER"

"ECONOMY &
GENTLENESS"

09

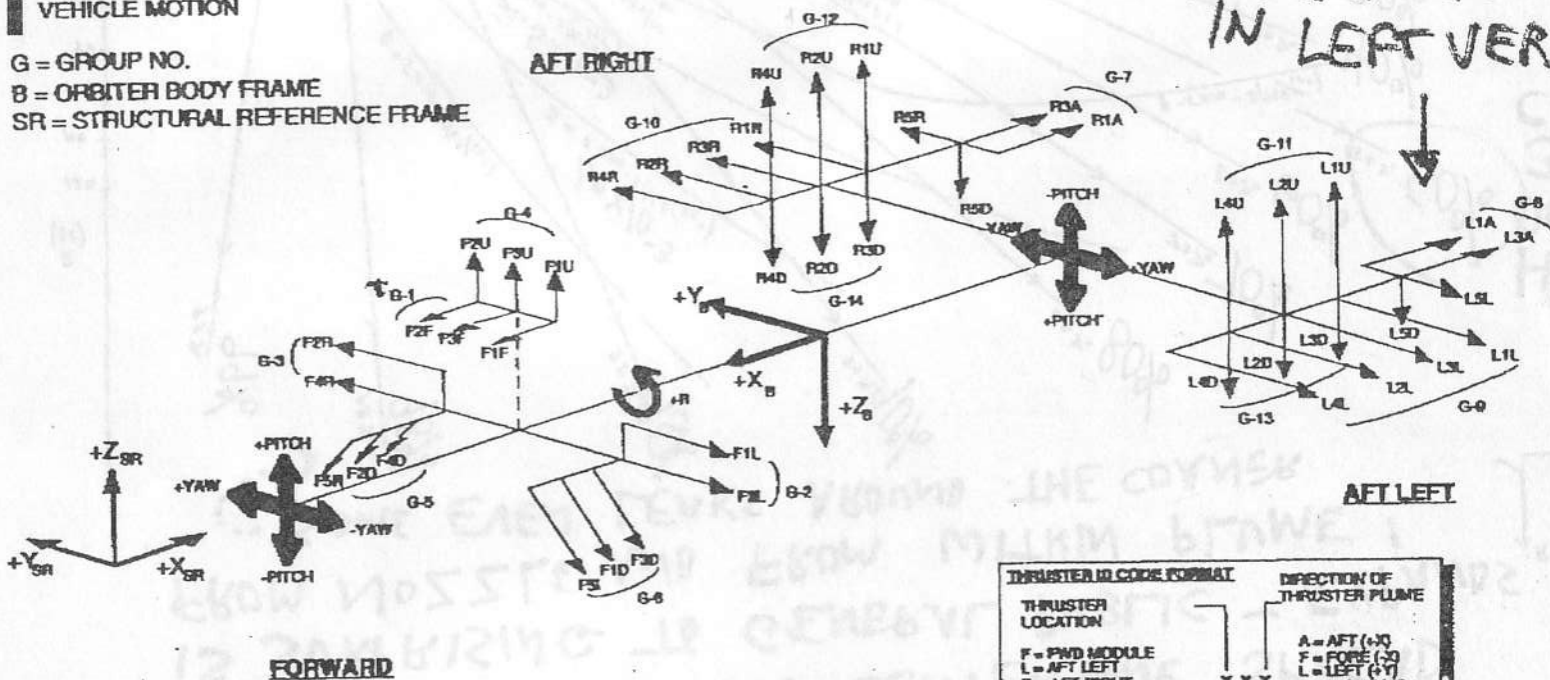
SHUTTLE'S 44 JET LOCATIONS

Orbiter RCS Jet Locations

↑ DIRECTION OF THRUSTER PLUME

↑ DIRECTION OF VEHICLE MOTION

G = GROUP NO.
B = ORBITER BODY FRAME
SR = STRUCTURAL REFERENCE FRAME



WE ARE GOING TO BE INTERESTED IN LEFT VERNIERS

NOTE: OMS/RCS PLUMES ARE GENERALLY INVISIBLE EXCEPT WHEN MIXTURE RATIO IS OFF NOMINAL - VISIBLE FLARES ARE ONLY SMALL PORTION OF TOTAL ENGINE FIRING INTERVALS

RCS JET PLUME IN VACUUM OF SPACE

THE AMOUNT OF OFF-CENTERLINE SPREAD IS SURPRISING TO GENERAL PUBLIC - EXPANDS FROM NOZZLE AND FROM WITHIN PLUME!
 SOME EVEN LEAKS AROUND THE CORNER

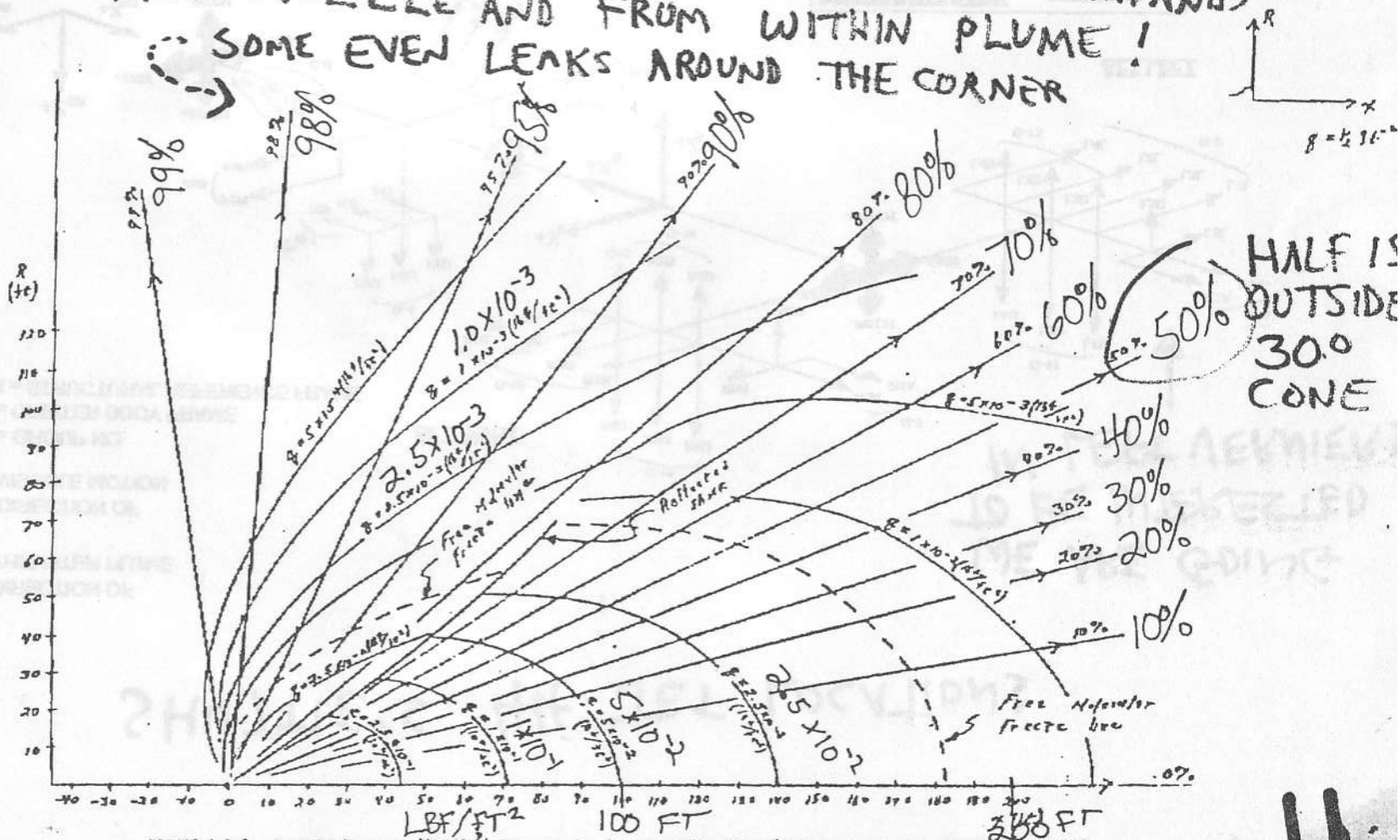


FIGURE 4.3-5. Dynamic Pressure (lbf/ft²) Contours in the RCS Engine Plume (Continuum and free molecular regimes)

DYNAMIC PRESSURE, RCS THRUSTER PLUME

HALF IS OUTSIDE 30° CONE

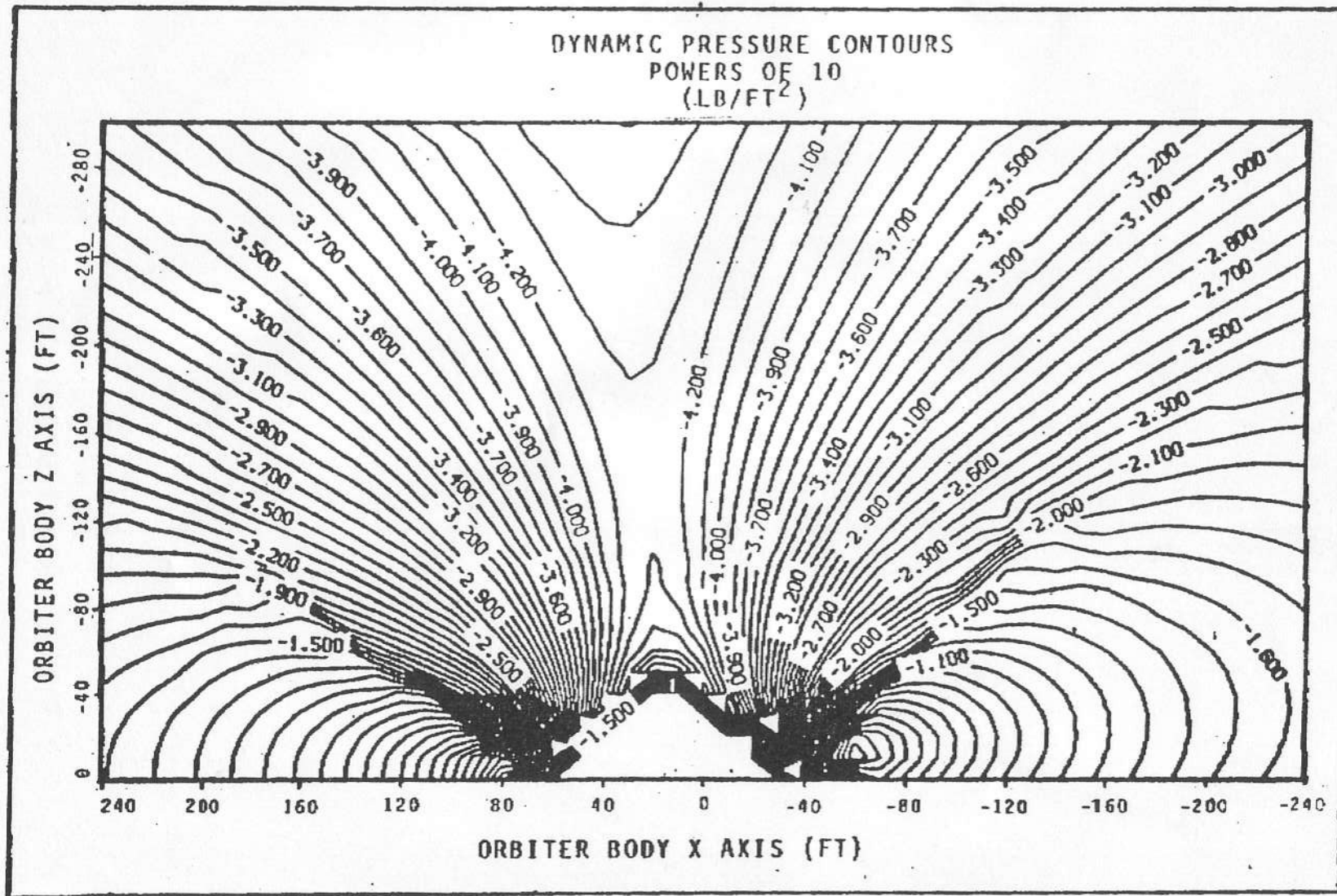
11

5. LOZ BURN, X-Z PLANE (FAR FIELD)

SPECIAL HI-PROP USE
BUT VERY GENTLE
APPROACH BRAKING SCHEME

● JETS FIRED: F1F, F2F, R1A, L1A

● C.M. LOCATION 89.68, 0, 31, 18 (FT)
X-Y-Z ORBITER STRUCTURAL COORD. SYS.



BACK END OF SHUTTLE- AWKWARD CONFIGURATION

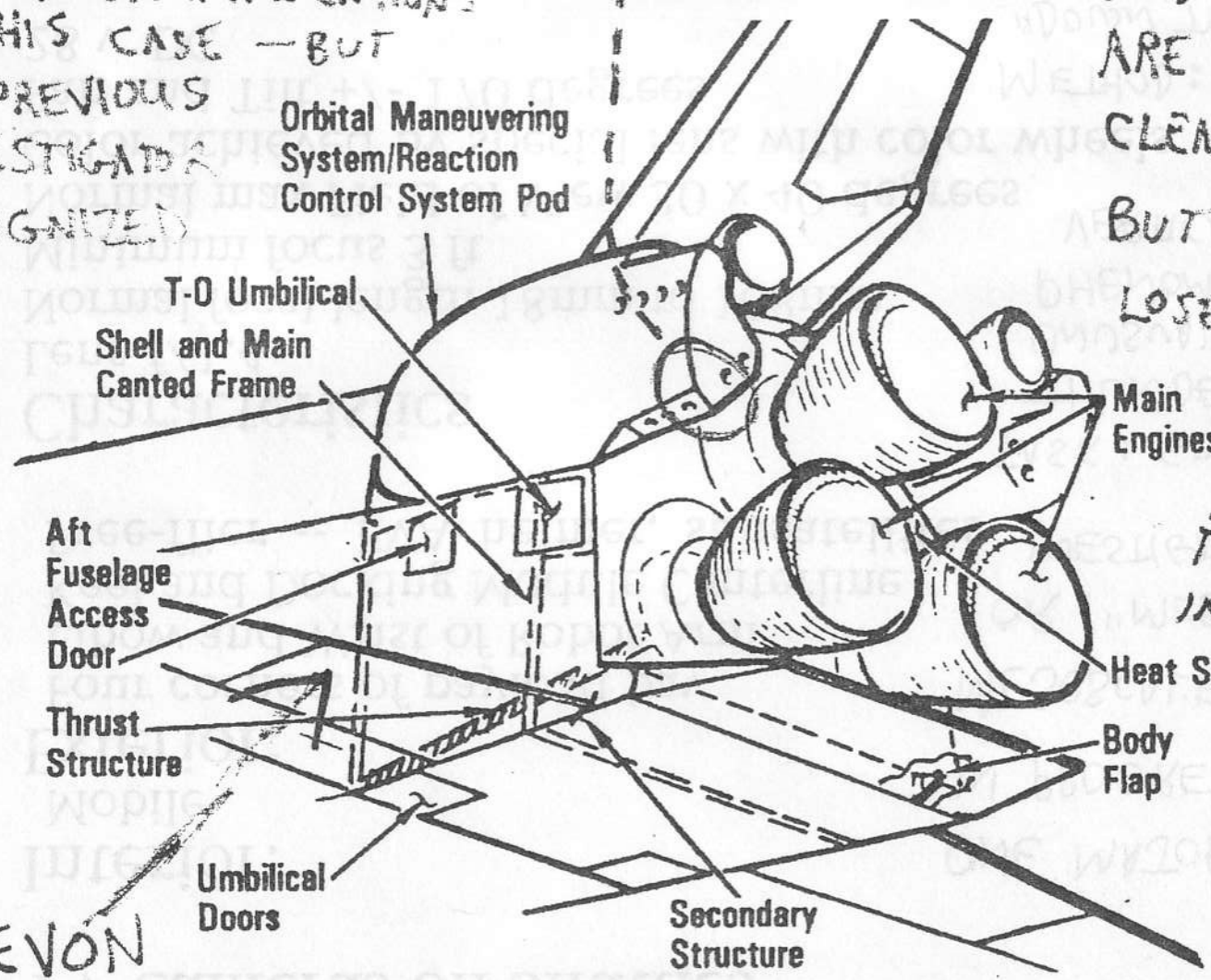
HAS MAJOR IMPLICATIONS
TO THIS CASE - BUT
NO PREVIOUS
INVESTIGATOR
RECOGNIZED
IT!

JET "L5D"

UP, SIDE, AFT JETS
ARE PRETTY "PURE"
CLEAR "FIELD OF FIRE"

BUT DOWN JETS
LOSE 30% OF FORCE

DUE TO
BOUNCE BACK
FROM STRUCTURE
IN PLUME FLOW



ELEVON

Aft Fuselage Structure

TV Cameras on Shuttles

Interior:

Mobile

Exterior:

Four corners of payload bay

Elbow and Wrist of Robot Arm

Keel and Docking Module Centerline

Free-flier -- EVA helmet, subsatellites

Characteristics

Lens f/1.4

Normal focal length 18mm to 108mm

Minimum focus 3 ft

Normal max Field of View 30 x 40 degrees

Color achieved by special lens with color wheels

Pan and Tilt +/- 170 degrees

28 v. DC

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ONE MAJOR APPLICATION -

IN PROGRESS AT THIS TIME -

MESOSCALE LIGHTNING EXP.

OR "MLE" (PRINCIPAL

INVESTIGATOR; "SKET" VAUGHAN

TASK: GET SIDE VIEWS OF

THUNDERSTORMS TO SEEK

UNUSUAL LIGHTNING

PHENOMENA SUCH AS

VERTICAL BOLTS, SPRITES

METHOD: POINT CAMERA BACK

"DOWN TRACK" TO VIEW

EARTH SURFACE AT HORIZON

DURING NIGHT PASSES.

013-48 JUNK LIST (~100 PAGES)

CONVERTED: 119663/119522

STS-48 ORBIT 044 (DOWNLINK)

GMT DAY 258	MET DAY 002	ORBIT STATION	CAM	CAPTION: EARTH VIEWS OVER SOUTH AMERICA, ATLANTIC, CREW WAKE UP, NIGHT PASS OVER USSR, CHINA, INDONESIA WITH LIGHTNING (MLE), EARTH VIEWS OF THE INDIAN OCEAN. A/G audio.
19:42:24	20:31:20	044	ELB	AOS TDRE VIDEO. Full Earth view over Brazil (South America).
19:44:57	20:33:53	TDRE	ELB	Full Earth view Brazil (South America).
19:45:31	20:34:27		A	Full Earth view of Brazil.
19:45:40	20:34:36		ELB	Full Earth view over Brazil and Guyana.
19:46:48	20:35:44		ELB	Discovery crosses over the northern coast of Guyana and continues over the Atlantic Ocean.
19:57:20	20:46:16		ELB	Glare enters view as Discovery approaches the terminator.
20:00:14	20:49:10		A	Full Earth view of the terminator.
20:03:19	20:52:15		B	Dark FOV.
20:03:29	20:52:25		C	Glare.
20:03:43	20:52:39		B	Glare.
20:06:22	20:55:18		C	Glare.
20:06:50	20:55:46		B	Glare.
20:08:32	20:57:28		B	City lights from Europe enter view. Continue over Russia.
20:11:07	21:00:03		B	Crew wake up call "Bear Necessities". Night pass continues over Russia.
20:16:03	21:04:59		C	Night pass over Russia.
20:17:28	21:06:24			LOS TDRE VIDEO.
20:19:04	21:08:00	TDRW	C	AOS TDRW VIDEO. Night pass over China. City lights in view.
20:23:59	21:12:55		B	Night pass over China. Lightning (MLE) is visible.
20:26:57	21:15:53		C	Night pass over China.
20:27:04	21:16:00		B	Night pass over China. Some lightning (MLE) visible.
20:30:09	21:19:05		C	WS/ Dark Earth limb with lightning visible over China and the Bay of Bengal. Continue over Burma, Malaysia, and Indonesia.
20:40:58	21:29:54		C	Glare enters view and CAM tilts down to PLB.
20:41:56	21:30:52		B	Glare in view. Full Earth view of the terminator. CAM repositions and views to EE, out of focus.
20:43:35	21:32:31		A	Full Earth view of the terminator. CAM repositions to the aft PLB. Zoom in on the cradle. Some Iris bloom.
20:47:39	21:36:35		ELB	White POV. Earth limb view of the Indian Ocean enters FOV. Iris bloom. Tilt down to a full Earth view.
20:49:52	21:38:48		A	MS/ Aft PLB with RMS shoulder in the right FOV.
20:50:27	21:39:23		ELB	Undefinable video.
20:51:56	21:40:52		A	MS/ Aft PLB. Tilt up to a clouded Earth view.
20:52:28	21:41:24		D	WS/ Earth limb view of the Indian Ocean.
20:53:25	21:42:21		A	Full, clouded Earth view.
20:54:13	21:43:09		A	Undefinable video. CAM repositions to a clouded Earth limb view.
20:55:36	21:44:32		ELB	LOS TDRW VIDEO.

LOG OF ALL VIDEO DOWN LINKED FROM SHUTTLE FOR WHOLE FLIGHT

CREW WAKE UP

Crew wake up call "Bear Necessities"

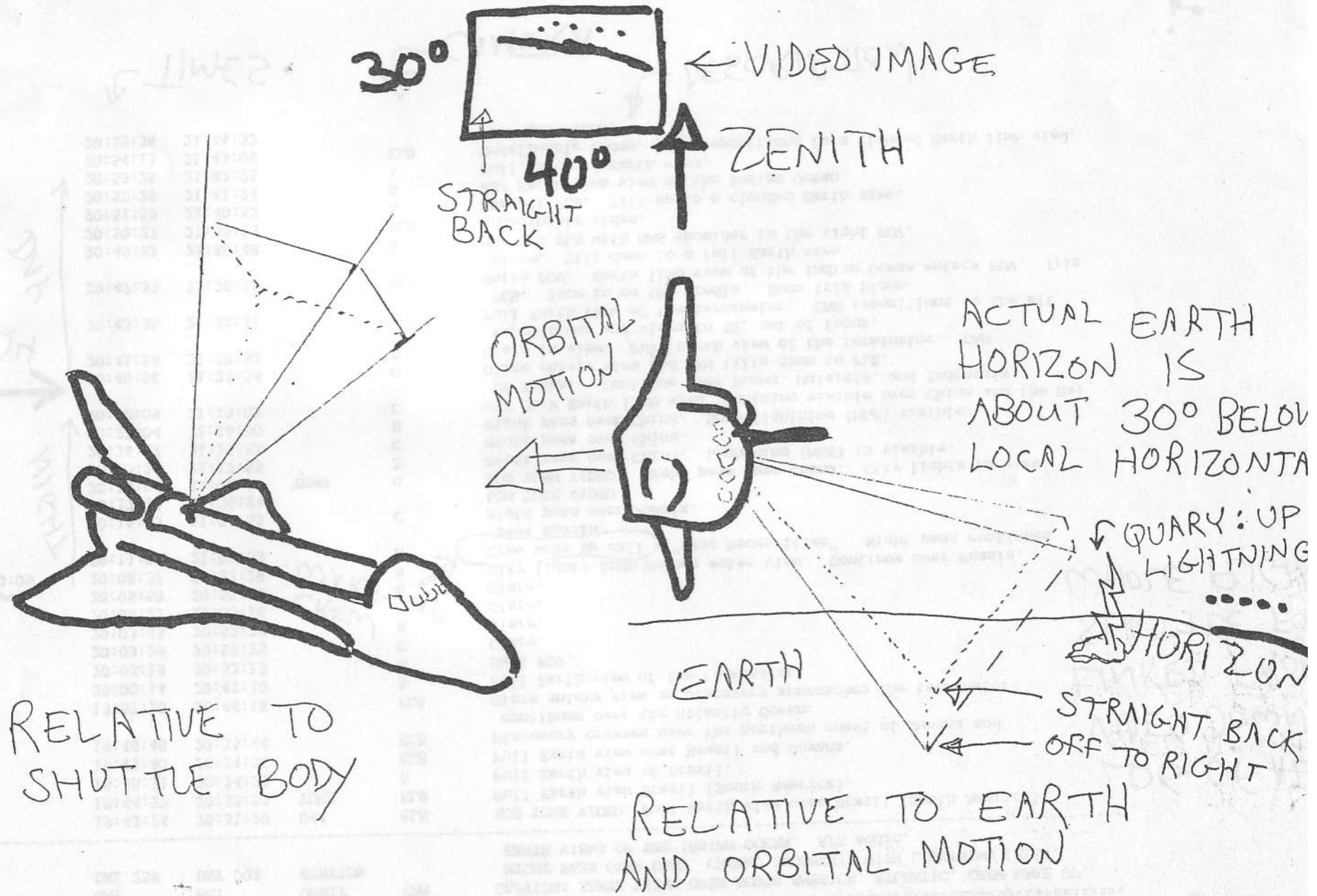
One inch tape change at 20:09
 TIME OF EVENT
 20:39:24 GMT
 NIGHT
 DAY

TIMES

CAMERA

DESCRIPTION

WHERE IS THE CAMERA'S FIELD-OF-VIEW ?

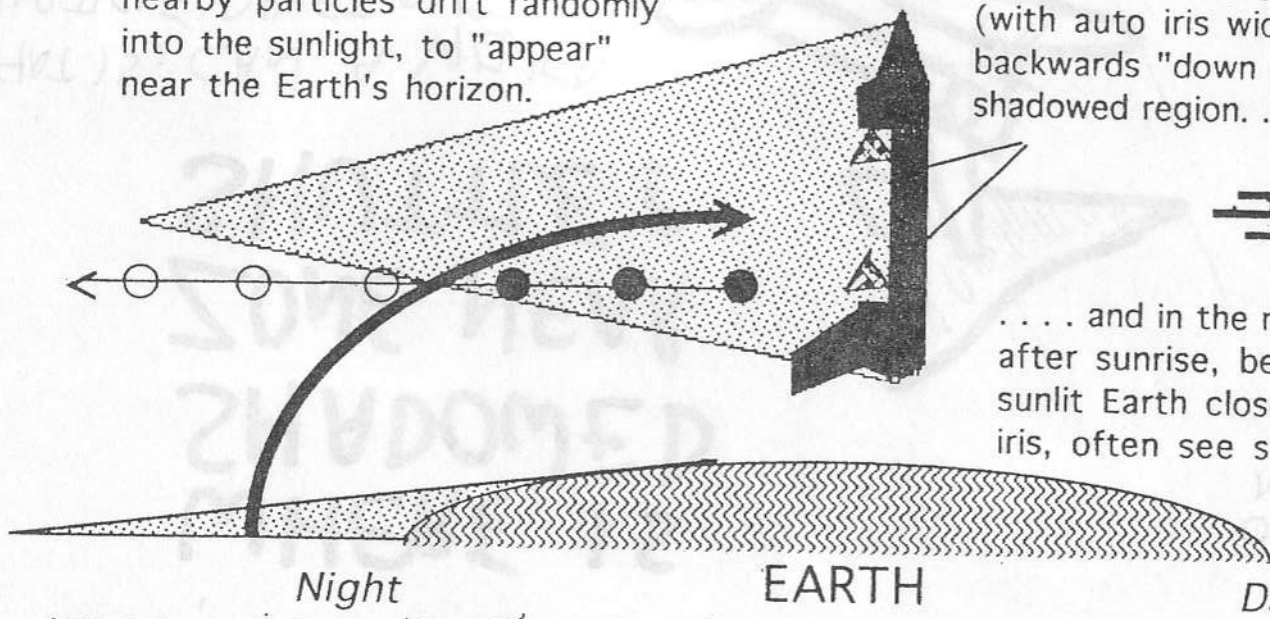


HOW MIGHT WHITE DOTS "APPEAR" IN FIELD-OF-VIEW?

SUNLIGHT BATHES THE SHUTTLE BUT BACK-LOOKING CAMERA DOES NOT DETECT IT - NO AIR!

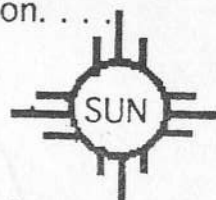
"Appearing Dots" in space shuttle sunrise views

Shuttle rises into sunrise, trailing its own shadow where nearby particles drift randomly into the sunlight, to "appear" near the Earth's horizon.



TEST: IF DOTS IN CAMERA VIEW ARE ONLY NEARBY DEBRIS DRIFTING AWAY FROM SHUTTLE, THEY SHOULD ALMOST ALWAYS "APPEAR" BUT RARELY IF EVER "DISAPPEAR". IF DISTANT UFOs, NO PREFERENCE - SO OBSERVE VIDEOS

TV cameras in payload bay (with auto iris wide open) look backwards "down sun" into shadowed region. . . .



. . . . and in the minutes after sunrise, before sunlit Earth closes the iris, often see small dots.

MANY DOTS APPEAR - I HAVEN'T SEEN ANY DISAPPEAR.

SCATTERED LIGHT FROM SUN SHUTTLE STRUCTURE MAY CAUSE "FOG" IN EDGE OF FRAME

SUNRISE TAKES 10-15 SECONDS (ANGULAR RATE: 4° PER MINUTE)

SEVERAL MINUTES AFTER EMERGING FROM SHADOW, SHUTTLE CROSSES "TERMINATOR" - LIGHT-DARK BORDER - AND REFLECTED SUNLIGHT FROM EARTH FILLS SHADOW ZONE WITH LIGHT

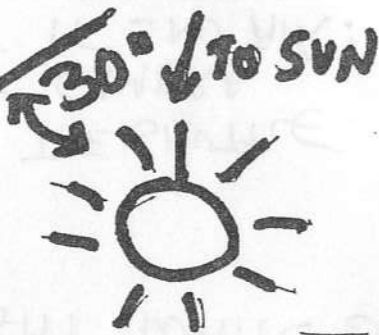
17

WHERE IS SHADOWED ZONE NEAR SHUTTLE?

THAT IS, CAN A VIEWED PARTICLE DRIFT OUT OF SHADOW AND SUDDENLY "APPEAR"?

YES

NOSE FORWARD
*X

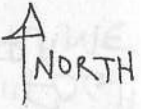


JUST WHERE CAMERA WAS POINTING



SUBSTANTIAL SHADOW ZONE ABOVE LEFT WING

MAP VIEW:
ORBITAL MOTION



NOSE 100° DOWN RELATIVE TO PURE LEFT



...AND SUN RISE ~45° TO LEFT OF ORBITAL TRACK

"BETA ANGLE" IS VECTOR FROM ORBITAL PLANE TO THE SUN - IT WAS 46.7°

CONFIRMED BY POSITION OF POLARIS IN 400° WIDE CAMERA FIELD OF VIEW

HYPOTHESIS :

What Probably Happened

- * Shuttle on autopilot overnight prior to day's activities
 - Left wing down, belly to wind, nose pitch down 10 degrees
 - Exterior cameras under ground control for lightning observations
 - Flight crew engaged in "post-sleep", not looking outside or even watching monitor
- * Sunrise began at 20h38m02s (took 10 sec to reach full)
 - Indicated by appearance of upper left corner glare (off Ku-band antenna?)
 - Further indicated by simo appearance of three drifting dots in lower FOV (appearance at this precise moment indicates their proximity to shuttle)
- * Over several minutes around SR, shuttle attitude is approaching "deadband" value
 - Camera's aft-pointing view of Earth does not change since surface still dark
 - Some new particles appear, some original particles drift out of FOV

(more)

GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
250:11:11/ 250:23:11	002:12:00/ 003:00:00	250:06:11/ 250:18:11	04/ 250 CDT	46.7		SEPTEMBER 15, 1991	STS-40	AS PLANNED	09/14/91

CDT :250	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	18	MET:003
FD :003	12	13	14	15	16	17	18	19	20	21	22	23	18	0					
MET :002																			

STS

SLEEP

CDT = GMT - 5 HRS

"BETA ANGLE"

WATER DUMP

INIT GG

NOT WASTE BUT PRODUCT OF FUEL CELLS

PRE SLEEP

PAGE FROM DAILY "EXECUTE PACKAGE"

POST SLEEP

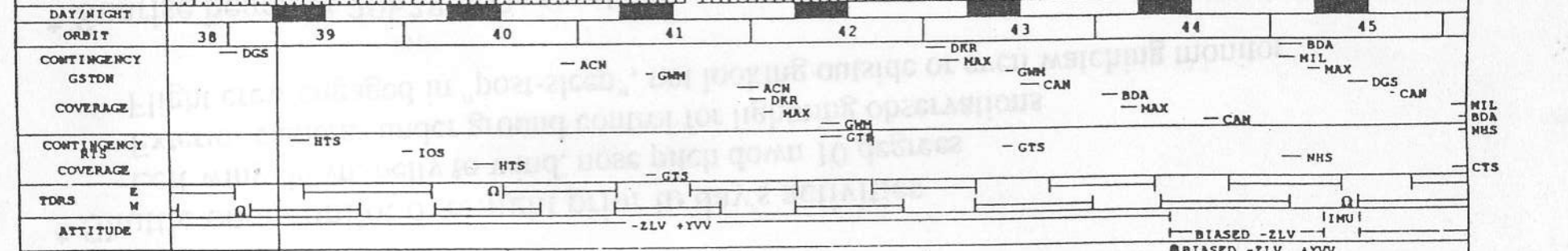
FAXED UP TO CREW OVERNIGHT FOR CHANGES TO NEXT DAY'S WORK.

MEANS BATHROOM, ACK BEDS,

PL

SHOWS CREW JUST GETTING UP - REFUTES THEORIES OF SECRET EXPERIMENTS

GET BREAKFAST, READ EMAIL



NOTES:

AS PLANNED FD3

● - POCC CMDS

○ - SUN OCCULTATIONS

"EVENT" → 15:39:24 CDT

SHOWS IT WAS AT SUN RISE 20:39:24 GMT



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TELEMETRY DATA : WHY JET FIRED & WHEN

DAP ERRORS, IMU BODY RATES & RATE ERRS

M E W S

SAMPLE RATE: 0 (sec/sample)

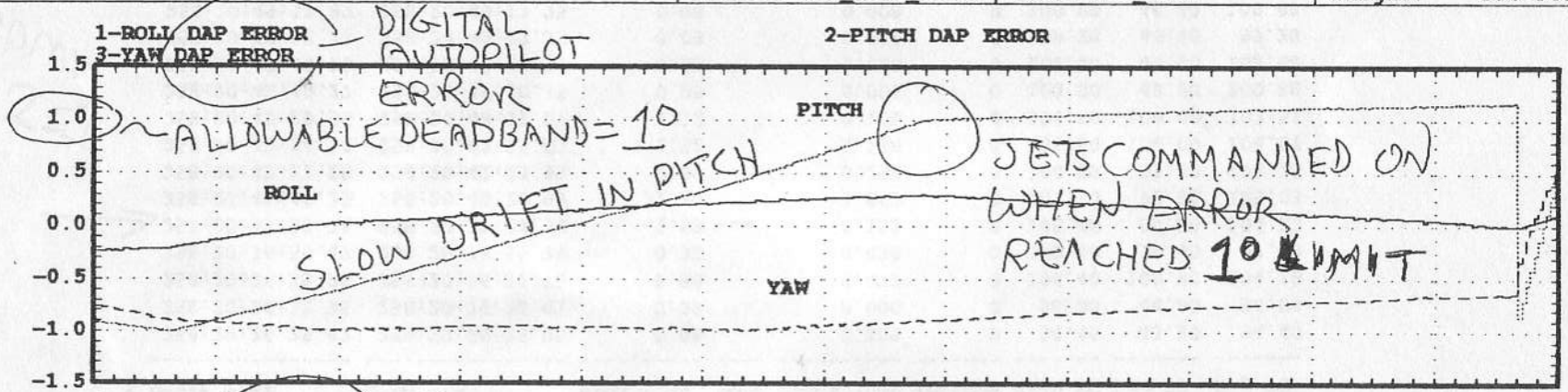
Subsystem: CNC DAP

FORMAT: DAP ERRS RATES

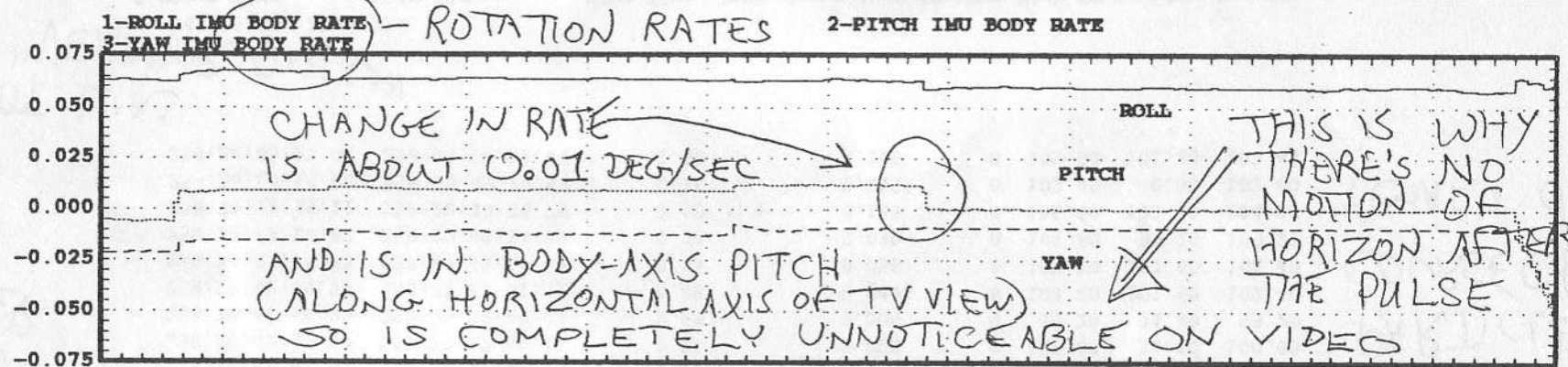
DATA: DAP RESP

Flight: STS-048

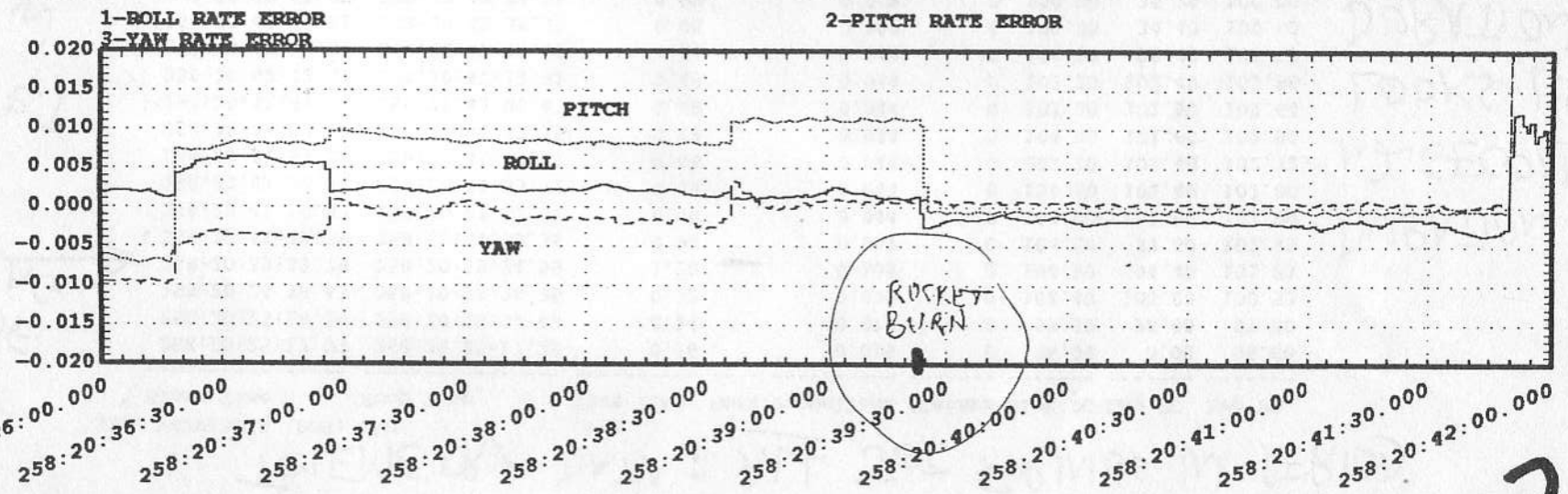
V90H2143C
DEG
V90H2141C
DEG
V90H2142C
DEG



V90R2223C
DEG/S
V90R2224C
DEG/S
V90R2225C
DEG/S



V90R2704C
DEG/S
V90R2705C
DEG/S
V90R2706C
DEG/S



TELEMETRY DATA : ALL JET FIRINGS IN PERIOD

SID: V42P2553A POS: L5D

* Start Time	Stop Time	Fire Time	Rmrk	Propellant	#DatErs	High PC	Low PC	Avg PC
258:20:25:17.07	258:20:25:17.23	0.16		0.015	0	96.00	0.00	95.60
258:20:26:14.19	258:20:26:14.43	0.24		0.022	0	99.20	96.00	97.00
258:20:26:36.43	258:20:26:36.75	0.32		0.030	0	102.40	100.80	100.53
258:20:39:23.79	258:20:39:24.99	1.20	-	0.109	0	104.80	94.40	101.83
258:20:41:49.39	258:20:41:50.35	0.96		0.087	0	104.00	97.60	101.49
258:20:41:50.83	258:20:41:51.31	0.48		0.044	0	104.00	101.60	102.80
258:20:41:53.23	258:20:41:53.71	0.48		0.044	0	104.00	102.40	102.80
258:20:41:54.19	258:20:41:54.67	0.48		0.044	0	103.20	102.40	102.72
258:20:41:57.07	258:20:41:57.55	0.48		0.044	0	104.00	101.60	102.96
258:20:41:59.95	258:20:42:00.43	0.48		0.044	0	103.20	101.60	102.64
258:20:42:12.43	258:20:42:12.91	0.48		0.044	0	103.20	102.40	102.96
258:20:42:20.67	258:20:42:25.63	4.96		0.449	0	104.80	98.40	103.53
258:20:42:39.31	258:20:42:39.39	0.08		0.008	0	100.00	34.40	100.00
8:20:42:41.87	258:20:42:41.95	0.08		0.008	0	100.00	35.20	100.00
258:20:42:45.07	258:20:42:45.15	0.08		0.008	0	100.00	34.40	100.00
258:20:42:46.99	258:20:42:47.07	0.08		0.008	0	99.20	34.40	99.20
258:20:42:50.83	258:20:42:51.31	0.48		0.044	0	103.20	101.60	102.40
258:20:43:00.75	258:20:43:01.39	0.64		0.058	0	103.20	101.60	102.40
258:20:49:14.67	258:20:49:14.99	0.32		0.030	0	101.60	99.20	100.27
258:20:49:15.11	258:20:49:16.75	1.68	+	0.149	0	105.60	102.40	104.25
258:20:49:16.83	258:20:49:16.99	0.16		0.015	0	102.40	0.00	102.40
258:20:49:17.07	258:20:49:18.67	1.60		0.145	0	105.60	101.60	103.43

TIME OF ZIG-ZAG →

L5D JET LEFT DOWN VERNIER

DURATION OF 1.2 SECONDS LOOKS LIKE DURATION OF PARTICLE COURSE CHANGE (CHART 04)

AUTOPILOT WAS SET TO "VERNIER ONLY"

SID: V42P3553A POS: R5D

* Start Time	Stop Time	Fire Time	Rmrk	Propellant	#DatErs	High PC	Low PC	Avg PC
258:20:26:29.87	258:20:26:29.95	0.08		0.008	0	94.40	43.20	94.40
258:20:26:31.95	258:20:26:32.03	0.08		0.008	0	96.00	44.80	96.00
258:20:26:35.95	258:20:26:36.75	0.80		0.072	0	106.40	100.80	104.18
258:20:36:55.47	258:20:36:55.79	0.32		0.030	0	100.80	94.40	97.20
258:20:39:23.31	258:20:39:24.99	1.68	-	0.152	0	106.40	99.20	104.22
258:20:41:49.39	258:20:42:20.99	31.60		2.862	0	107.20	92.80	105.03
258:20:42:21.15	258:20:42:23.95	2.80		0.254	0	104.80	93.60	104.25
258:20:42:24.11	258:20:42:25.63	1.52		0.138	0	105.60	104.00	104.67
258:20:48:29.95	258:20:48:31.07	1.12		0.101	0	104.80	100.80	103.51
258:20:48:40.27	258:20:48:40.35	0.08		0.008	0	100.80	48.00	100.80
258:20:48:44.11	258:20:48:44.19	0.08		0.008	0	102.40	48.00	102.40
258:20:49:12.27	258:20:49:12.35	0.08		0.008	0	99.20	46.40	99.20
258:20:49:13.87	258:20:49:13.95	0.08		0.008	0	100.80	46.40	100.80
258:20:49:14.67	258:20:49:18.67	4.00		0.362	0	107.20	92.80	104.75
258:20:49:20.59	258:20:49:20.67	0.08		0.008	0	102.40	48.80	102.40
8:20:49:24.43	258:20:49:24.51	0.08		0.008	0	102.40	48.00	102.40
258:20:49:29.07	258:20:49:29.15	0.08		0.008	0	101.60	48.80	101.60

RED JET RIGHT DOWN VERNIER

(continued)

* Another dot appears in center of FOV, near (measurably below) Earth horizon

Exits from shadow over shuttle's left wing

Not in atmosphere because straight flight path not refracted

Reaches full brightness over period of one second

MOONSET BEHIND ATMOSPHERE
SHOWS SIGNIFICANT DISTORTION
NO DISTORTION IMPLIES NOT BEHIND
CONSISTENT WITH EMERGING
FROM SHUTTLE'S SHADOW

* Autopilot commanded firing of thrusters L5D and R5D

-- Begins at time of 20h39m23.79s, lasts for 1.2 seconds

-- Shuttle pitch rate changed by 0.01 degrees/sec (along horizontal in FOV)
(undetectable from image measurement alone)

-- Outer plume impinged left wing trailing edge and bounced back up,
sweeping through space above the wing and gently nudging all particles there
(down thrusters lose 30% of their force due to structural impingement)

-- Flash was "ragged" because thruster firings not always visible

* The "great zig-zag dance" occurs

-- "Main object" turns

Course change achieved in slightly more than one second

Subsequent brightness reduction consistent with distancing (Carlotto)

-- Five other objects in FOV also turn (a few others do not)

One of them had appeared at sunrise 80 seconds earlier

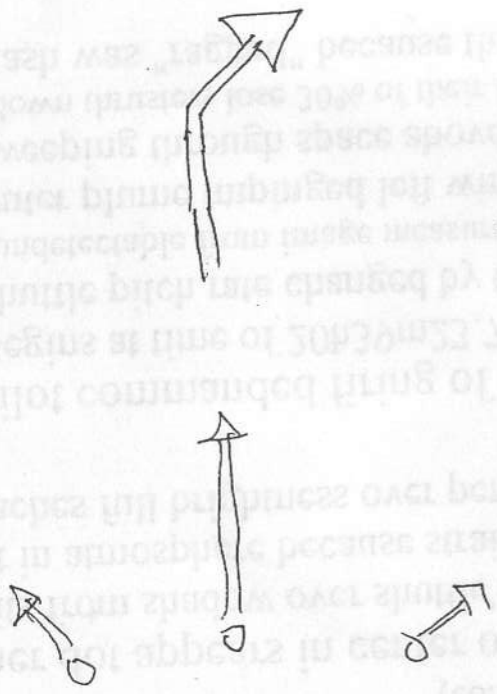
This specific object provides conclusive key to explain event

-- Two fast moving dots cross FOV originating from lower left

ALL FAST-MOVERS (EVEN STARS) LEAVE STREAKS
ON CAMERA OPTICS - EVEN MISTAKEN FOR METEORS

VIEWING ENTIRE VIDEO SEQUENCE
REVEALS THAT PARTICLE RATSCH'S (CARLOTTO "MØ")
IS THE KEY TO OPENING THE PUZZLE - SEE CHART 03

(READ FROM
BOTTOM TO TOP)

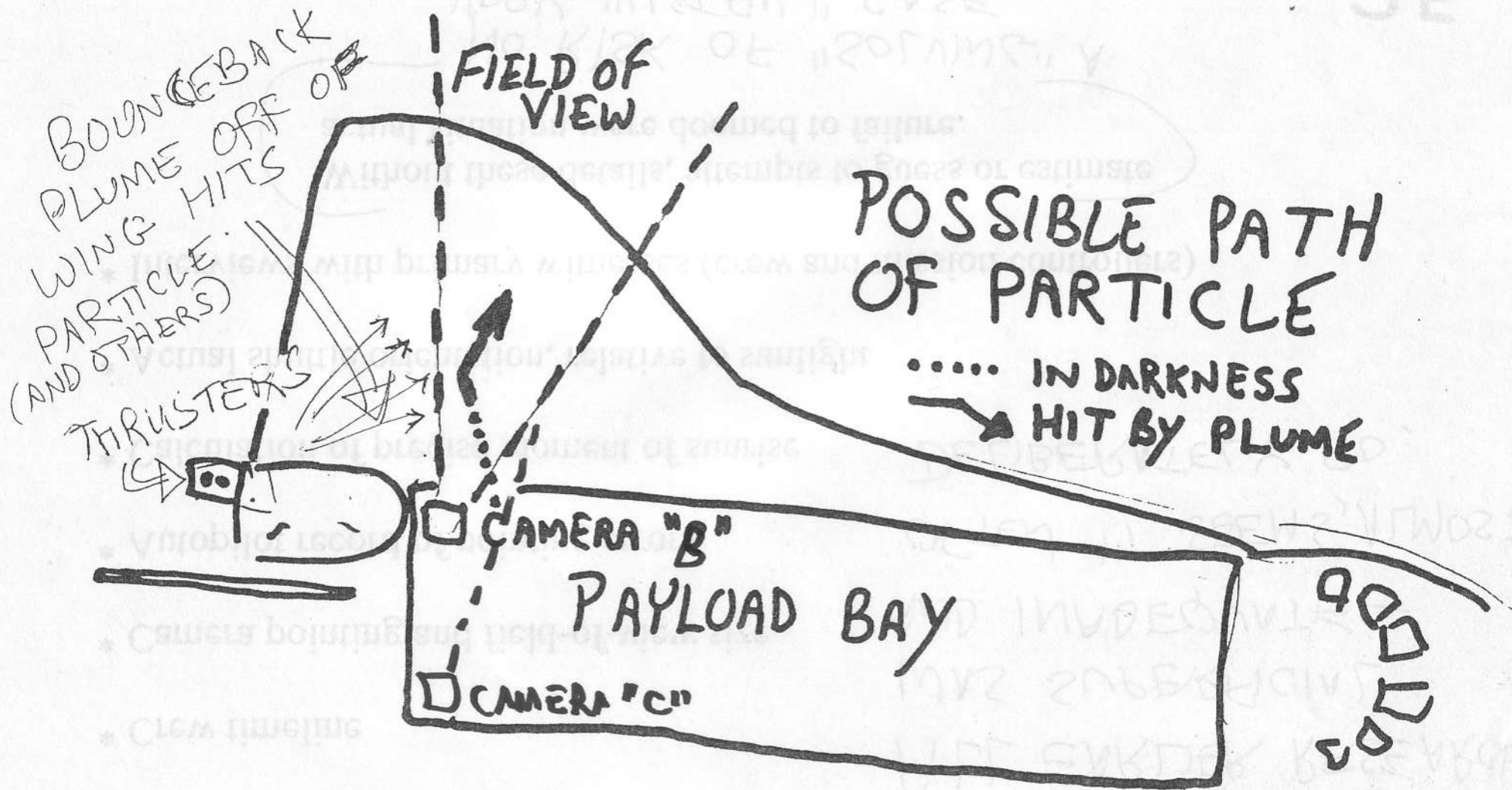


FLARE IS SEEN AT 20:39:24 AND
PARTICLE MAKES COURSE CHANGE. TIME
FROM APPEARANCE TO COURSE CHANGE
③ (80 SECONDS) IS IDENTICAL TO INTERVAL
FROM SUNRISE TO JET FIRING (80 SEC)
THIS CONNECTS ALL EVENTS TO SHUTTLE EVENT.

② DRIFTS LINEARLY FOR ~80 SECONDS
WHILE OTHER PARTICLES APPEAR OR ENTER
VIEW

① APPEARS SLOWLY AT
~ 20:38:05 SIMO WITH
OTHER DOTS AND GLARE IN
UPPER LEFT CAMERA FIELD-OF-VIEW,
AT SHUTTLE SUNRISE. IMPLIES IT'S
A NEARBY SUNLIT PARTICLE.

236



VERY SHARP TURN IS GEOMETRY ARTIFACT
OF VIEWING DEPARTING PARTICLE FROM CLOSE
TO ITS POINT OF ORIGIN, ACTUAL COURSE
CHANGE MAY BE 30-40° OR EVEN LESS.

Additional technical data never sought by previous researchers

- * Thruster firing histories
- * Crew timeline
- * Camera pointing and field-of-view size
- * Autopilot record of pointing errors
- * Calculation of precise moment of sunrise
- * Actual shuttle orientation, relative to sunlight
- * Interviews with primary witnesses (crew and mission controllers)

ALL EARLIER RESEARCH
WAS SUPERFICIAL AND
INADEQUATE AND NAIVE -
OFTEN, IT SEEMS, ALMOST
DELIBERATELY SO.

Without these details, attempts to guess or estimate
actual situation were doomed to failure.

RUNS NO RISK OF 'SOLVING' A
VERY 'USEFUL' CASE FOR PERSUASION 25

Lyndon B. Johnson Space Center
2101 NASA Road 1
Houston, Texas 77058-3696



RECORDS WERE ALWAYS
EASY TO OBTAIN IF
ANYBODY WANTED TO LOOK -

OCT 27 1994

to Attn of: AP2-FOIA-94-477

Irwin Wieder, Ph.D.

~~1500 [redacted] Way~~
~~200 [redacted] CA 94022~~

Dear Dr. Wieder:

This is in response to your Freedom of Information Act (FOIA) request, dated October 11, 1994, and received October 13, 1994, for a copy of the following information relating to the video taken during Shuttle Mission STS-48:

1. Copies of correspondence between NASA, Ms. Beverly Byron, Martin Kress, George Brown, etc. In short the correspondence file between NASA and any requestors of information on the video.
2. A copy of the original review by NASA scientists.
3. Copies of any videos which cover the original event plus any videos prepared especially for UFO investigators or others making inquiries.
4. The exact time of the firing of the vernier thruster in relation to the time that the objects in the video start to change direction.

The above information is enclosed.

Per NASA Regulations [14 CFR Sec. 1206.700 (i) (2)], the fee for the enclosed information is waived as the cost is less than \$5.

Sincerely,

Stella Luna
FOIA Coordinator

ONE
REVIEWER
OF CARLOTTA'S
PAPER IN THE
"JOURNAL OF
SCIENTIFIC
RESEARCH"

Main Errors in Previous Studies (Kasher's "Five Proofs It Can't Be Ice")

"A Scientific Analysis of the Videotape Taken by Space Shuttle Discovery on Shuttle Flight STS-48 Showing Sharply Accelerating Objects", Jack Kasher, PhD, U of Nebraska at Omaha, June 30, 1994. Supported in part by a grant from the Fund for UFO Research.

Proof 1: During the approx. 1 second interval when the object's horizontal motion is changing from leftwards to rightwards, it stops for a few tenths of a second before resuming the change in motion. It is 2 or 3 pixels off from where a smooth curve would have moved it. This must be deliberate and cannot be natural. IGNORES ERROR BARS WHICH IF ADDED SHOW CONSISTENCY WITH CONTINUOUS GENTLE CURVE DURING AND ONLY DURING DURATION OF THE DOCUMENTED FIRING.

Proof 2: The two fast-moving particles must have been travelling directly away from the RCS thruster. Appendix J proves that only the aft left-firing vernier (L5L) could possibly affect the motion of particles above the shuttle ("This is crucial when we examine the trajectories of the objects more carefully"). Their motion is linear ("If a rocket did the firing, the lines MUST meet"). Since the lines and the line of the main object do not trace back to a single point, they cannot be ice particles accelerated by a thruster. WRONG ASSUMPTION OF WHICH JET FIRED BASED ON ABSENCE OF TELEMETRY RECORDS AND LACK OF KNOWLEDGE OF ACTUAL PERFORMANCE OF DOWN-FIRING VERNIERS, INCLUDING RANDOM WIDE BOUNCEBACK OFF WING.

Proof 3: Any particle in the thruster plume would be accelerated nearly to plume velocity (96%). Appendix B proves this, that the acceleration is independent of the mass or drag coefficient of the particle. The main object clearly wasn't accelerated to this speed by the thruster firing, which lasted 0.4 seconds (as measured by the duration of the pulse). So it couldn't have been a particle. MATH ERROR CAUSING PARTICLE MASS TO CANCEL; FALSE ASSUMPTION THAT PARTICLE MUST BE IN PLUME.

(?)

ERRONEOUS DURATION OF THRUSTER FIRING

Proof 4: The main object remained at rest for about half a second during the period of the main flash (following a shorter pre-flash earlier), and then accelerated sharply. "Presumably this was the time the rocket exhaust was moving through vacuum up to the 'ice particle'" If it were ice, it would have been about 64 ft away from the thruster. That half second delay is too long for the fast-moving exhaust, so it couldn't have been ice. OVERLOOKS EARLY FLASH, MISTAKENLY BELIEVES FLASH INDICATES ENTIRE THRUSTER FIRING; OWN CHARTS SHOW OBJECT CHANGING COURSE DURING AND ONLY DURING FIRING.

Proof 5: Since any particle hit by a thruster exhaust would have to reach a speed of 8300 ft/sec, it would be too far away at the end of the thruster firing to be visible. FALSE ASSUMPTIONS ABOUT PARTICLE BEING IN FULL PLUME RATHER THAN EDGE.

OR IN BOUNCE-BACK ONLY

Main Errors in Previous Studies (Carlotto, "Journal of Scientific Research")

"The lack of any deflection in star motion or change in the position of the horizon line suggests that the flash was not caused by a thruster firing." WHEN CONFRONTED WITH THRUSTER FIRING DATA, RECANTED

"Instead of changing abruptly as one would expect of an ice particle near the shuttle passing from shadow into sunlight, the brightness increases gradually over a one second period". OVERLOOKS ANGULAR SIZE OF SUN WHICH WOULD CAUSE EXACTLY SUCH A GRADUAL RATHER THAN ABRUPT ILLUMINATION.

"When M1 appears in the video, the shuttle is in daylight with the sun to the right. It is thus unlikely that M1 is near the shuttle since there is no mechanism to explain its appearance." Figure 4 (p. 48) shows sun in front of and 10 degrees ABOVE nose of shuttle, with no shadowed regions at all. INCORRECT SPHERICAL TRIGONOMETRY, PLUS OVERLOOKS EVIDENCE THAT SUN IS OFF THE NOSE BUT ABOUT 30 DEGREES BELOW THE NOSE, CREATING ENTIRELY ADEQUATE SHADOWED ZONE ABOVE WING.

SEE CHART 18

The dots can't be ice because "all the objects in the shuttle video appear to be about the same size, yet some scintillate and some do not". Further, "The thruster firing does not seem to alter the brightness characteristics of any of the objects. This implies that the objects are not affected by the gases and must thus be far from the shuttle." DEPENDING ON SHAPE AND MOTION, SOME ICE DOES FLICKER AND SOME DOESN'T. ROUNDED PIECES RARELY FLICKER NO MATTER WHAT SPIN RATE. POSTULATES IMAGINARY CRITERION.

* Published attempts to prove that these phenomena have NO possible prosaic explanation fail fundamental principles of scientific argument: the criteria proposed are never tested under double-blind trials to validate their efficacy in discriminating prosaic from other.

MAJOR FAILURE OF FUNDAMENTAL SCIENTIFIC METHOD - FAULTY CLAIM TO ELIMINATE PROSAIC EXPLANATION VIA CRITERIA NEVER TESTED AGAINST REAL CASES - PROBABLY A GUESS 78

STS-48 zigzagger joins other notorious bogus "astronaut UFO" stories

- * NASA "Chief of Apollo Communications" Maurice Chatelain (pure fiction)
- * Mercury-7 "blob" photo (tethered tracking balloon outside window)
- * Gordon Cooper's Mercury-9 encounter (fictitious, probably by Frank Edwards)
- * Robert White on X-15 ("There are things out there!") - (... "the size of a piece of paper.")
- * Jim McDivitt's "beer can" on Gemini-4 (probably own booster; all photographs released)
- * Twin force-field UFOs photographed on Gemini-7 (retouched view of two nose thrusters)
- * Gemini-7 "bogie" (debris during booster re-encounter; Borman denounces "UFO freaks")
- * Gemini-11's fly-past and photography of blobby UFOs (Soviet Proton-3 satellite)
- * Gemini-12's "four in a row, not stars" (describing four trash bags recently jettisoned)
- * Apollo-11 voice transcript of UFOs on surface (fabrication by tabloid newspaper)
- * Apollo-11 photographs of fuzzy spheres (retouched photos of window reflection of ceiling light)
- * Apollo-12 photographs of bright structured disk (retouched photos of S4B staged sunlit top)
- * Apollo-12 translunar companions (jettisoned "SLA panels", the LM's garage walls)
- * Apollo-16 "disk over moon" (probably window reflection of camera's own sunlit lens)

STS-29 "alien spacecraft in view" (Hoax voice on amateur frequency used to relay air-to-ground)

STS-33, 44 Story Musgrave's "space snakes" (jettisoned twisting wire or tile gap filler strip)

STS-58 overtaking UFO during launch (camera is panning down near horizon, light is a/c or star)

STS-6x Hubble Repair Mission objects (ordinary payload bay detritus)

STS-73 "We have an unidentified flying object" (joke in windowless Spacelab about crewmate's anatomy)

STS-80 fleets of UFOs (another post-sunrise panorama of sunlit near-shuttle debris)

STS-82 "What's that flashing" (conversation inside airlock about blinking LED panel display)

..and doubtless many, many more to come.....

Eyewitness Testimony

Monday, February 22, 1999 7:53:54 AM

From: james.r.bates1@jsc.nasa.gov (Jim Bates has worked in Mission control since Gemini days)

Jim, During STS-48 I was in MCC watching the 'snow' or ice particles during the low-light level TV scenes. For many flights during slow times when crew was asleep (or awake) we would watch chunks of ice float away from main engine nozzles and ice fly out of RCS (and vernier?) thrusters. AND we would watch the small 'snow' get blasted by the thruster plumes. The bigger ice pieces from the SSME's would slowly tumble away, turning and glinting sunlight in the process. If someone saw only a piece of such videos, yes they could think they are UFO's. And to them, they are UFO's. But, I'm sorry, these things are not.

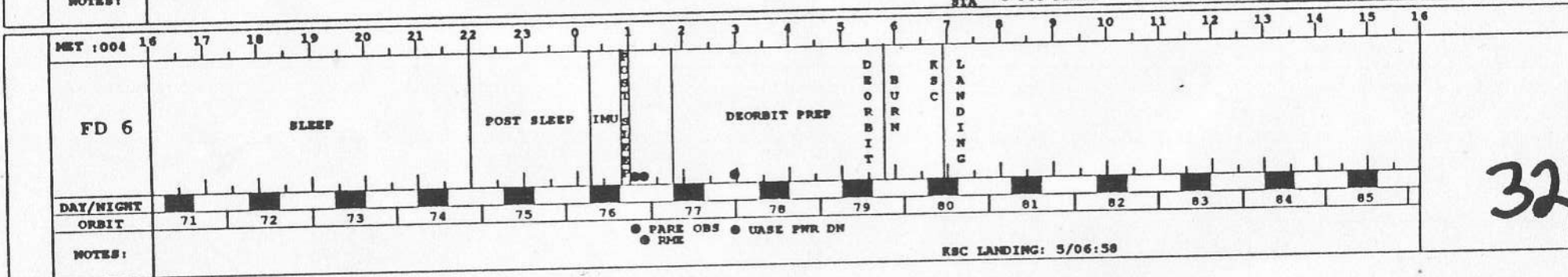
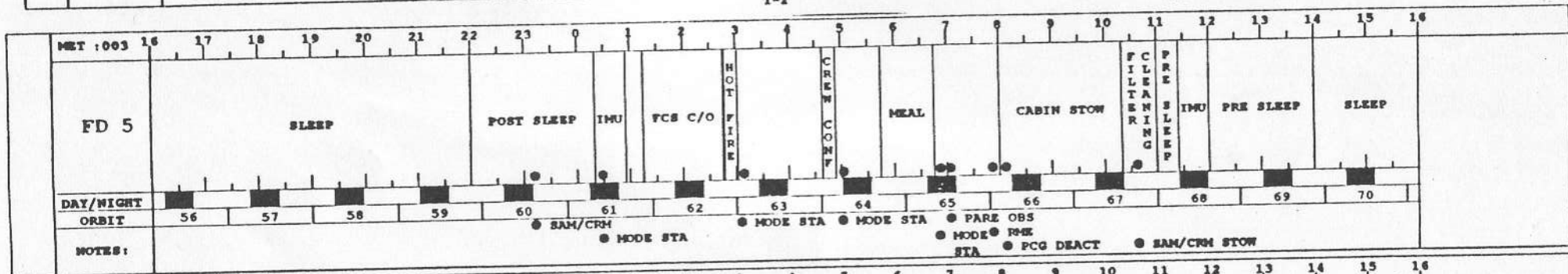
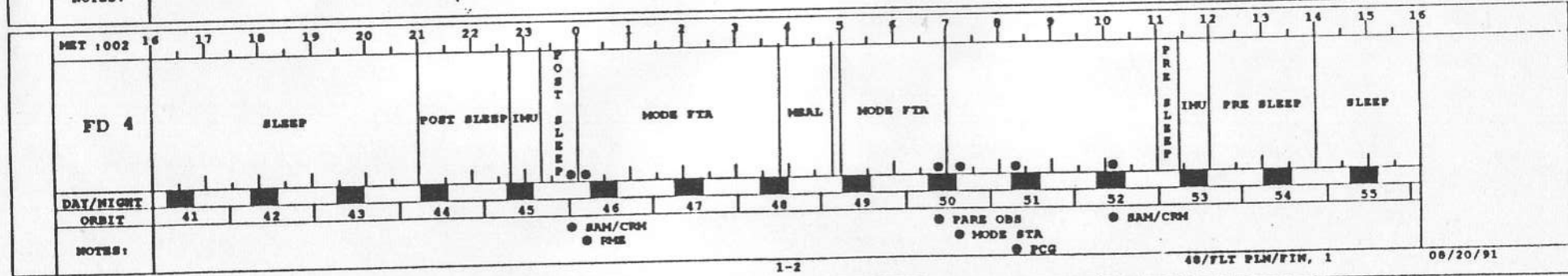
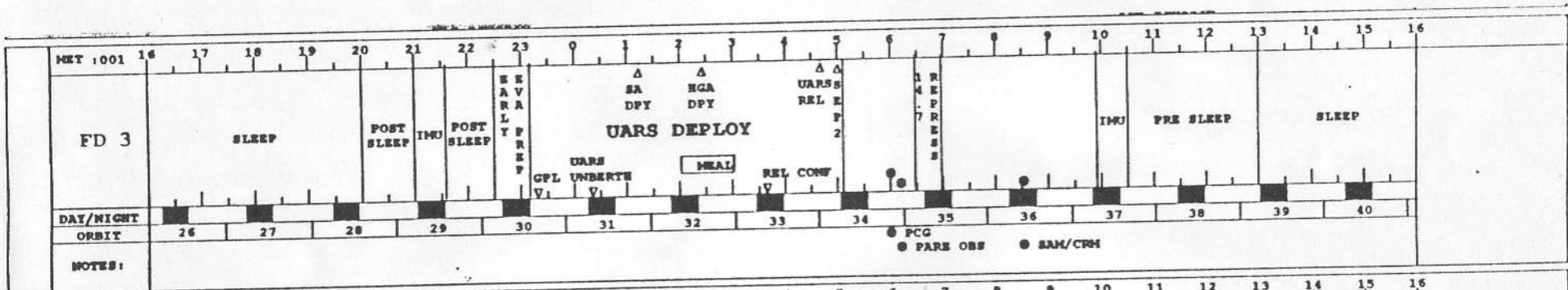
I was a Flight Integration Manager for the Shuttle Program Office during those days and was the manager of the Customer Support Room where most of the payloads and other tests were managed or run. For STS-48, I worked one of the shifts in the CSR. I had also worked with Skeet Vaughn to get his lightning survey implemented, and was very familiar with all of the low-light TV 'phenomena' we watched for hours upon end during many of the flights.

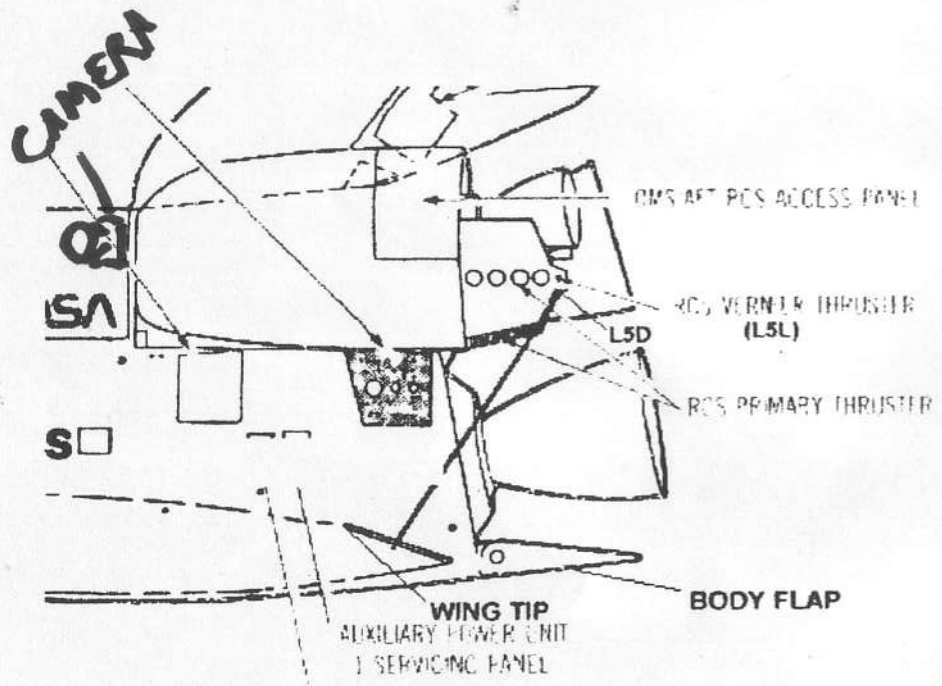
Yes, you can quote me on this topic. I was very amused and amazed when I caught a portion of the TV show last week that showed a 'physicist' who was studying the ice crystals being blasted by the attitude thrusters. Of course, he only saw a part of the big picture and was trying to come up with a solution with limited knowledge.

(30 DELETED)

31

STS-48 SUMMARY TIMELINE





L5L THRUSTER
 PLUME BOUNCE-BACK
 OFF ELEVON, INTO
 FIELD-OF-VIEW OF
 CAMERA-C

