Skylab: bylo, nebylo

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

DOMÁCÍ ÚKOL 1

1963: před podpisem s firmou Bucyrus-Erie

Konkurenční Marion Power Shovel Company protest

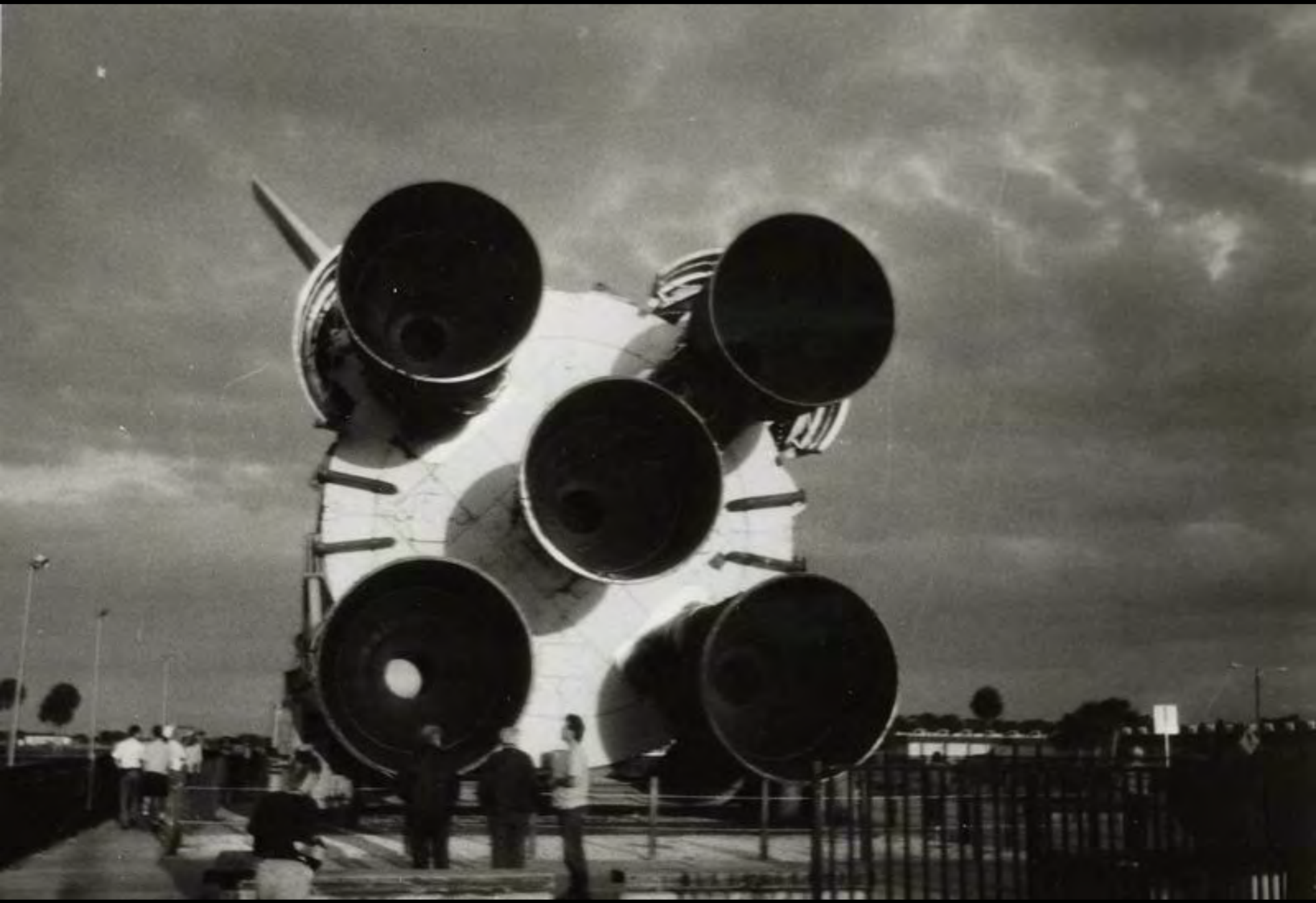
Nový vítěz: Marion Power Shovel Company

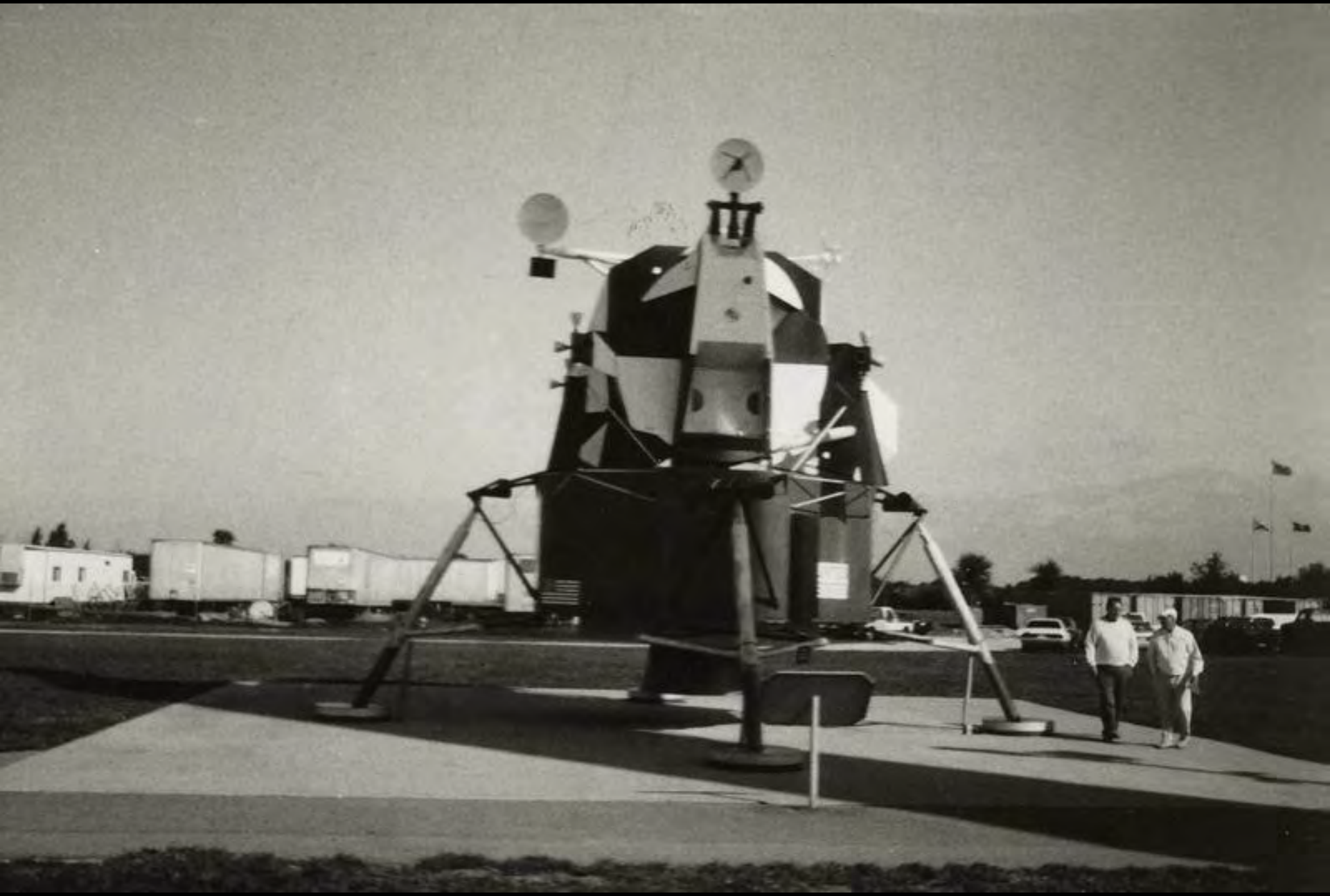
8 vs. 11 mil. dolarů

23. července 1997 kupuje Marion Power firma…


…Bucyrus
International

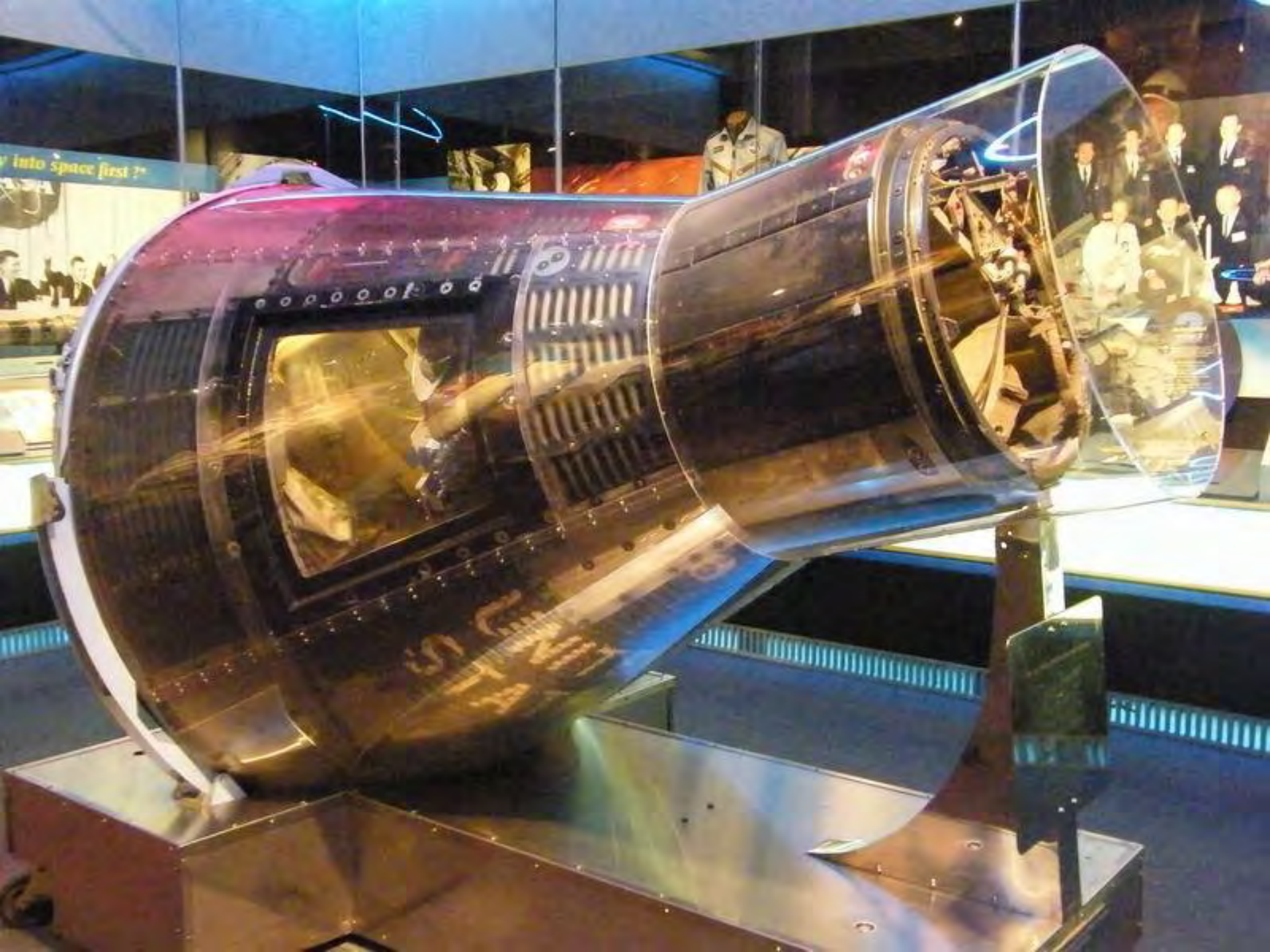
DOMÁCÍ ÚKOL 2

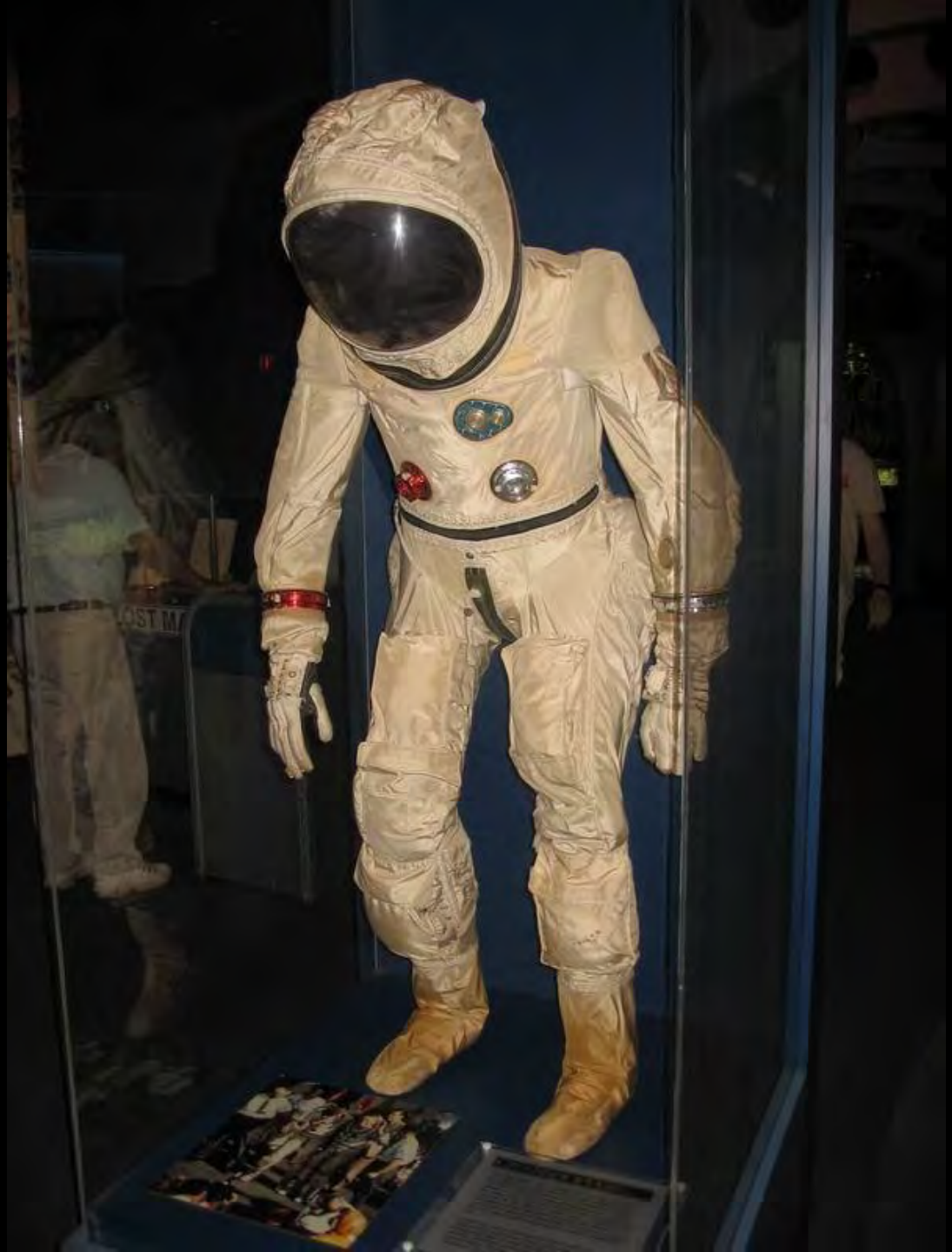




DOMÁCÍ ÚKOL 3


Kennedy Space Center
UNITED STATES ASTRONAUT HALL OF FAME


into space first ?




NASA


NASA
NAVY
ENTRY CHECKLIST
STS 41-G
ASCENT CHECKLIST
STS 41-G
Re-Entry Checklist for Commander and Pilot during re-entry from STS-41G.
The Ascent Checklist from STS-2 includes detailed step-by-step procedures and emergency contingency plans for Commander and Pilot during ascent, orbit, and emergency re-entry.


H. TAFAPA
H. HAGARD

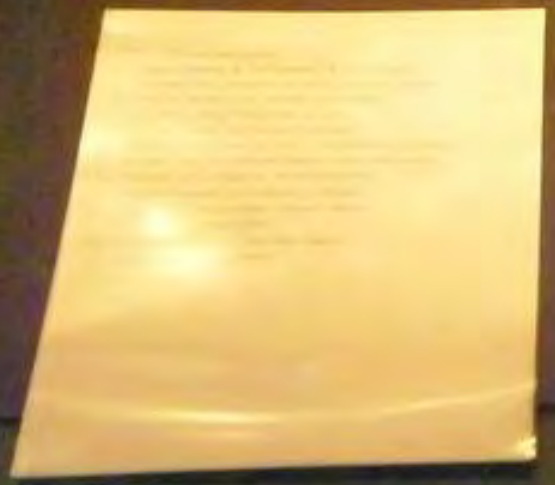
Lt. Cdr. Ron Evans, *Navy*
Lt. Cdr. Paul Weitz, *Navy*
Maj. James B. Irwin, *Air Force*
Maj. Gerald Carr, *Marine Corps*
Capt. Stuart Roosa, *Air Force*
Capt. Alfred Worden, *Air Force*
Lt. Thomas "Ken" Mattingly, *Navy*
Capt. Jack Lousma, *Marine Corps*

Schirra demonstrates his harmonica virtuosity.

Command Module Pilot Jack Lousma played these cassettes during his 56-day stint aboard the Skylab space station.

Jim McDivitt used this tape recorder to make notes and play his favorite music during Apollo 9.

On Gemini 6 in December 1965, Wally Schirra and Tom Stafford reported a UFO. Mission Control was concerned until they heard Schirra play "Jingle Bells" on a harmonica like this. The UFO was Santa Claus!



Space Music

In space, music helps pass the time. Some astronauts want to hear special songs during the unique spaceflight experience. Other times songs play a part in jokes. Mission Control awoke crews to music, a tradition still observed today.

Geri Ann Vanderoef, a secretary at the Manned Spacecraft Center in Houston, recorded classical music for Frank Borman and Jim Lovell, then lobbied Mission Control to play it over the radio during their two-week long-duration flight. This is the Gemini 7 playlist.

-4:00 RATE/ERR MON (BOTH) - LDG RDR/CMPTR
ATT MON (BOTH) - AGS
RATE SCALE - 5°/SEC
THR CONT - MAN
MAN THROT - CDR
ATT/TRANSL - 4 JET
BAL CPL - OFF
ENG GMBL- ~~ENABLE~~ OFF
DES ENG CMD OVRD - OFF
DEADBAND - MIN
ATT CONT: ROLL - PULSE
PITCH - PULSE
YAW - MODE CONT
MODE CONT ~~(BOTH) - ATT HOLD~~ (BOTH) - ATT Hold
~~PRPLNT QTY MON - DES 1~~

TTCA (CDR) - THROT (MIN) FOR DPS, JETS FOR RCS
TTCA (LMP) - JETS

-1:00 ~~MASTER ARM - ON~~

- :35 ~~V98E~~
~~F 16 83 ΔVX,Y,Z (All Zero)~~ (.1fps)
~~ENG ARM - DES~~

~~10~~ ~~:10 MANUAL ULLAGE (LMP)~~

- :02 ~~CMC MODE - FREE~~

~~ACA - Out of Detent (Yaw) (Zero Error Needles)~~

:00 ~~ENG START (CDR) - PUSH~~ +V ULLAGE
Ignition

+ :05 TTCA (CDR) - Throttle Up As Req'd
ATT CONT: PITCH, ROLL - As Req'd

+:15 ~~MASTER ARM - OFF~~

Basic Date 1/6/70
Changed 3/23/70

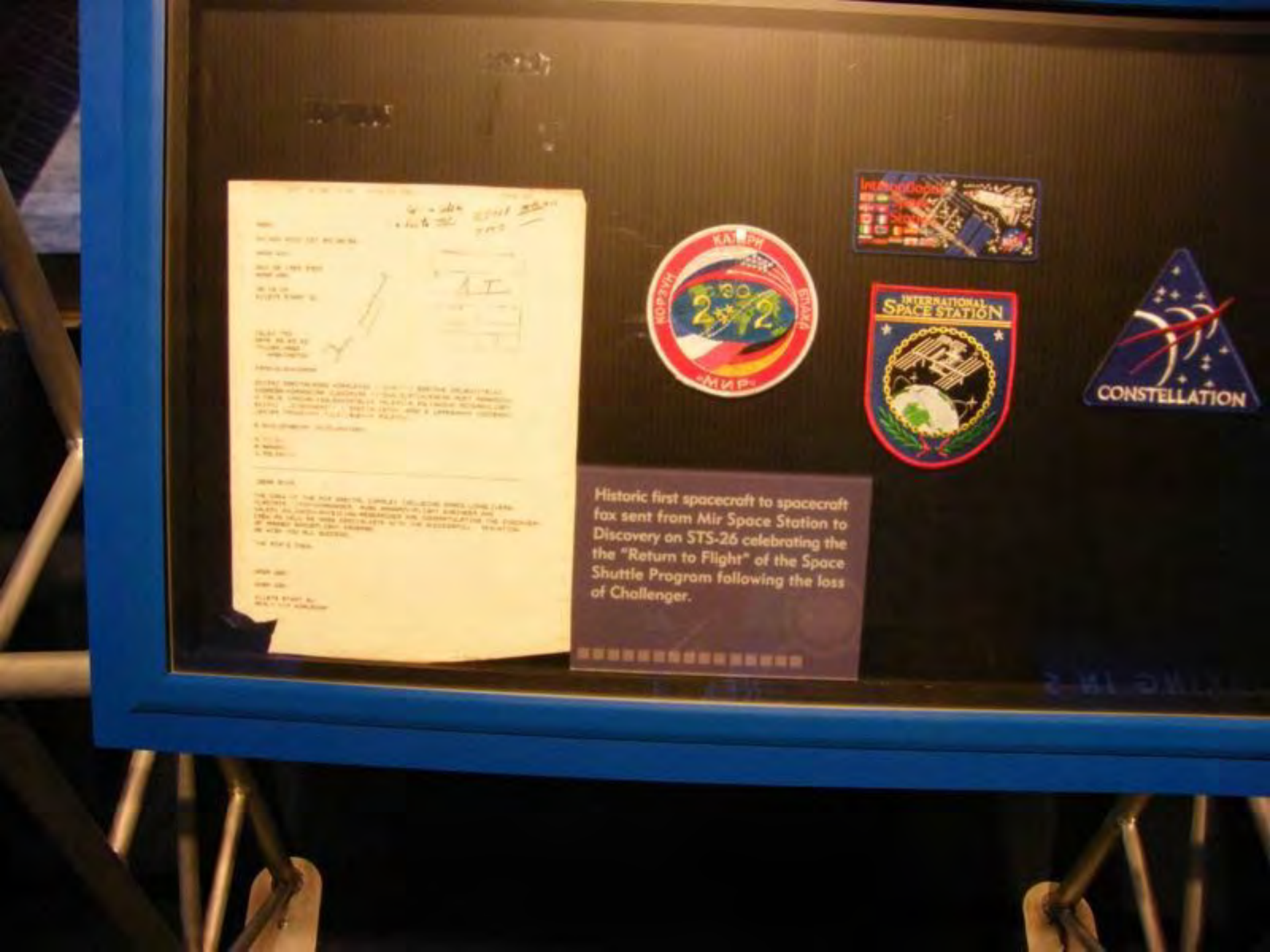
Dining in Space

Technology has come a long way from the days when astronauts ate bite-sized cube food coated with gelatin.

"Shrimp cocktail in spicy horseradish sauce!"

--Richard Covey

on being asked "what is your favorite astronaut food in space?"


INTERNATIONAL SPACE STATION
CONSTELLATION
Historic first spacecraft to spacecraft fax sent from Mir Space Station to Discovery on STS-26 celebrating the the "Return to Flight" of the Space Shuttle Program following the loss of Challenger.

TELEX 753
DATE 30.09.88
TO:USA.NASA
WASHINGTON

FROM:GLAVKOSMOS

EKIPAJ ORBITALNOGO KOMPLEKSA ..MIR'' V SOSTAVE DOLGOJITELEI KOSMOSA-KOMANDIRA VLADIMIRA TITOVA.INZHENERA MUSY MANAROVA. A TAKJE VRACHA-ISSLEDOVATELIA VALERIIA POLIAKOVA POZDRAVLIAET EKIPAJ ..DISKAVERI'' I SPECIALISTOV NASA S USPESHNYM VOZOBNOV-LENIEM PROGRAMMY PILOTIRUEMYH POLETOV.

S NAILUCHSHIMI POJELANIIAMI.

V.TITOV
M.MANAROV
V.POLIAKOV

DEAR SIRS.

THE CREW OF THE MIR ORBITAL COMPLEX INCLUDING SPACE LONGLIVERS: VLADIMIR TITOV-COMMANDER. MUSA MANAROV-FLIGHT ENGINEER AND VALERI POLIAKOV-PHYSICIAN-RESEARCHER ARE CONGRATULATING THE DISCAVERY CREW AS WELL AS NASA SPECIALISTS WITH THE SUCCESSFULL RESUMTION OF MANNED SPACEFLIGHT PROGRAM.
WE WISH YOU ALL SUCCESS.

THE MIR'S CREW.

Language Class

Flying together in space meant learning enough of each other's languages to be able to rendezvous, dock, deal with emergencies, and exchange courtesies. Leonov and Kubasov studied English, while Stafford, Brand, and Slayton worked on Russian.

Notepad Vance Brand used to study Russian.

All Apollo-Soyuz official documentation was bilingual. Below is Deke Slayton's Apollo-Soyuz checklist.

RUSSIAN NOTEBOOK 2 VANCE BRAND

Lesson 43

Border
water
level (m)
length
mile
height
foot (measure)
point
peak
USA
China
Mississippi
Nile
Amazon
Elborus (in the Caucasus)
Kazbek "
The most; The very
sea (adj)
important
deep
shallow

—
—
уровень
длина
миля
высота
фут
точка
пик
Соединенные Штаты Америки
—
Миссисипи
Нил
Амазонка
Эльбрус
Казбек
самый
морской
важный
глубокий
мелкий

TRAVEL VOUCHER

MEMORANDUM

NASA - Johnson Space Center

Col. William R. Pogue - 07039

Code: CB/Bldg. 4 PLEASE MAIL CHECK TO:

Ext. 3411

Voucher No. 0377 3

Official Duty Station: Houston, Texas

Residence: Seabrook, TX

For travel and other expenses: From (date) 11/13/73 To (date) 2/10/74

Applicable travel authorization(s): No. X00056-00 Date 7/6/73 ~~2/31/74~~

TRAVEL ADVANCE

TRANSPORTATION REQUESTS ISSUED

Transportation request number	Agent's valuation of ticket	Initials of carrier issuing ticket	Mode, class of service and accommodations	Date issued	Points of travel: From	Points of travel: To
Gov Air					Houston, Texas	Cocoa Beach, FL Skylab Space Station Recovery Ship San Diego, CA
					and return	to Houston, TX
No Cna						

3/12/74

DIFFERENCES:

	Dollars	Cts.
Amount claimed →	[illegible]	65
Total verified correct for charge to appropriation(s)	19	65
Applied to travel advance (appropriation symbol)		
Net to traveler →	1[illegible]	65

MAR 2 5 1974

C. W. Bird

Authorized Certifying Officer

ACCOUNTING CLASSIFICATION

957-23-89-00-CA-2031-CB11

Astr
exp
Here
vou

August 1970
Title 2, GAO Manual
Supp. 2A2

TRAVEL VOUCHER
MEMORANDUM

DEPARTMENT, BUREAU OR ESTABLISHMENT: NASA - Johnson Space Center

VOUCHER NO. 03773

PAYEE'S NAME: Col. William R. Pogue - 07039

SCHEDULE NO.

MAILING ADDRESS (Including ZIP Code): PLEASE MAIL CHECK TO:
Code: CB/Bldg. 4
Ext. 2411

PAID BY

OFFICIAL DUTY STATION: Houston, Texas

RESIDE: Seabrook, TX

FOR TRAVEL AND OTHER EXPENSES
FROM (DATE): 11/13/73
TO (DATE): 2/10/74

TRAVEL ADVANCE
Outstanding $
Amount to be applied
Balance to remain outstanding $

CHECK NO.

CASH PAYMENT OF $
RECEIVED (DATE)

APPLICABLE TRAVEL AUTHORIZATION(S)
NO. X00056-00
DATE 11/6/73 ~~2/10/74~~

TRANSPORTATION REQUESTS ISSUED

TRANSPORTATION REQUEST NUMBER	AGENT'S VALUATION OF TICKET	INITIALS OF CARRIER ISSUING TICKET	MODE, CLASS OF SERVICE, AND ACCOM-MODATIONS *	DATE ISSUED	POINTS OF TRAVEL FROM-	POINTS OF TRAVEL TO-
Gov Air					Houston, Texas	Cocoa Beach, FL Skylab Space Station Recovery Ship San Diego, CA and return to Houston, TX

No CAR.

3/12/74

Approved. *Long distance telephone calls are certified as necessary in the interest of the Government.*

	Dollars	Cts
AMOUNT CLAIMED →	1 17	65
DIFFERENCES		
Total verified correct for charge to appropriation(s) (initials)	17	65
Applied to travel advance (appropriation symbol)		
NET TO TRAVELER →	19	65

NET PREVIOUS VOUCHER PAID UNDER SAME TRAVEL AUTHORITY
VOUCHER NO. | D.O. SYMBOL | DATE (MONTH-YEAR)

MAR 2 6 1974

C. W. Bird
Authorized Certifying Officer

ACCOUNTING CLASSIFICATION

957-23-89-00-CA-2031-CB11

* Abbreviations for Pullman accommodations: MR, master room; DR, drawing room; CP, compartment; BR, bedroom; DSR, duplex single room; RM, roomette; DRM, duplex roomette; SOS, single occupancy section; LB, lower berth; UB, upper berth; LB-UB, lower and upper berth; S, seat.

The Mercury 7 astronauts signed this baseball used in the first Houston Astros game in the new Astrodome.

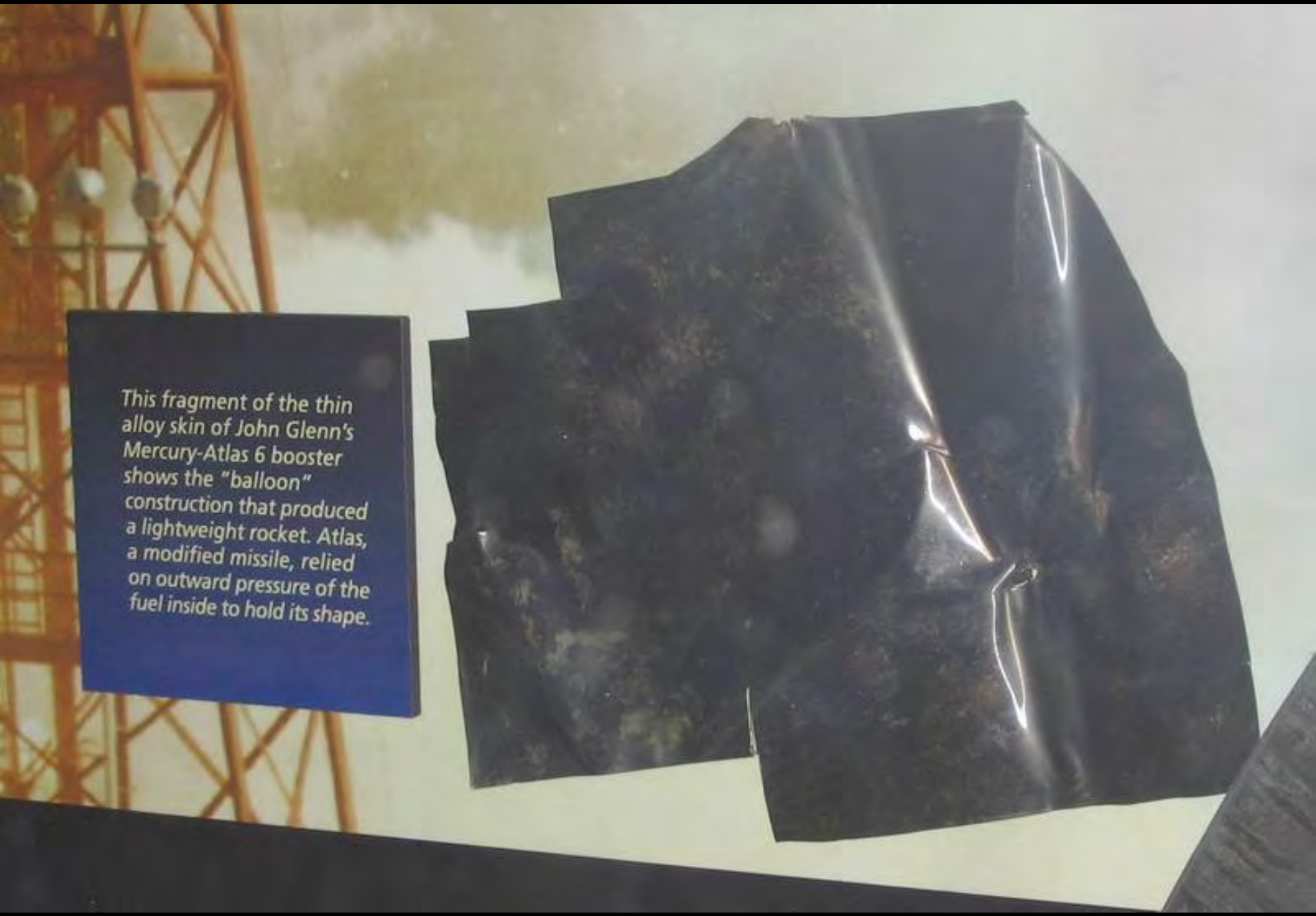
Welcome to Houston

In 1961, the Space Task Group began searching for a new home. San Francisco, Tampa, Boston, and St. Louis were all candidates, but in 1962, the Group—renamed the Manned Spacecraft Center—moved to new quarters south of Houston, Texas. Houstonians welcomed their new neighbors and outer space connection with Texas-size enthusiasm.

President John Kennedy spoke in downtown Houston on September 11, 1962. He told Houstonians that their city, once "the furthest outpost in the old frontier of the West," was now "the furthest outpost on the new frontier of science and space."


APOLLO 14 COMMAND MODU
Kitty Hawk
This spacecraft flew to the Moon
and back January 31 February 9, 1971.
Alan Shepard Commander
Edgar Mitchell, Lunar Module Pilot
Stuart Roosa, Command Module Pilot


Ambassador of Exploration Lunar Sample
Presented to the
U.S. Astronaut Hall of Fame
In Memory of
Col. Stuart Roosa (USAF, Ret)
On behalf of the
National Aeronautics and Space Administration
and
Joan Roosa and Family


This fragment of the thin alloy skin of John Glenn's Mercury-Atlas 6 booster shows the "balloon" construction that produced a lightweight rocket. Atlas, a modified missile, relied on outward pressure of the fuel inside to hold its shape.

Carried aboard Skylab
May 14 - June 22, 1973

Joseph P Kerwin


FALLBACK AREA
TEMPORARY
PARKING PERMIT
APOLLO 11
LUNAR TEAM
SPACE RACE
MAN ON THE MOON
WE SAW AMERICA PUT A
MAN ON THE MOON
APOLLO XI


d of mystical being out there on the launch pa
to the sounds.
s like a breathing, alive machine."
--Frederick H. (Rick) Hauck
Pilot STS-7
Commander STS-26, STS-51A
CE TRAVEL
APPROACH AND
Enterprise
N SPACE EX
Crew members viewed earth through this overhead Space Shuttle window which flew multiple STS missions.
This metal mid-deck chair flew on early Challenger and Columbia missions and was later replaced by a more lightweight chair.


ENTER
HERE


be recocked, but this
handed operation. I let go of
the rail for an instant, recock
the sleeve, and grab the rail
again. In the process I swing
wildly and bang up against
the side of the spacecraft."
Michael Collins
Gemini, Apollo


the sleeve, and grab the rim again. In the process I swing wildly and bang up against the side of the spacecraft."
–Michael Collins
Gemini, Apollo

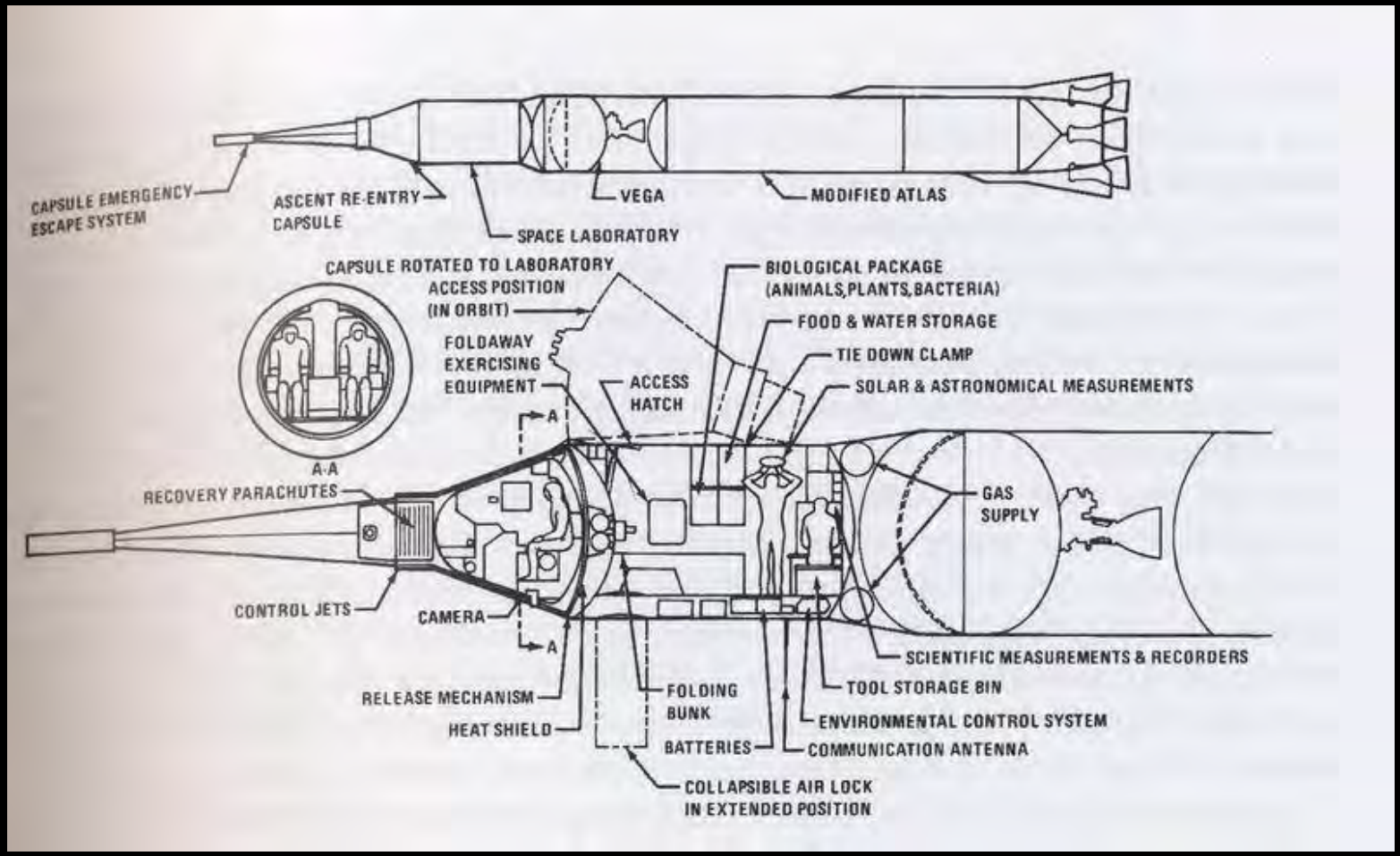

Moon Smell
"Odor is very subjective,
but to me, there was a
distinct smell to the lunar
material—pungent, like
gunpowder or spent cap-
pistol caps. We carted a
fair amount of lunar dust
back inside the vehicle
with us...on our suits
and boots..."
-Buzz Aldrin
Apollo 11


Footprints on the Moon
"I'm going to step off the pad... Oooh, is that soft and queasy."

Skylab: bylo, nebylo

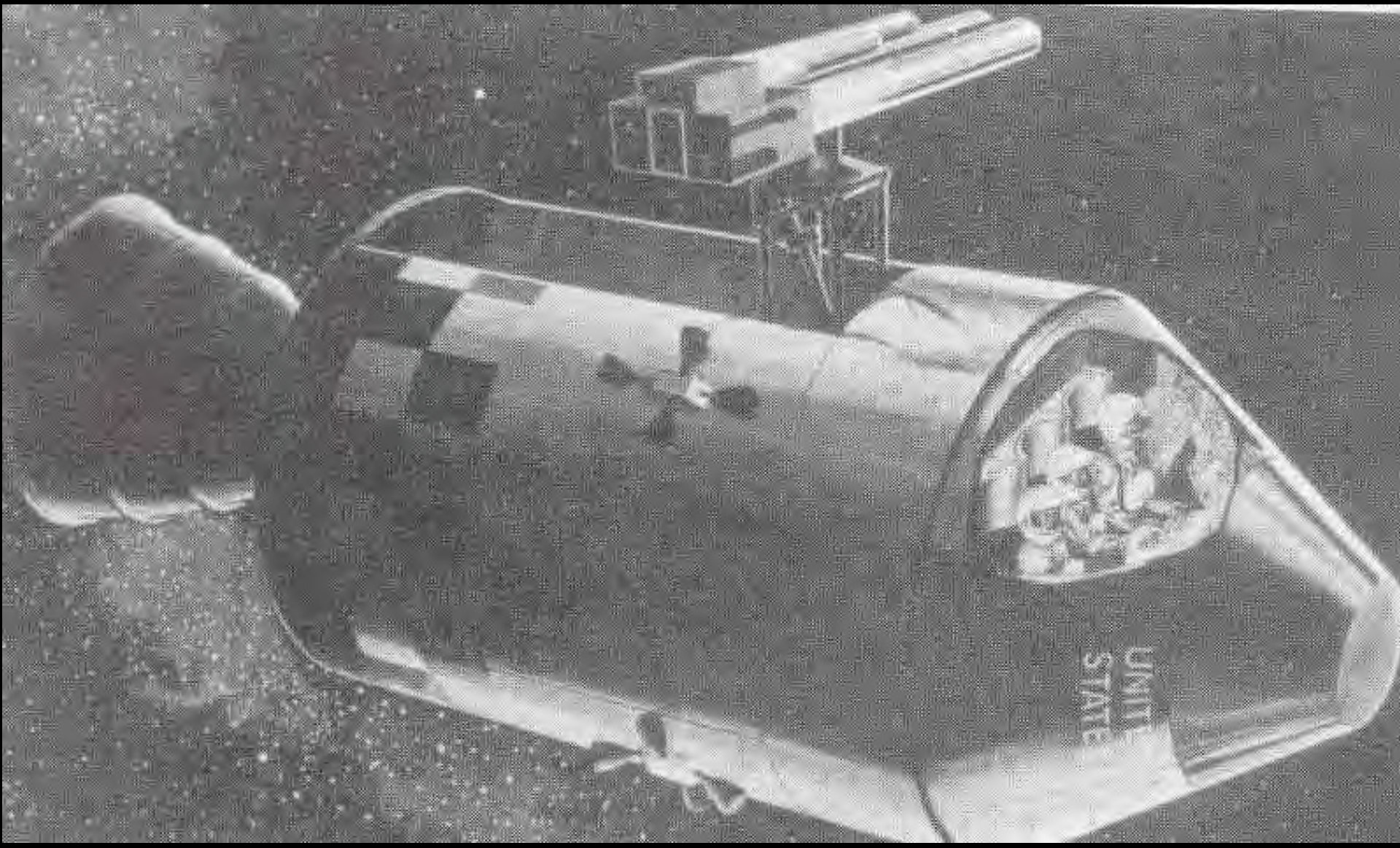
Ing. Tomáš PŘIBYL
tomas.pribyl@seznam.cz
www.kosmonaut.cz

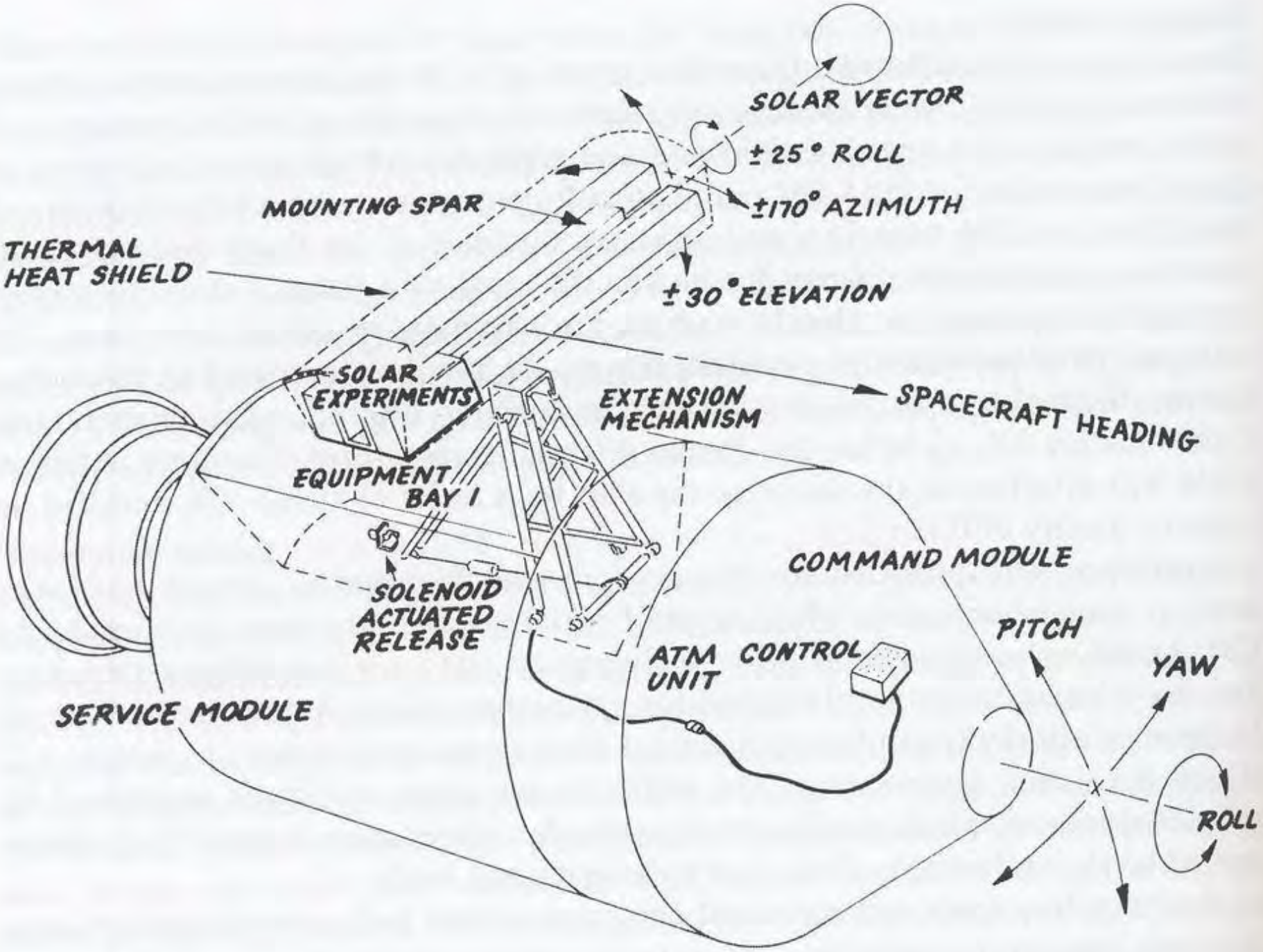
1958

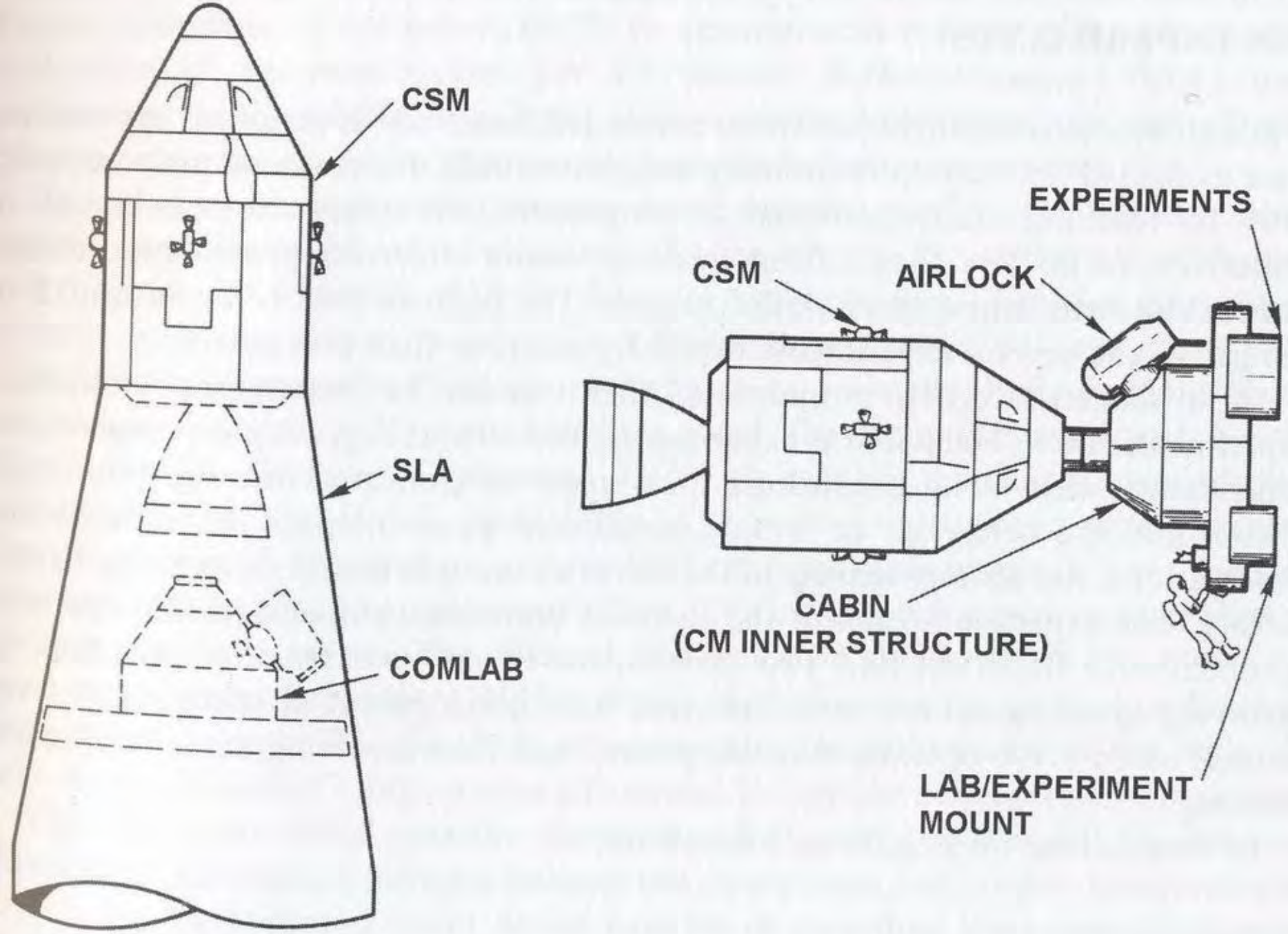


Kurt Strass a Caldwell Johnson (Space Task Group, Langley Field)

Apollo X (eXperimental, eXtended)




SOLAR VECTOR
± 25° ROLL
±170° AZIMUTH
MOUNTING SPAR
THERMAL HEAT SHIELD
± 30° ELEVATION
SOLAR EXPERIMENTS
EXTENSION MECHANISM
SPACECRAFT HEADING
EQUIPMENT BAY 1
SOLENOID ACTUATED RELEASE
COMMAND MODULE
PITCH
YAW
ATM CONTROL UNIT
SERVICE MODULE
ROLL


CSM
SLA
COMLAB
EXPERIMENTS
CSM
AIRLOCK
CABIN
(CM INNER STRUCTURE)
LAB/EXPERIMENT
MOUNT

Srpen 1964

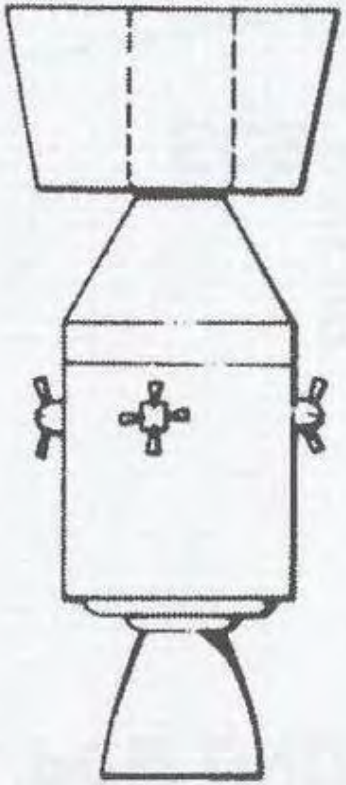
A: dva astronauti, 14 až 45 dní, bez přídavného modulu.

B: tři astronauti, 45 dní, jeden modul.

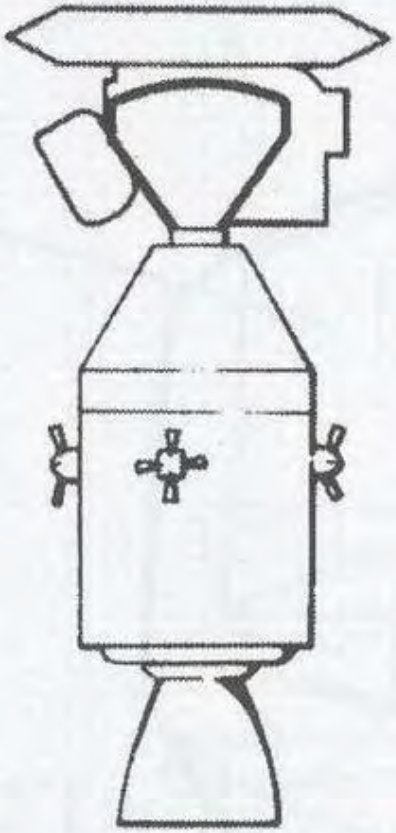
C: tři astronauti, 45 dní, dva moduly.

D: tři astronauti, 120 dní, nezávislý modul.

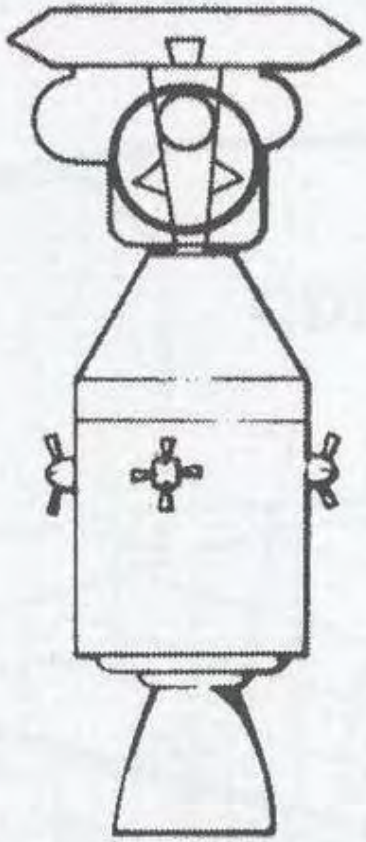
EARLY LABORATORY



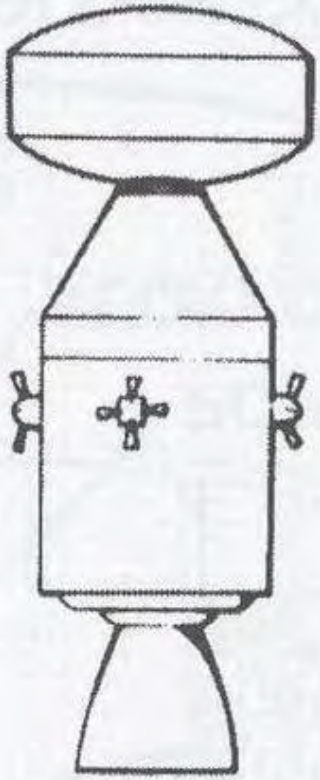
EXTENDED APOLLO SYSTEM UTILISATION STUDY



COMMAND MODULE LAB (COMLAB)

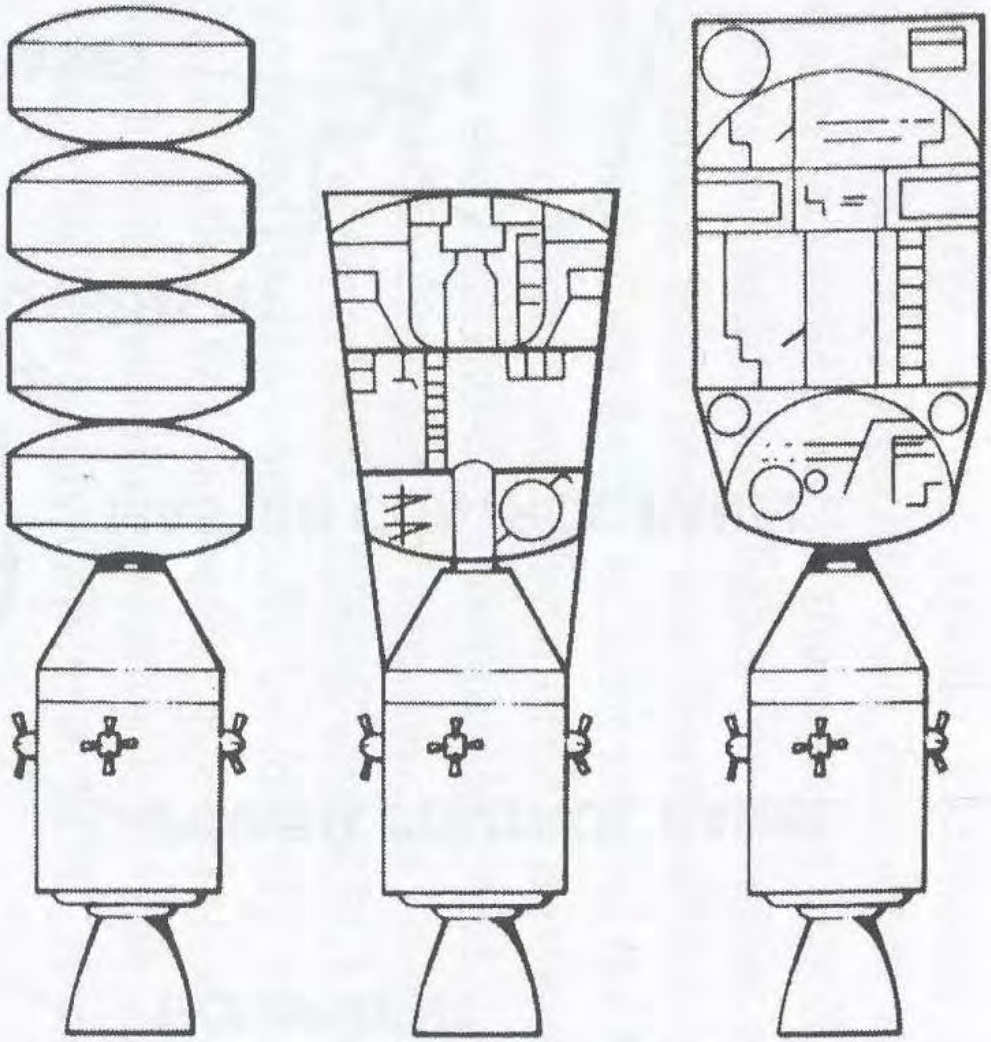


LEM LAB



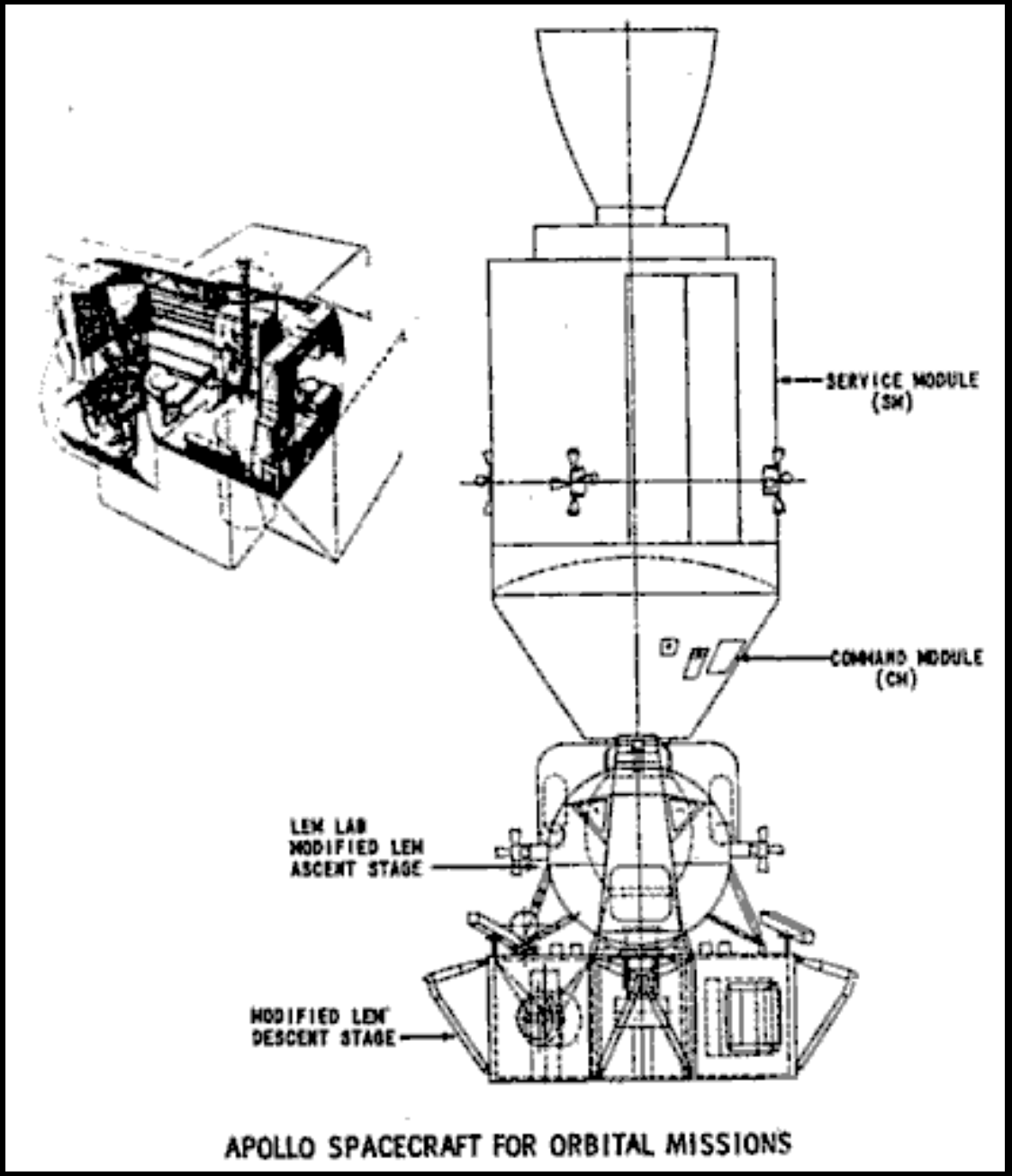
NEW LAB MODULE

ADVANCED LABORATORY

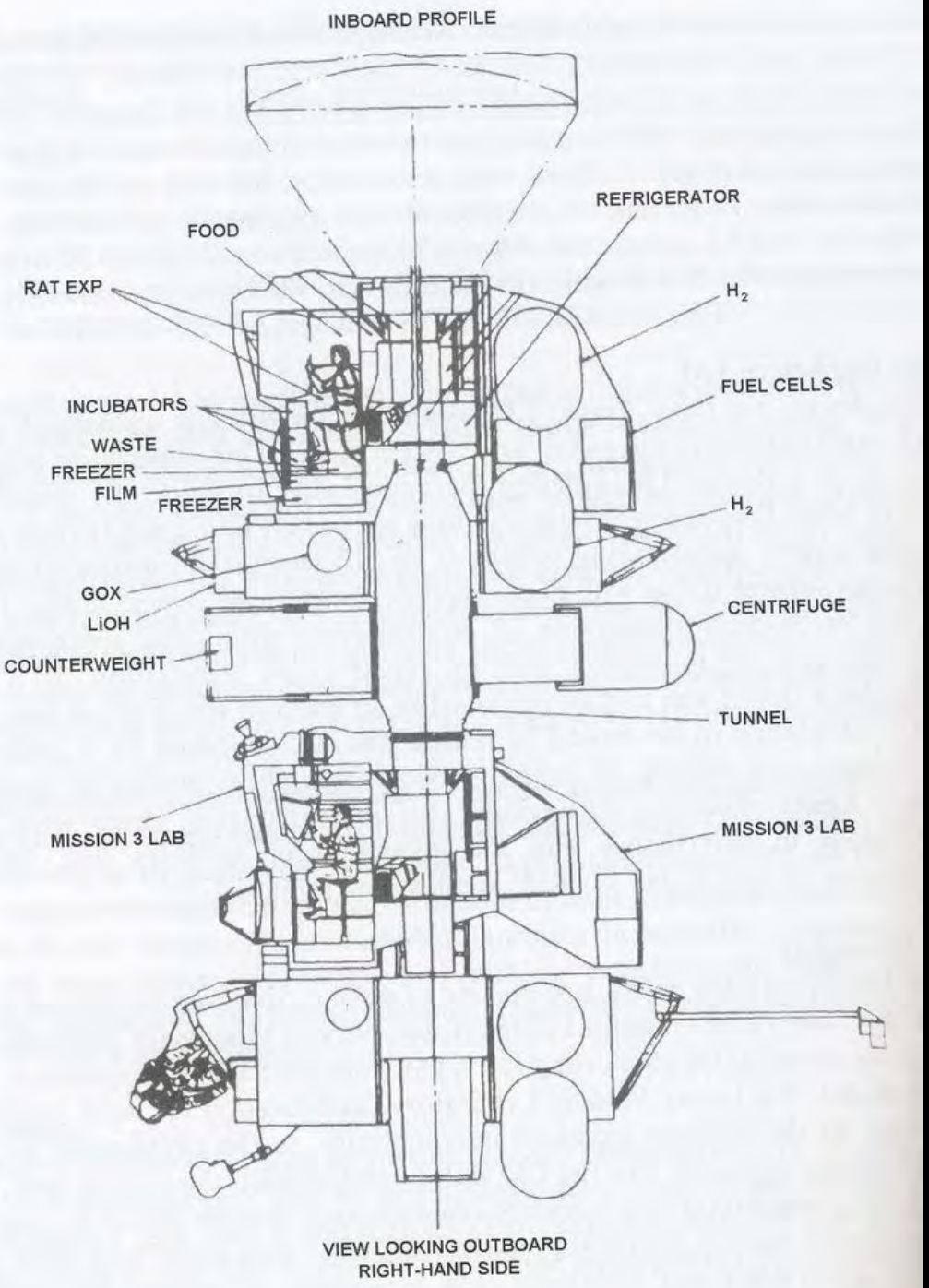


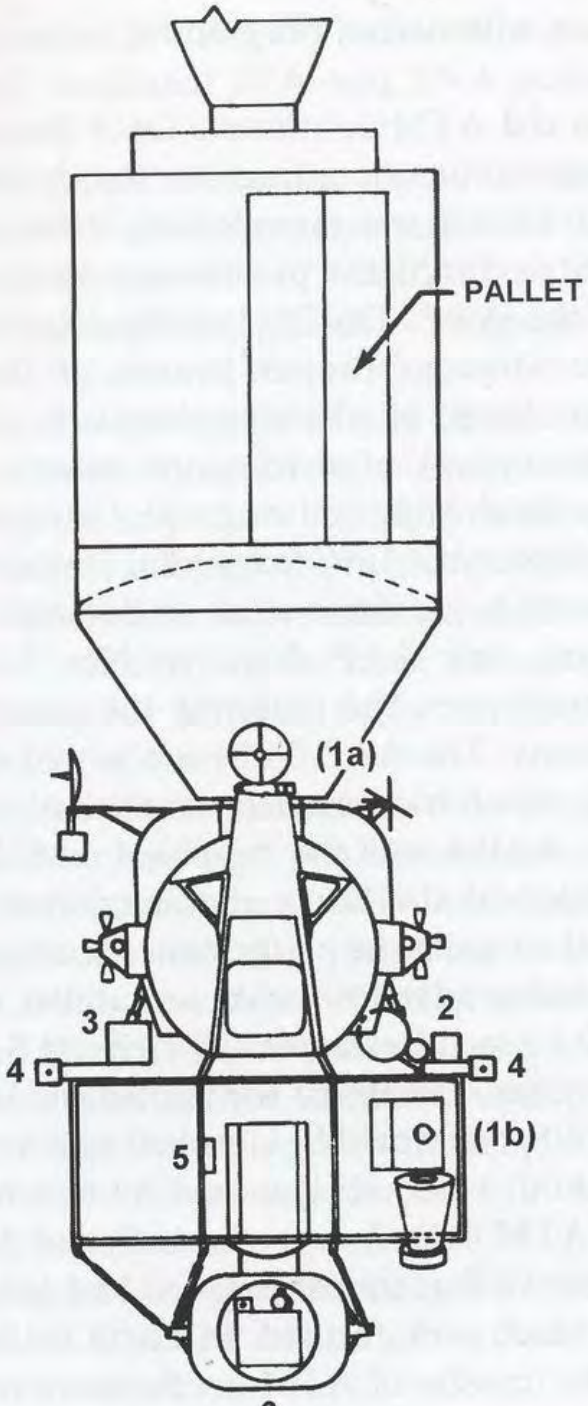
MULTIPLE MODULES

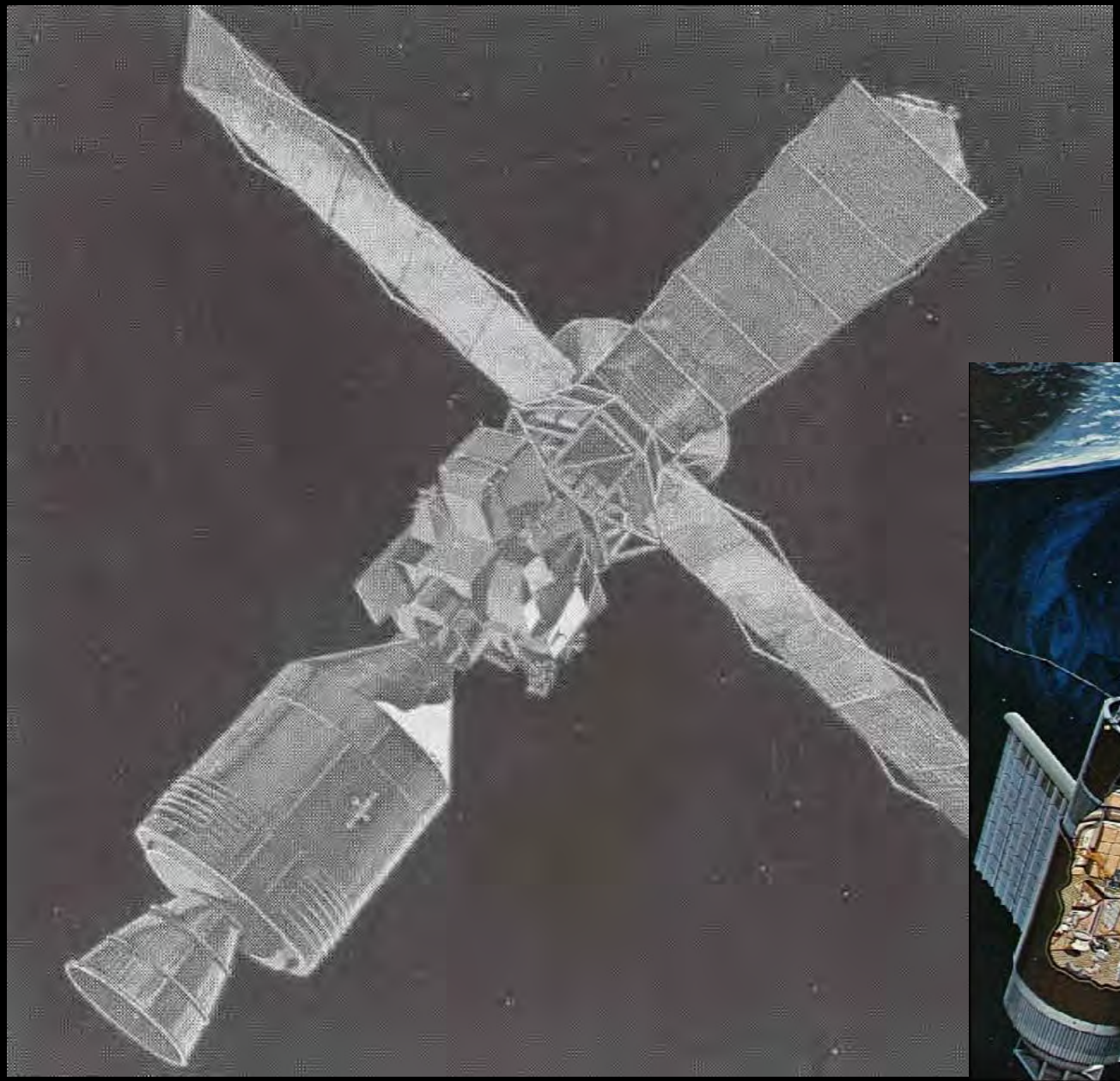
LARGE MODULES



APOLLO SPACECRAFT FOR ORBITAL MISSIONS


INBOARD PROFILE
REFRIGERATOR
FOOD
RAT EXP
H_2
FUEL CELLS
INCUBATORS
WASTE
FREEZER
FILM
FREEZER
H_2
GOX
LiOH
CENTRIFUGE
COUNTERWEIGHT
TUNNEL
MISSION 3 LAB
MISSION 3 LAB
VIEW LOOKING OUTBOARD
RIGHT-HAND SIDE


PALLET
(1a)
2
3
4
4
(1b)
5
6



Wernhern von Braun

Použité stupně rakety Saturn mohou vytvořit základ stanice.

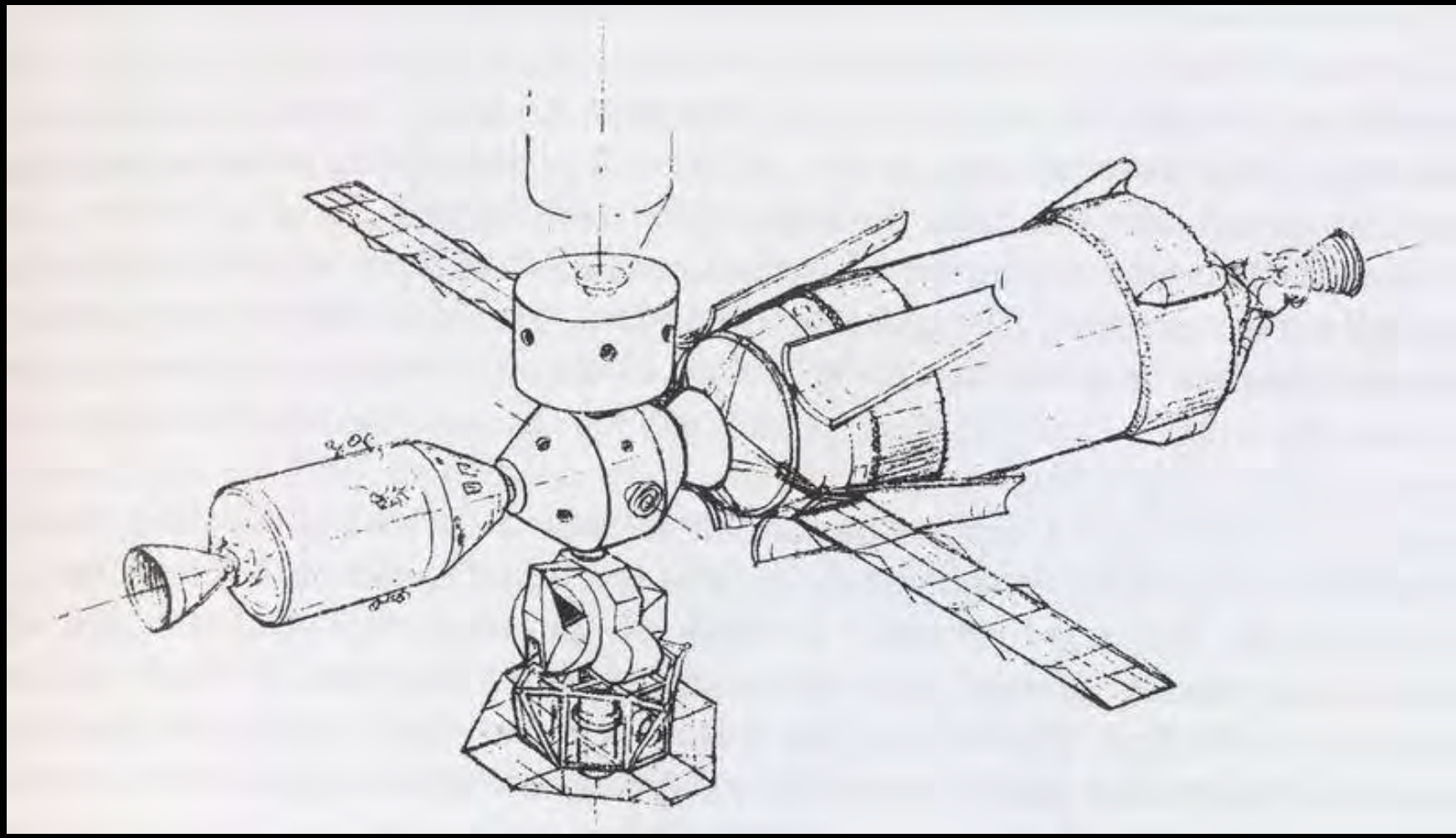
AES (Apollo Extension System).

Srpen 1965: Saturn/Apollo Application Office

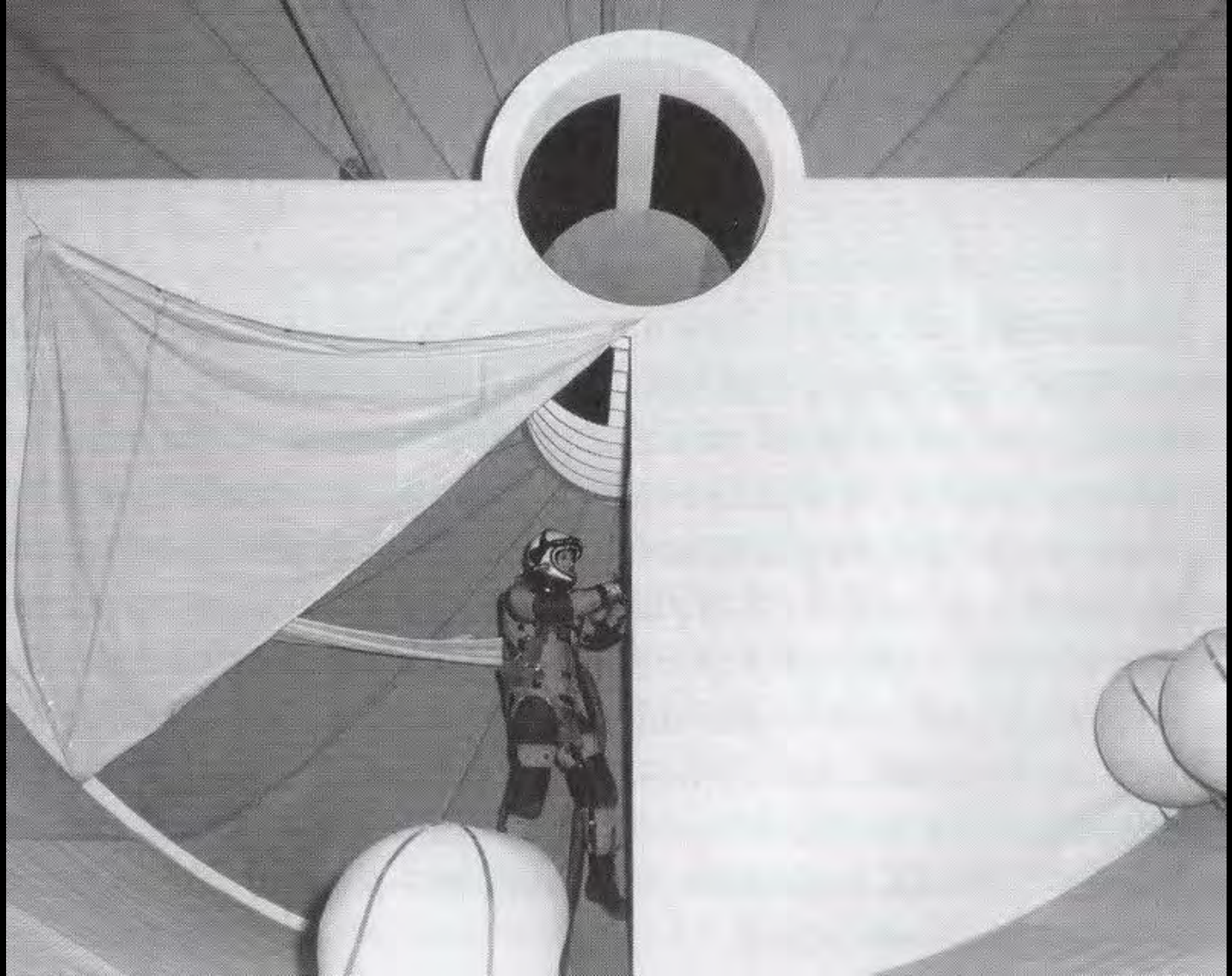
Apollo Applications Program.

1966: plány předloženy Kongresu USA.

Koncem 1965: William Taub (MSC)



„Mokrá laboratoř“.



23. března 1966

Saturn 1B Launch vehicle flight assignments SA-201 - SA-228

Vehicle	Designation	Mission Type	Parameters	Spacecraft	Objectives	Remarks
SA-201	Apollo	Launch vehicle development	Sub-orbital	CSM	Demonstrate Saturn 1B /CSM compatibility	*First Saturn 1B Launch, 26 February 1966*
SA-202	Apollo	Launch vehicle development	Sub-orbital	CSM	Re-entry of CSM at near lunar return velocity	*Launched, 25 August 1966*
SA-203	Apollo	Launch vehicle development	Low Earth orbit	None	Validation of LH2 behavior zero G	*Launched, 5 July 1966.*
SA-204	Apollo	LEM development	Low Earth orbit	LEM	First LEM launch	*Apollo 5, 22 January 1968.*
SA-205	Apollo	First manned CSM	Low Earth orbit	CSM	CSM development	*Apollo 7, first manned Apollo mission. Launched 11 October 1968.*
SA-206	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*First manned Skylab mission. Launched 25 May 1973.*
SA-207	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*Second manned Skylab mission. Launched 23 July 1973.*
SA-208	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*Final manned Skylab mission Launched 16 November 1973.*
SA-209	Alternate Mission	Space operations and technology	Low Earth orbit 14 days duration	CSM	Manned operations with spent S-IVB stage (wet workshop).	*Mission not flown. SA-209 served as Skylab backup. Not launched. On display at KSC.*
SA-210	Alternate Mission	Space Operations and Technology	Low Earth orbit	LEM lab	Autonomous rendezvous with S-IVB workshop.	*Actually launched ASTP 15 July 1975. Last Saturn 1B launch.*
SA-211	Alternate Mission	Space Operations and Technology	Low Earth orbit 28 days duration	CSM	Same as SA-209/210, but longer duration.	*Built but not flown. S-1B 211 on display in Huntsville, S-IVB 211, location unknown.*
SA-212	Alternate Mission	Space Operations and Technology	Low Earth orbit 28 days duration	LEM lab	Same as SA-209/210, but longer duration	*Built, but not flown. S-IVB 212 converted to Skylab, launched 14 May 1973. S-1B 212 location unknown.*
SA-213	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	LEM lab 14 days duration	Unmanned	*Built, placed on lot at Michoud Assembly Facility.*
SA-214	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	CSM	Rendezvous with 213's LEM.	*Placed on lot at Michoud Assembly Facility. Last Saturn 1B.*
SA-215	Apollo Applications	Space Operations/ Technology	Low Earth orbit Up to 36 days	LEM lab	Unmanned launch for operations with SA-216 & 217.	*Not built*
SA-216	Apollo Applications	Space Operations/ Technology	Low Earth orbit	CSM	Manned operations with SA-215's LEM and CSM from SA-217	*Not built*
SA-217	Apollo Applications	Space Operations/ Technology	Low Earth orbit	CSM	Manned re-supply mission to SA-215 and 216's .	*Not built*
SA-218	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	LEM lab	Unmanned for operations with SA-219	*Not built*
SA-219	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	XCSM 45 days duration	Long duration mission with LEM lab from SA-218	*Not built*
SA-220	Apollo Applications	Space Operations/ Technology	Low Earth orbit	LEM lab	Joint operations with SA-221 & SA-222	*Not built or flown*
SA-221	Apollo Applications	Space Operations/ Technology	Low Earth orbit 45 days duration	XCSM	Joint operations with SA-221 & SA-222	*Not built*
SA-222	Apollo Applications	Space Operations/ Technology	Low Earth orbit	LEM taxi	Simulation of a lunar taxi mission	*Not Built*
SA-223	Apollo Applications	Astronomy/Space Operations	Low Earth orbit 90 days duration	LEM lab	Joint operations with SA-224 and SA-225	*Not Built*
SA-224	Apollo Applications	Astronomy/Space	Low Earth orbit	XCSM	Solar observations	*Not Built*
SA-225	Apollo Applications	Astronomy/Space	Low Earth orbit 90 days duration	XCSM	Docking with LEM SA-220, SA-223. Joint operations with LEM	*Not Built*
SA-226	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit	LEM lab	Joint operations with SA-227 & SA-228	*Not built*
SA-227	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit	XCSM	Operations with LEM, remote sensing of Earth	*Not built*
SA-228	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit 45 days duration	XCSM	Re-supply simulate space station assembly.	*Not built*

Chart based on office of Manned Space Flight Directive M-D ML 3200.031 3 Saturn Apollo Flight Mission Assignments 22 March 1966. Copy on file Marshall Space Flight Center history office.

Saturn V Launch vehicle flight assignments SA-501- SA-525

Vehicle	Designation	Mission Type	Parameters	Spacecraft	Objectives	Remarks
SA-501	Apollo	Launch vehicle development	Earth orbit	CSM	Validate Saturn V. Place CSM in orbit; CM re-entry	*First Saturn V launch. 9 November 1967. Unmanned.*
SA-502	Apollo	Launch vehicle development	Earth orbit	CSM	Same as SA-501	*Second Saturn V launch, 4 April 1968. Unmanned.*
SA-503	Apollo	Lunar orbit	Lunar orbit	CSM	First manned lunar orbit mission	*Launched Apollo 8. 21 December 1968.*
SA-504	Apollo	LEM development	Earth orbit	CSM/LEM	First manned LEM test	*Launched Apollo 9. 3 March 1969.*
SA-505	Apollo	Lunar orbit	Lunar orbit	CSM/LEM	Lunar landing dress rehearsal	*Launched Apollo 10. 18 May 1969.*
SA-506	Apollo	Lunar landing	Lunar landing	CSM/LEM	First manned lunar landing	*Launched Apollo 11. 16 July 1969.*
SA-507	Alternate mission	Space Operations/ Technology	High Earth orbit 14 days duration	CSM/LEM	Operate Apollo spacecraft, deploy LEM for rendezvous.	*Actually launched Apollo 12*
SA-508	Apollo	Lunar landing	Lunar landing	CSM/LEM	Lunar landing mission aborted by SM explosion	*Actually launched Apollo 13. 11 April 1970.*
SA-509	Alternate mission	Astronomy	High Earth orbit 14 days duration	CSM/LEM	Rendezvous and inspect LEM from 507	*Actually launched Apollo 14. 31 January 1971.*
SA-510	Apollo	Lunar landing	Lunar landing	CSM/LEM	First J mission	*Actually launched Apollo 15. 26 July 1971.*
SA-511	Alternate mission	Lunar surface sensing	Polar lunar orbit	CSM/LEM	Survey potential landing sites	*Actually launched Apollo 16. 16 April 1972.*
SA-512	Apollo	Lunar landing	Lunar landing	CSM/LEM	J mission. Final lunar landing mission	*Actually launched Apollo 17. 6 December 1972.*
SA-513	Alternate mission	Space applications	Synchronous Earth orbit. 14 day duration	CSM/LEM	Achieve synchronous orbit. Communications experiments. Deploy LEM for subsequent rendezvous.	*Actually launched Skylab space station. 14 May 1973.*
SA-514	Alternate mission	Lunar surface exploration	Lunar landing re-visit mission 512's landing site. 10 day duration/ two - three days on lunar surface.	CSM/LEM	Demonstrate pin-point landing. Utilize equipment from mission 512.	*SA-514 built, but not launched. S-IC stage at JSC; S-II on display at KSC; S-IVB at KSC.*
SA-515	Alternate mission	Lunar surface sensing	Lunar polar orbit.	CSM/LEM	Repeat of mission 511	*SA-515 built, but not flown. S-IC stage at Michoud; S-II stage at JSC; S-IVB stage (Skylab backup), Washington.*
SA-516	Not Assigned					*Not Built*
SA-517	Apollo applications mission	Astronomy	Synchronous Earth orbit. 45 days duration.	CSM/LEM lab	Deploy LEM lab for subsequent use.	*Not Built*
SA-518	Apollo applications mission	Space applications	Synchronous Earth orbit, 14 days duration	Extended CSM and LEM lab	Rendezvous with and re-use LEM from mission 513	*Not Built*
SA-519 & SA-520	Apollo applications mission	Lunar surface rendezvous - dual launch mission with SA-520	Lunar orbit. Eight day duration (SA519) and lunar landing. 21 days duration/14 days on lunar surface (SA-520).	XCSM/LEM shelter (SA-519) XCSM/LEM taxi (SA-520)	Deliver LEM shelter to automated lunar landing in advance of mission 520's crew. Conduct manned landing near LEM shelter.	*Not Built*
SA-521	Not Assigned					*Not Built*
SA-522	Apollo applications mission	Lunar surface sensing	Lunar orbit/ 35 days duration	XCSM/LEM lab	Survey potential landing sites for extended duration lunar surface missions.	*Not Built*
SA-523	Apollo applications mission	Astronomy	Earth orbit/ 45 days duration	XCSM/LEM lab	Rendezvous and re-use LEM lab from mission 517.	*Not Built*
SA-524 & SA-525	Apollo applications mission	Lunar surface rendezvous - dual launch mission with SA-525	Lunar orbit. Eight day duration (SA524) lunar landing. 21 days duration/14 days on lunar surface (SA-525)	XCSM/LEM shelter (SA-524) XCSM/LEM taxi (SA-525)	Deliver LEM shelter to automated lunar landing in advance of mission 525's crew. Conduct manned landing near LEM shelter.	*Not Built*

Chart based on office of Manned Space Flight Directive M-D ML 3200.031 3 Saturn Apollo Flight Mission Assignments 22 March, 1966. Copy on file Marshall Space Flight Center, history office.

Saturn IB

SA-201	Apollo	Launch vehicle development	Sub-orbital	CSM	Demonstrate Saturn 1B /CSM compatibility	*First Saturn 1B Launch, 26 February 1966*
SA-202	Apollo	Launch vehicle development	Sub-orbital	CSM	Re-entry of CSM at near lunar return velocity	*Launched, 25 August 1966*
SA-203	Apollo	Launch vehicle development	Low Earth orbit	None	Validation of LH2 behavior zero G	*Launched, 5 July 1966.*
SA-204	Apollo	LEM development	Low Earth orbit	LEM	First LEM launch	*Apollo 5, 22 January 1968.*
SA-205	Apollo	First manned CSM	Low Earth orbit	CSM	CSM development	*Apollo 7, first manned Apollo mission. Launched 11 October 1968.*
SA-206	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*First manned Skylab mission. Launched 25 May 1973.*
SA-207	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*Second manned Skylab mission. Launched 23 July 1973.*
SA-208	Skylab	Manned CSM	Low Earth orbit	CSM	Skylab space station ferry mission	*Final manned Skylab mission Launched 16 November 1973.*
SA-209	Alternate Mission	Space operations and technology	Low Earth orbit 14 days duration	CSM	Manned operations with spent S-IVB stage (wet workshop).	*Mission not flown. SA-209 served as Skylab backup. Not launched. On display at KSC.*
SA-210	Alternate Mission	Space Operations and Technology	Low Earth orbit	LEM lab	Autonomous rendezvous with S-IVB workshop.	*Actually launched ASTP 15 July 1975. Last Saturn 1B launch.*
SA-211	Alternate Mission	Space Operations and Technology	Low Earth orbit 28 days duration	CSM	Same as SA-209/210, but longer duration.	*Built but not flown. S-1B 211 on display in Huntsville, S-IVB 211, location unknown.*
SA-212	Alternate Mission	Space Operations and Technology	Low Earth orbit 28 days duration	LEM lab	Same as SA-209/210, but longer duration	*Built, but not flown. S-IVB 212 converted to Skylab, launched 14 May 1973. S-1B 212 location unknown.*
SA-213	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	LEM lab 14 days duration	Unmanned	*Built, placed on lot at Michoud Assembly Facility.*
SA-214	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	CSM	Rendezvous with 213's LEM.	*Placed on lot at Michoud Assembly Facility. Last Saturn 1B.*

SA-215	Apollo Applications	Space Operations/ Technology	Low Earth orbit Up to 36 days	LEM lab	Unmanned launch for operations with SA-216 & 217.	*Not built*
SA-216	Apollo Applications	Space Operations/ Technology	Low Earth orbit	CSM	Manned operations with SA-215's LEM and CSM from SA-217	*Not built*
SA-217	Apollo Applications	Space Operations/ Technology	Low Earth orbit	CSM	Manned re-supply mission to SA-215 and 216's .	*Not built*
SA-218	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	LEM lab	Unmanned for operations with SA-219	*Not built*
SA-219	Apollo Applications	Space Operations/ Technology	Low Earth orbit High inclination	XCSM 45 days duration	Long duration mission with LEM lab from SA-218	*Not built*
SA-220	Apollo Applications	Space Operations/ Technology	Low Earth orbit	LEM lab	Joint operations with SA-221 & SA-222	*Not built or flown*
SA-221	Apollo Applications	Space Operations/ Technology	Low Earth orbit 45 days duration	XCSM	Joint operations with SA-221 & SA-222	*Not built*
SA-222	Apollo Applications	Space Operations/ Technology	Low Earth orbit	LEM taxi	Simulation of a lunar taxi mission	*Not Built*
SA-223	Apollo Applications	Astronomy/Space Operations	Low Earth orbit 90 days duration	LEM lab	Joint operations with SA-224 and SA-225	*Not Built*
SA-224	Apollo Applications	Astronomy/Space	Low Earth orbit	XCSM	Solar observations	*Not Built*
SA-225	Apollo Applications	Astronomy/Space	Low Earth orbit 90 days duration	XCSM	Docking with LEM SA-220, SA-223. Joint operations with LEM	*Not Built*
SA-226	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit	LEM lab	Joint operations with SA-227 & SA-228	*Not built*
SA-227	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit	XCSM	Operations with LEM, remote sensing of Earth	*Not built*
SA-228	Apollo Applications	Remote Surface Sensing/Operations	Low Earth orbit 45 days duration	XCSM	Re-supply simulate space station assembly.	*Not built*

Saturn V

SA-501	Apollo	Launch vehicle development	Earth orbit	CSM	Validate Saturn V. Place CSM in orbit; CM re-entry	*First Saturn V launch. 9 November 1967. Unmanned.*
SA-502	Apollo	Launch vehicle development	Earth orbit	CSM	Same as SA-501	*Second Saturn V launch, 4 April 1968. Unmanned.*
SA-503	Apollo	Lunar orbit	Lunar orbit	CSM	First manned lunar orbit mission	*Launched Apollo 8. 21 December 1968.*
SA-504	Apollo	LEM development	Earth orbit	CSM/LEM	First manned LEM test	*Launched Apollo 9. 3 March 1969.*
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SA-507	Alternate mission	Space Operations/ Technology	High Earth orbit 14 days duration	CSM/LEM	Operate Apollo spacecraft, deploy LEM for rendezvous.	*Actually launched Apollo 12*
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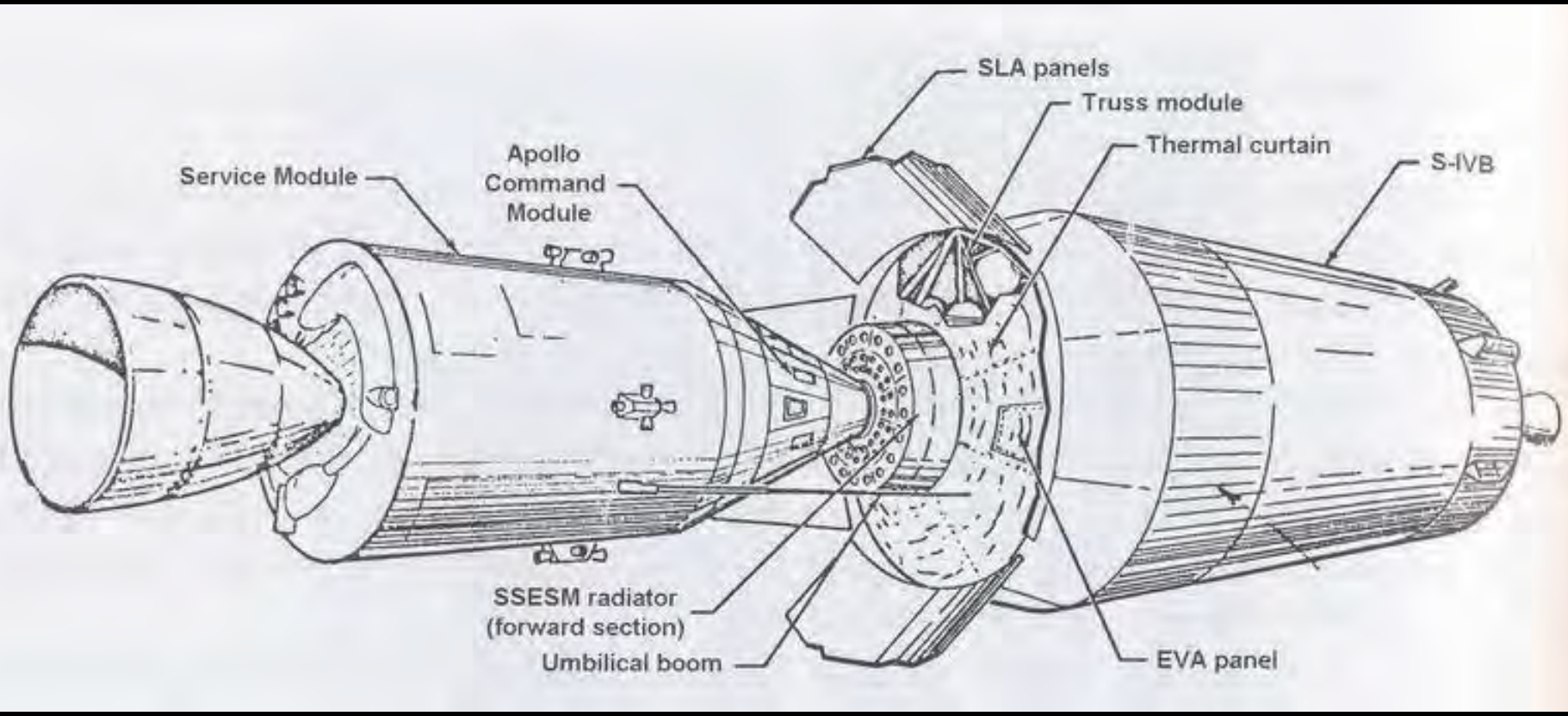
SA-510	Apollo	Lunar landing	Lunar landing	CSM/LEM	First J mission	*Actually launched Apollo 15. 26 July 1971.*
SA-511	Alternate mission	Lunar surface sensing	Polar lunar orbit	CSM/LEM	Survey potential landing sites	*Actually launched Apollo 16. 16 April 1972.*
SA-512	Apollo	Lunar landing	Lunar landing	CSM/LEM	J mission. Final lunar landing mission	*Actually launched Apollo 17. 6 December 1972.*
SA-513	Alternate mission	Space applications	Synchronous Earth orbit. 14 day duration	CSM/LEM	Achieve synchronous orbit. Communications experiments. Deploy LEM for subsequent rendezvous.	*Actually launched Skylab space station. 14 May 1973.*
SA-514	Alternate mission	Lunar surface exploration	Lunar landing re-visit mission 512's landing site. 10 day duration/ two - three days on lunar surface.	CSM/LEM	Demonstrate pin-point landing. Utilize equipment from mission 512.	*SA-514 built, but not launched. S-IC stage at JSC; S-II on display at KSC; S-IVB at KSC.*
SA-515	Alternate mission	Lunar surface sensing	Lunar polar orbit.	CSM/LEM	Repeat of mission 511	*SA-515 built, but not flown. S-IC stage at Michoud; S-II stage at JSC; S-IVB stage (Skylab backup), Washington.*

SA-516	Not Assigned					*Not Built*
SA-517	Apollo applications mission	Astronomy	Synchronous Earth orbit. 45 days duration.	CSM/LEM lab	Deploy LEM lab for subsequent use.	*Not Built*
SA-518	Apollo applications mission	Space applications	Synchronous Earth orbit, 14 days duration	Extended CSM and LEM lab	Rendezvous with and re-use LEM from mission 513	*Not Built*
SA-519 & SA-520	Apollo applications mission	Lunar surface rendezvous - dual launch mission with SA-520	Lunar orbit. Eight day duration (SA519) and lunar landing. 21 days duration/14 days on lunar surface (SA-520).	XCSM/LEM shelter (SA-519) XCSM/LEM taxi (SA-520)	Deliver LEM shelter to automated lunar landing in advance of mission 520's crew. Conduct manned landing near LEM shelter.	*Not Built*
SA-521	Not Assigned					*Not Built*
SA-522	Apollo applications mission	Lunar surface sensing	Lunar orbit/ 35 days duration	XCSM/LEM lab	Survey potential landing sites for extended duration lunar surface missions.	*Not Built*
SA-523	Apollo applications mission	Astronomy	Earth orbit/ 45 days duration	XCSM/LEM lab	Rendezvous and re-use LEM lab from mission 517.	*Not Built*
SA-524 & SA-525	Apollo applications mission	Lunar surface rendezvous - dual launch mission with SA-525	Lunar orbit. Eight day duration (SA524) lunar landing. 21 days duration/14 days on lunar surface (SA-525)	XCSM/LEM shelter (SA-524) XCSM/LEM taxi (SA-525)	Deliver LEM shelter to automated lunar landing in advance of mission 525's crew. Conduct manned landing near LEM shelter.	*Not Built*

Duben 1966: SSESM



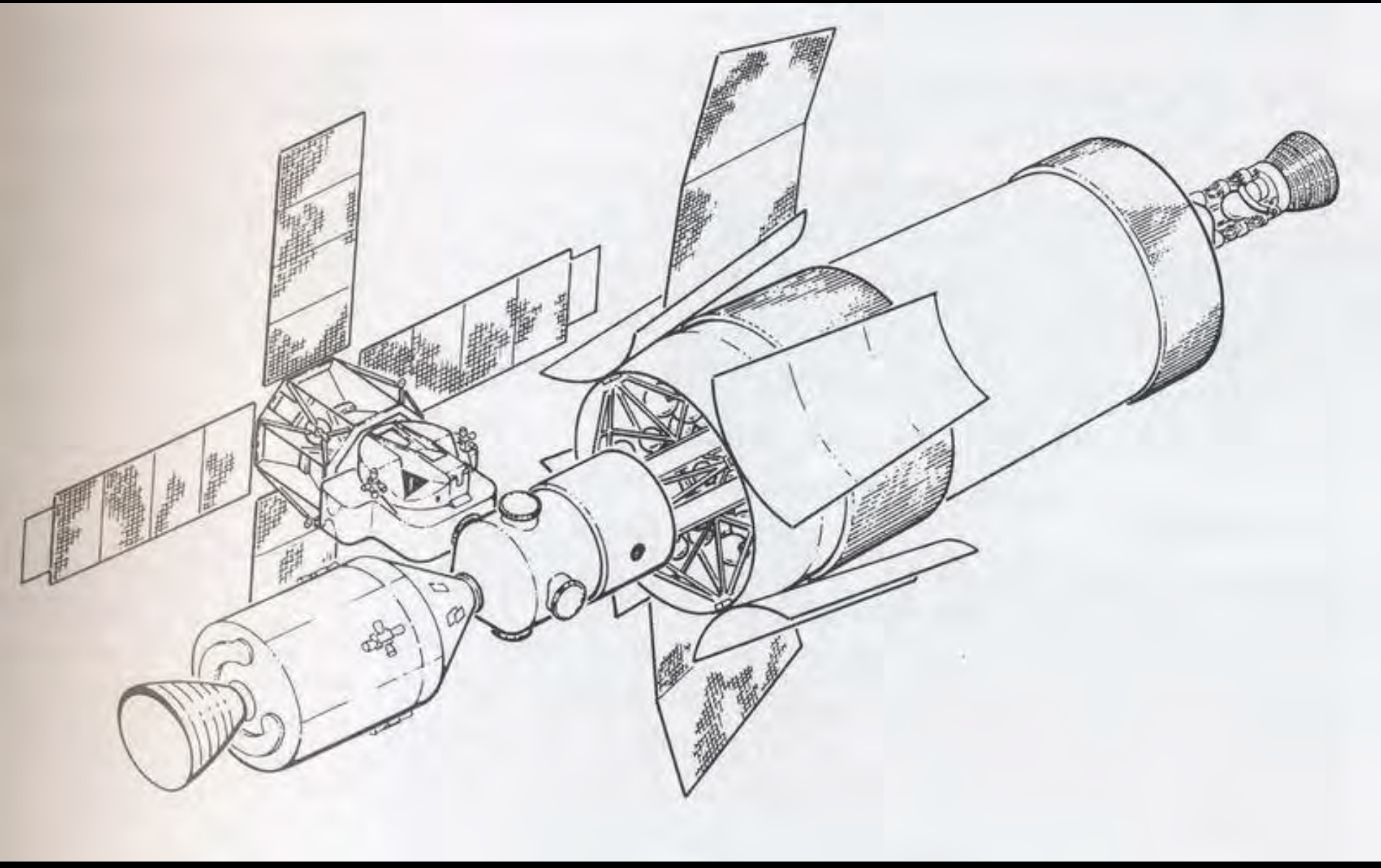
Spent Stage Experiment Support Module

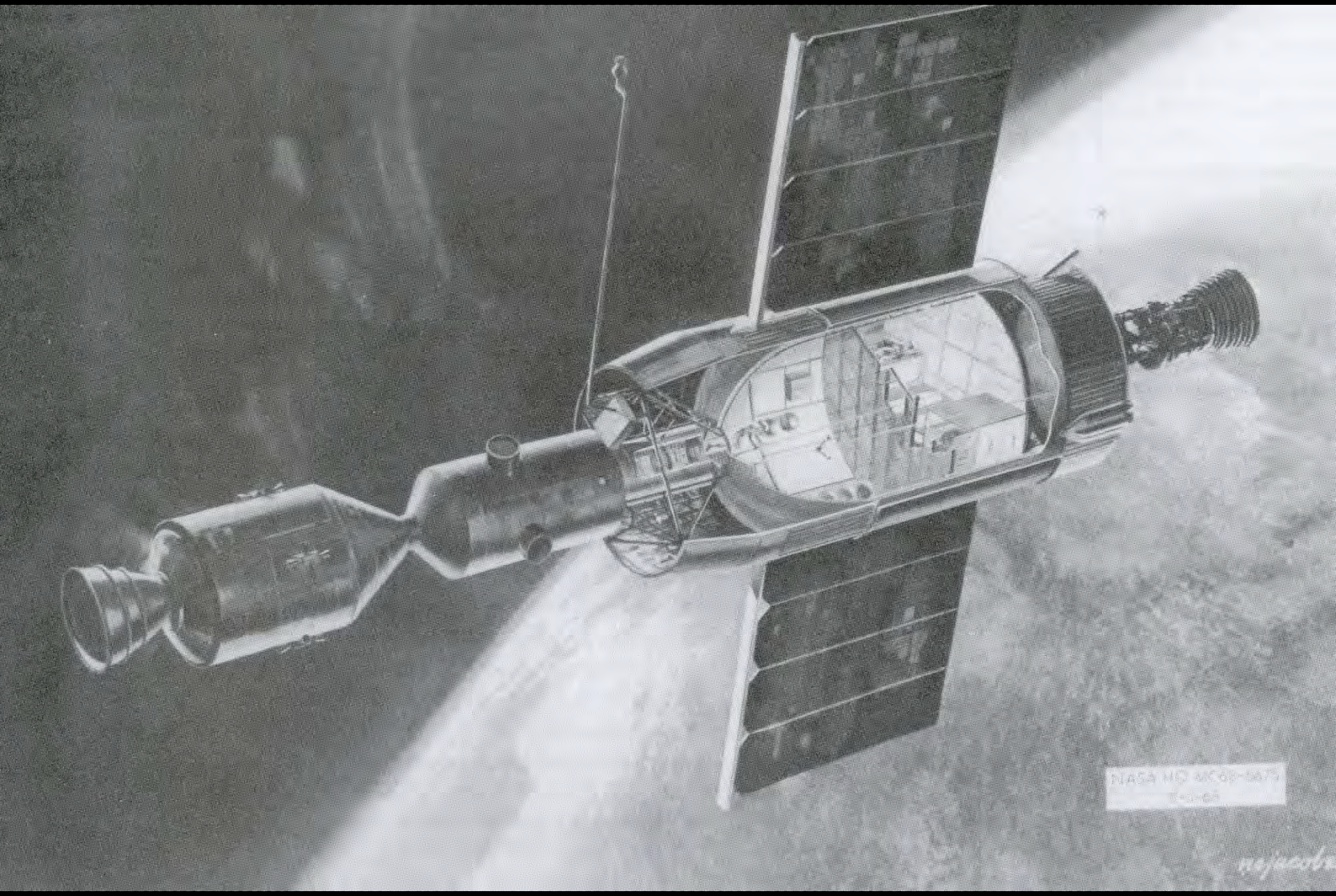
25. července 1966

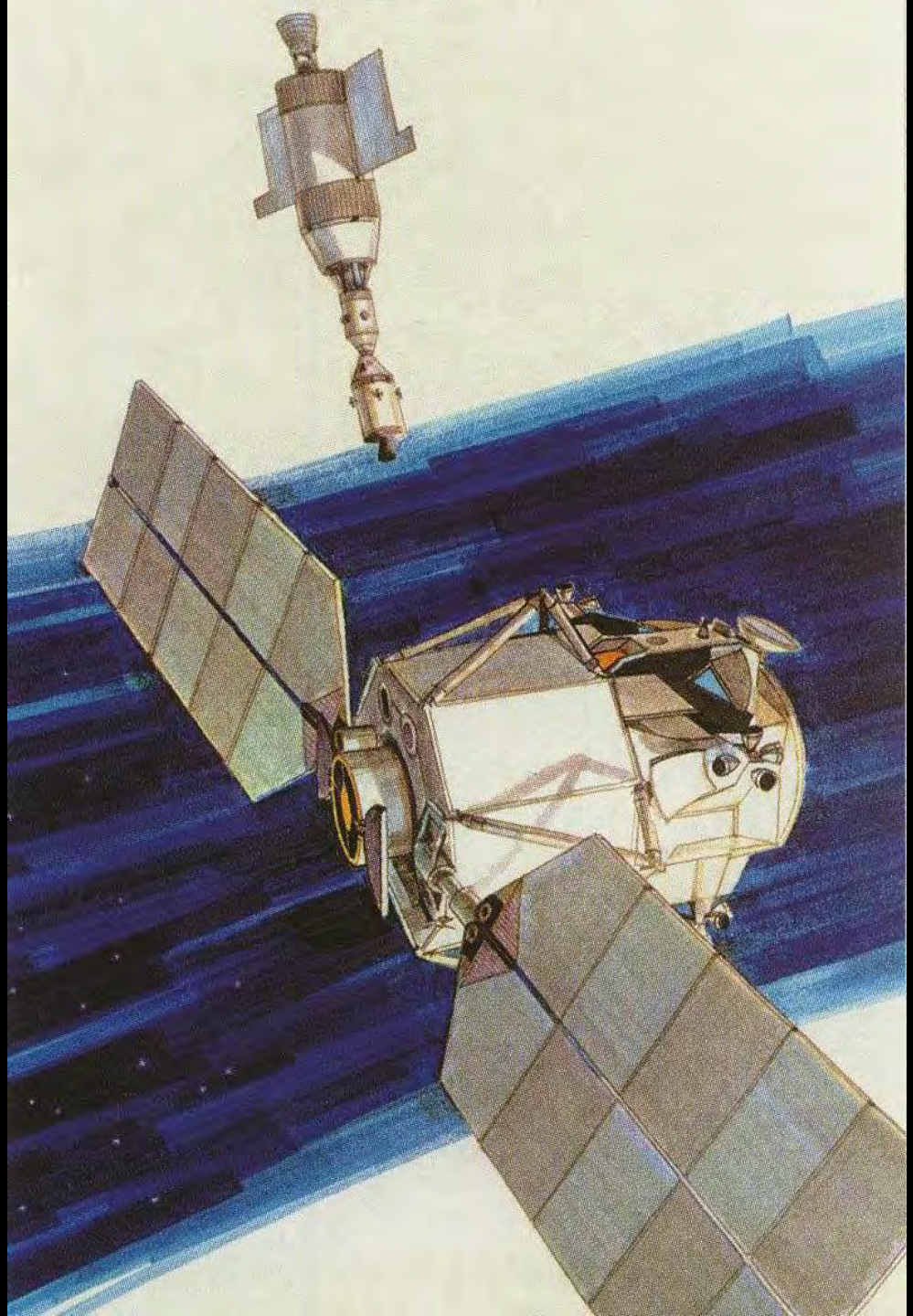
209: bezpilotní, „stanice“ se stykovacím uzlem.

210: pilotovaná, přechodový tunel.

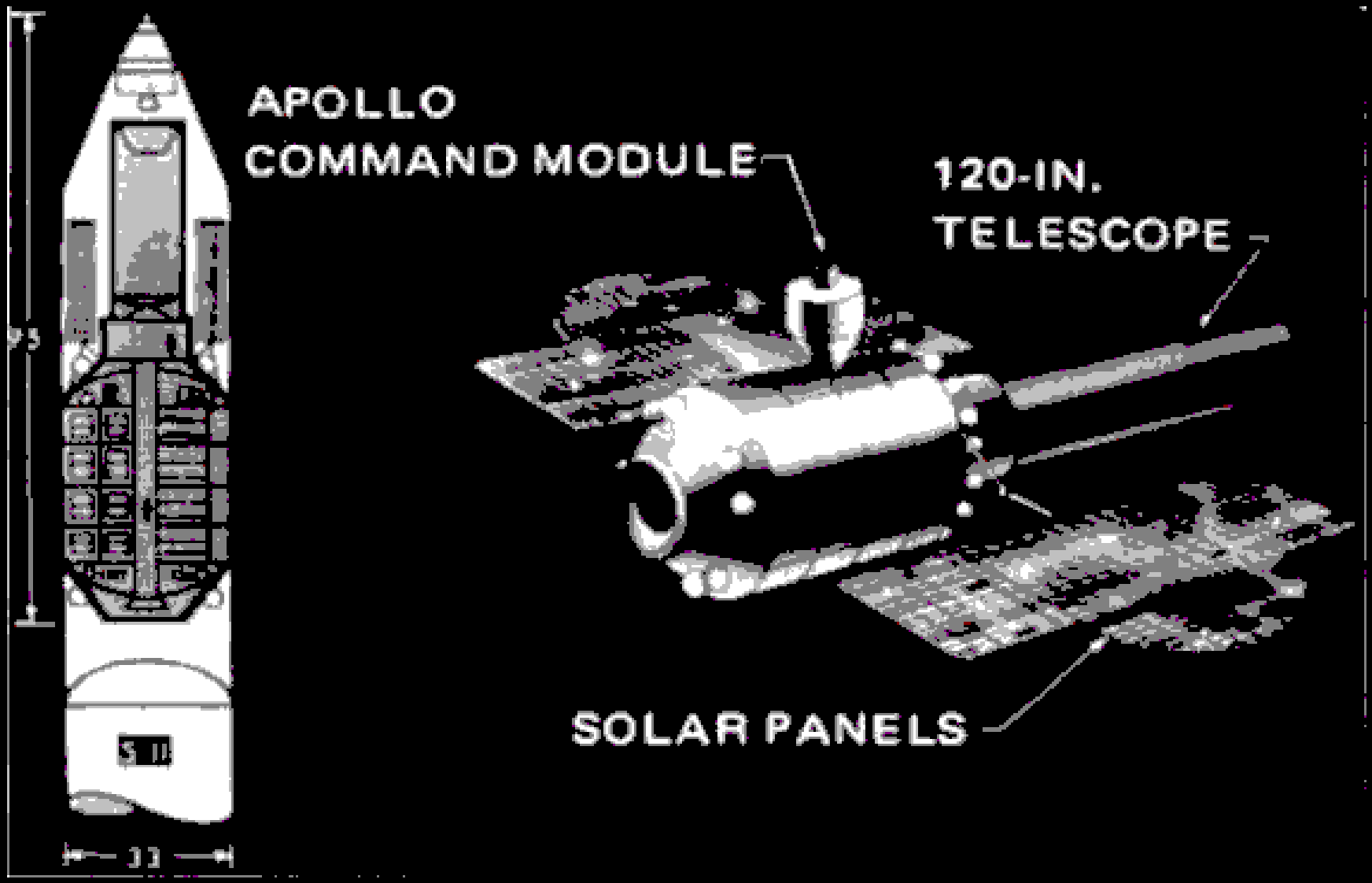
1967



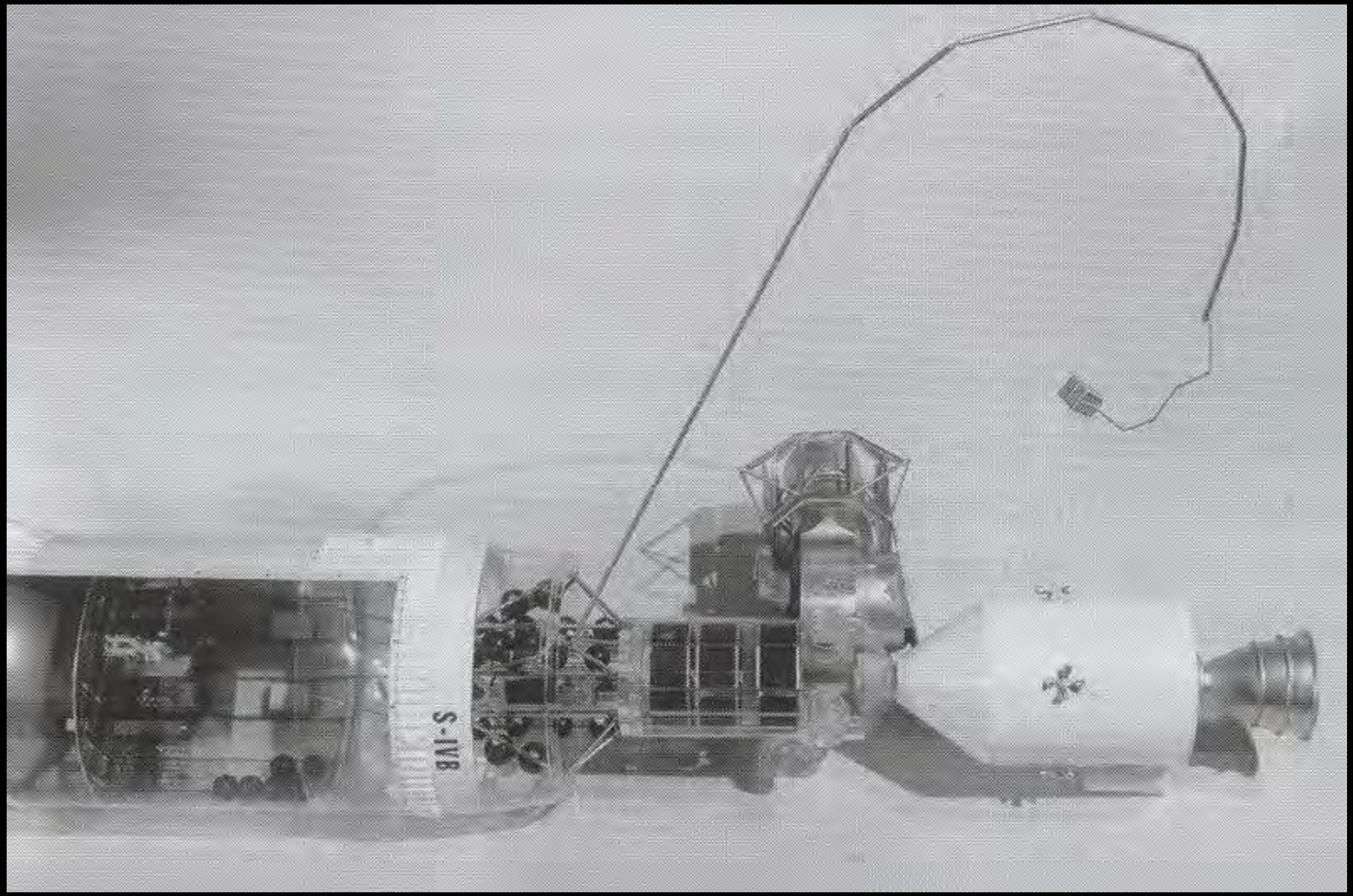




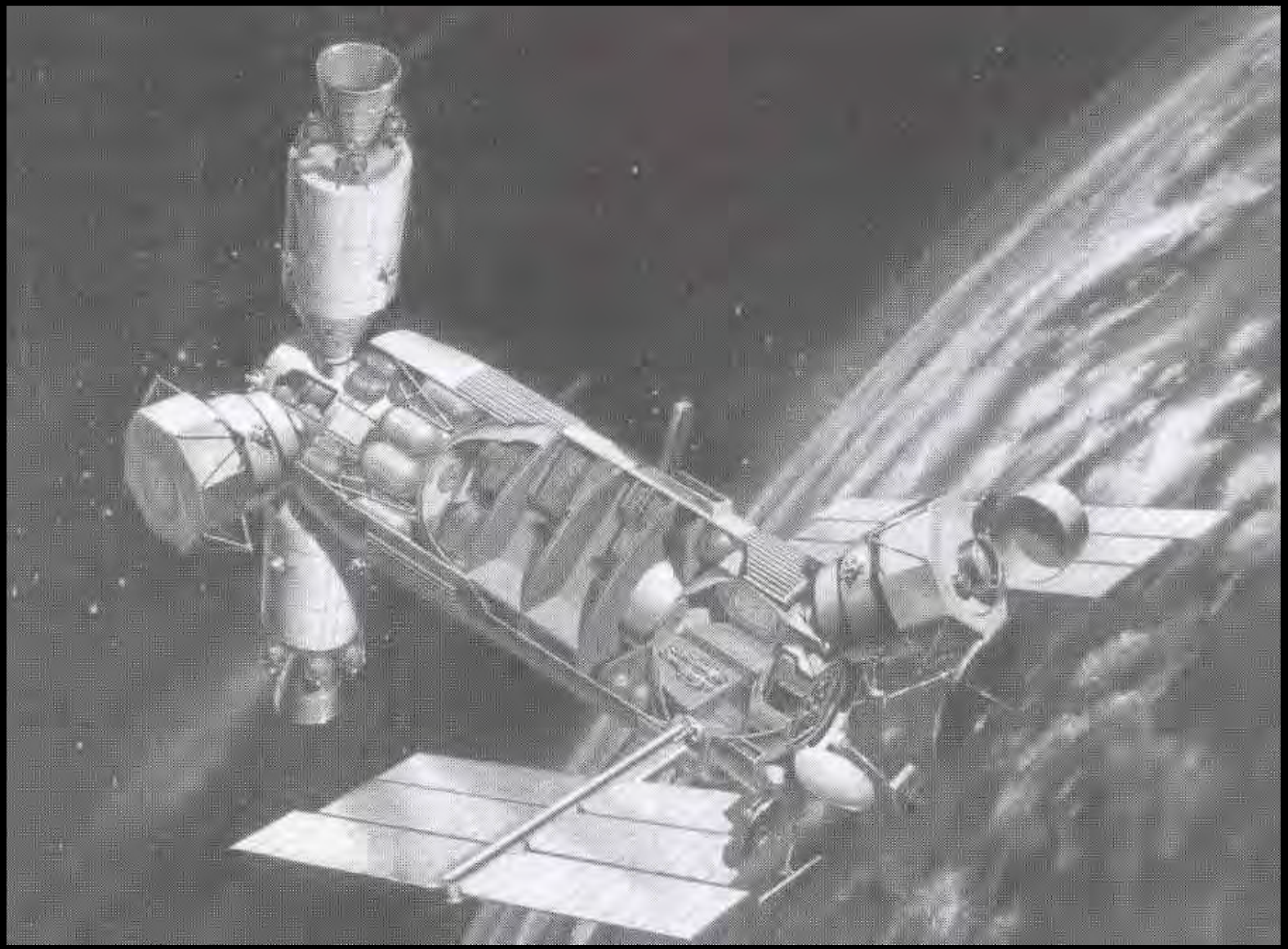
Superteleskop (Apollo-120)



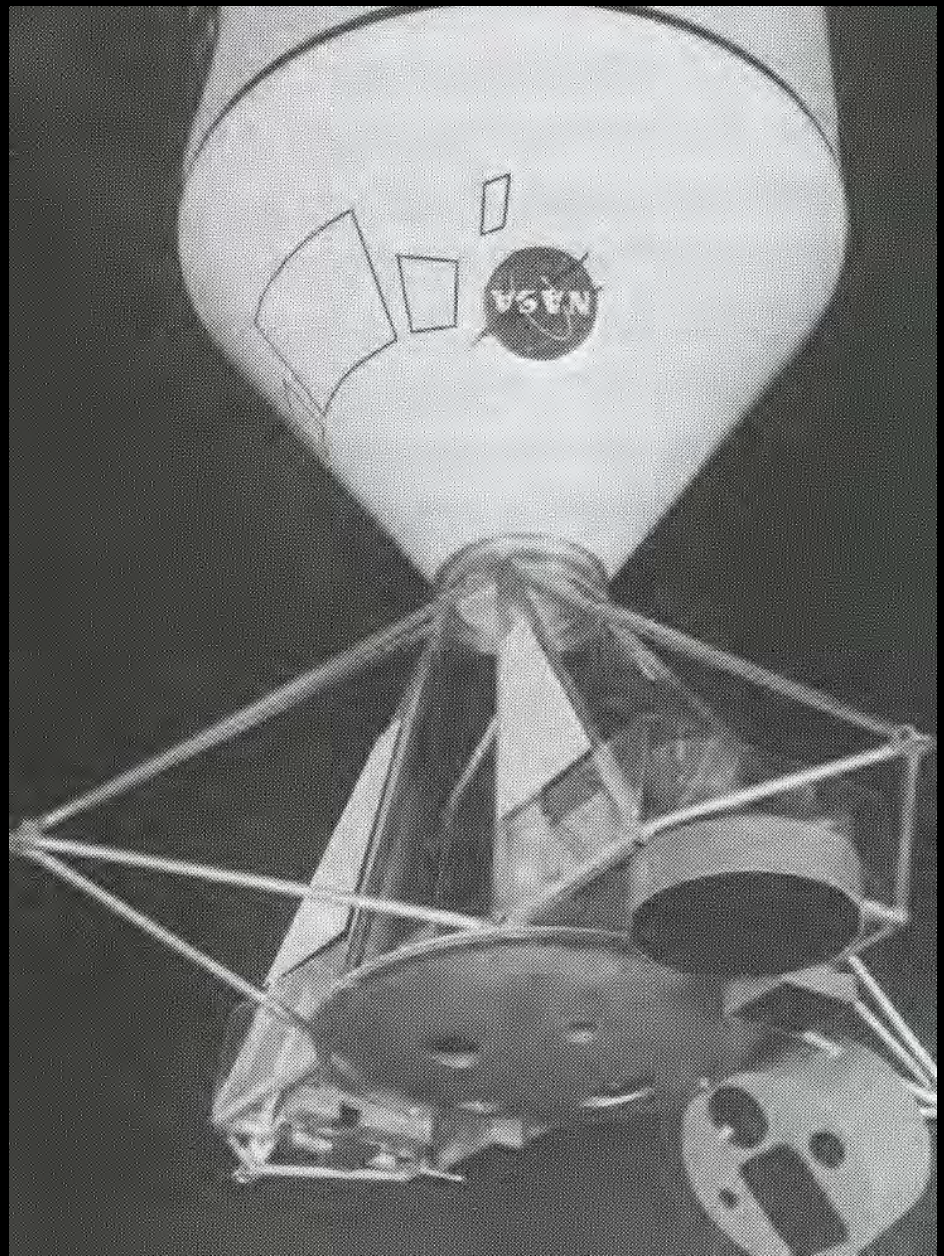
1967: serpentuátor



Velmi pokročilá laboratoř



AAP-1 zrušeno prosinec 1967



Leden 1968

AAP zůstávají tři Saturny 1B a tři Saturny V.

Červen 1968

Jedenáct Saturnů 1B, jeden Saturn V. Dvě laboratoře, jedna „mokrá“ (Saturn 1B), jedna „suchá“.

Srpen 1968

Stop: 27x H-1, 8x F-1 a 3x J-2.

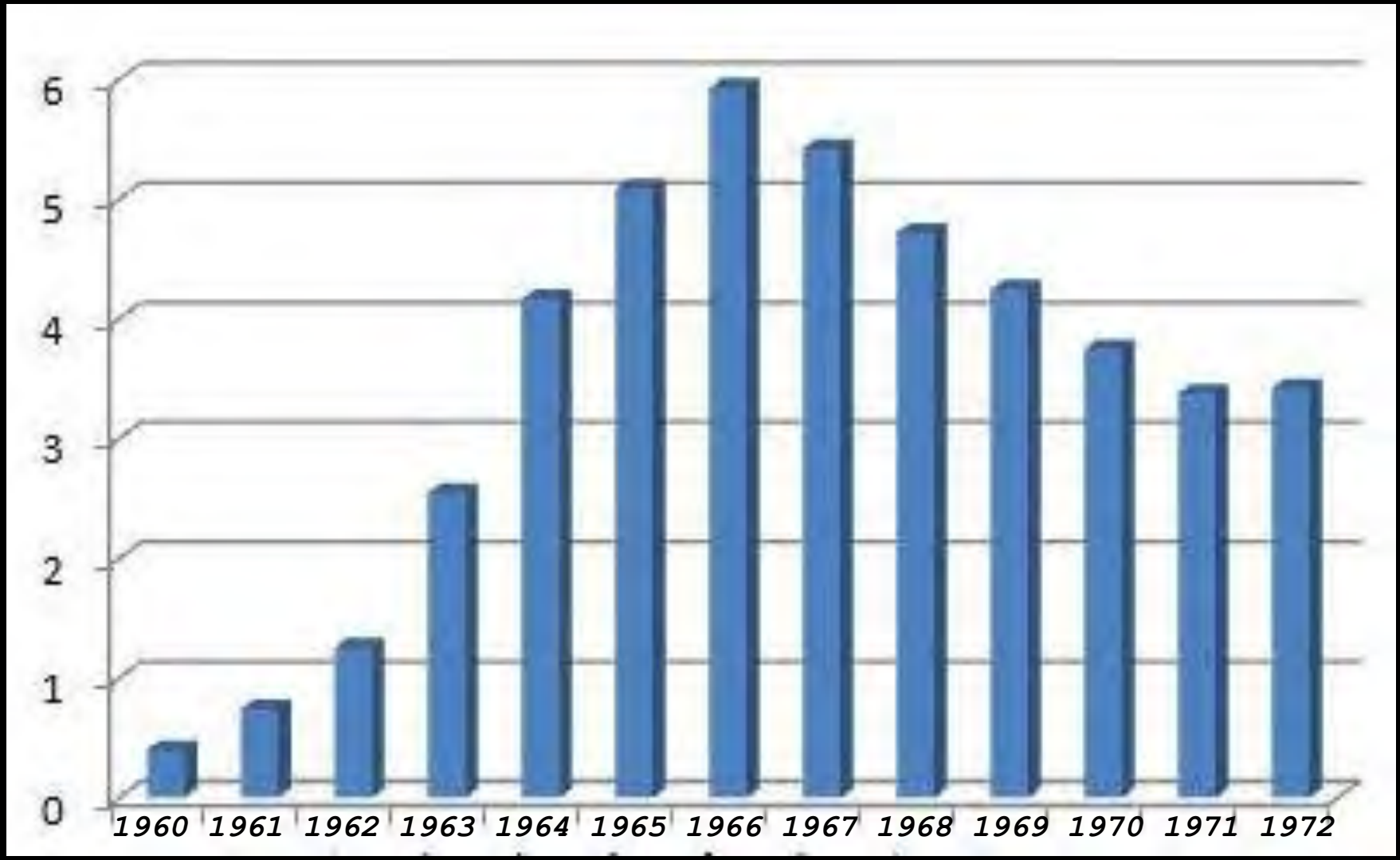
Srpen 1968

James Webb zastavuje SA-516 a -517

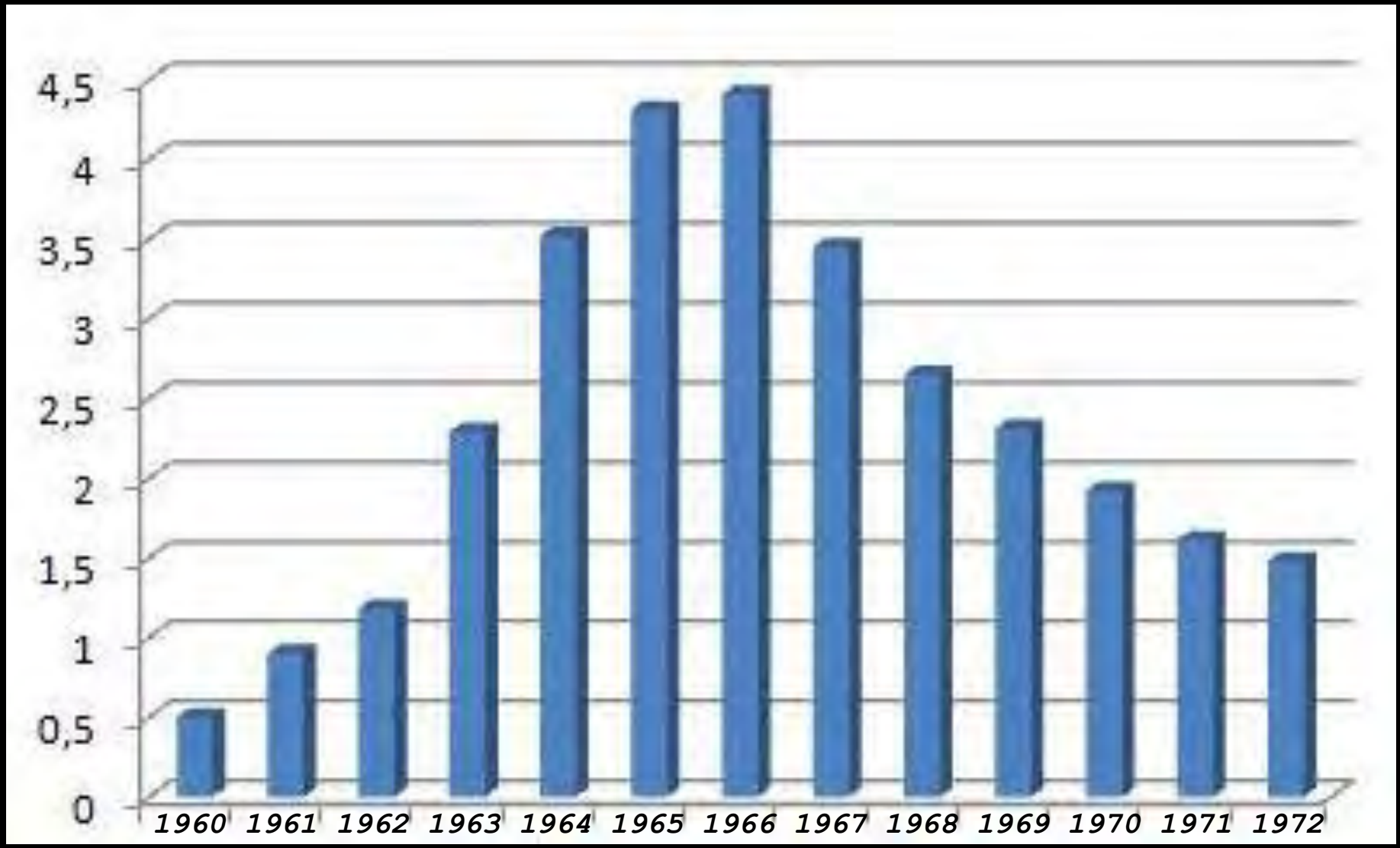
George Mueller, 1963: „all up“

Výrobní číslo 2

Rozpočet NASA (mld. dolarů)



Rozpočet NASA (procent HDP)



Jediná cesta: „mokrá laboratoř"

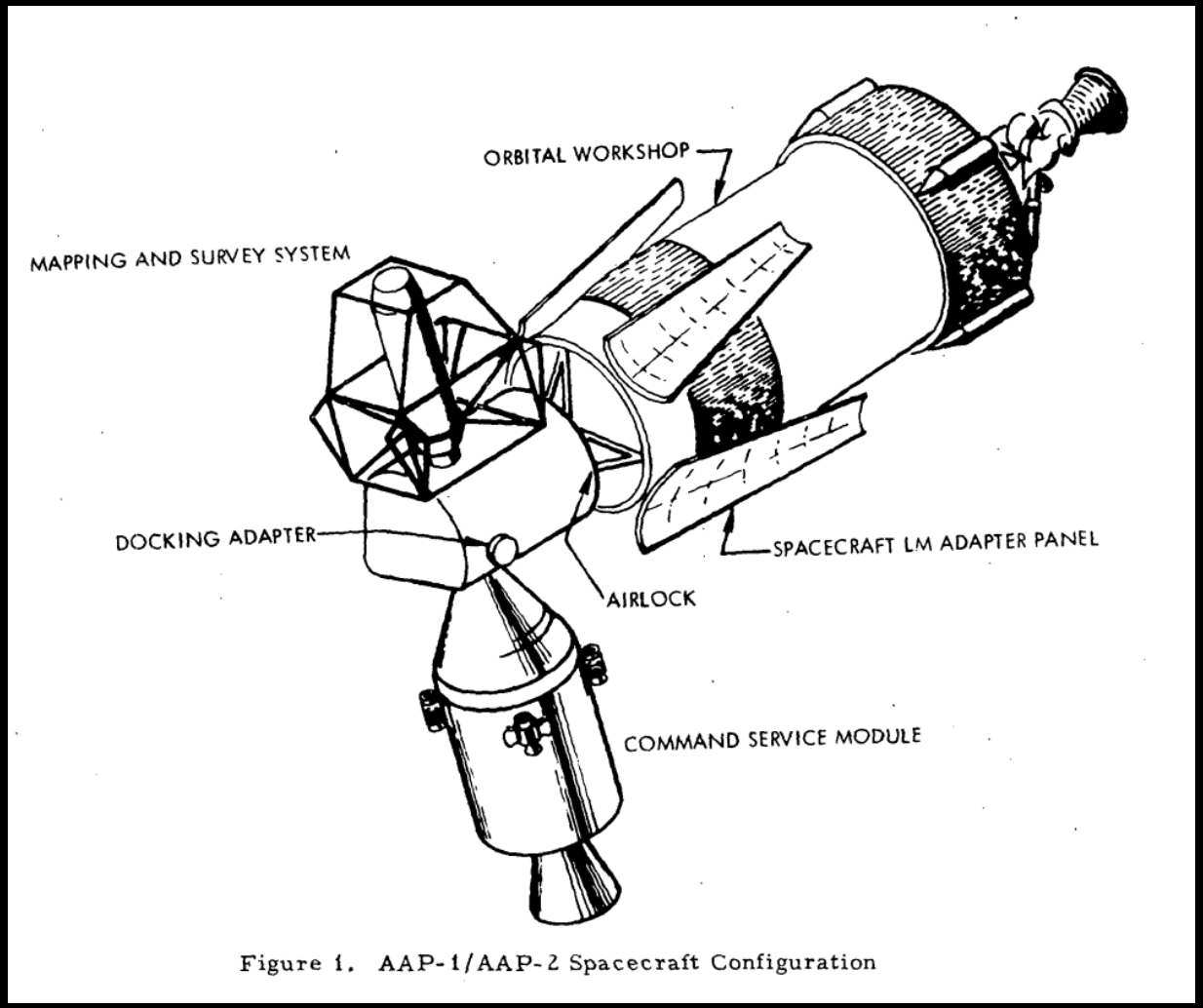
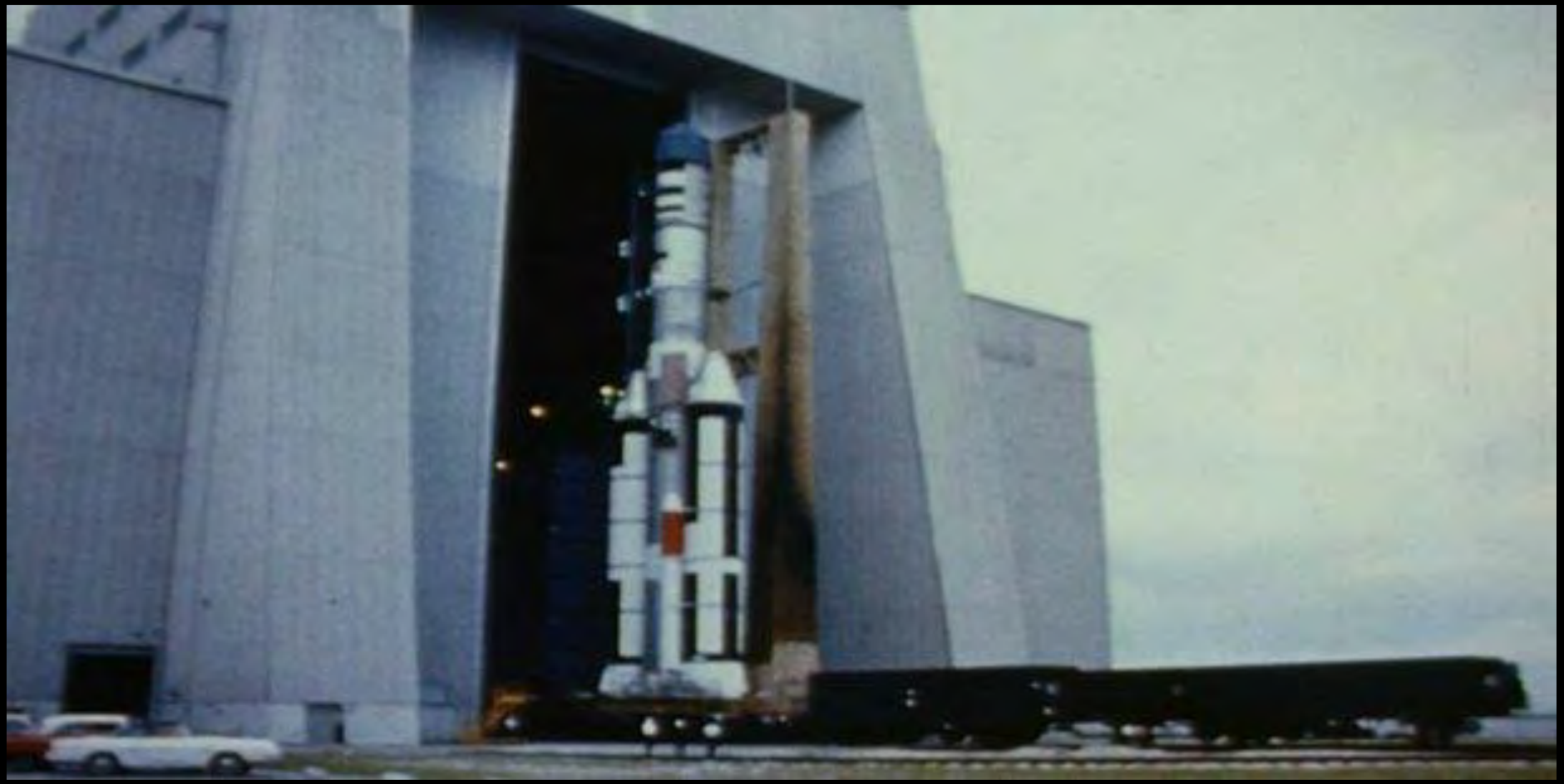


Figure 1. AAP-1/AAP-2 Spacecraft Configuration

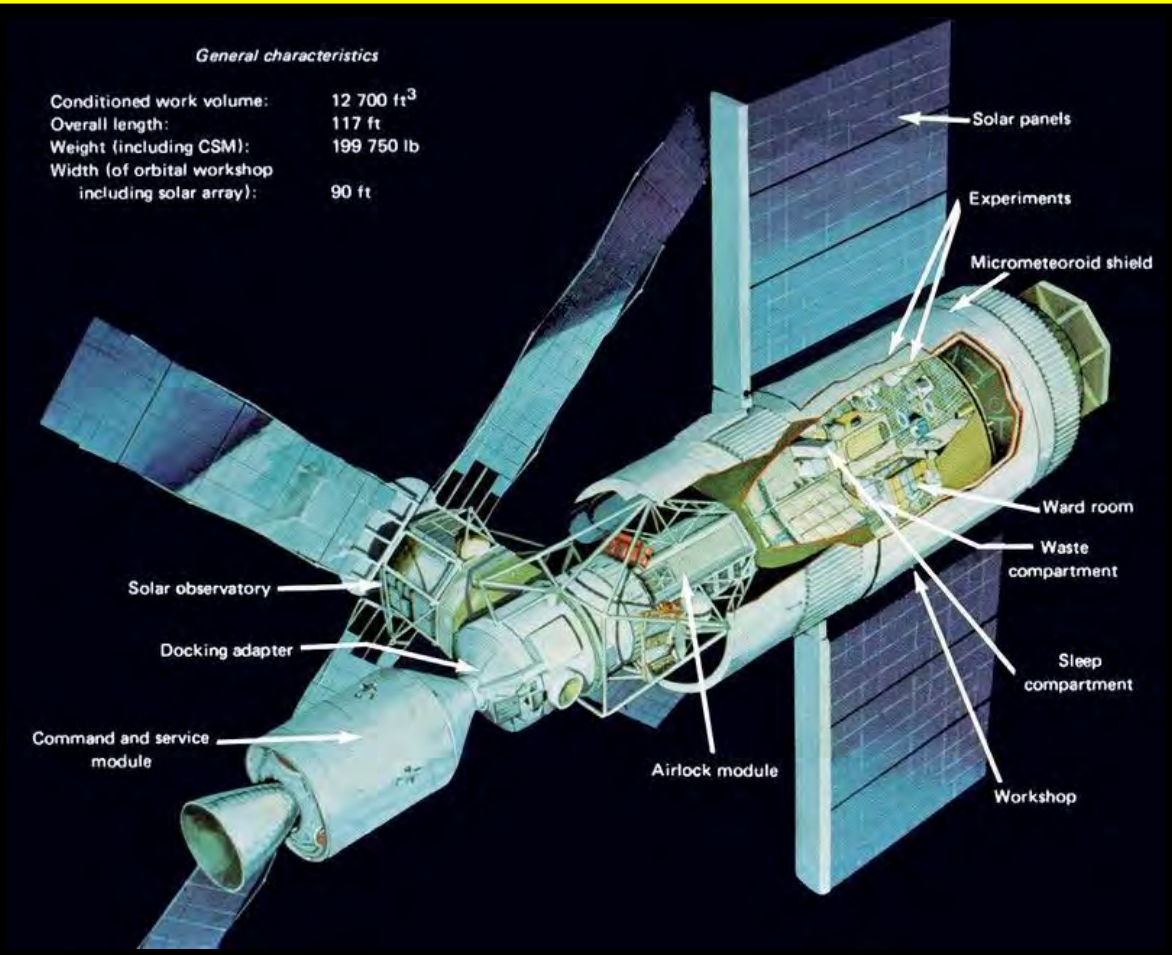
Červen 1969: zrušení MOL



4. ledna 1970 – zrušeno Apollo-20

Čtyři lunární mise do konce roku 1971 – potom tři mise na Skylab – potom další tři mise na Měsíc.

17. února 1970: Skylab



„A laboratory in the sky." Donald Steelman, USAF, 1968.

Červenec 1970 – až čtyři další mise zrušeny!

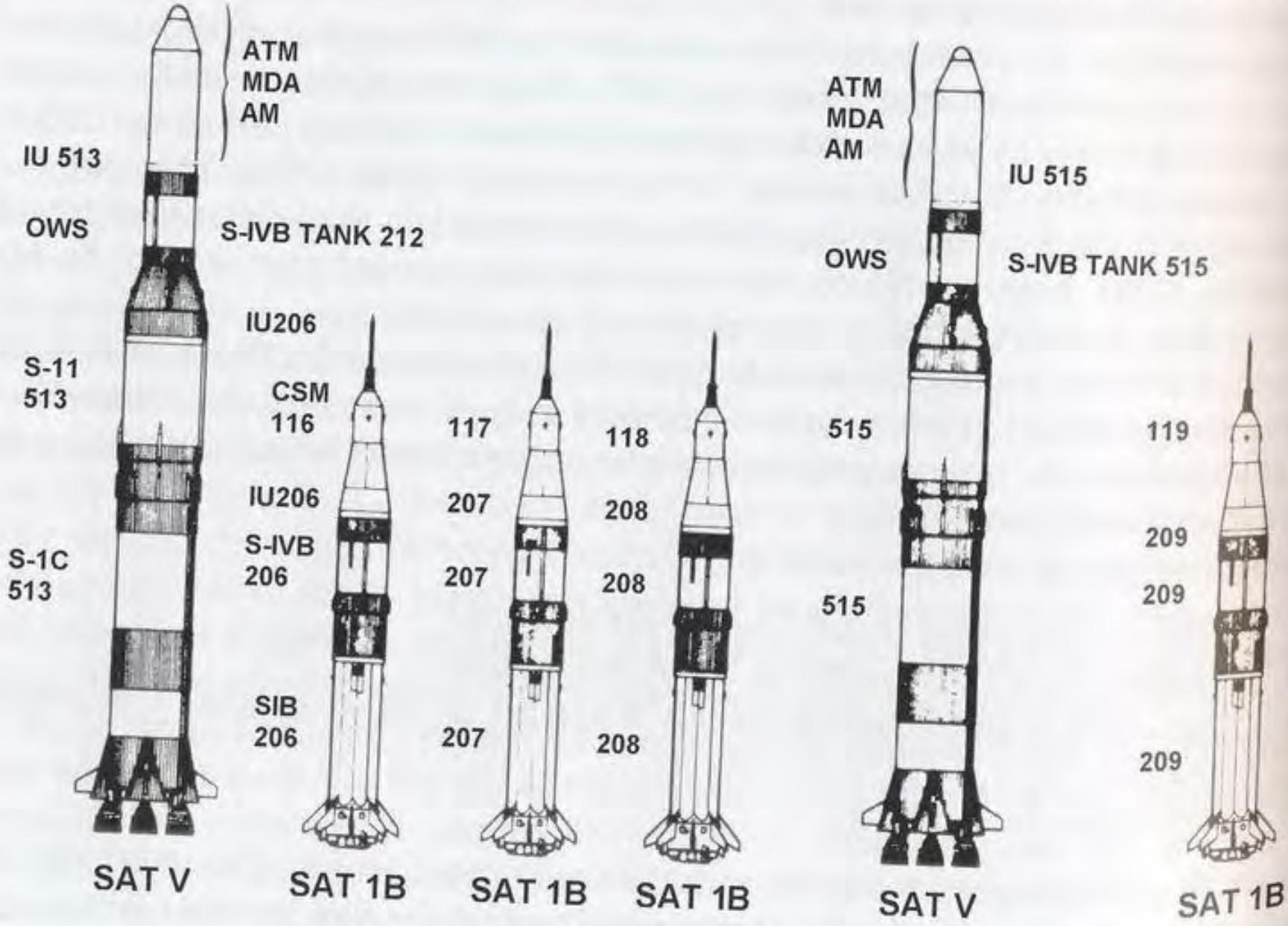
Program by končil letem Apollo-15!

Letový řád

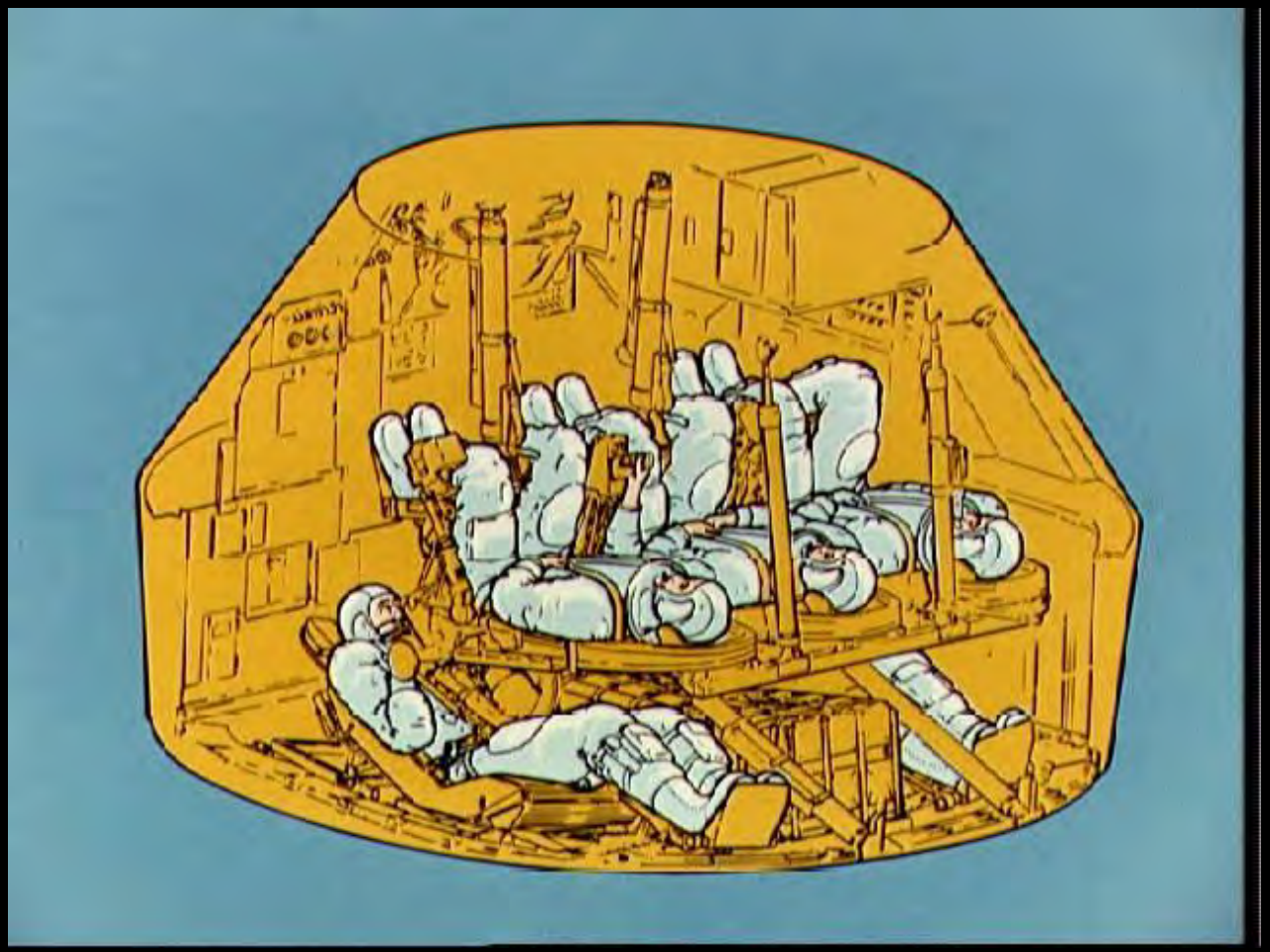
9. listopadu 1972: 28 dní – 65 dní, 56 dní (celkem osm měsíců).

SKYLAB-A HARDWARE

SKYLAB BACK-UP HARDWARE



Nutná záchranná mise!



Rockwell negarantuje vypnutí systémů.

První nominace

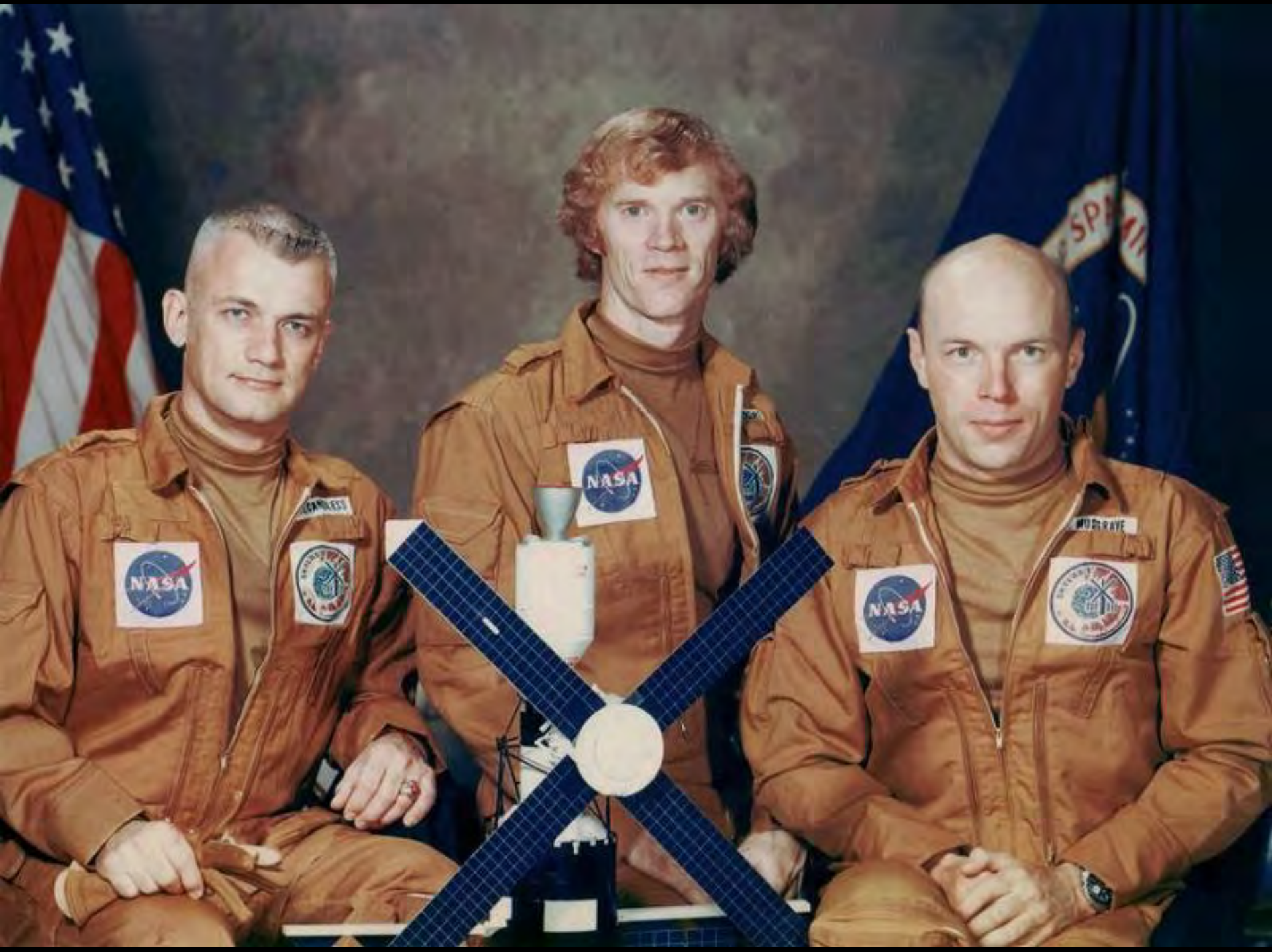
SL-2 Charles Conrad, Joe Kerwin, Paul Weitz – záloha Walt Cunningham, Story Musgrave, Bruce McCandless.

SL-3 Alan Bean, Owen Garriott, Jack Lousma – záloha Russell Schweickart, William Lenoir, Don Lind.

SL-4 Jerry Carr, Ed Gibson, William Pogue – záloha Russell Schweickart, William Lenoir, Don Lind.

Úprava

SL-2 Charles Conrad, Joe Kerwin, Paul Weitz – záloha Russell Schweickart, Story Musgrave, Bruce McCandless.
SL-3 Alan Bean, Owen Garriott, Jack Lousma – záloha Vance Brand, William Lenoir, Don Lind.
SL-4 Carr, Ed Gibson, Pogue – záloha Vance Brand, William Lenoir, Don Lind.


NASA
NASA
NASA

Číslování

Když byly jmenovány posádky, Skylab 1 až 4 (2 až 3 pilotované).

Interní dokumentace „Manned Mission 1, 2 a 3".

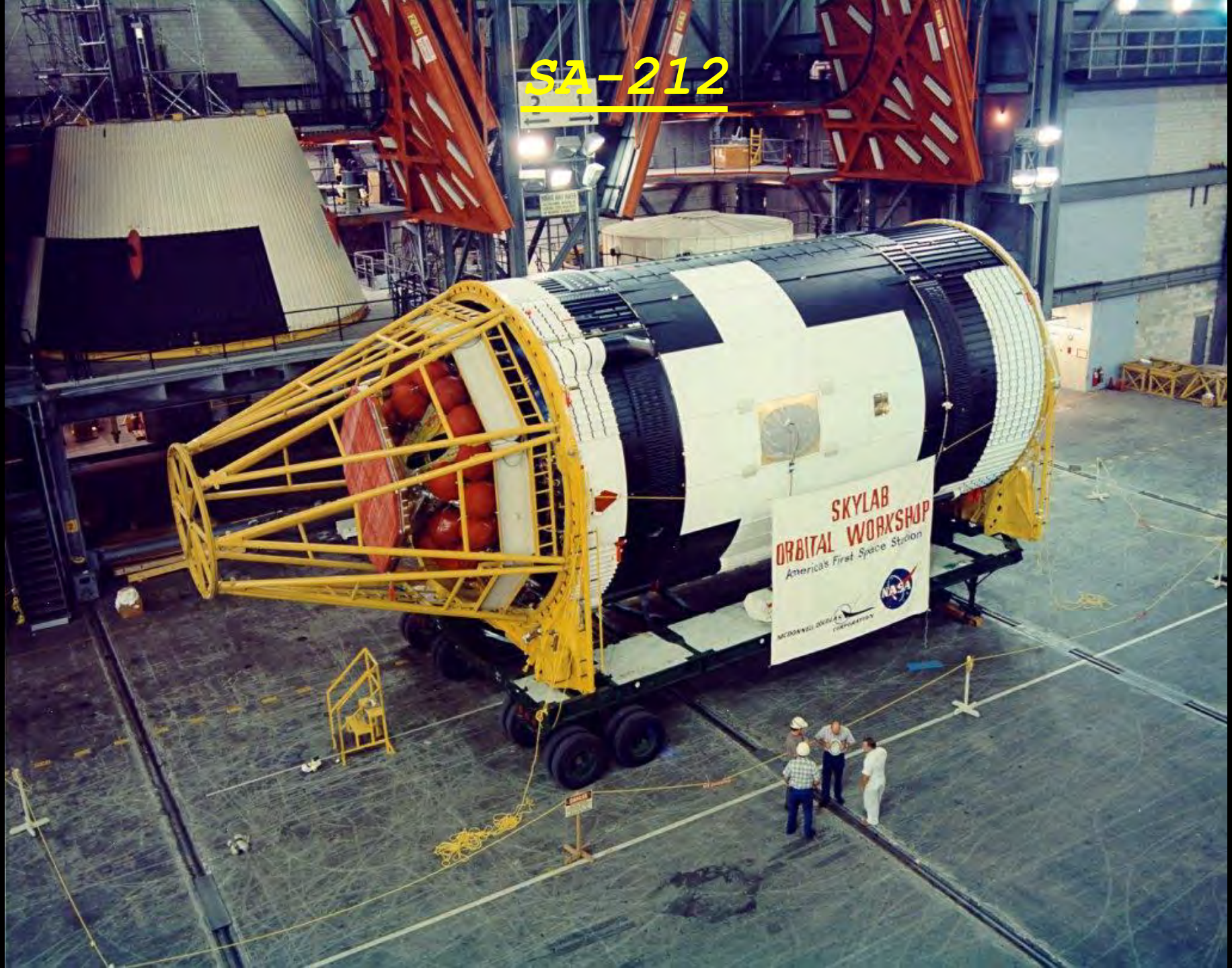
NASA Hq. upozornilo, že 2 až 4.

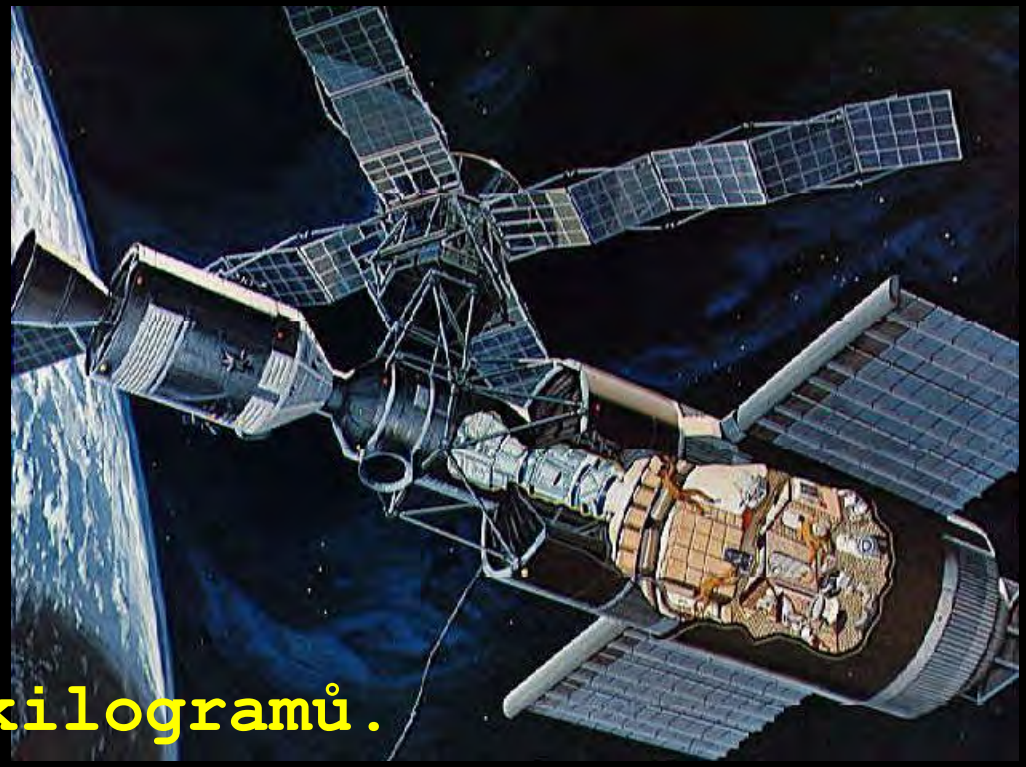
Jenže…


SKYLAB I


BEAN GARRIOTT LOUSMA
SKYLAB II


SKYLAB
3
CARR-GIBSON-POGUE


SA-212
SKYLAB
ORBITAL WORKSHOP
America's First Space Station



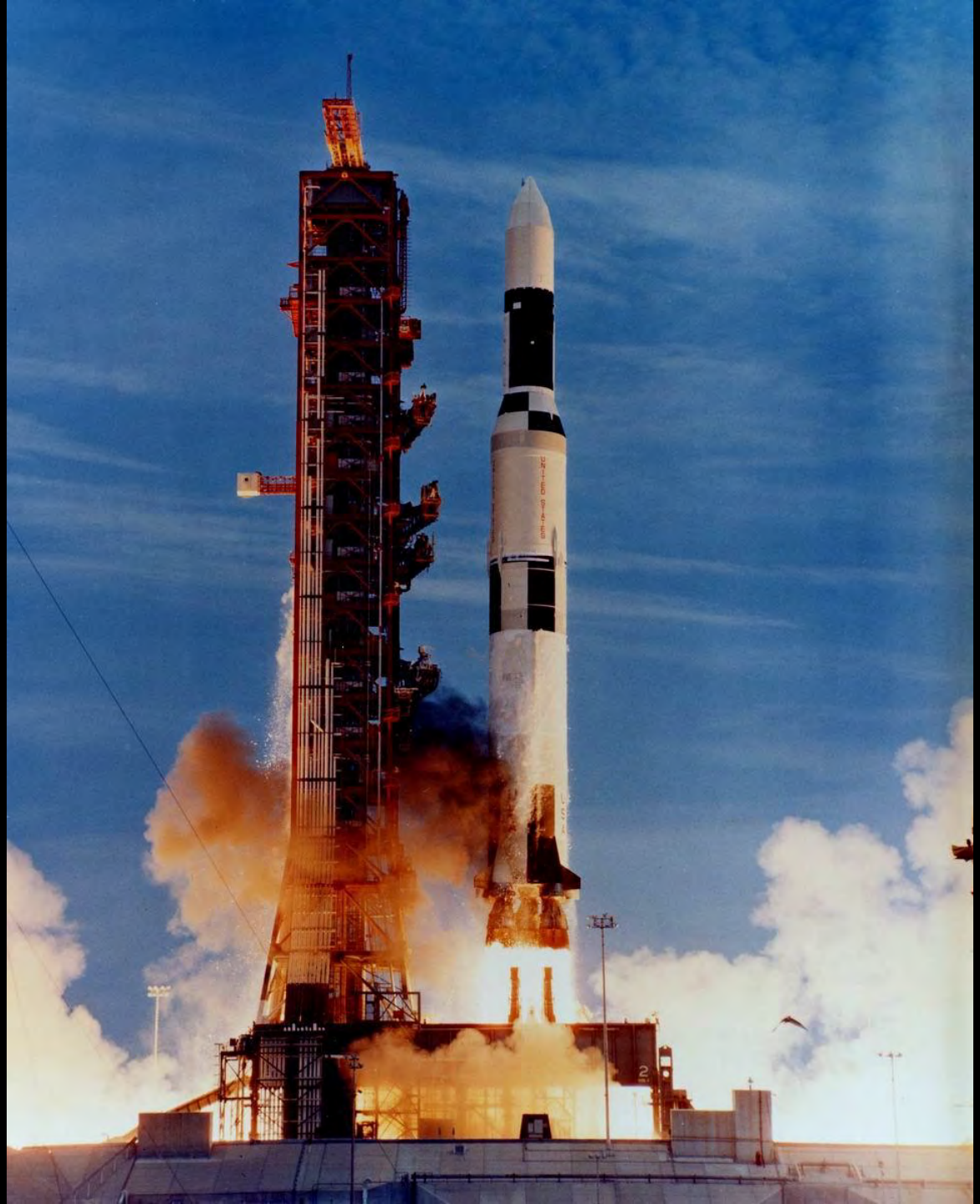
Délka: 36 metrů.

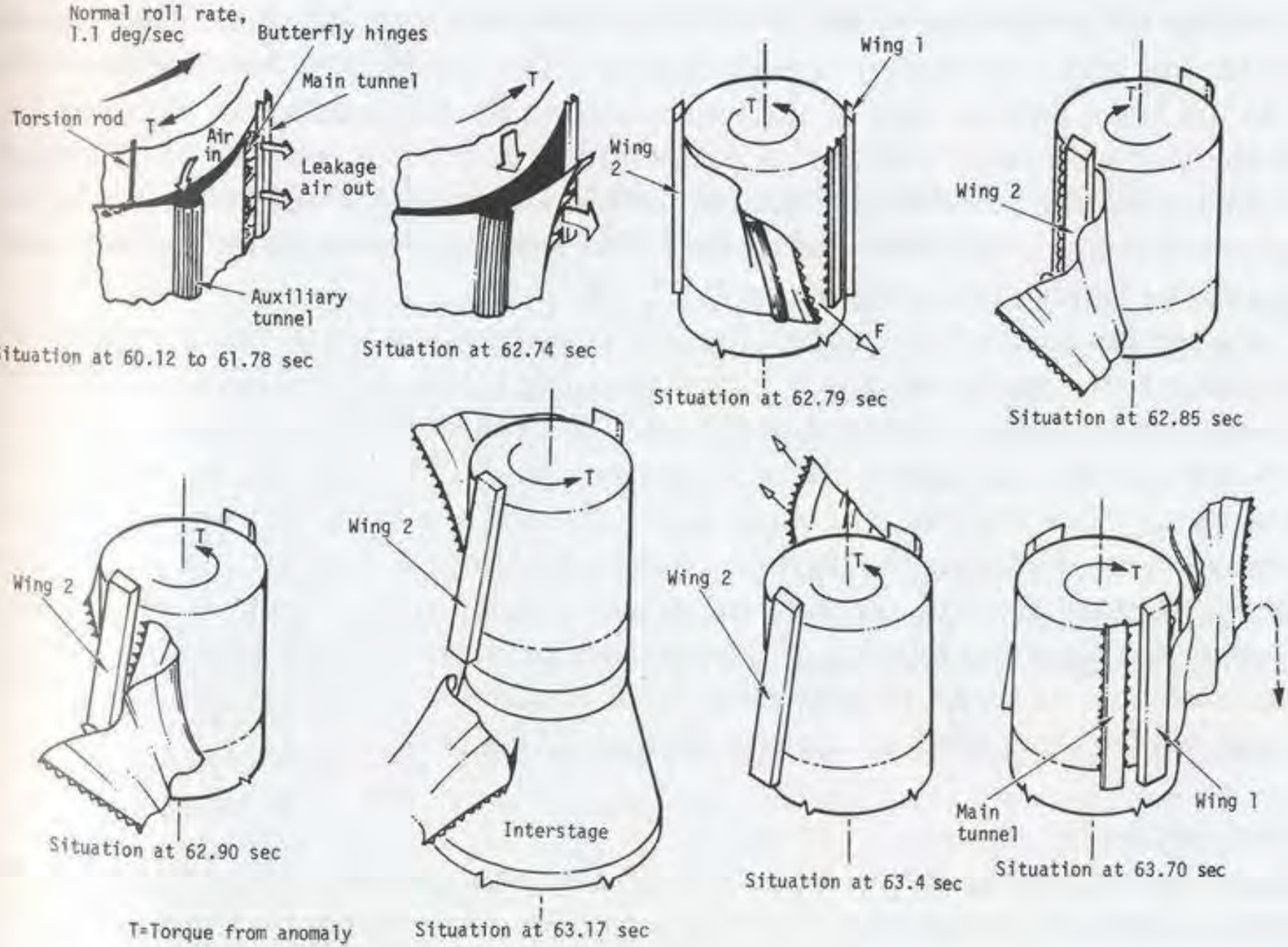
Hmotnost: 86725 kilogramů.

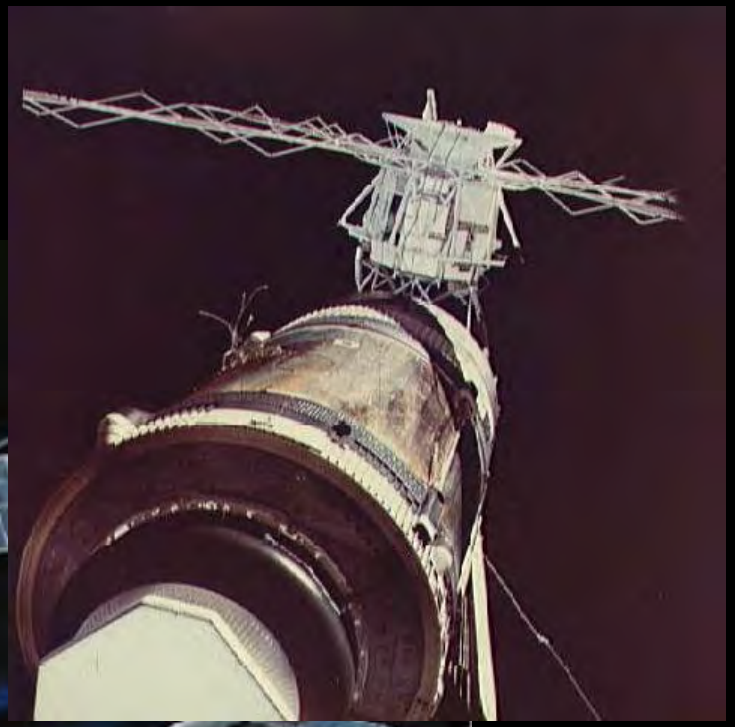
Obytný prostor 344 metrů krychlových.

Vlastní stanice, přechodová komora, univerzální adaptér, teleskop ATM (Apollo Telescope Mount).

14. května 1973


UNITED STATES


Normal roll rate,
1.1 deg/sec
Butterfly hinges
Main tunnel
Torsion rod
T
Air in
Leakage air out
Auxiliary tunnel
Situation at 60.12 to 61.78 sec
T
Situation at 62.74 sec
Wing 1
Wing 2
T
F
Situation at 62.79 sec
T
Wing 2
Situation at 62.85 sec
T
Wing 2
Situation at 62.90 sec
T
Wing 2
Interstage
Situation at 63.17 sec
T=Torque from anomaly
T
Wing 2
Situation at 63.4 sec
T
Main tunnel
Wing 1
Situation at 63.70 sec



První posádka

CDR: Charles Conrad (4).

SP: Joseph Kerwin (1).

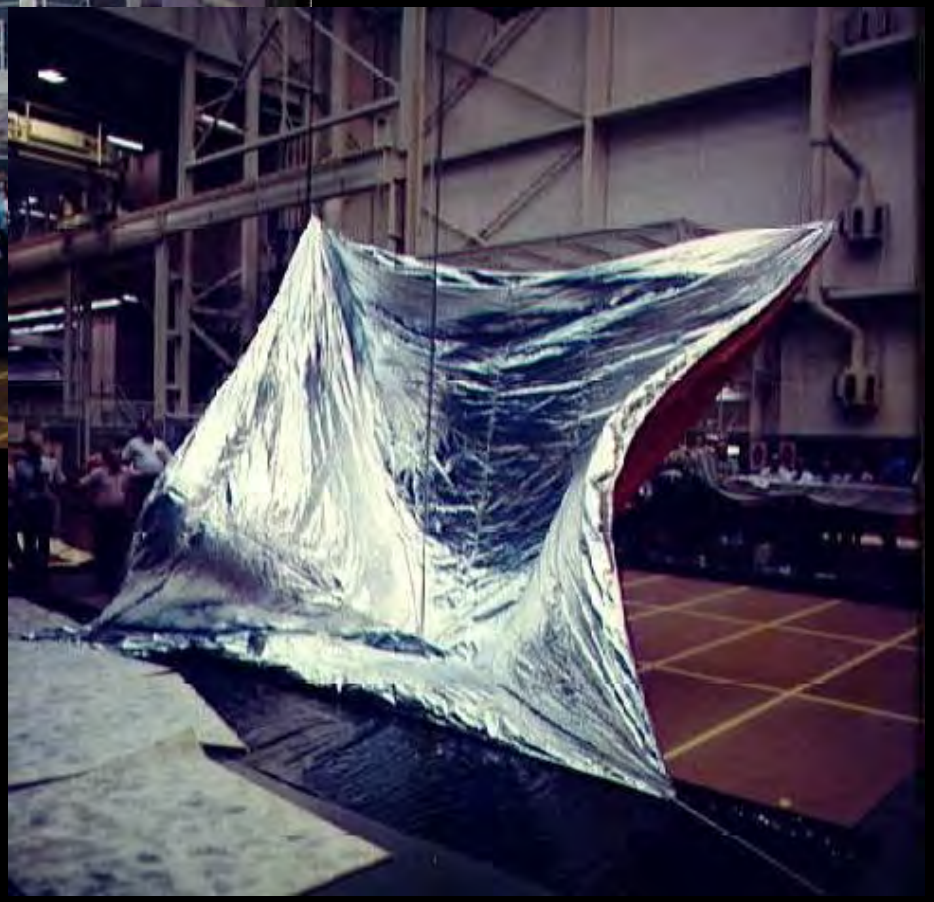
PLT: Paul Weitz (1).

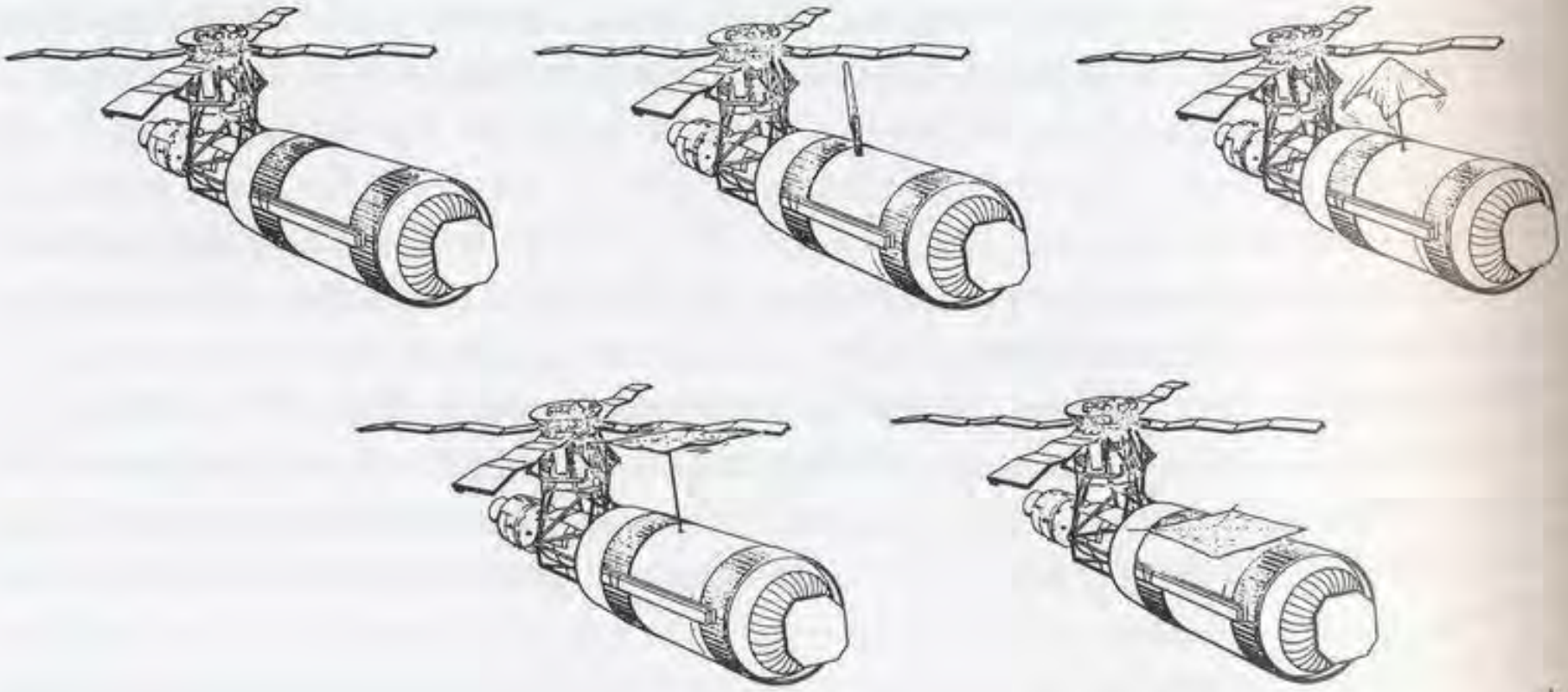
Start: 25. května 1973.

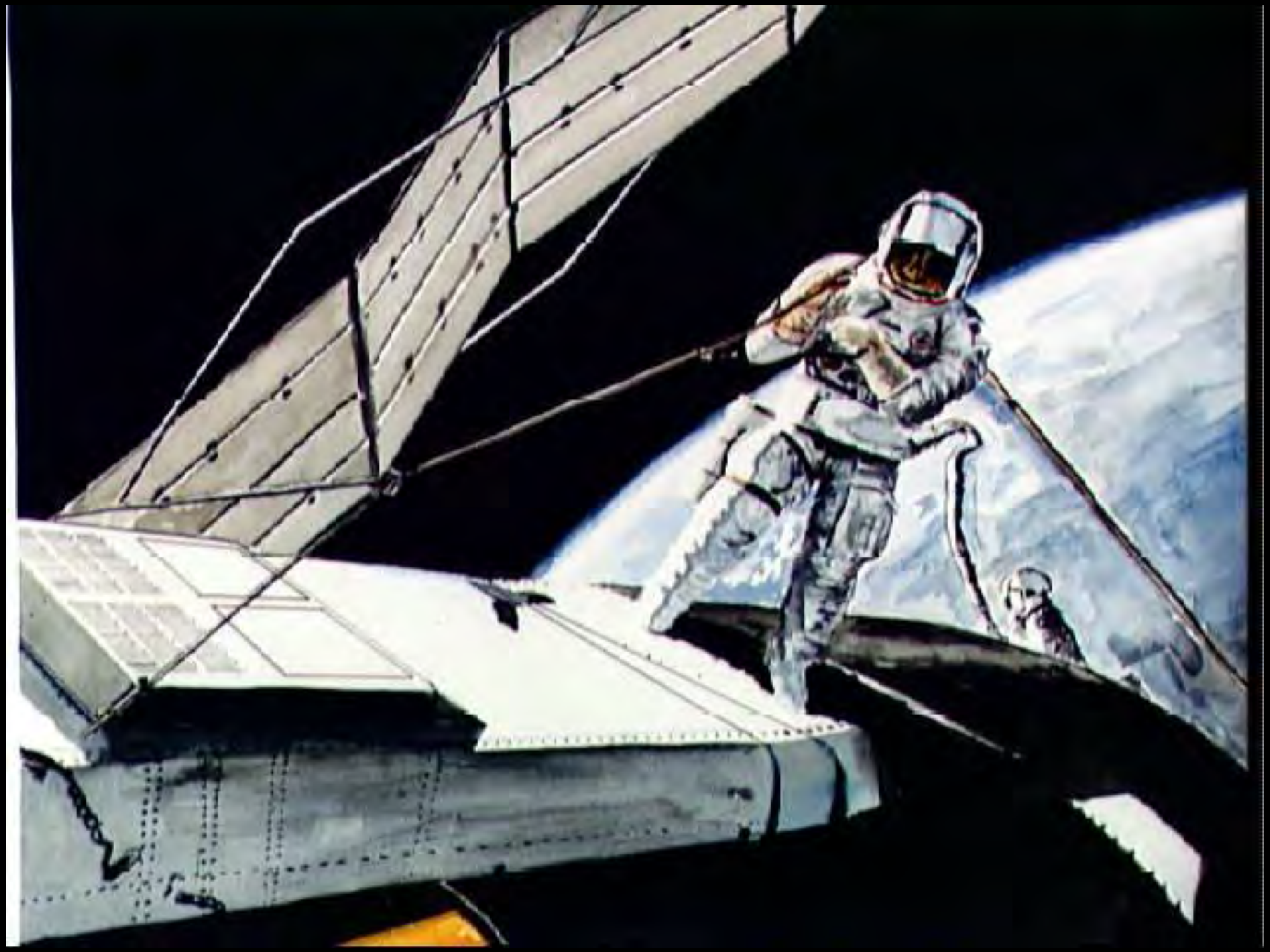
Přistání: 22. června 1973.

Let: 28 dní.


NASA
NASA
NASA





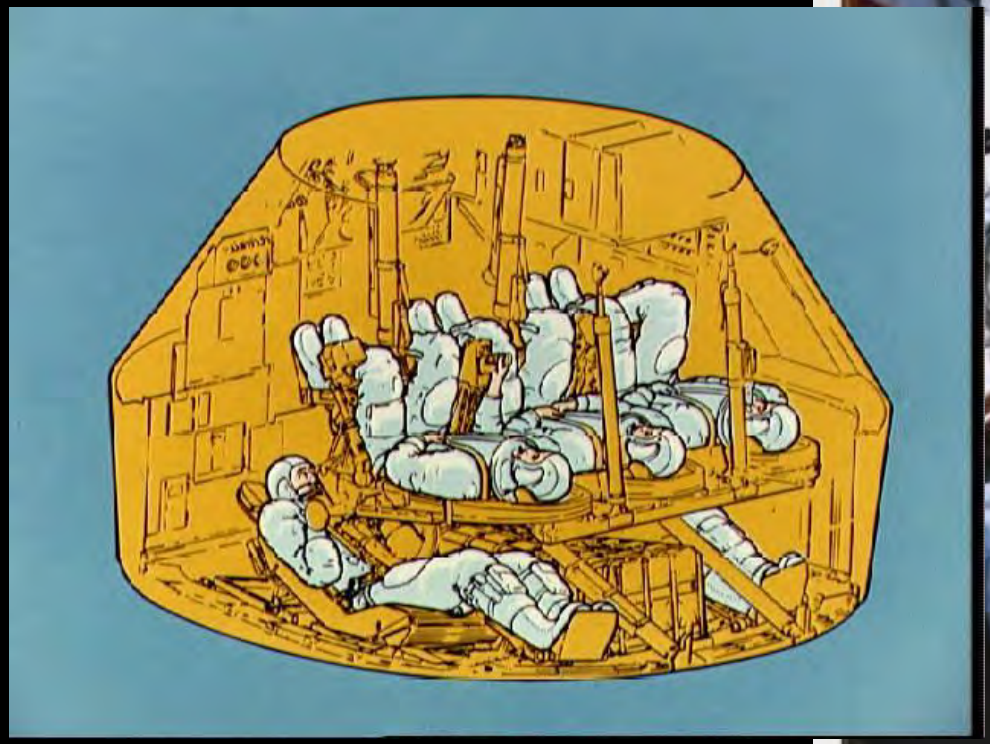


Druhá posádka


UNITED
STATES

Pavouk Arabella

Záchranná posádka



Třetí posádka

CDR: Gerald Carr (1).

SP: Edward Gibson (1).

PLT: William Pogue (1).

Start: 16. listopadu 1973.

Přistání: 8. února 1974.

Let: 84 dnů.


NASA
NASA
NASA

Čtvrtá posádka?

Vance Brand, Don Lind a William Lenoir.

Skylab druhý (SA-515)

Stop 13. srpna 1973

Do června 1974 žádné nevratné

Překlenutí mezery vs. přelití prostředků

Mise

SL-5 prosinec 1975: stanice

SL-6 prosinec 1975: trojice (návrat květen 1976)

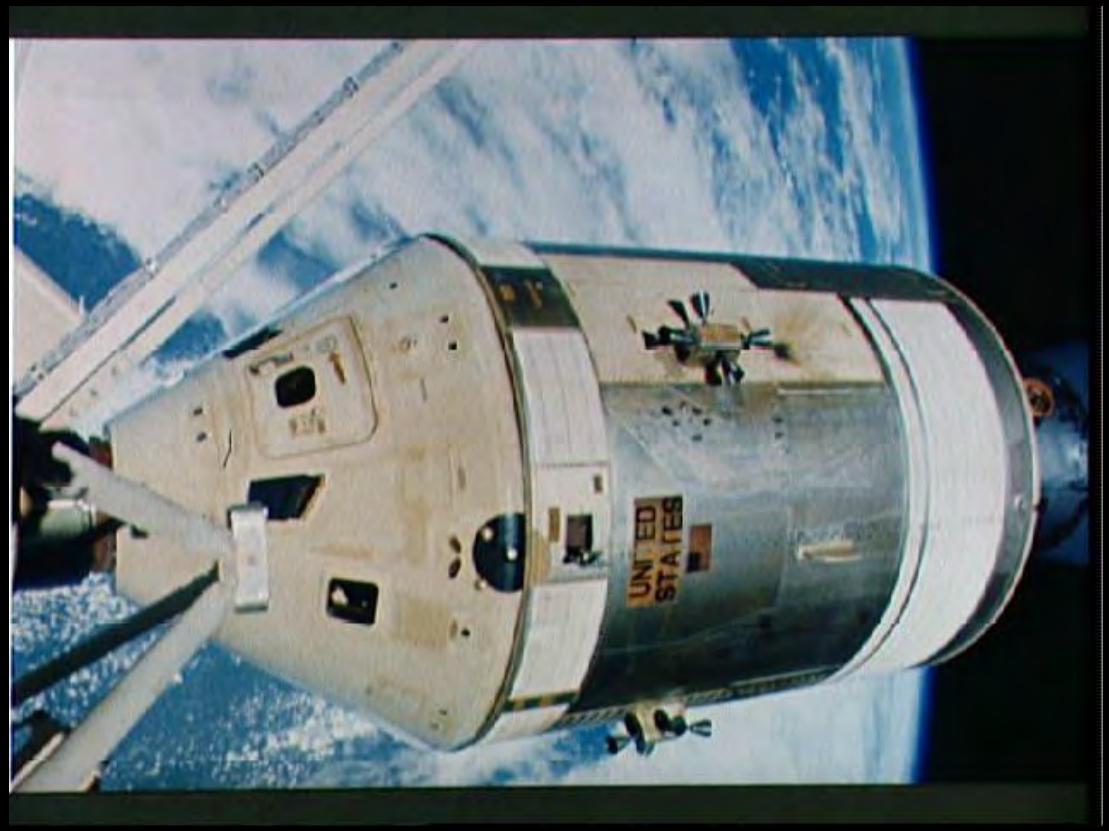
SL-7 březen 1976: dvojice (výměna lodi)

SL-8 červen 1976: trojice (návrat duben 1977)

SL-9 listopad 1976: dvojice (výměna lodi)

Posádka Brand, Lind, Lenoir

8. února 1974



Perigeum 433 km, apogeum 455 km.

Závěrečná kontrola

Snížení tlaku, změna orientace.

Březen 1983

Do roku 1980 perigeum o 2 km.

Dva roky – dalších 100 km.

1977 - ALT

Houston i Huntsville studie.

Skylab: pátý start (1979)

Inventura

Tepelná regulace – doplnění pracovní kapaliny.

Oprava elektroinstalace.

Doplnění komunikačních systémů.

Cca 1000 litrů vody (původně 3000 l)

„Pravděpodobně pitelná, ale asi bude chutnat hnusně. Nepředpokládají se v ní živé organismy, nicméně bude mít divnou barvu.“

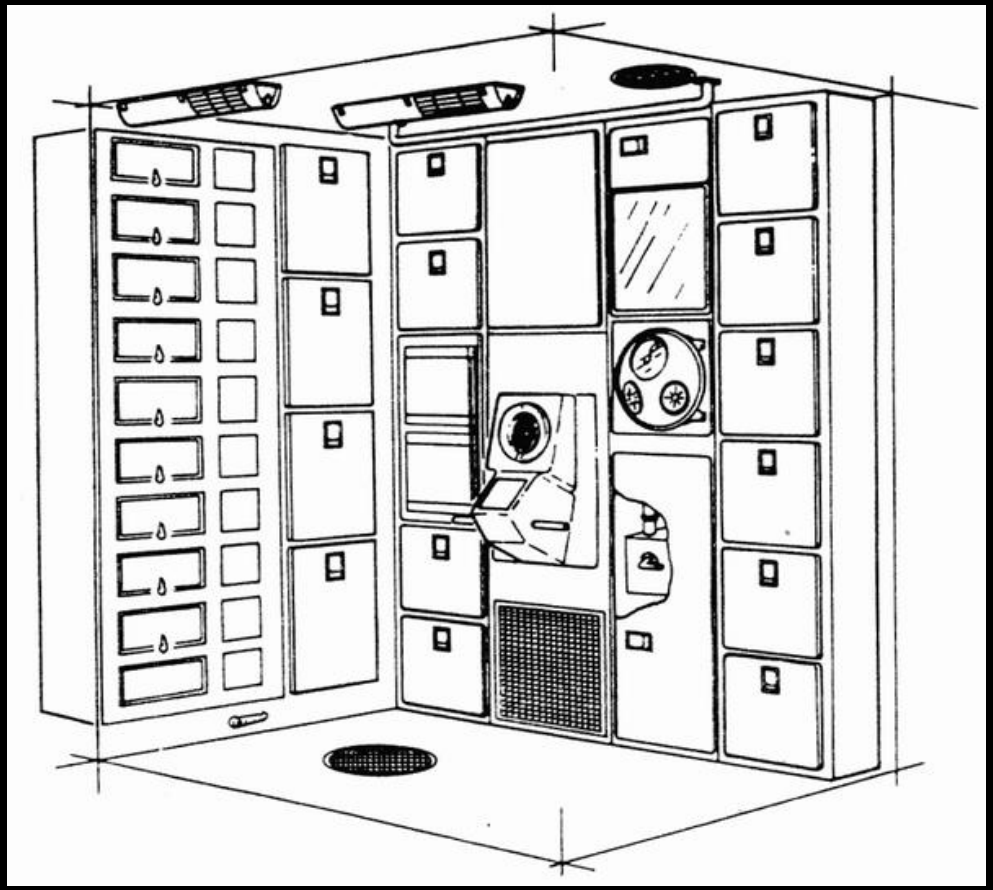
800 kg kyslíku (420 osobodní)

Tlak třetinový.

Přechodová komora vs. zvýšení tlaku.

Kryt na průlez pro výstup.

Biologové se těší



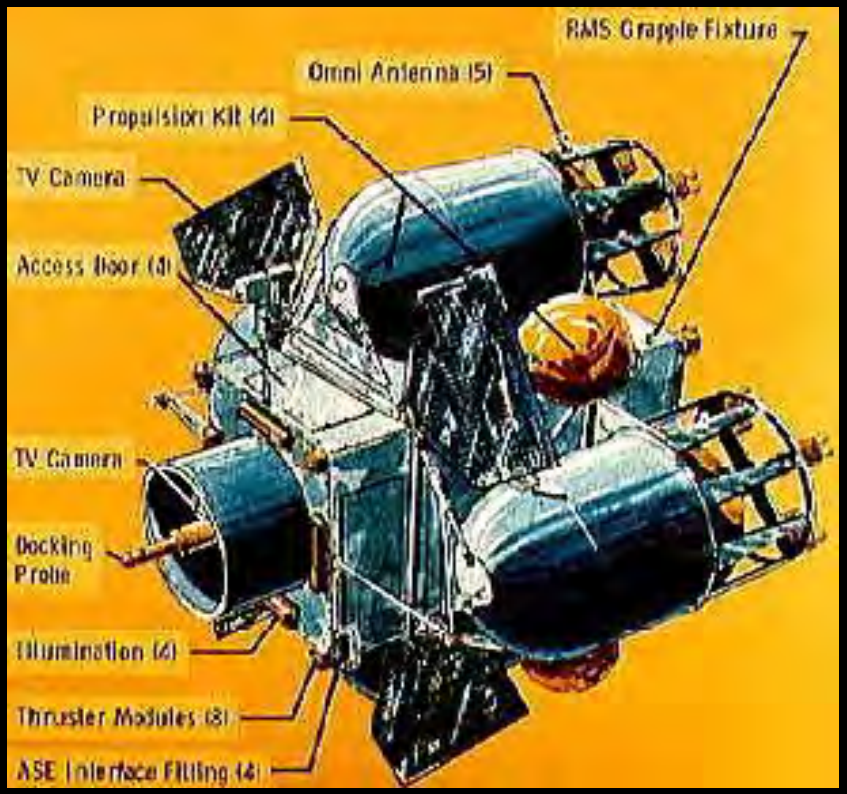
Několik set generací života (odpadky, exkrementy, plísně).

Stabilizace

Jeden gyroskop pryč, nedostatek dusíku (EVA), pryč hvězdné čidlo.

PEP (Power Extension Package)

Záchranný stupeň



Tlačení raketoplánem, tažení na laně…

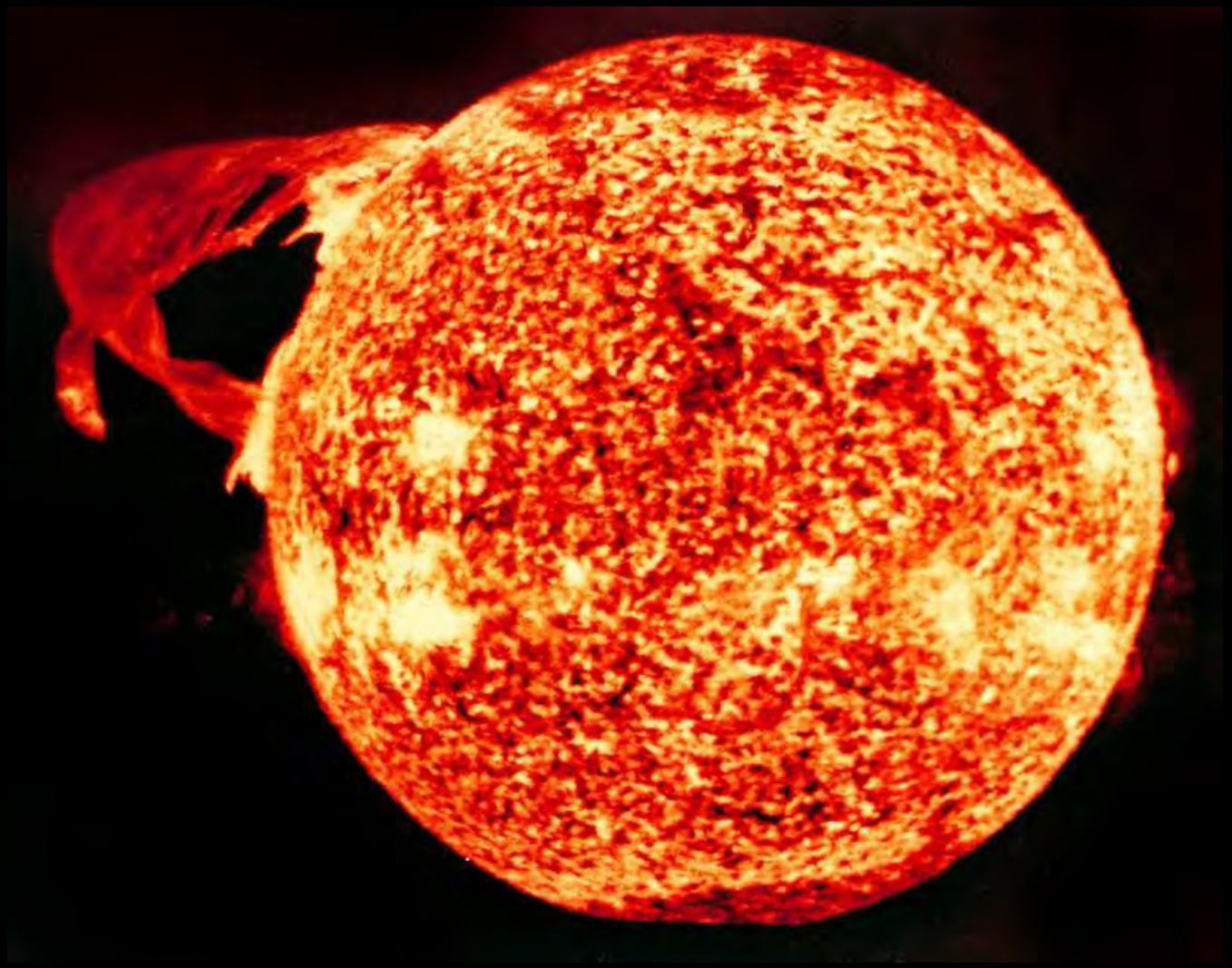
TRS (Tele-operated Reboost System)

Listopad 1977: Martin Marietta Corporation.

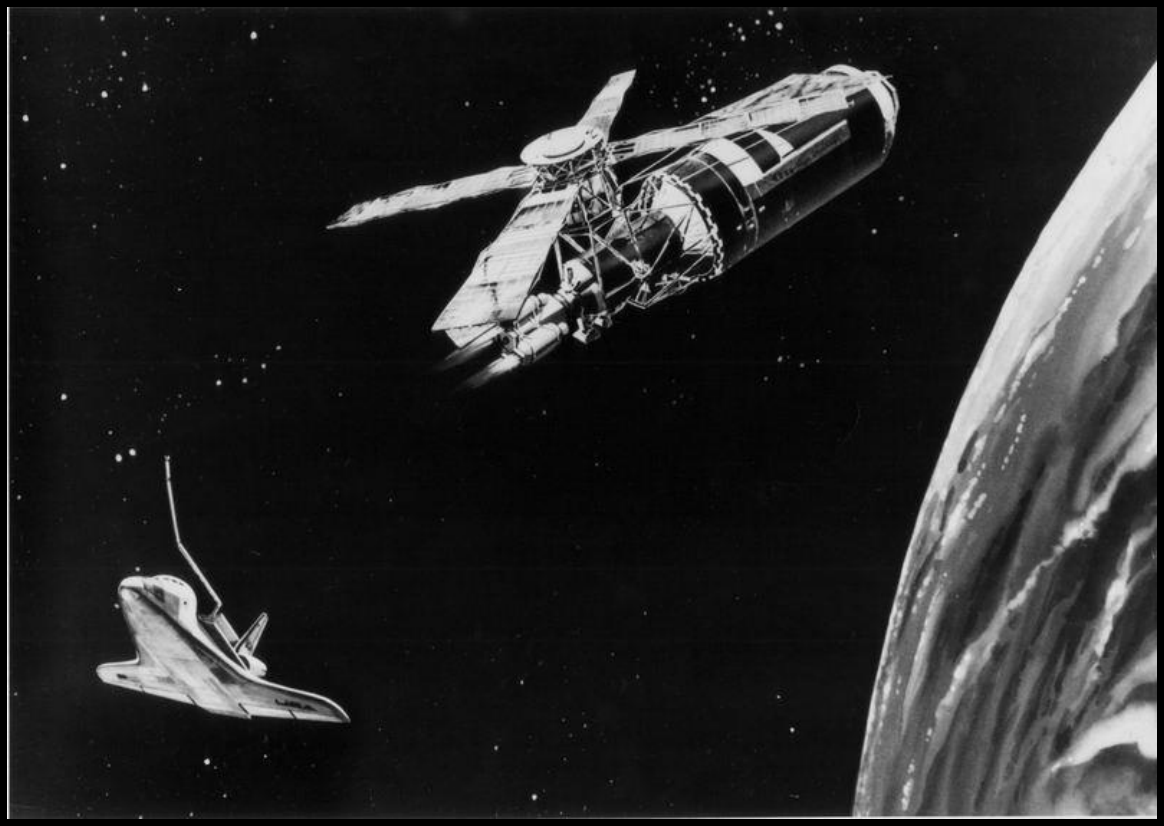
Délka 3,3 m, průměr 3,2 m.

Hmotnost 4392 kg, z toho pohonné látky 2744 kg.

První varování z NOAA



První fáze: záchrana



O pět až sedm let.

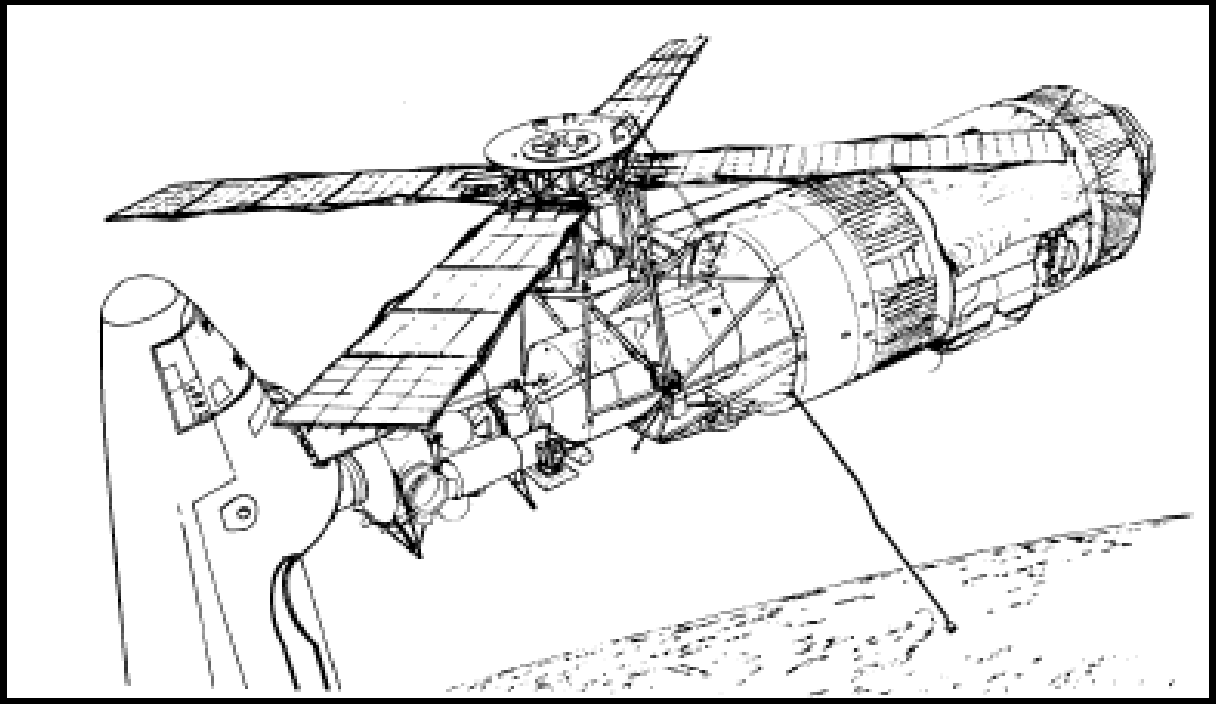
Fred Haise, Jack Lousma.

Druhá fáze - dovybavení

Leden 1982 - tunel.

Srpen 1983 - kontrola.

Třetí fáze



Několik návštěv – PEP, ATM oživení, nový logistický modul aj.

Čtvrtá fáze - využívání

Další moduly? Energetická platforma? Velká parabola?

Jenže…

Kosmos 954 (1978).

Řízený zánik?


USA
UNITED STATES
UNITED STATES

Prověrky stanice

Možnosti řízeného zániku.

Omezená komunikace - Bermudy

Záchrana třetí let

Září 1979.

Prosinec 1978

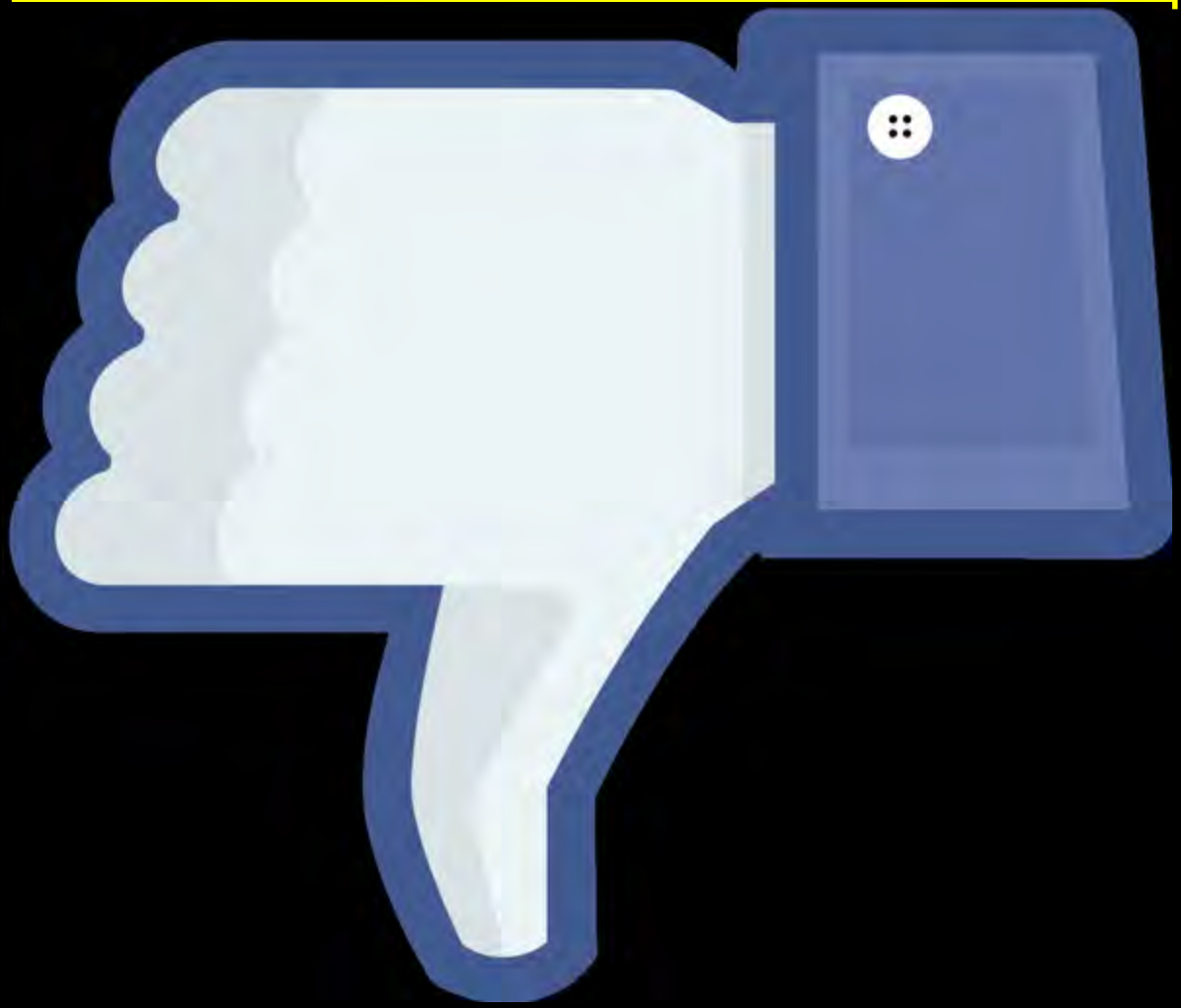
TRS téměř hotov.

Pět týmů se střídá na řízení Skylabu.

Jenže zároveň…

TRS na raketě Titan III?

15. prosince 1978



„Skylab není možné zachránit.“

11. července 1979

O devět hodin později zánik.


SKYLAB FRAGMENT

ZÁVĚR

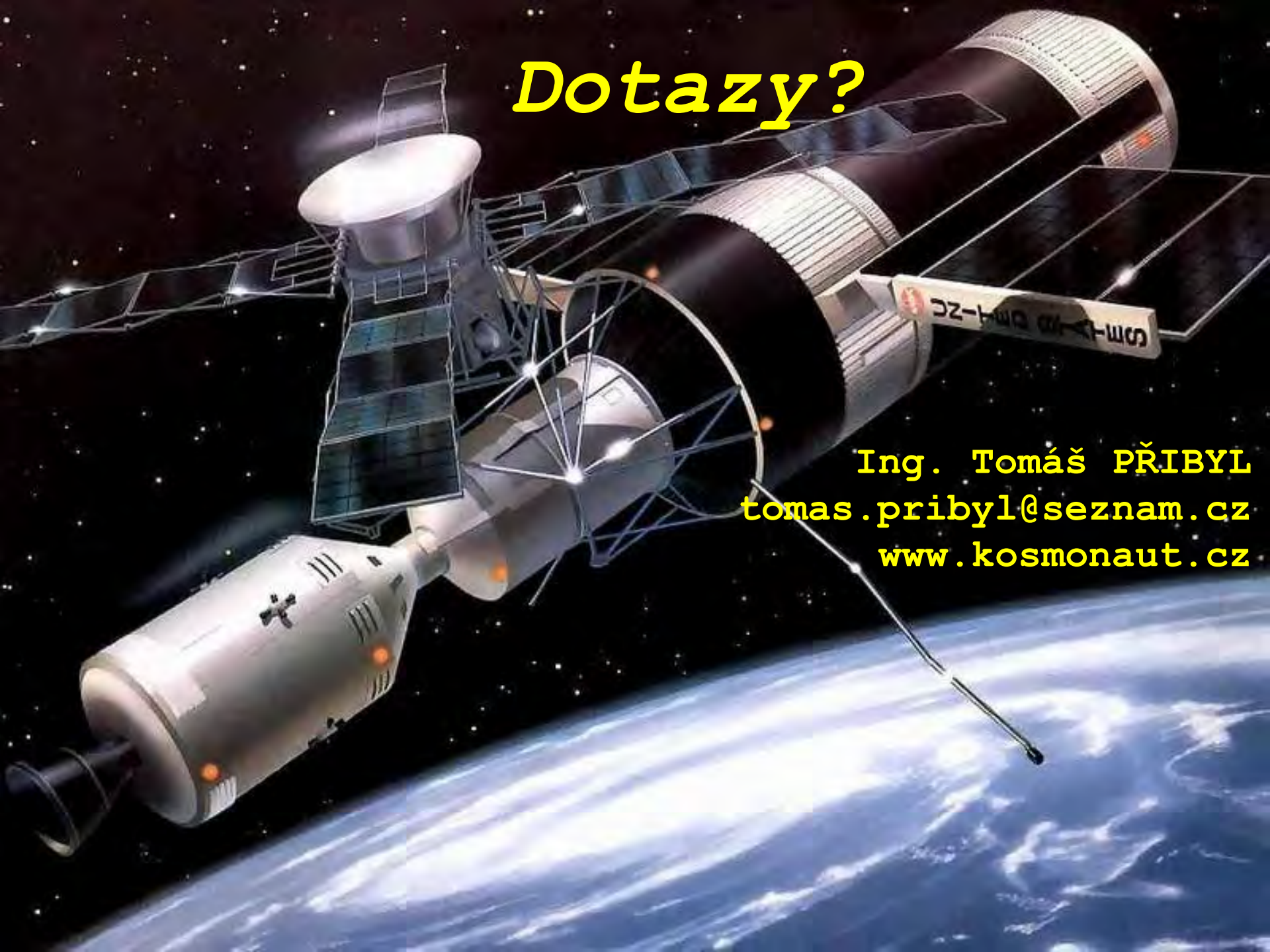

SA-209


SA-211

1- SA514, 2 – SA515, 3 – SA513

SA-515 první

SA-515 třetí


Dotazy?
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www.kosmonaut.cz