

Zkáza raketoplánu Challenger: havárie, které předcházelo tisíc varování



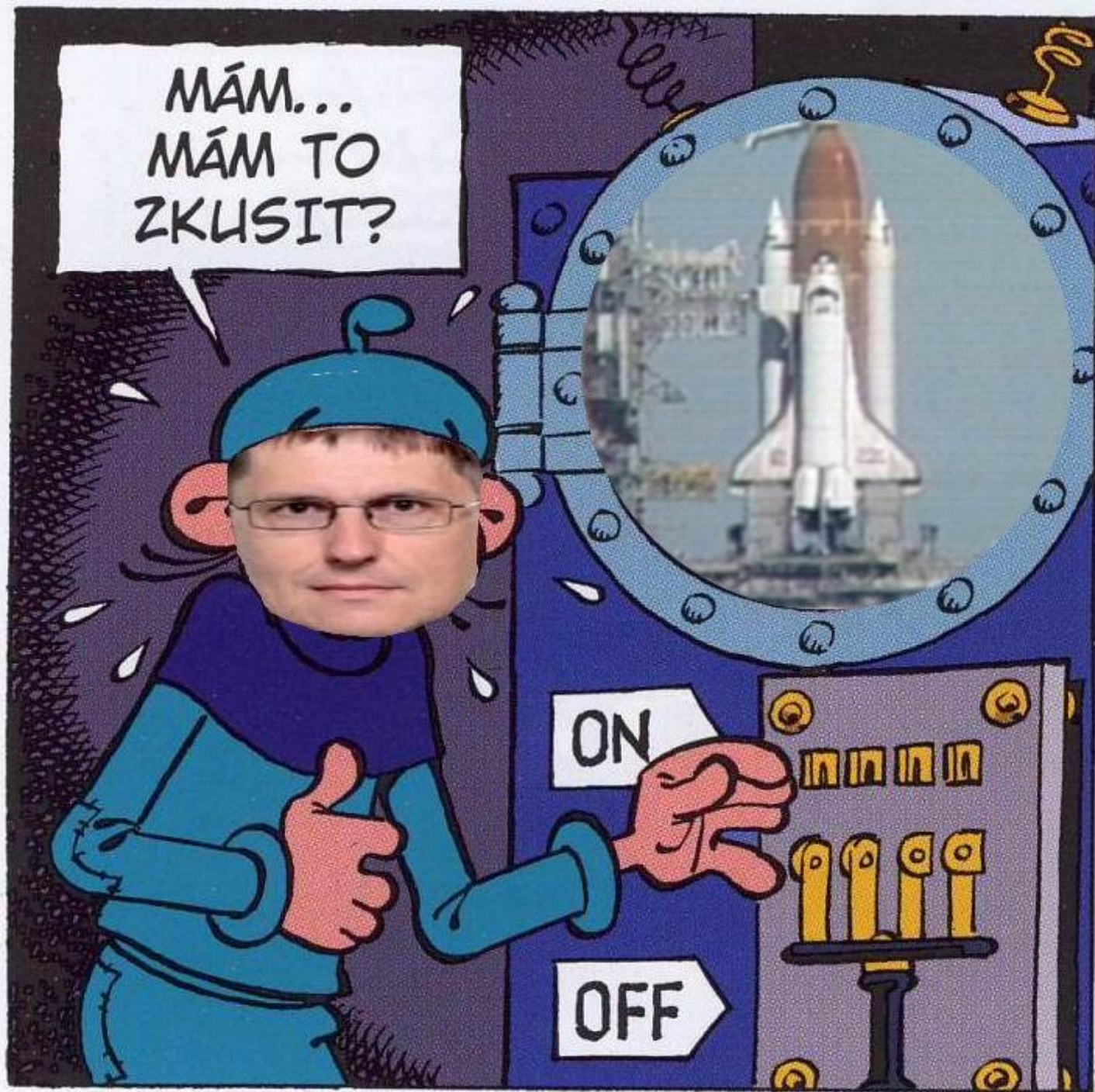
Ing. Tomáš PŘIBYL
tomas.pribyl@seznam.cz
www.kosmonaut.cz



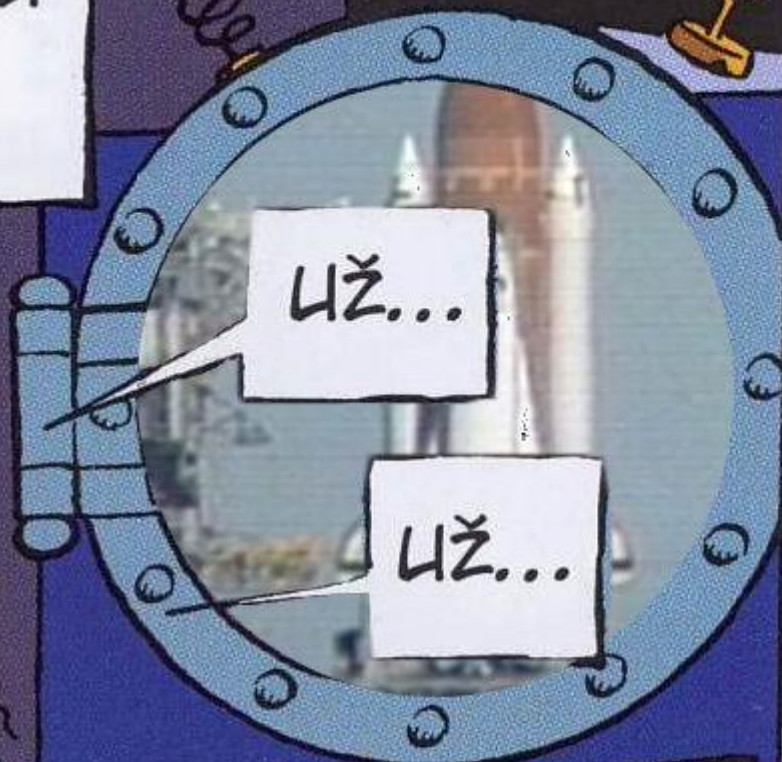
VIDA, ZASE NĚJAKÝ
NOVÝ VYNÁLEZ!



MĀM...
MĀM TO
ZKUSIT?

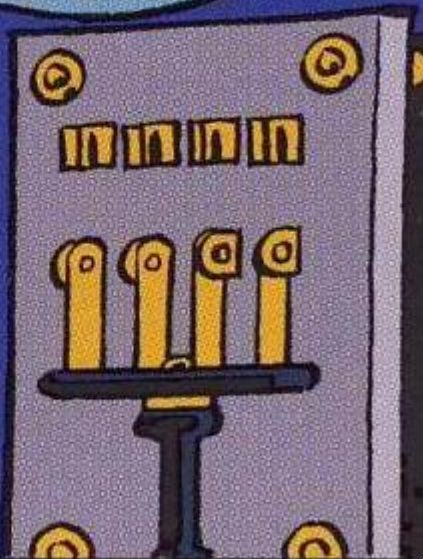


CÍTÍM, ŽE TOMU
POKUŠENÍ
PODLEHNU!



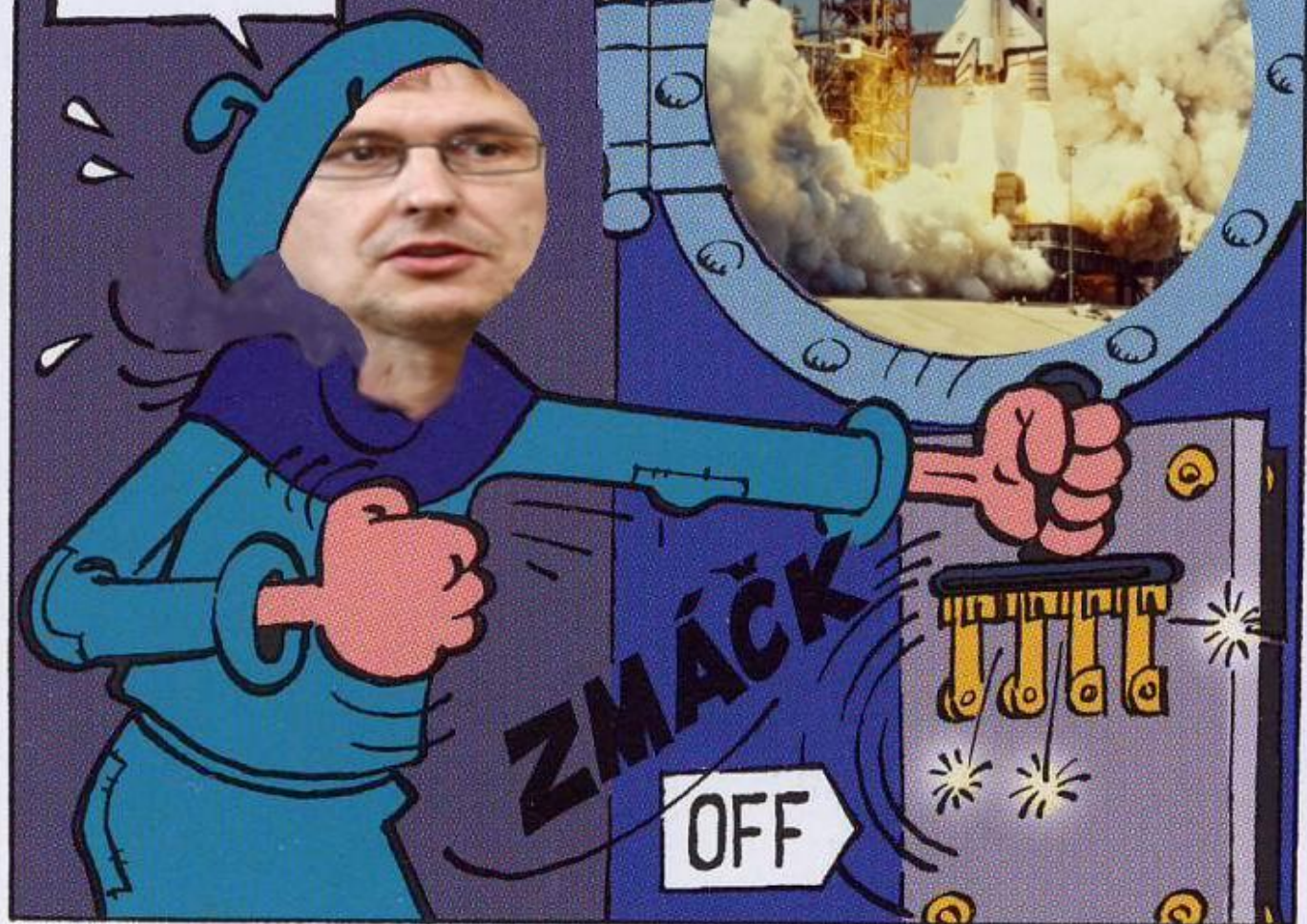
ON

OFF



UŽ JSEM PODLEHNUL!

...A JAK
RÁD!





*Zkáza raketoplánu Challenger:
havárie, které předcházelo
tisíc varování*



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119993-1985 04 1986

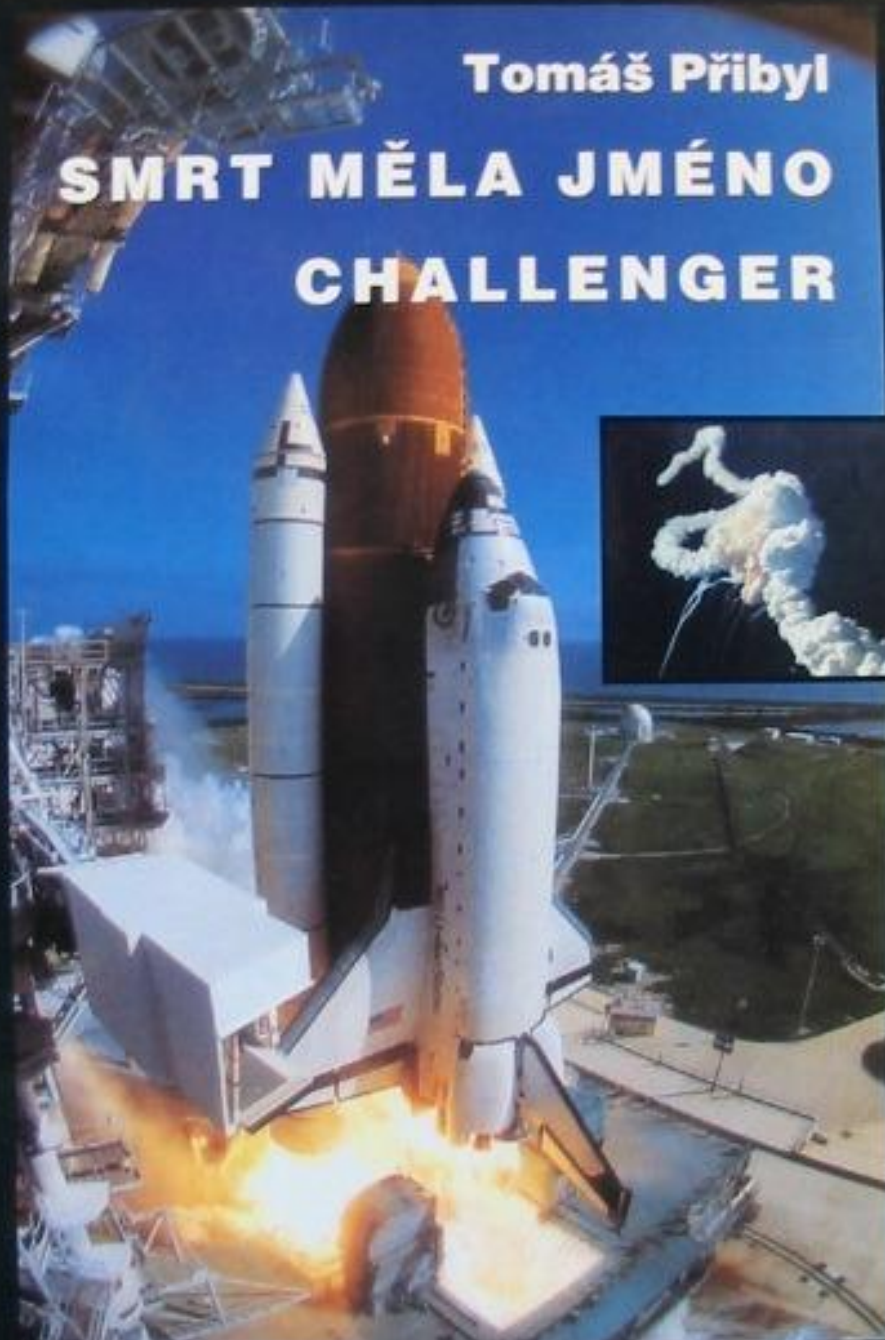
11 54

TIME

SPACE SHUTTLE
CHALLENGER
JANUARY 28, 1986

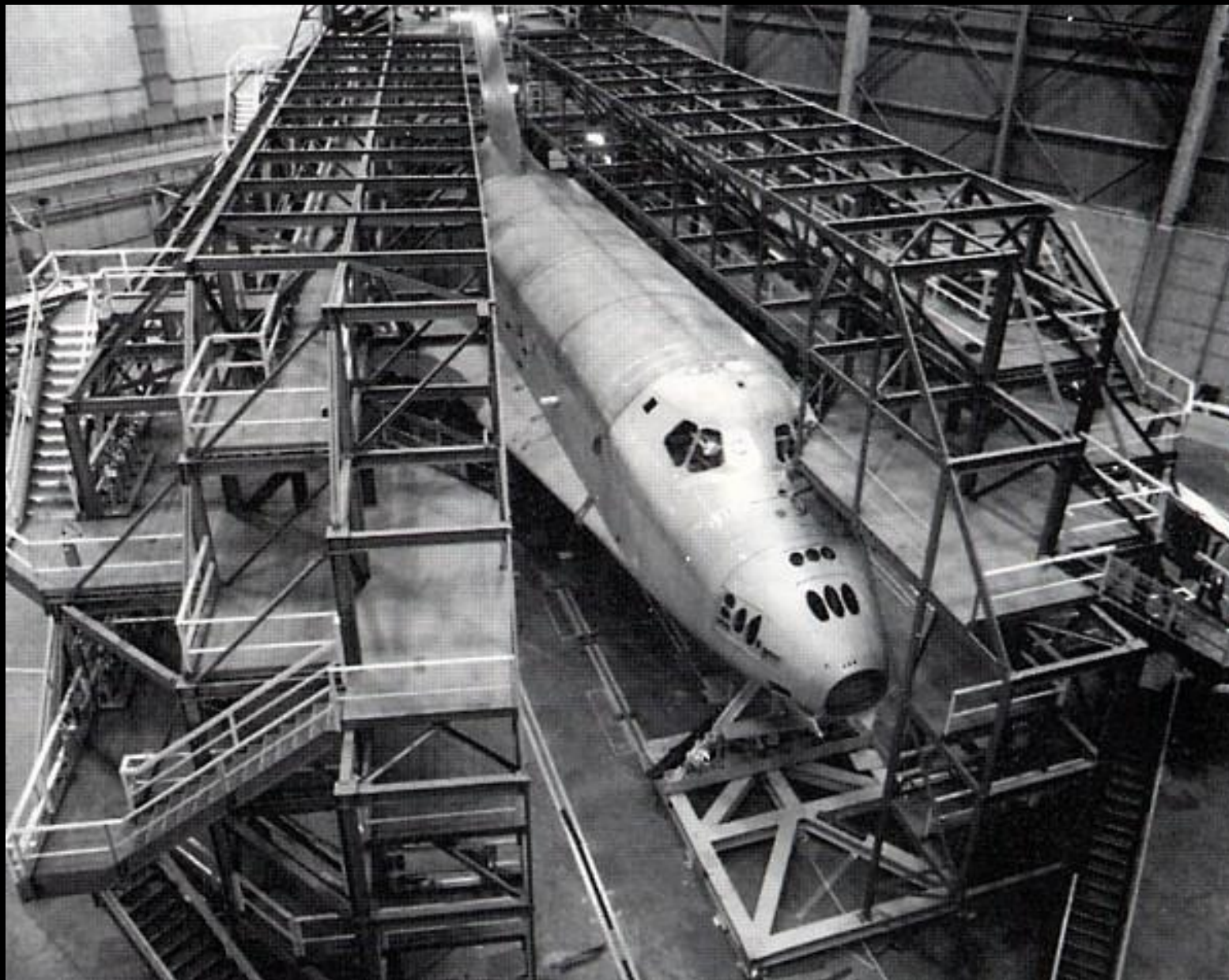


Tomáš Příbyl
SMRT MĚLA JMÉNO
CHALLENGER



NE-RAKETOPLÁN CHALLENGER

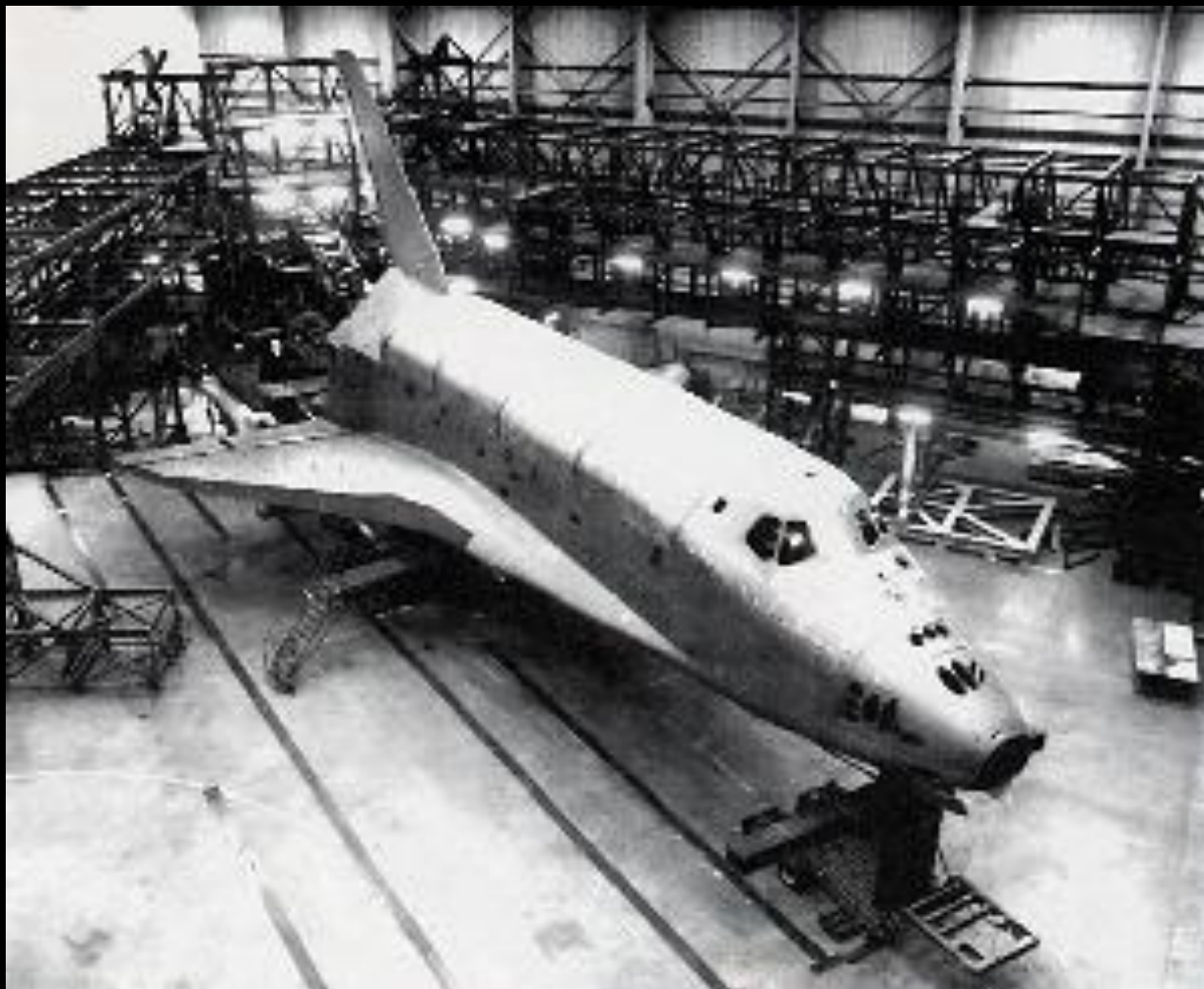
Kontrakt červenec 1972



Montáž zahájena: listopad 1975



Dokončeno únor 1978



Jenže...



Leden 1979: nový kontrakt



Říjen 1981: konec montáže



MPTA-098

STA-099 (Challenger)

OV-101 (Enterprise)

OV-102 (Columbia)

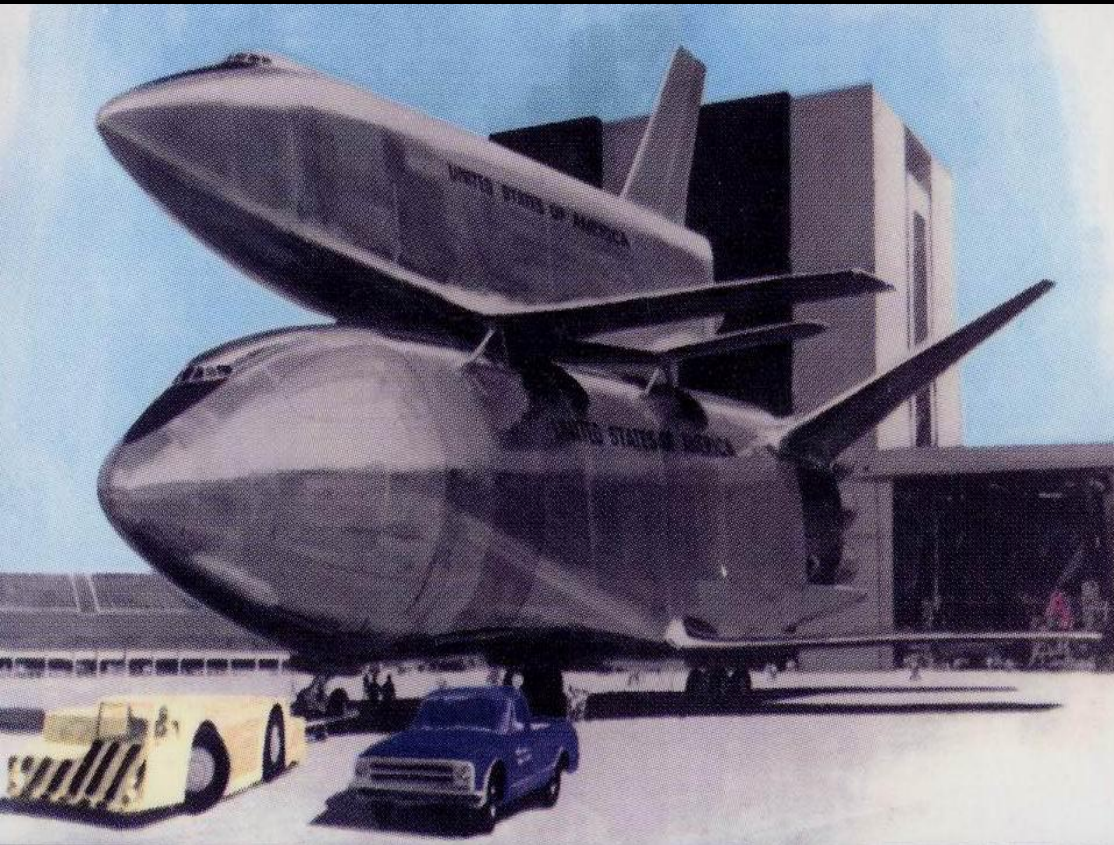


(OV-098) Pathfinder



U KOLÉBKY PROBLÉMU

1. června 1970: požadavky



Dvoustupňový, plně vícenásobně použitelný.

Oba stupně možnost říditelného přistání.

Start do 43 hodin.

Vertikální start, horizontální přistání.

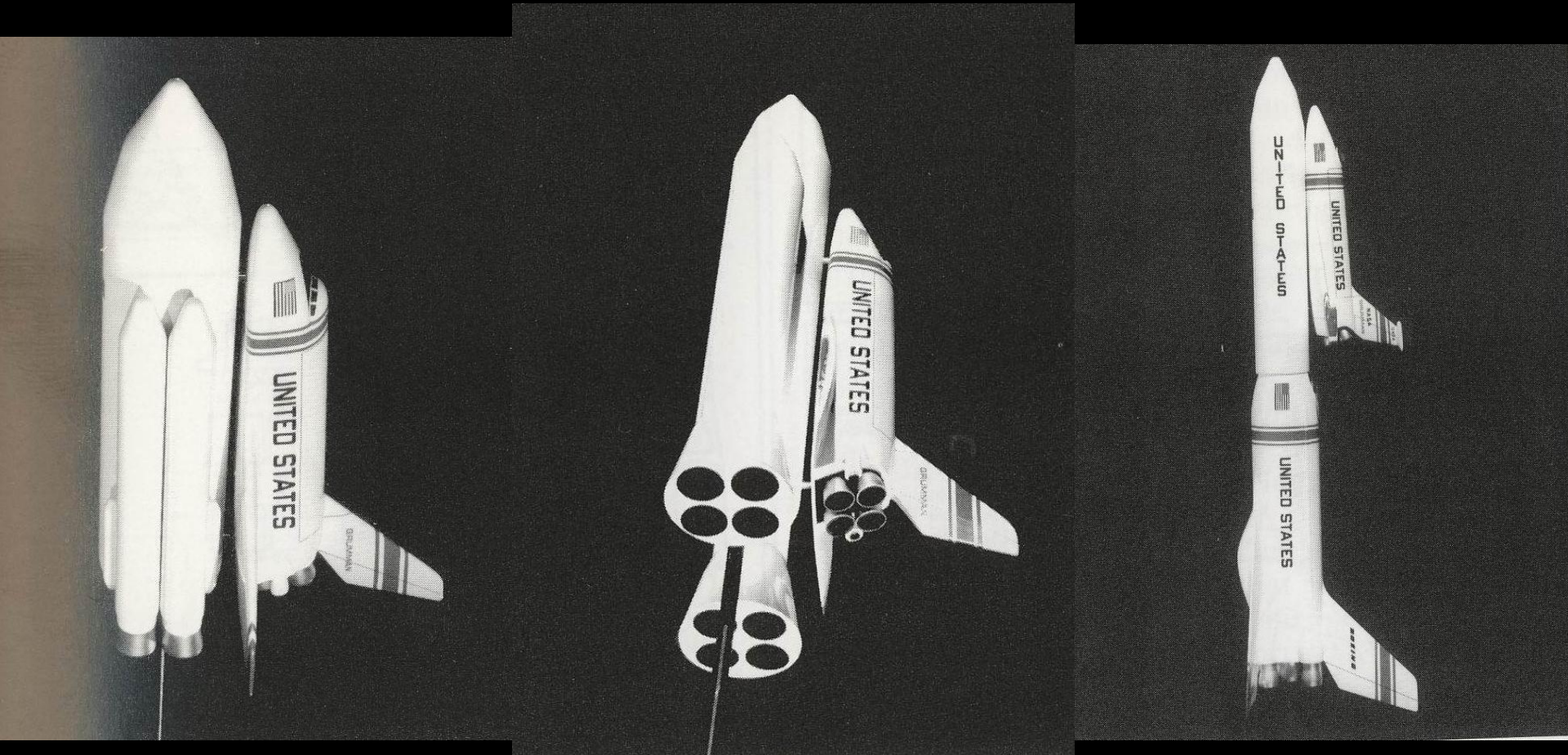
První start před koncem 1977.

Sedm dní výdrž.



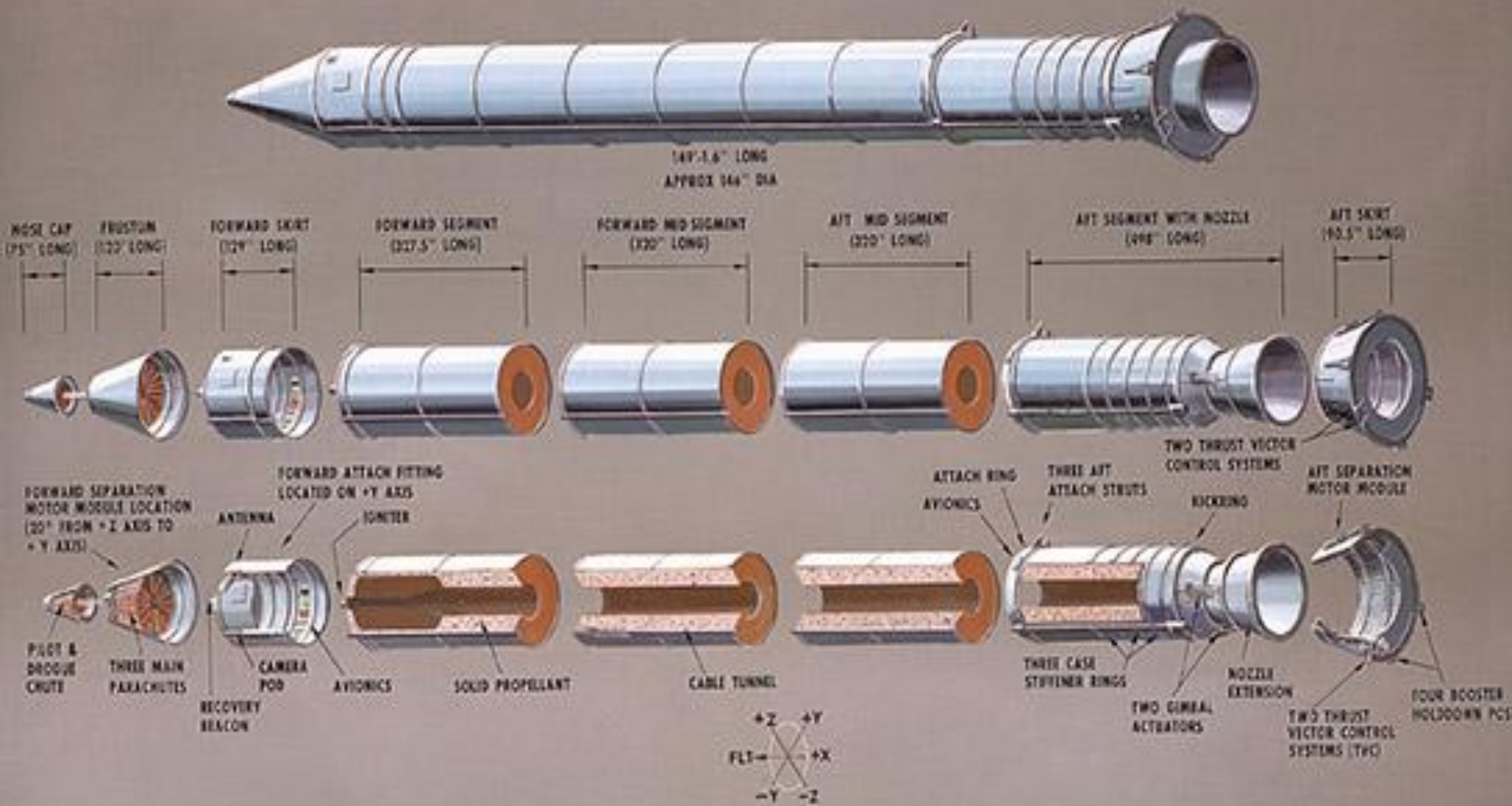
5. ledna 1972

Paralelní vs. sériové, najednou vs. postupně





SOLID ROCKET BOOSTER-SRB







Thiokol (1982 Morton Thiokol)

A photograph of the Space Shuttle Challenger at the Utah Space Museum. The shuttle is lying horizontally on a gravel display area. In the foreground, several other aerospace artifacts are displayed on stands, including a large white rocket with a blue band, a smaller white rocket with 'USAF' markings, and a white missile labeled 'STANDARD MISSILE 2'. The background shows a cloudy sky and distant mountains.



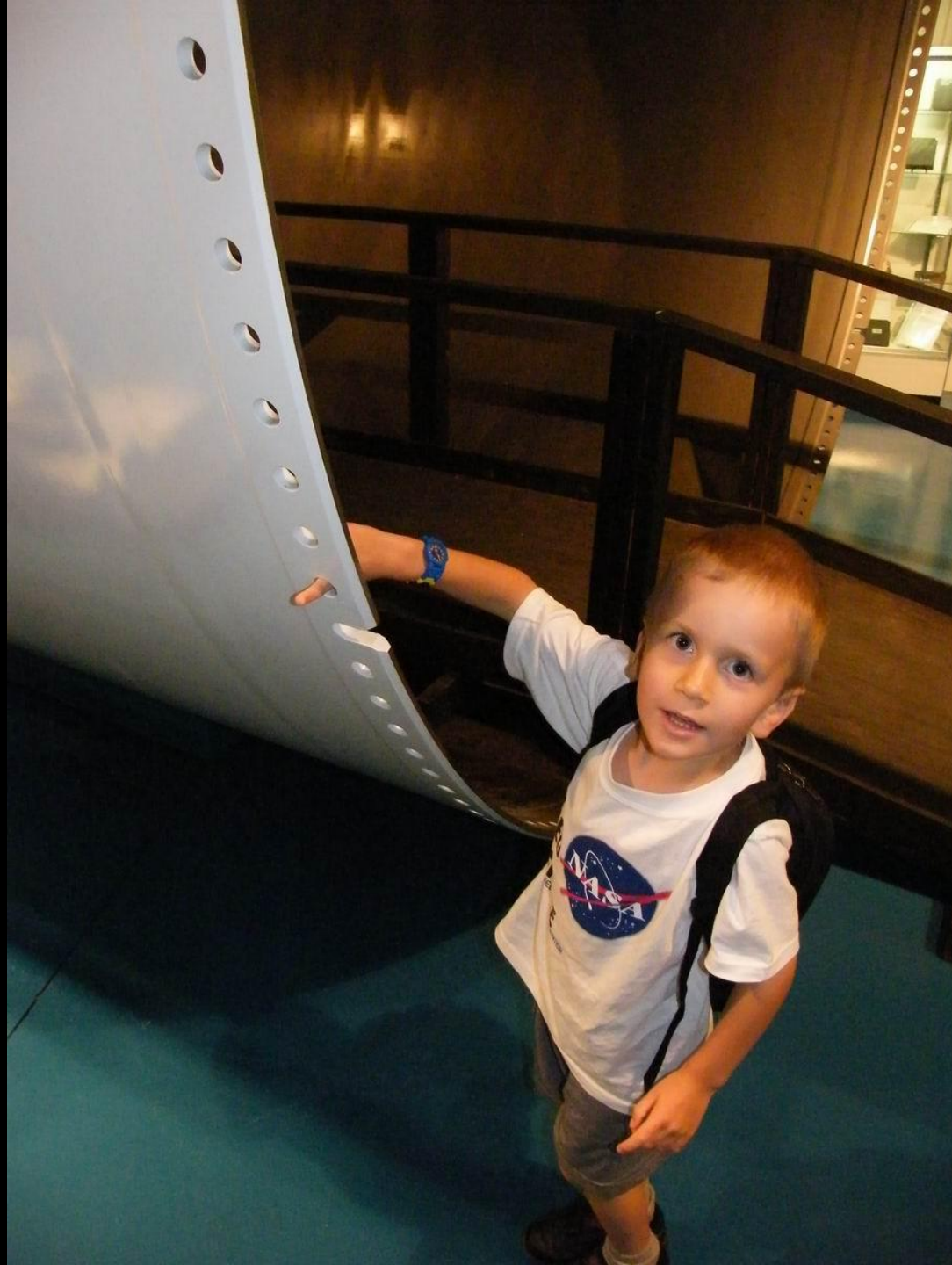






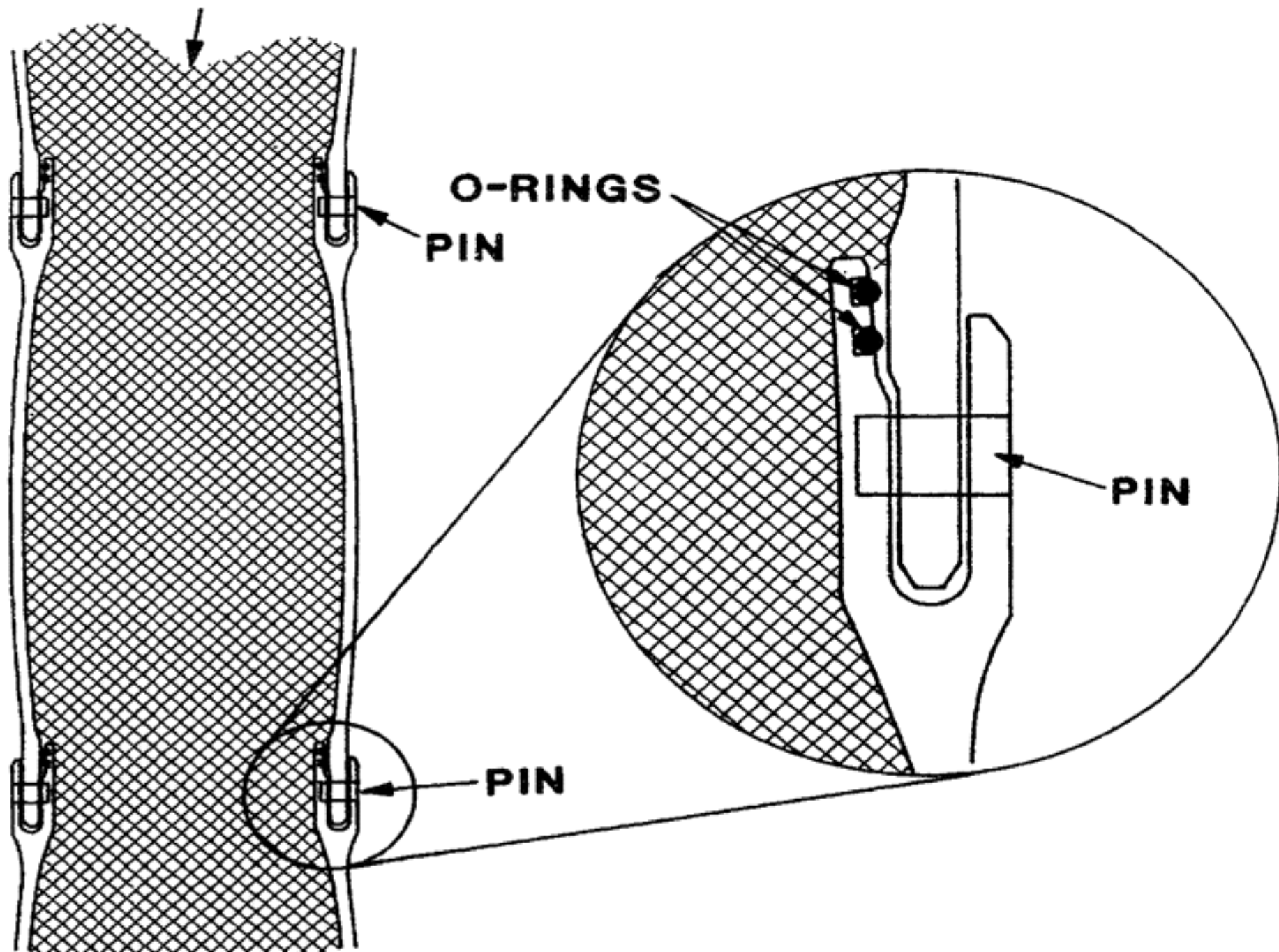




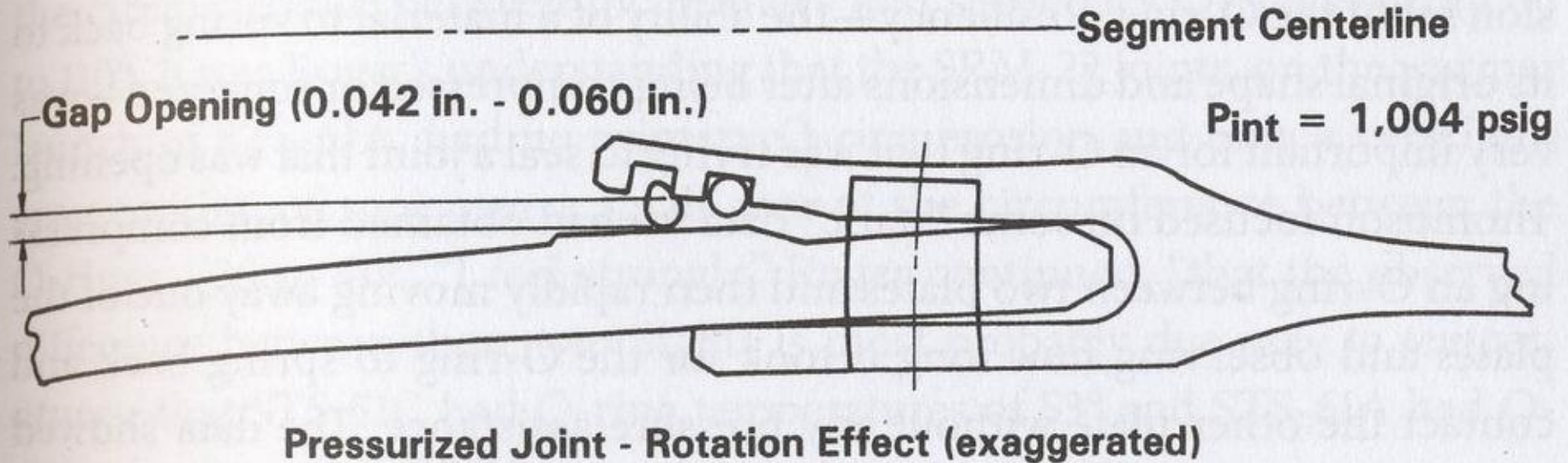
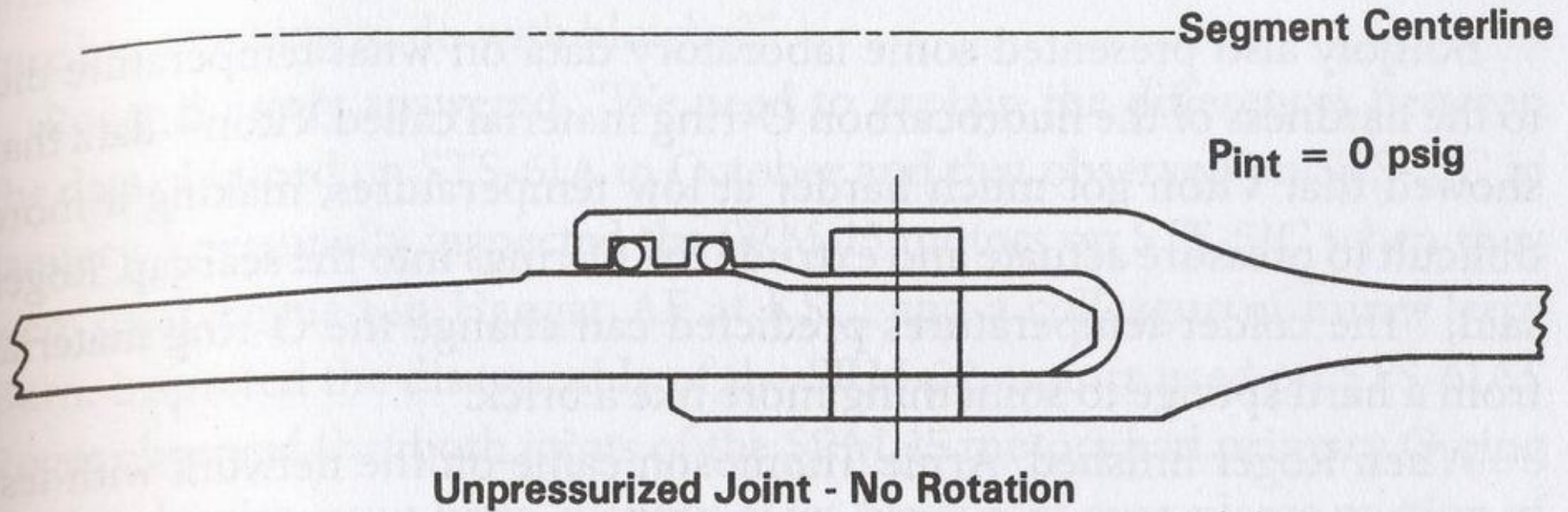




SOLID ROCKET BOOSTER



Primary Concerns (Cont)







VAROVÁNÍ,
KTERÁ NESTAČILA

1977 (Leon Ray)



Letní stroj



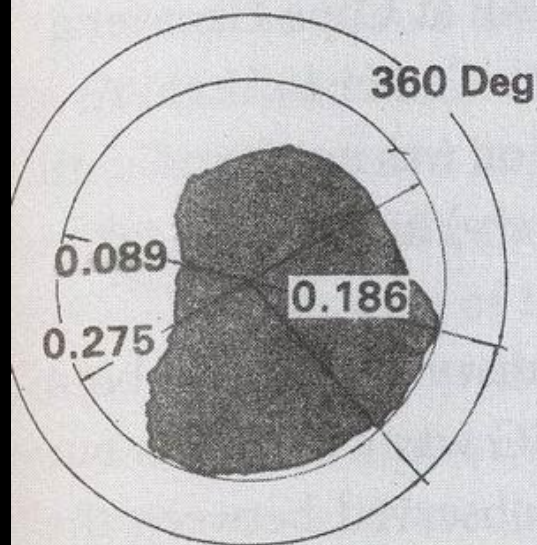
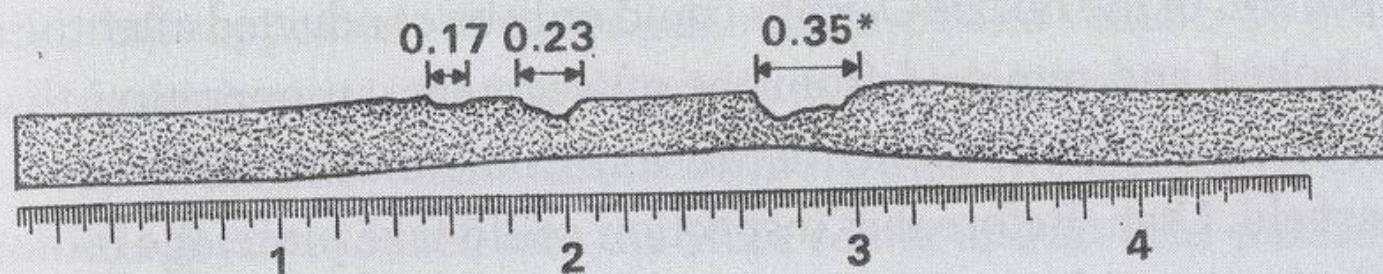
Columbia STS-2



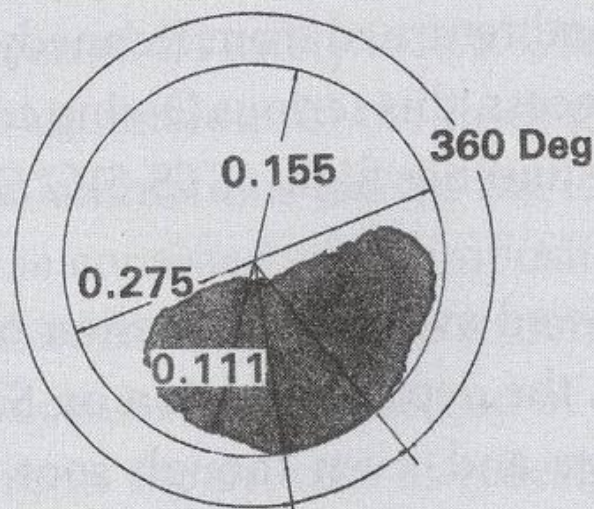
Discovery STS-51C



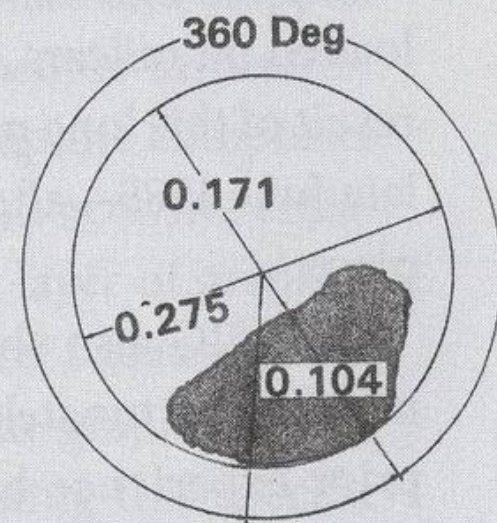
Multiple Burn-Through of the SRM-16A Nozzle-Joint Primary O-Ring



Left Notch

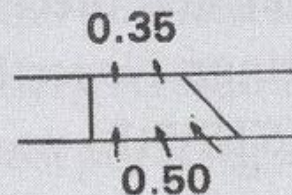


Center Notch

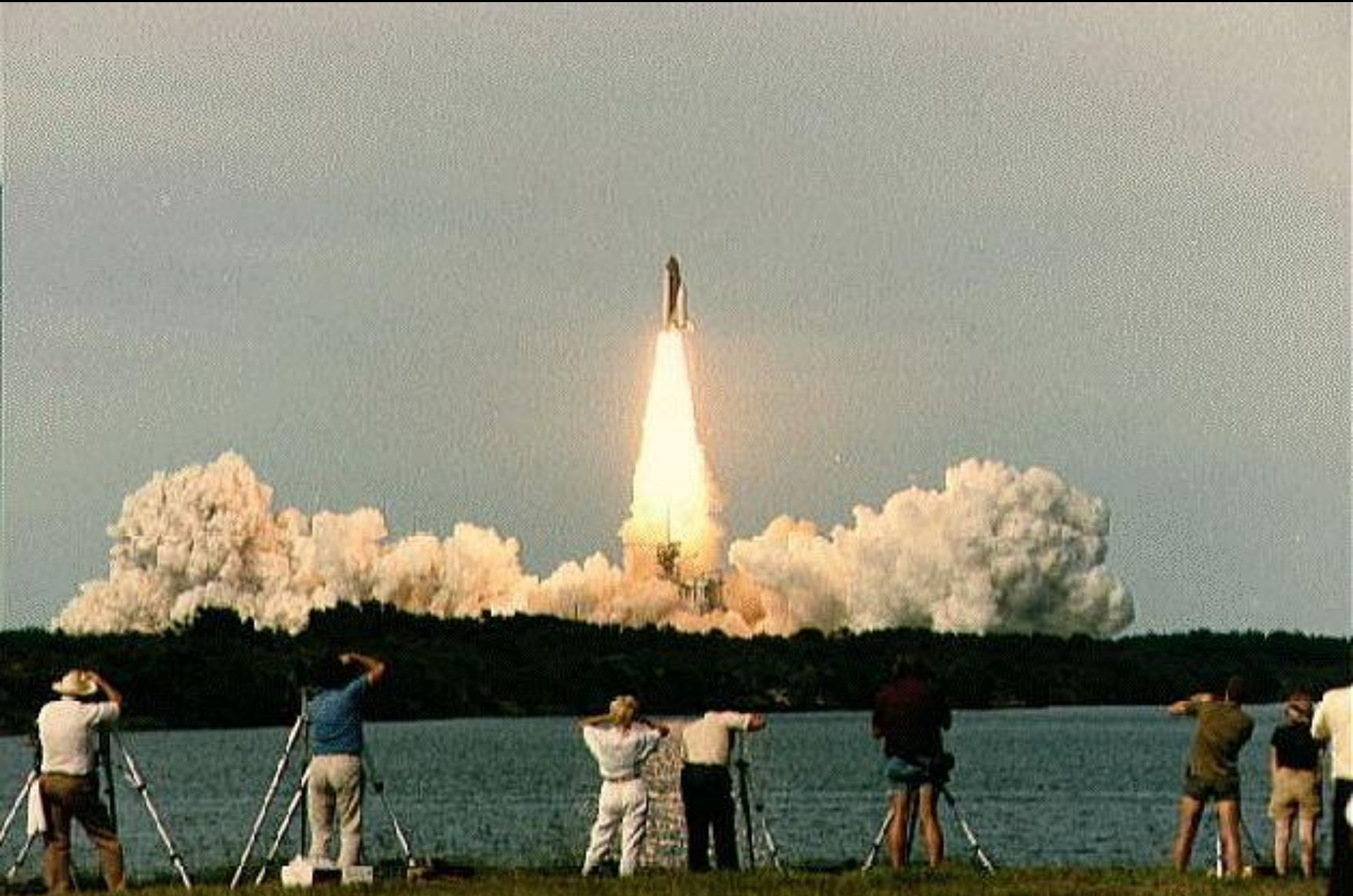


Right Notch

*Top View

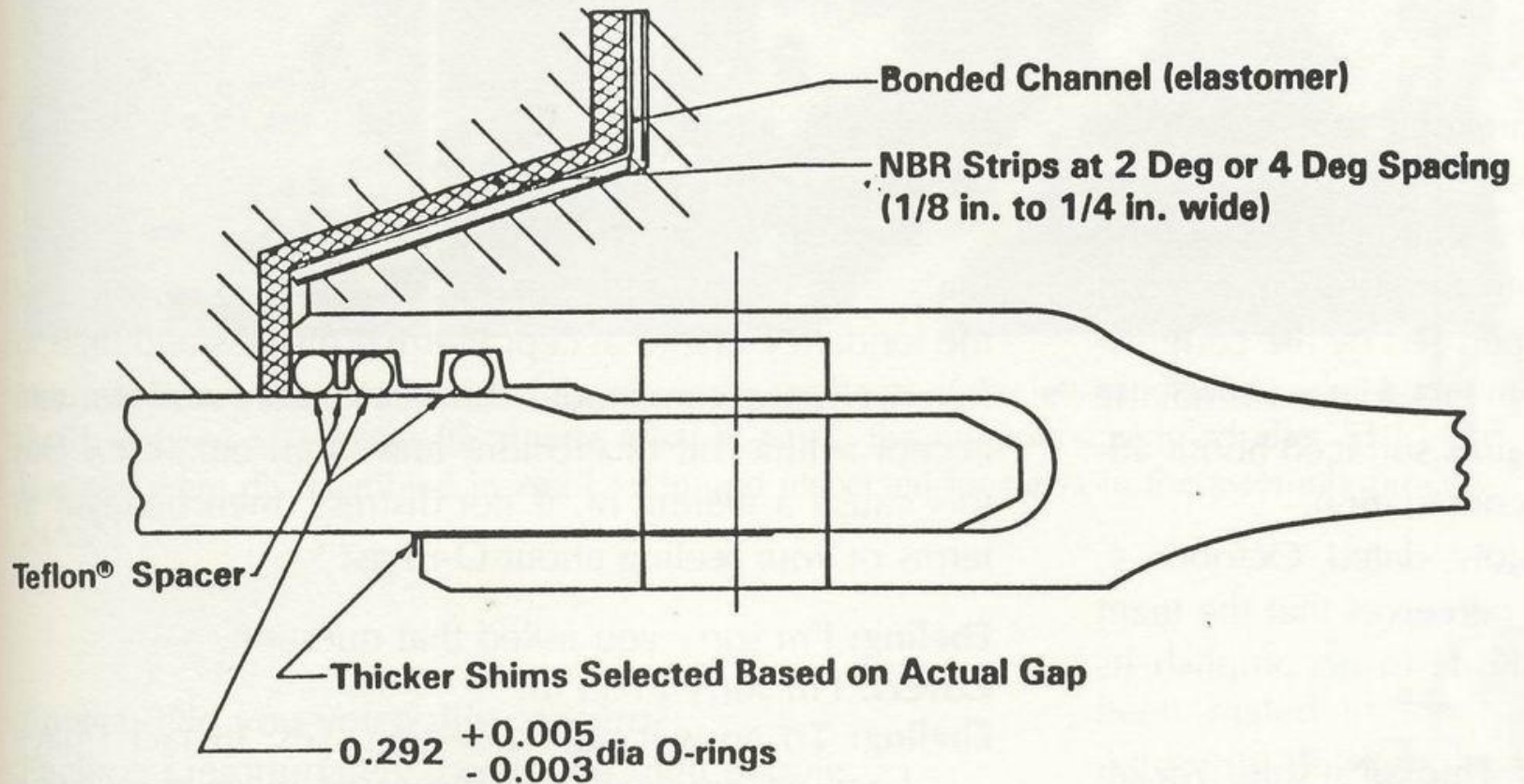


Challenger STS-51F



Červen 1987

- Potential near term conditions - field joint

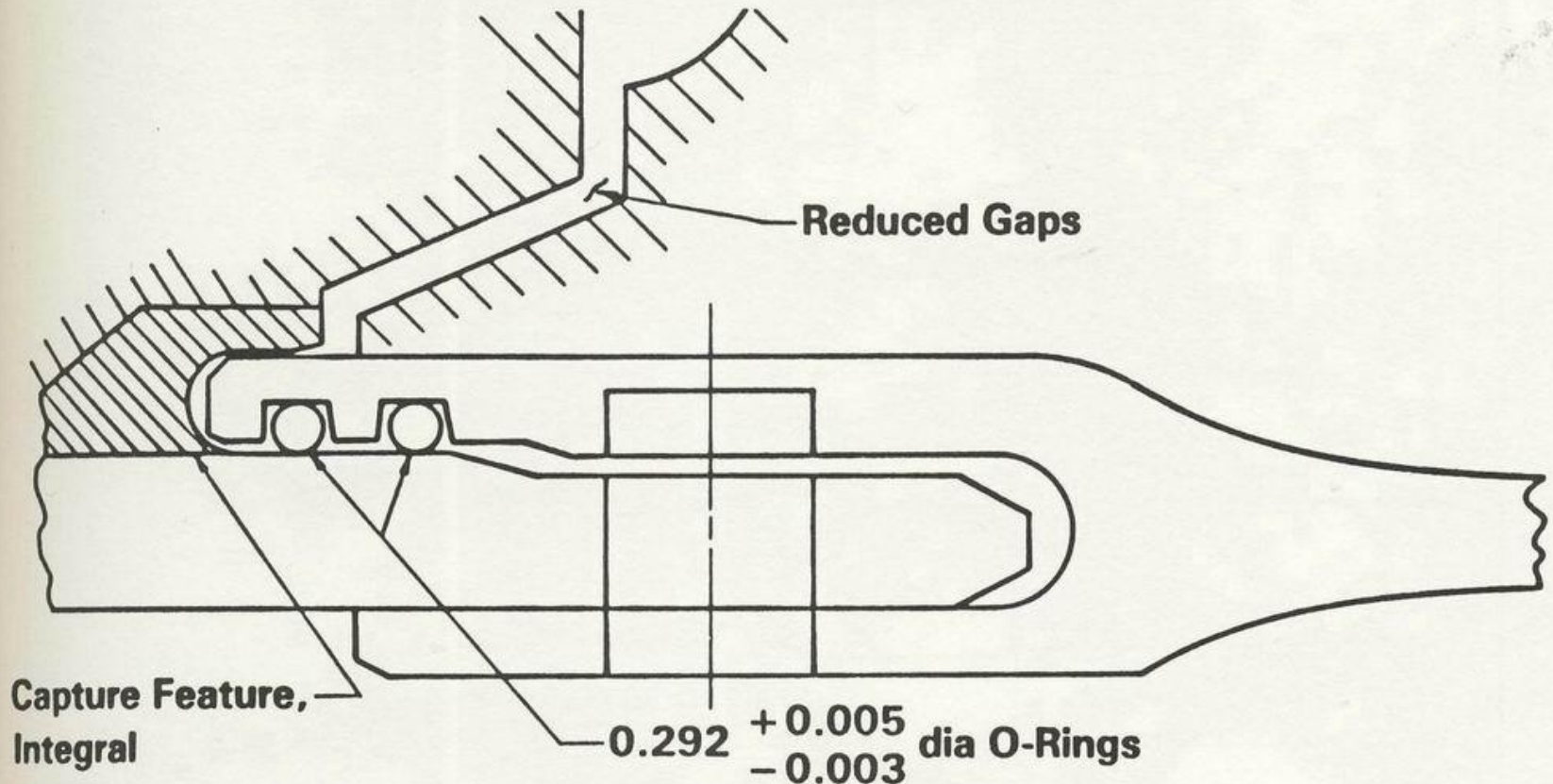


- Earliest possible implementation

- Clevis modification 12 months, STS-71J (SRM-46)

Září 1987 až červen 1988

Potential Long Term Solutions--Field Joints

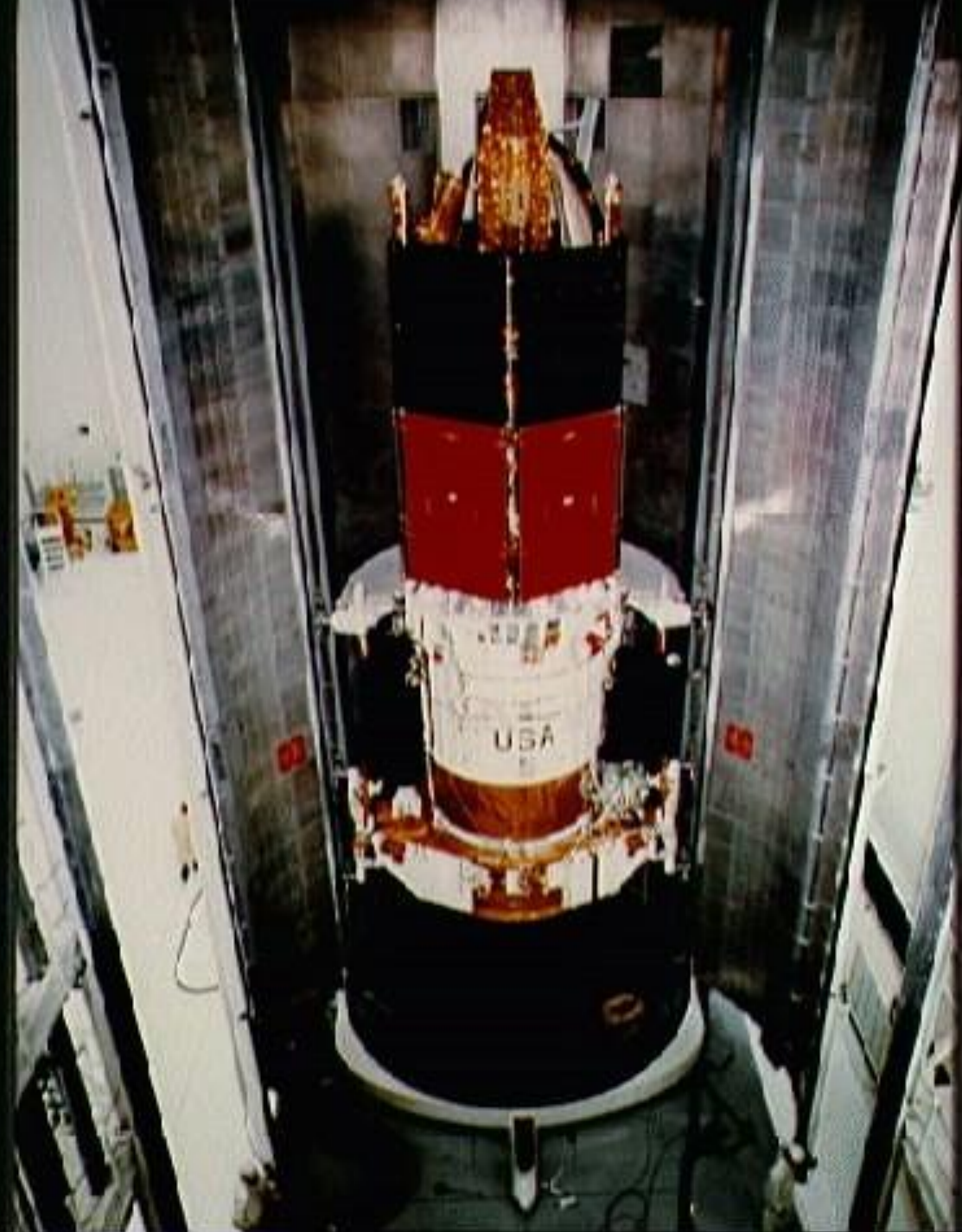


- Earliest possible implementation
 - Capture feature - 27 months, STS-81N (SRM-67)
 - Reduced gaps - 12 months, STS-71P (SRM-52)

14 z 24



DEN STARTU





NASA
Spartan



Tlaky

Politické

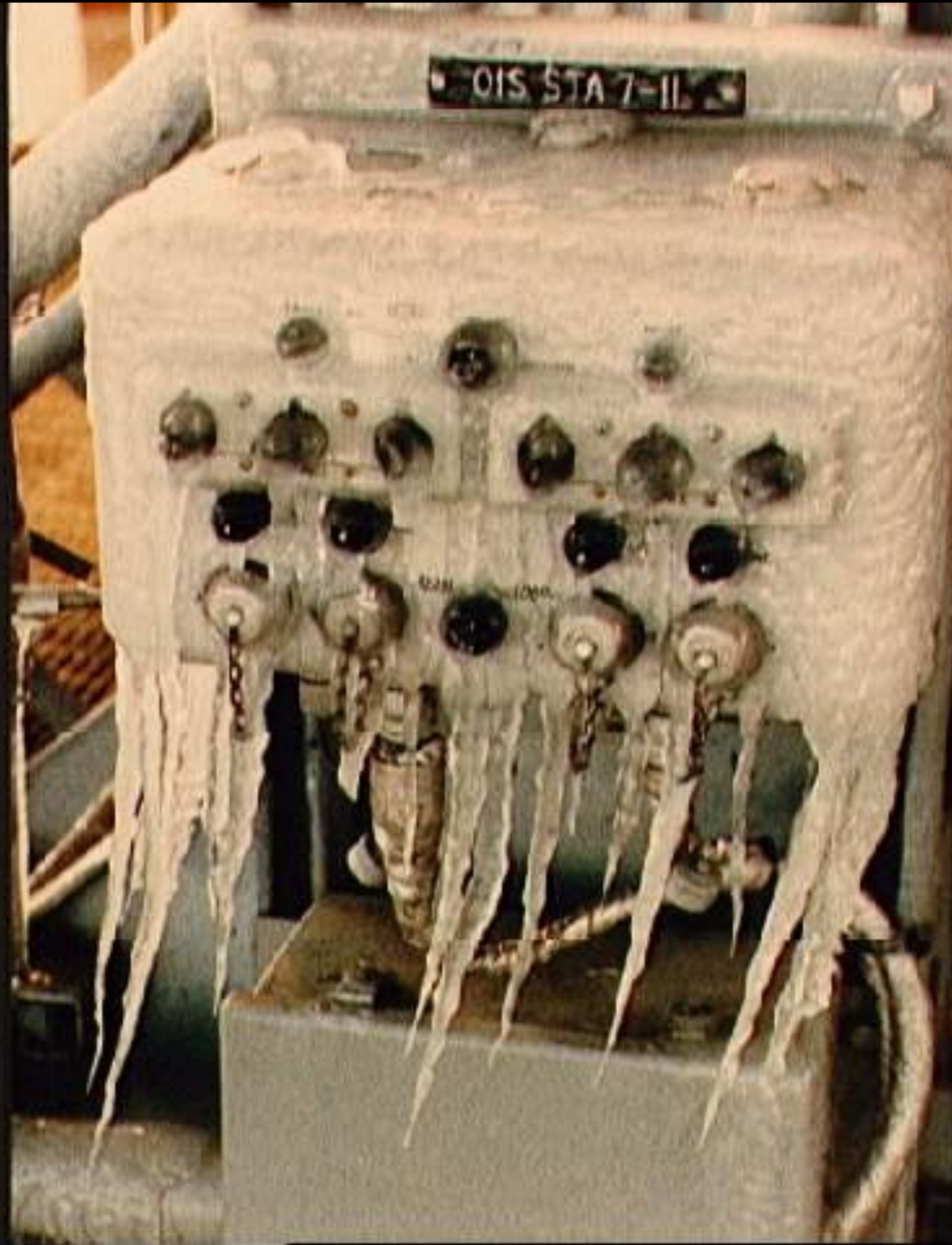
Provozní – 16 startů?

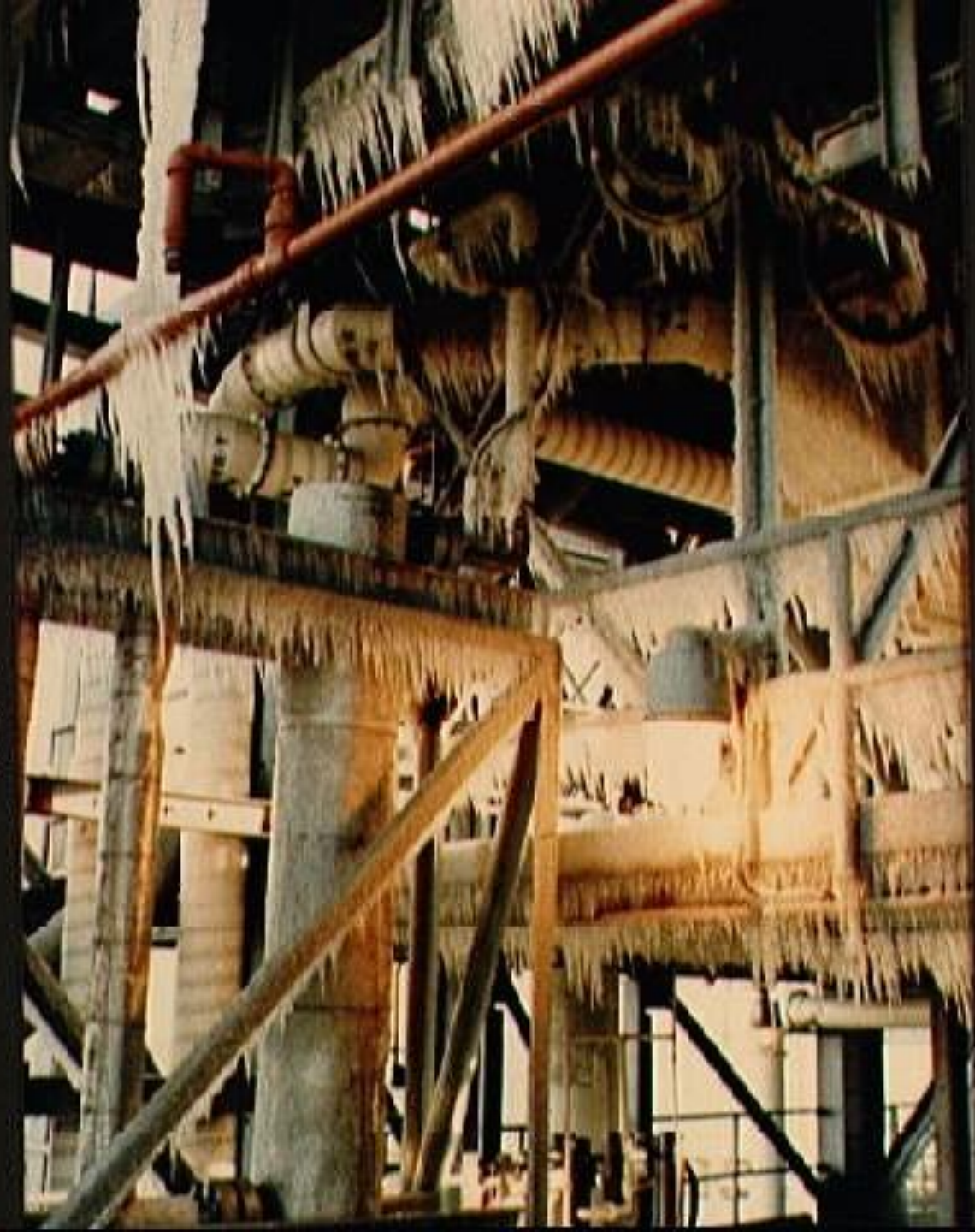
„Propagační“

Zákazníci



OIS STA 7-II





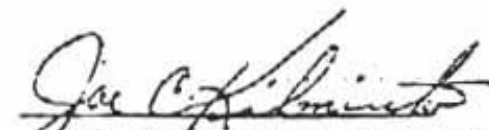


Larry Mulloy, Joe Kilminster



MTI ASSESSMENT OF TEMPERATURE CONCERN ON SRM-25 (51L) LAUNCH

- 0 CALCULATIONS SHOW THAT SRM-25 O-RINGS WILL BE 20° COLDER THAN SRM-15 O-RINGS
- 0 TEMPERATURE DATA NOT CONCLUSIVE ON PREDICTING PRIMARY O-RING BLOW-BY
- 0 ENGINEERING ASSESSMENT IS THAT:
 - 0 COLDER O-RINGS WILL HAVE INCREASED EFFECTIVE DUROMETER ("HARDER")
 - 0 "HARDER" O-RINGS WILL TAKE LONGER TO "SEAT"
 - 0 MORE GAS MAY PASS PRIMARY O-RING BEFORE THE PRIMARY SEAL SEATS (RELATIVE TO SRM-15)
 - 0 DEMONSTRATED SEALING THRESHOLD IS 3 TIMES GREATER THAN 0.038" EROSION EXPERIENCED ON SRM-15
 - 0 IF THE PRIMARY SEAL DOES NOT SEAT, THE SECONDARY SEAL WILL SEAT
 - 0 PRESSURE WILL GET TO SECONDARY SEAL BEFORE THE METAL PARTS ROTATE
 - 0 O-RING PRESSURE LEAK CHECK PLACES SECONDARY SEAL IN OUTBOARD POSITION WHICH MINIMIZES SEALING TIME
- 0 MTI RECOMMENDS STS-51L LAUNCH PROCEED ON 28 JANUARY 1986
 - 0 SRM-25 WILL NOT BE SIGNIFICANTLY DIFFERENT FROM SRM-15



JOE C. KILMINSTER, VICE PRESIDENT
SPACE BOOSTER PROGRAMS

MORTON THIOKOL, INC.

Wasatch Division



"Ten seconds to launch... are the seals holding?"



POSÁDKA

Velitel Francis Scobee



Dvě letenky v kapse



Druhý „afro-americký“ astronaut



Astronaut z Havaje

(Aljaška, Nevada, Vermont nebo Wyoming)



Astronautka (s předky) z Ukrajiny





Učitel(ka) ve vesmíru









„Smolař“ Gregory Jarvis



Gregory Jarvis + William Butterwoth



STS-51D (4/1985)





STS-51G (6/1985)



STS-51L (8/1985)



Columbia STS-61C (1/1986)



Challenger STS-51L





SPACE SHUTTLE CHALLENGER - STS - 51L CREW - PRINTED PHOTOGRAPH SIGNED IN INK CO-SIGNED BY: LT. COLONEL ELLISON S. ONIZUKA, GREG JARVIS, RONALD E. McNAIR, LT. COLONEL DICK (FRANCIS R.) SCOBEE, CHRISTA McAULIFFE, JUDITH RESNIK, CAPTAIN MICHAEL J. SMITH - DOCUMENT 334947

[Click Here to Enlarge Image](#)



photo in quarantine at the Kennedy Space Center's while awaiting their launch. The space shuttle Challenger mission STS-51L, the craft's 10th flight, was launched on Jan. 28, 1986. This was the deadliest accident in NASA history until the destruction of the Columbia during its February 1st, 2003 re-entry. The crew of seven included Mission Commander FRANCIS "DICK" SCOBEE, a veteran of the Challenger's 41-C mission (April 6-13, 1984); Pilot MICHAEL J. SMITH, a former U.S. Navy test pilot on his maiden shuttle voyage; and Mission Specialists Dr. RONALD McNAIR, who had previously been aboard Challenger mission 41-B (February 3-11, 1984); Colonel ELLISON ONIZUKA, a former crew member on Discovery mission STS 51-C (January 24-27, 1985); and Dr. JUDITH RESNIK, who had been aboard the maiden flight of the orbiter Discovery (August 30-September 5, 1984). Also aboard were two civilian Payload Specialists, GREGORY JARVIS of Hughes Co., who specialized in space communications satellites; and SHARON CHRISTA McAULIFFE, a "teacher in space" from Concord, New Hampshire, who was scheduled to teach a televised class to school children across America. Seventy-three seconds into the flight, a crucial seal in the rocket failed, causing the craft to explode in a ball of fire with the tragic loss of all crew members. NASA postponed all Space Shuttle flights for over two years because of this disaster and didn't resume them until the Sept. 29, 1988 Discovery mission of STS-26. Corners slightly worn and creased. Stain on upper left corner. Slightly soiled. Otherwise, fine condition.

For more documents by these signers click the names below:

[SPACE SHUTTLE CHALLENGER - STS - 51L CREW](#) [LT. COLONEL ELLISON S. ONIZUKA](#) [GREG JARVIS](#) [RONALD E. McNAIR](#)
[LT. COLONEL DICK SCOBEE](#) [CHRISTA McAULIFFE](#) [JUDITH RESNIK](#) [CAPTAIN MICHAEL J. SMITH](#)

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CHALLENGER STS-51L

This official NASA photograph is a crew photo of the ill-fated Challenger mission STS-51L, which exploded in midair on Jan. 28, 1986 and was the deadliest accident in NASA history until the destruction of the Columbia in 2003. This rare photograph contains the signatures of all seven crew members of STS-51L, who are shown in flight suits and holding their helmets.

Printed photograph signed: "Mike Smith", "Dick/Scobee", "Ron McNair", "El Onizuka", "S. Christa/McAuliffe", "Greg/Jarvis", "Judy/Resnik", color 10x8.

Captioned: "Crew of Space Shuttle/Mission 51-L. This photograph is an official NASA crew photo of the ill-fated Challenger mission STS-51L. It contains the signatures of all seven crew members, including teacher Christa McAuliffe, who died when the space shuttle exploded 73 seconds after launch. The recipient of this photo, Dot Davis, worked with the Challenger crew at the Johnson Space Center. Accompanied by: A letter of provenance from Davis noting that the Challenger crew signed this

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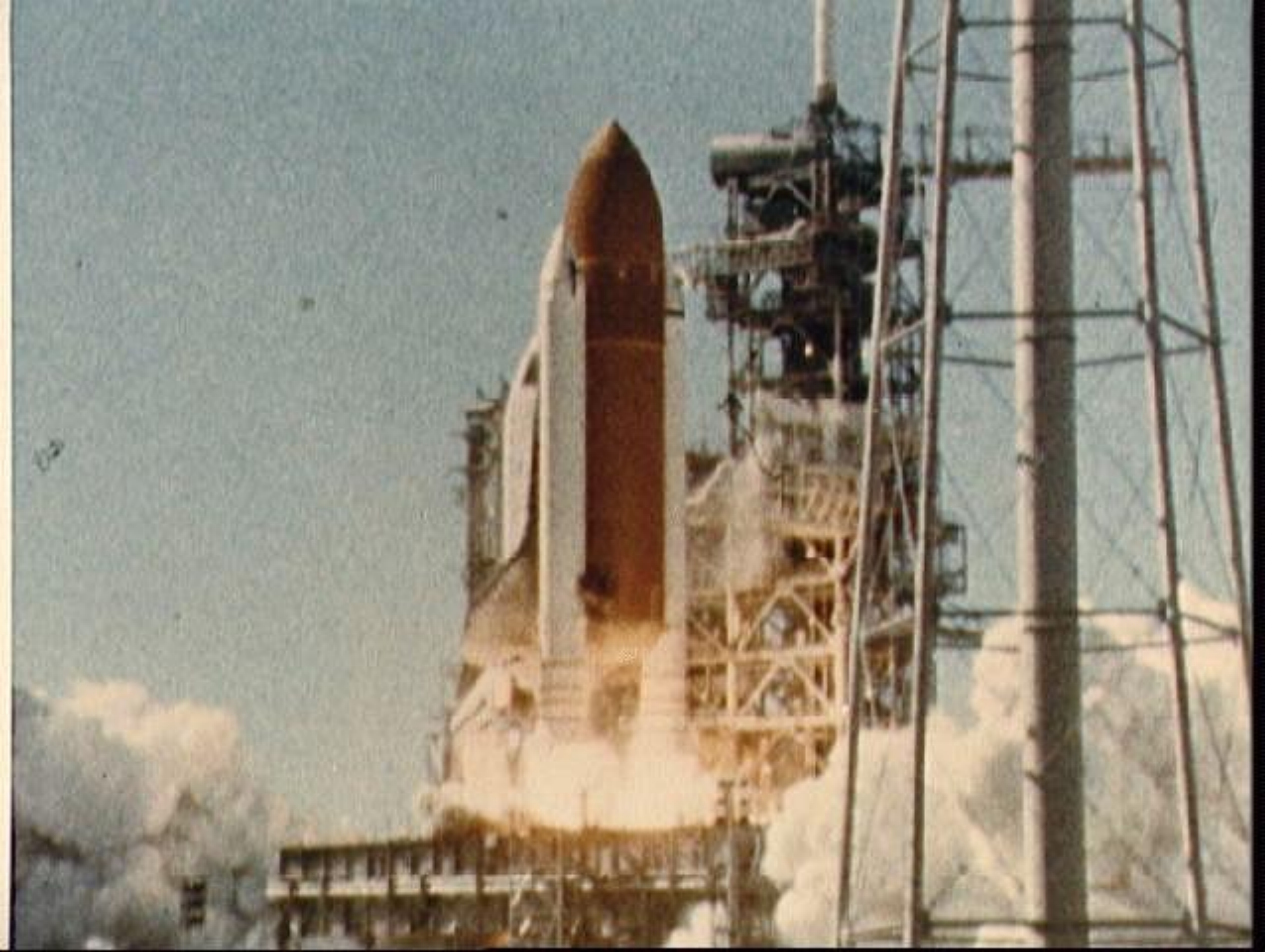
Make an Offer

SCÉNÁŘ ZKÁZY































VYŠETŘOVÁNÍ







45 procent Challengeru

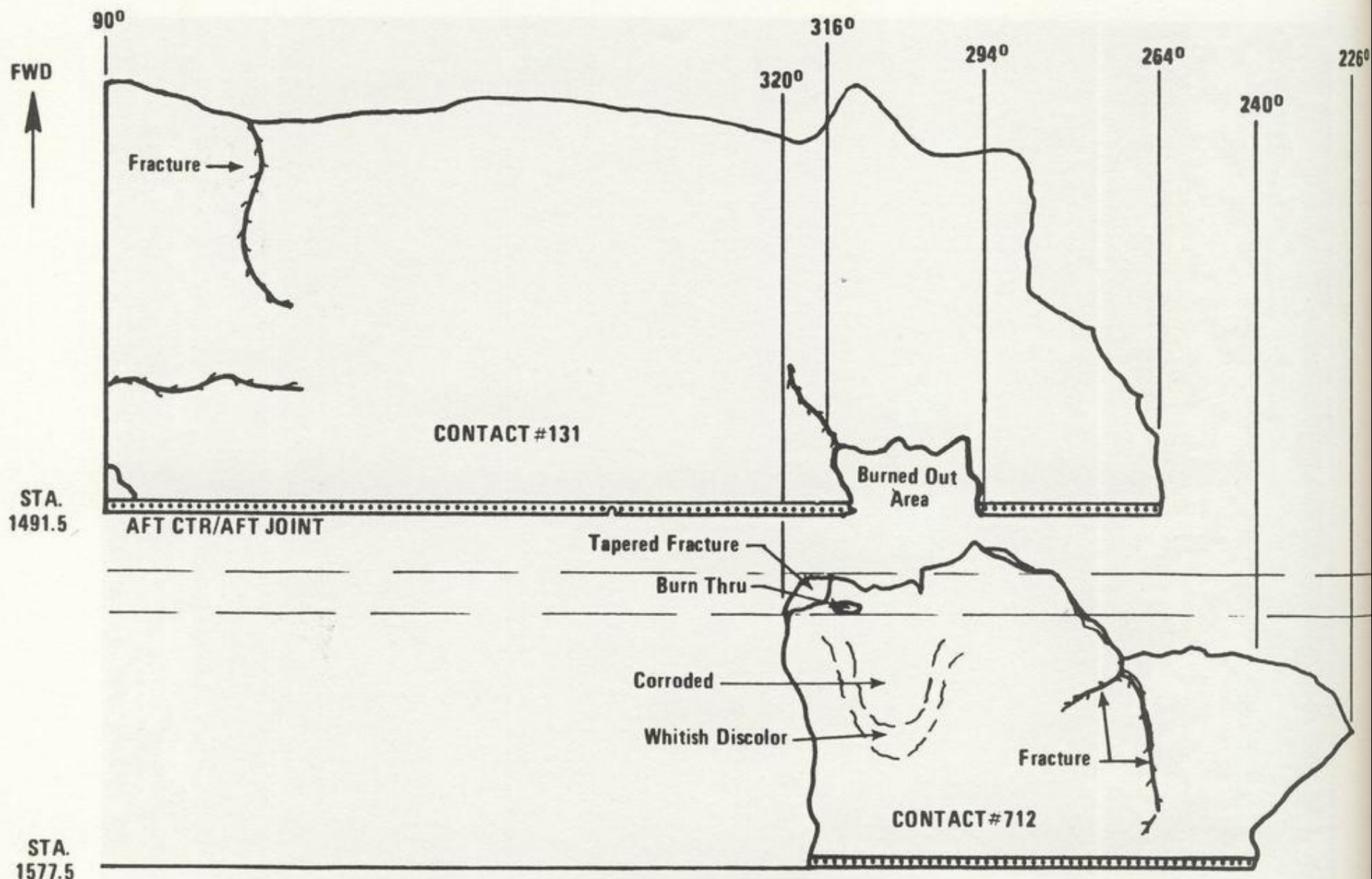


30 procent hlavní nádrže



45 procent pomocných motorů

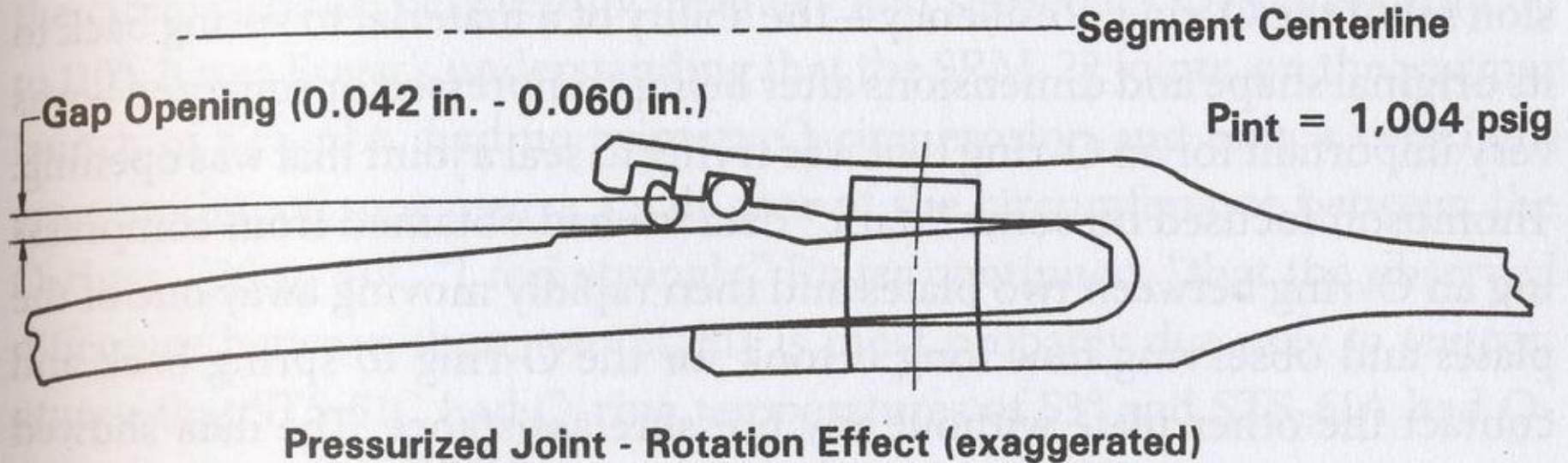
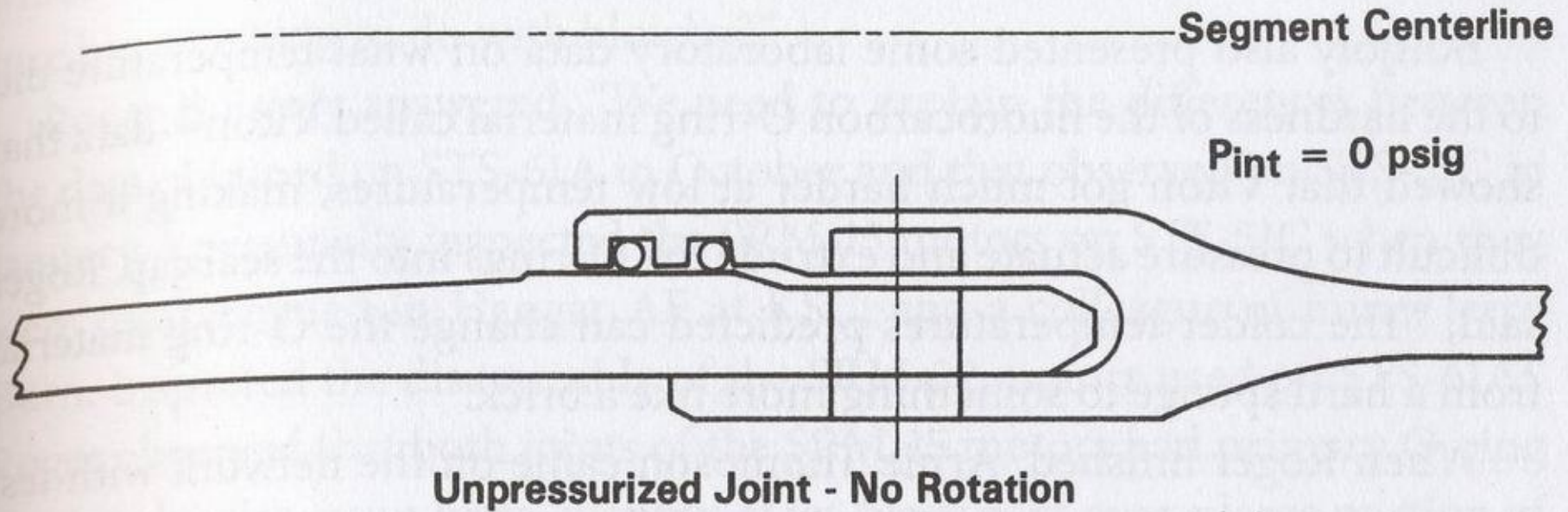




SRB RECOVERED DEBRIS
RH AFT SEGMENT
View From Outboard



Primary Concerns (Cont)



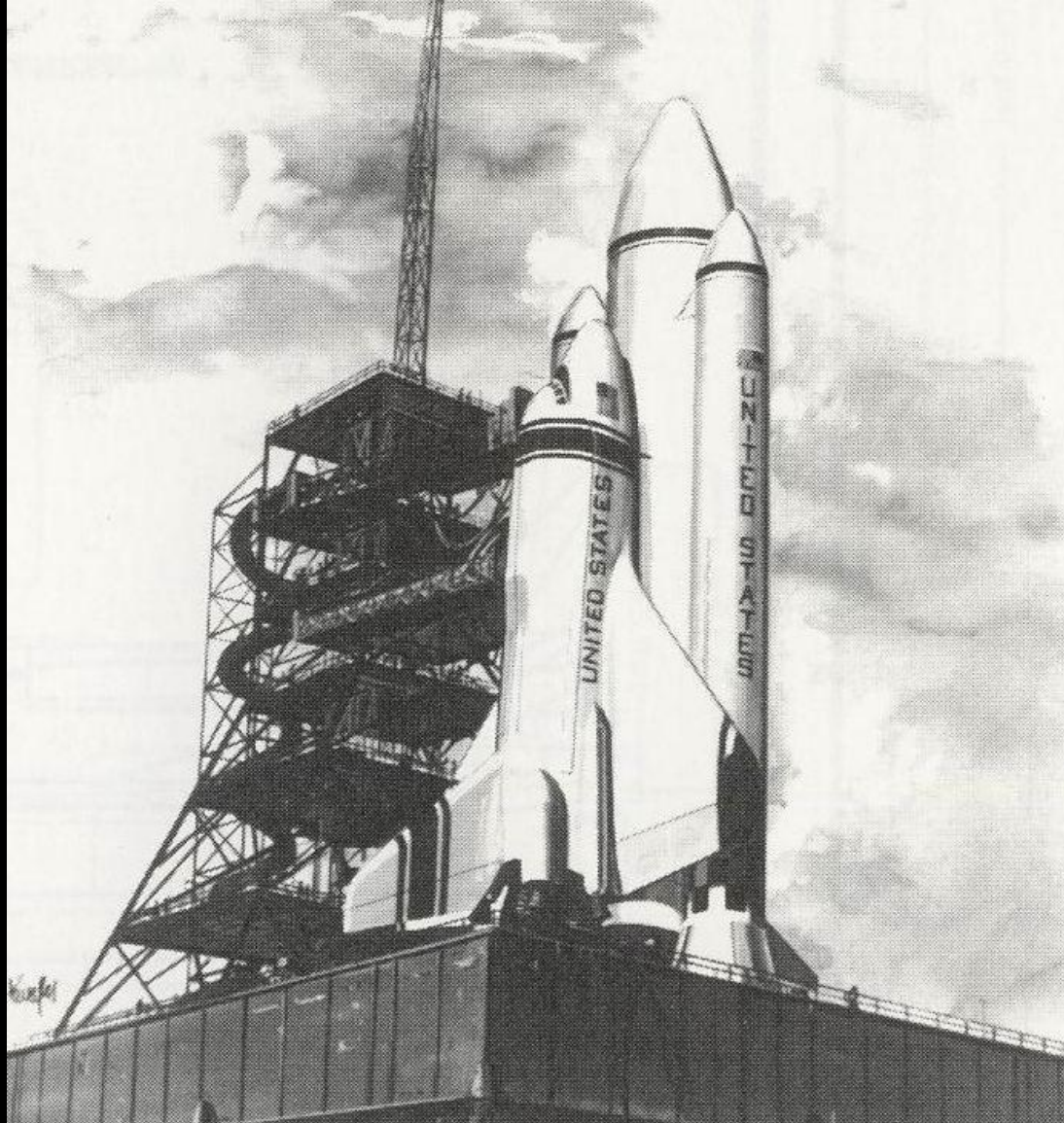






OSUD ASTRONAUTŮ

Abort Solid Rocket Motors





Upper
Forward
Fuselage
• Skin-Stringer
Aluminum
2824-T81



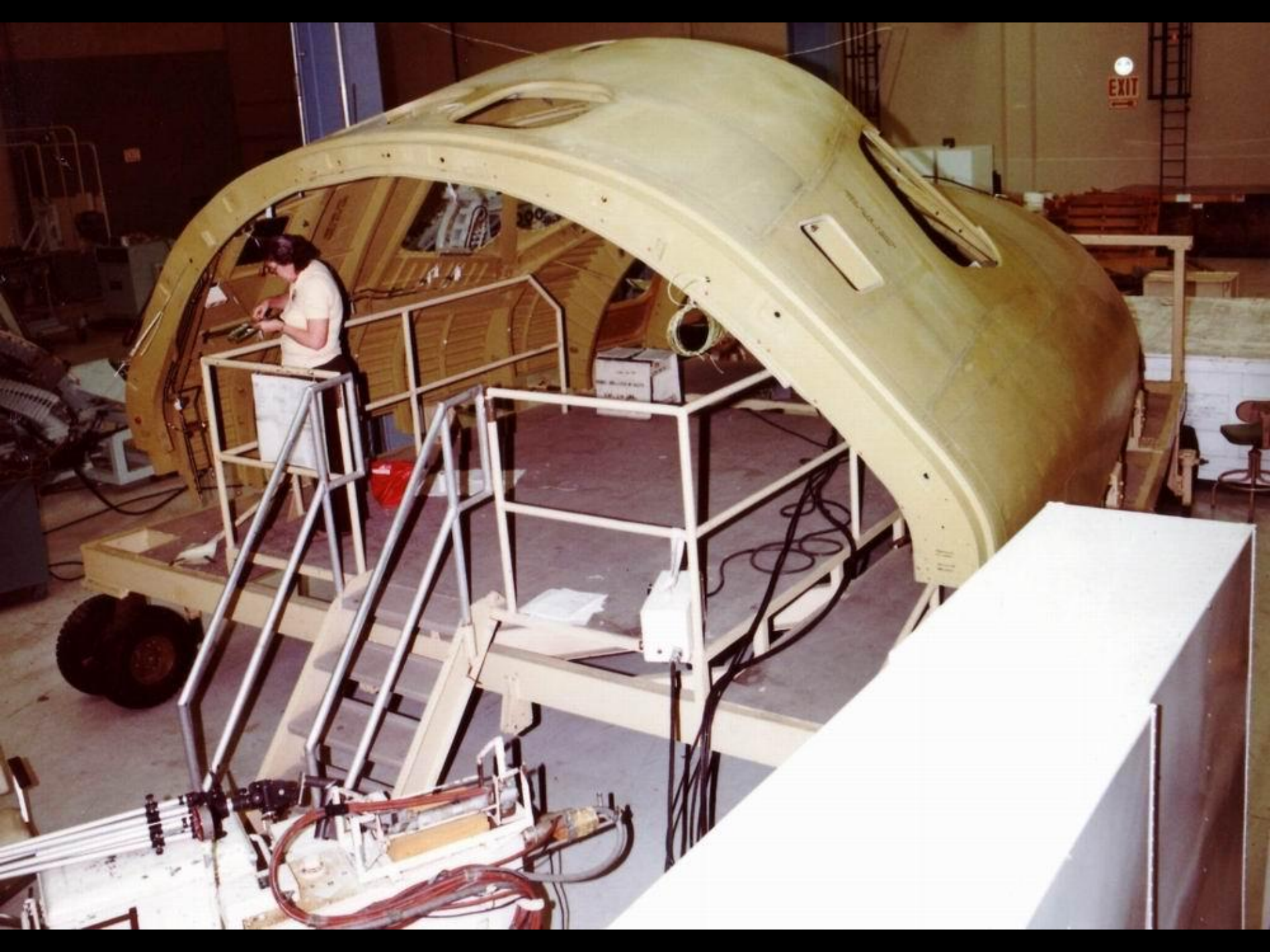
Lower Casapartment
• Floating
• Welded Skin Aluminum
2218-T851



Forward RCS
Module
• Skin-Stringer



Lower Forward
Fuselage
• Skin-Stringer









Left Wing

Main Engines

Crew Cabin







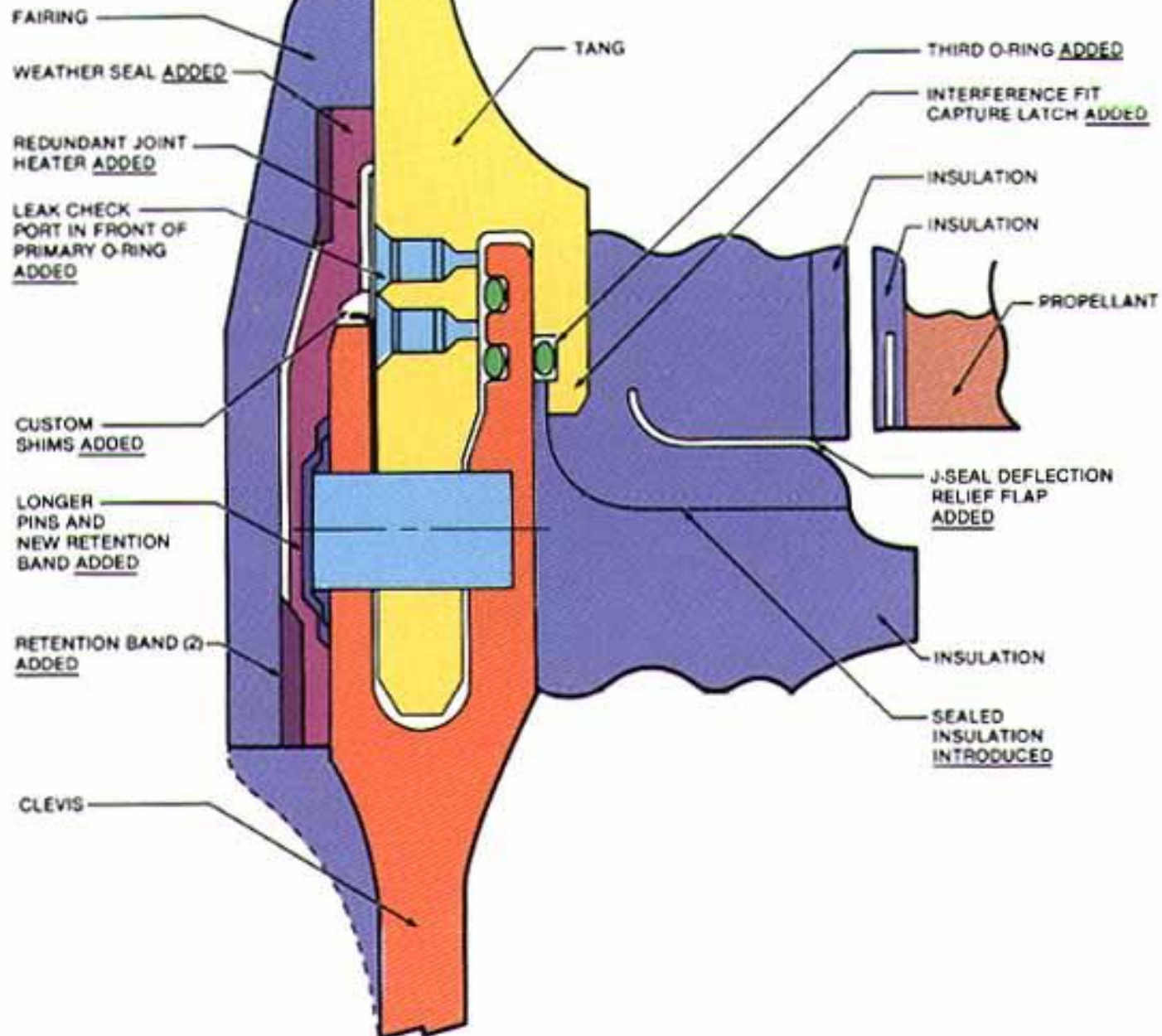
PEAP (Personal Egress Air Pack)





IN GRATEFUL
AND LOVING TRIBUTE
TO THE BRAVE CREW
OF THE UNITED STATES
SPACE SHUTTLE CHALLENGER
28 JANUARY 1986

ZTRÁTY



Do vesmíru se nevrátili



Do vesmíru se nepodívali





Kenneth Nordsieck



Robert Stevenson



Starty v roce 1986



„Hvězda smrti“





Problémy sondy Galileo



Komplex SLC-6













Novinář ve vesmíru

Terry Anzur (NBC News)

James Asker (Houston Post)

A. Blaine Baggett (KCET-TV)

Jay Barbee (freelancer)

Marcia Bartusiak (freelancer)

William Blakemore (ABC News)

Ted Conover (freelancer)

Walter Cronkite (CBS News)

Morton Dean (INN)

Diane Eicher (Denver Post)

Joan Esposito (WLS-TV)

Timothy Ferris (freelancer)

Jerry Flint (Forbes)

Michael Gold (Science 86)

Stanley Grossfield (Boston Globe)

Richard Hart (KPIX-TV)

Paul Hayes (Milwaukee Journal)

Hal Higdon (freelancer)

John Hockenberry (NPR)

Jim Klobuchar (Minneapolis Star-Tribune)

Terry Marotta (freelancer)

Michael Masterson (WHECO Media)

Lee McEachern (KGO-TV)

Jay Mathews (Washington Post)

Robert Navias (UPI)

Charles Petit (San Francisco Chronicle)

Paul Recer (Associated Press)

Peter Rinearson (Seattle Times)

Roger Rosenblatt (TIME)

Alexander Rossiter (UPI)

Storer Rowley (Chicago Tribune)

Kathy Sawyer (Washington Post)

Barry Serafin (ABC News)

Lynn Sherr (ABC News)

Katie Sherrod (Fort Worth Star-Telegram)

Jim Slade (MBS)

Barbara Stanton (Detroit Free-Press)

Robert White (Mexico Ledger)

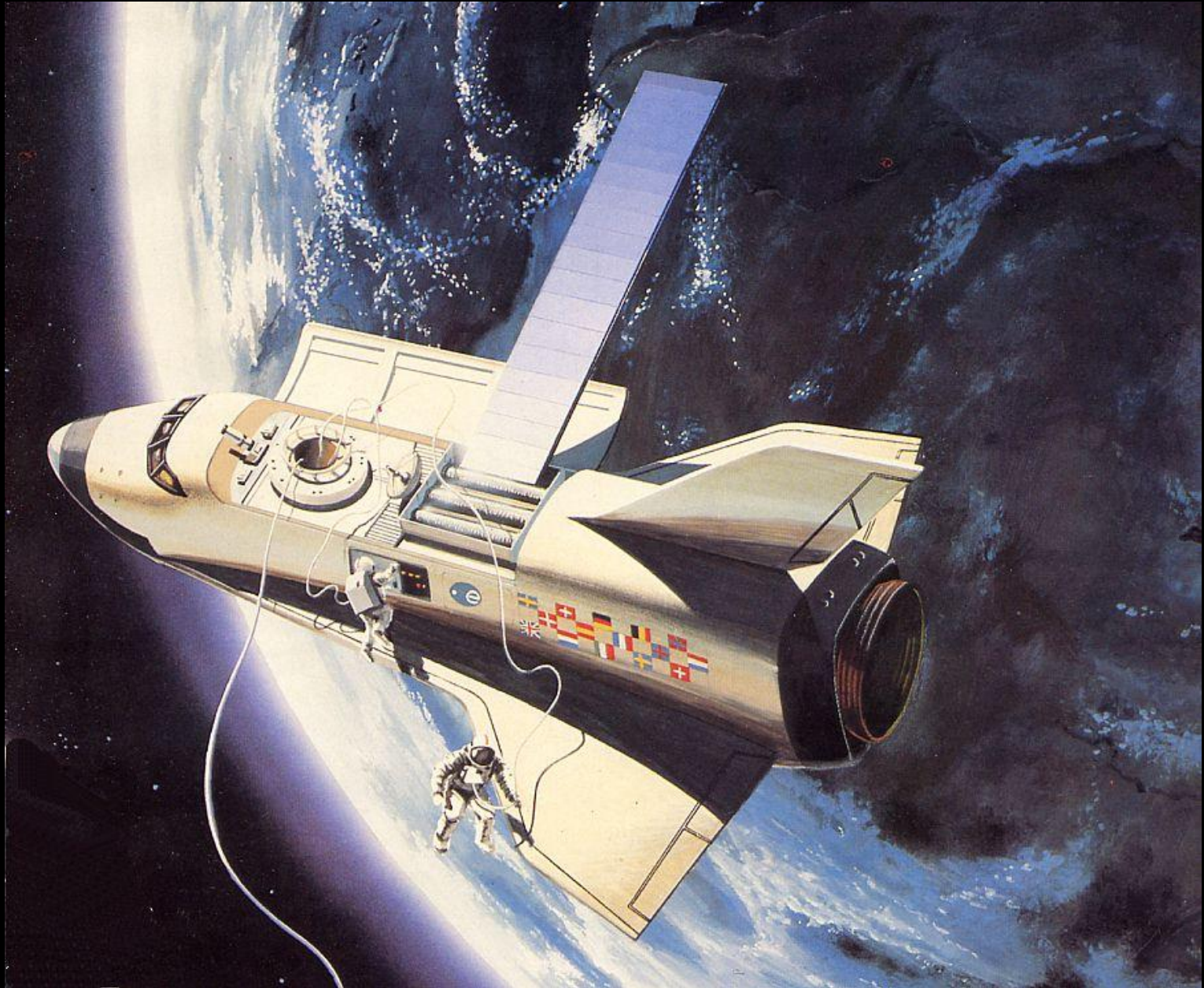
John Noble Wilford (New York Times)

James Wooten (ABC News)

Umělci, studenti, osobnosti...



Raketoplán Hermés

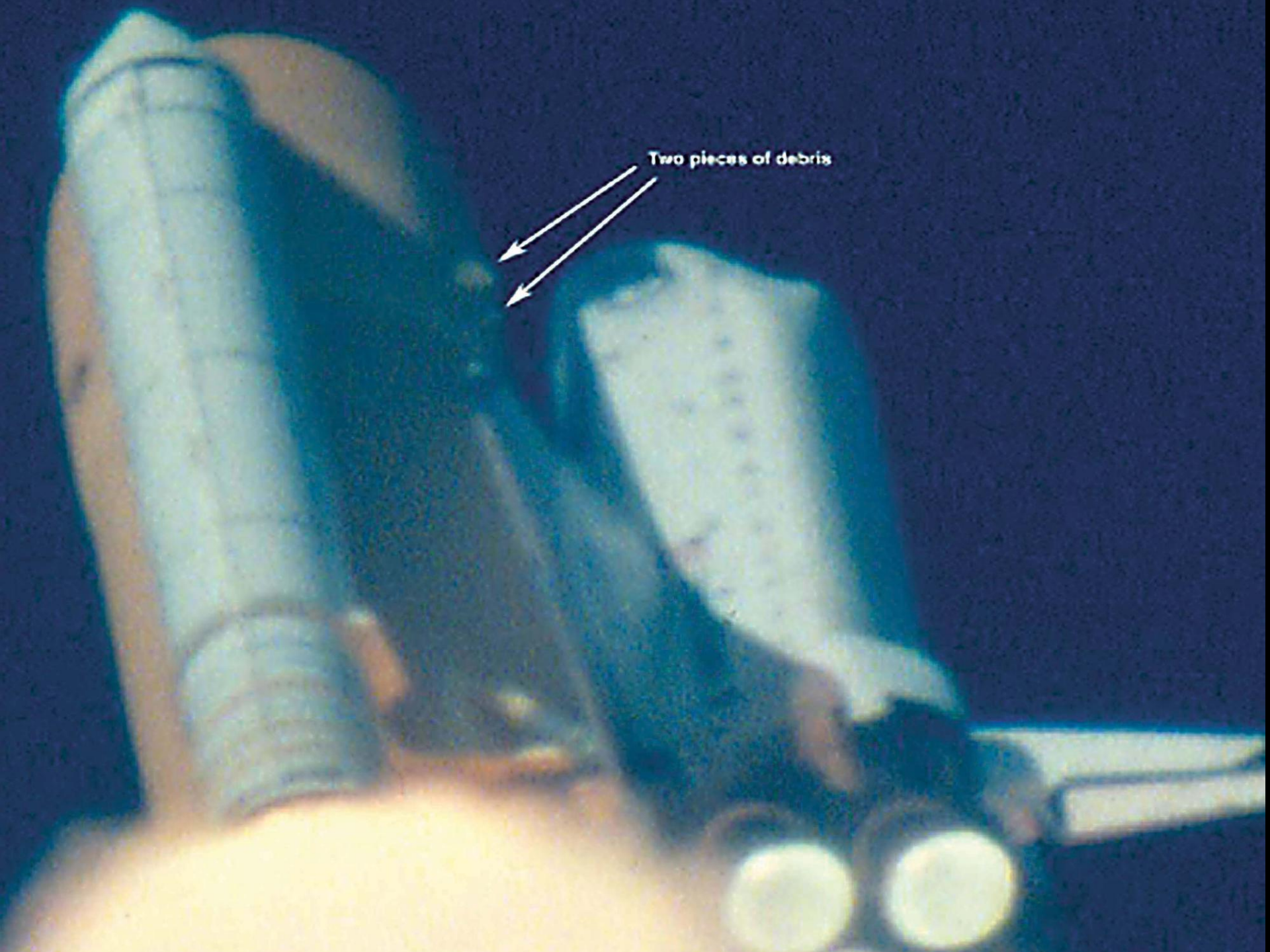




EPILOG





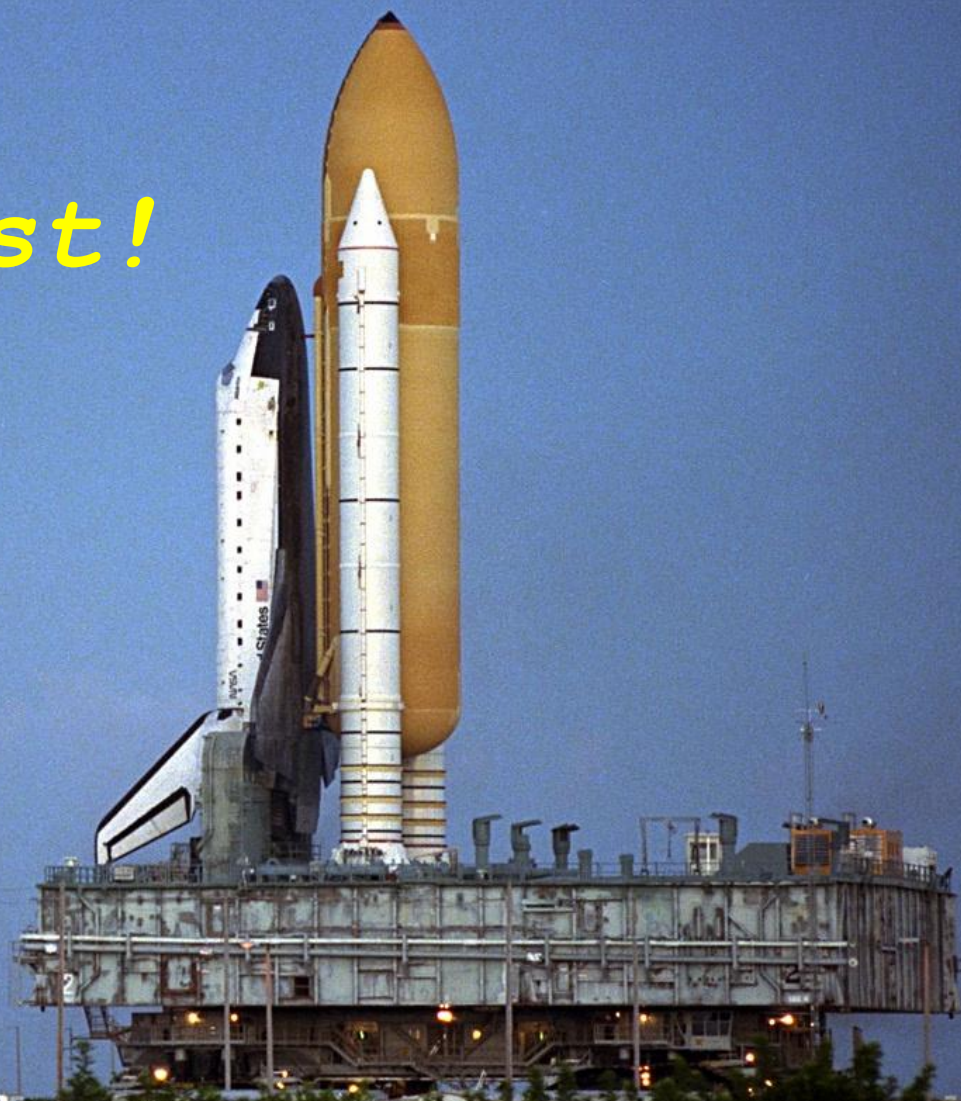


Two pieces of debris

Zkáza raketoplánu Columbia



*Děkuji
za pozornost!*



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