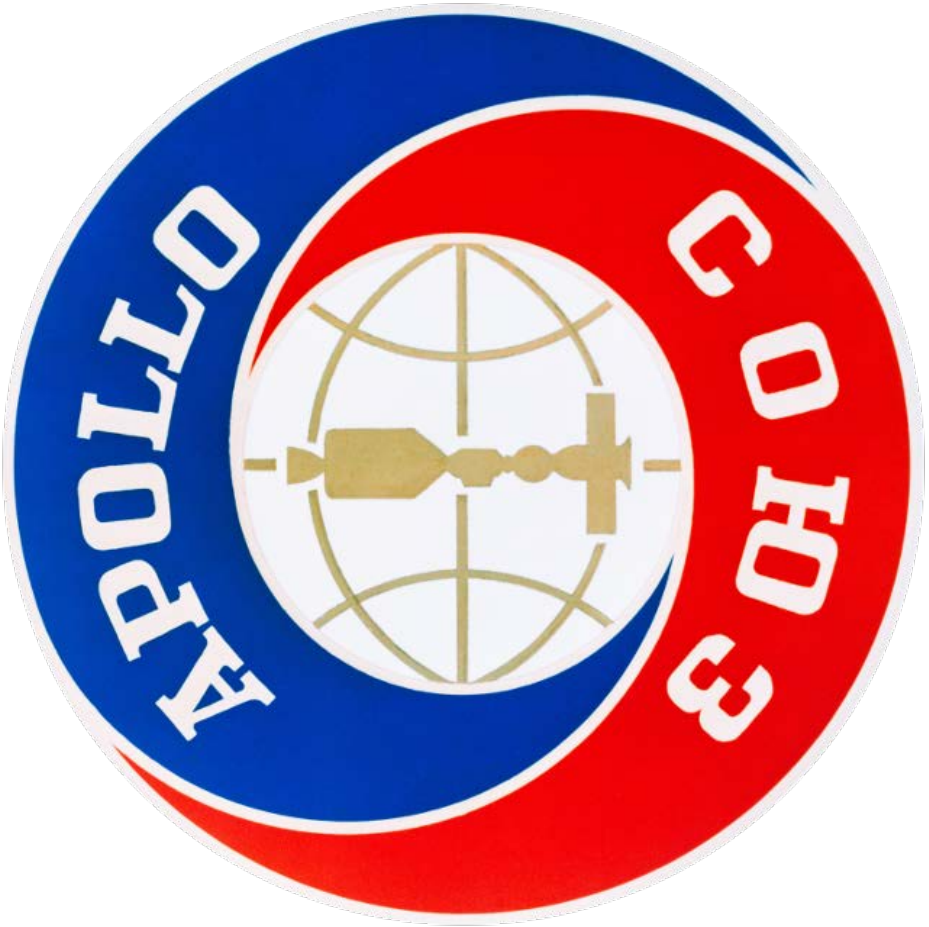



Karol J. Bobko

# Background

- Soviet –American cooperation in space had been discussed as early as 1962 by NASA's Hugh Dryden and Academician Blagonrovov.
- The major objectives for a cooperative space mission were:
  - 1) Demonstration in space of the new androgynous docking system, and
  - 2) Improvement of communication and reduction of Cold War tensions between East and West
- In October 1970 R. Gilruth headed a small NASA delegation for a visit to Moscow to promote space cooperation. That visit was successful.
- Following additional meetings, when President Nixon visited Moscow in May 1972, he and Alexei Kosygin signed an agreement providing for cooperation and the peaceful uses of space
  - The leaders specifically approved the Apollo-Soyuz flight being planned and they agreed on a 1975 launch.
- Dr. Glynn Lunney was appointed as the U.S. technical director of the project
- The US crew was announced in January; the USSR crew in May of 1973
- The first training visit was cosmonauts visiting JSC in July of 1973

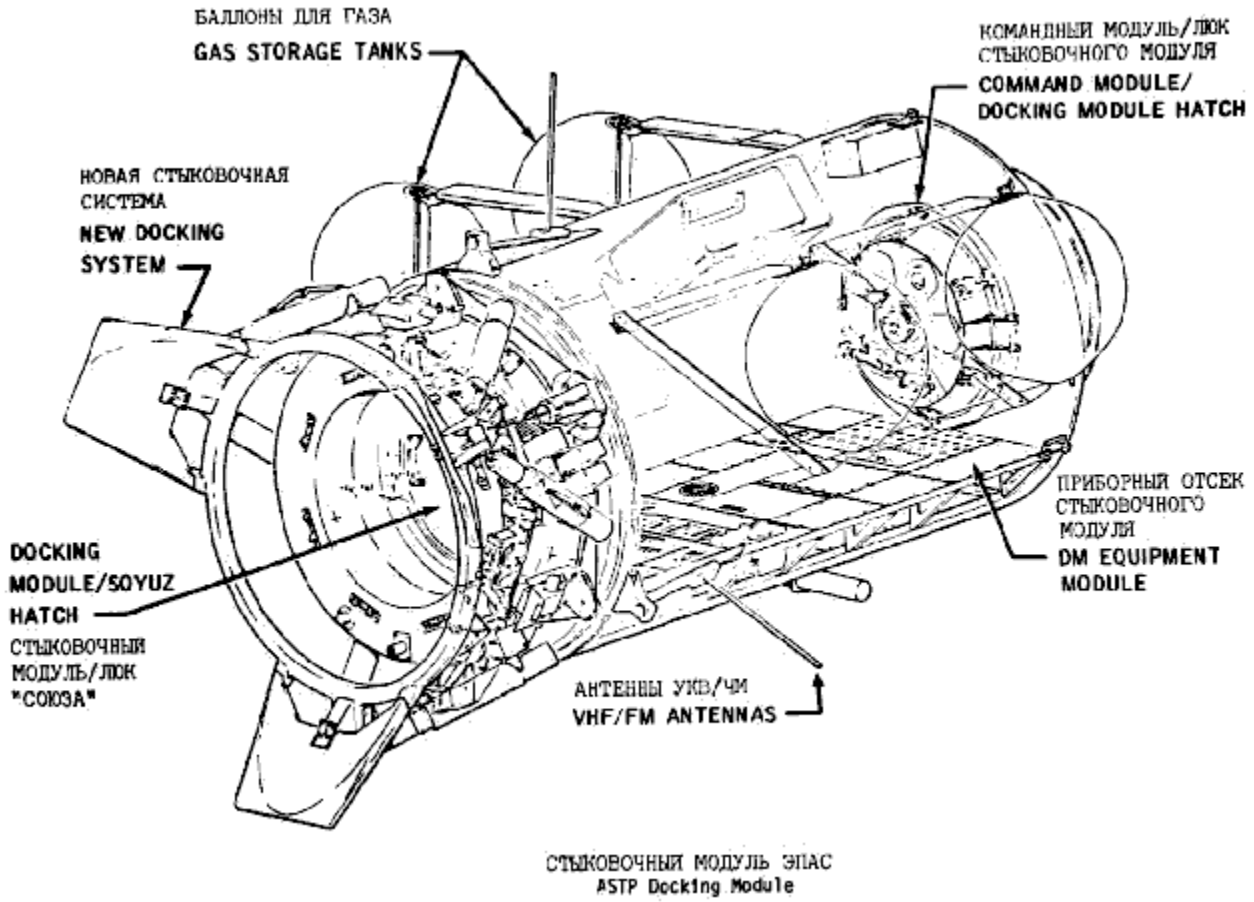
# System Changes

- A Docking Module was developed to:
  - Act as an airlock between the two spacecraft
    - The Apollo operated with a 100% oxygen but at .34 atmospheres
    - The Soyuz normally operated at 1.0 atmospheres but for this flight it operated at .68 atmospheres
    - Since the difference between the modules was only .34 atmospheres it was felt the danger of going from one pressure to the other, without pre-breathe, was minimal.
  - The Docking Module had extra oxygen and nitrogen and executed the change in pressures to allow passage back and forth between the modules
  - The docking module had no capability to remove CO2

# Docking Module (Cont.)

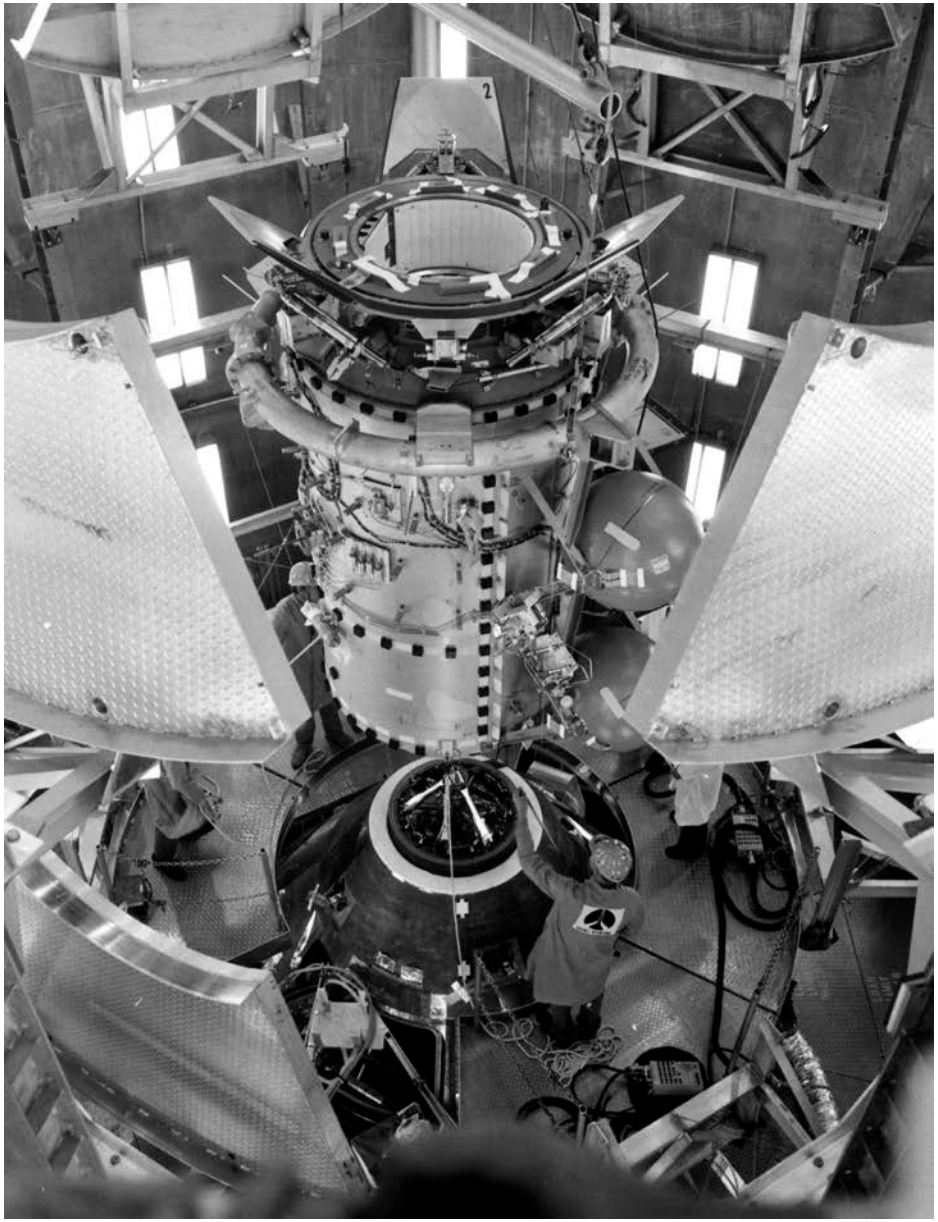
- The front end of the Docking Module had the APDS, which was used to dock with the Soyuz
- The rear part of the Docking Module had the probe and drogue system which was used to dock with the Apollo Command Module.

# Docking Module



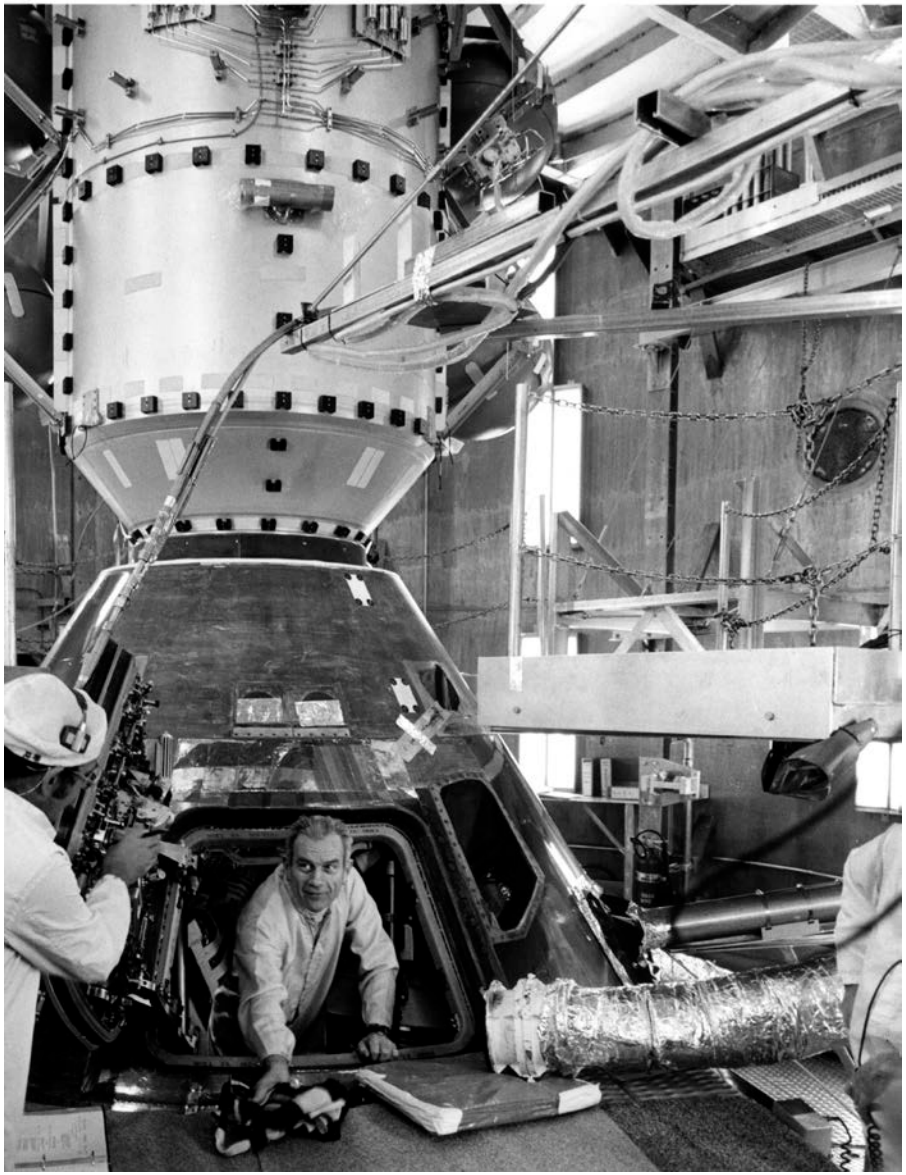
# Docking Module

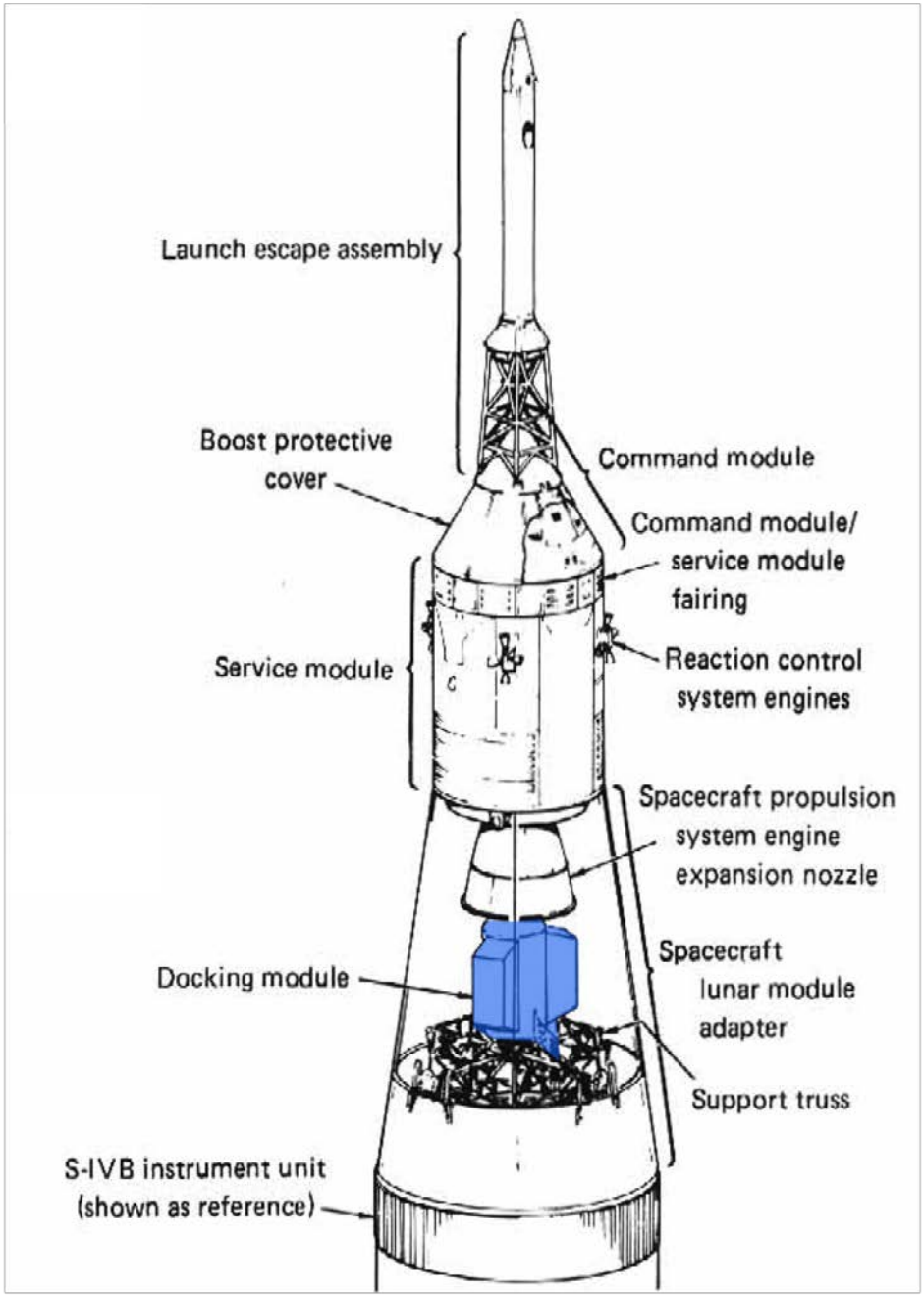
(In the vacuum chamber at KSC)
Note the Probe on the Apollo spacecraft at the lower part of the picture
Note the APDS on the upper part of the Docking Module



# Docking Module

- Deke Slayton participating in the fit checks between the Apollo spacecraft and the docking module.






- The Docking Module was flown into orbit behind the Command Module.

- The module was in the place where the Lunar Excursion Module (LEM) was normally located on lunar missions.

- Once on orbit the Command Module:
  - was separated from the Saturn 1B stack,
  - turned around,
  - docked with the Docking Module
  - separated the Docking Module from the Saturn 1B stack now attached to the front of the Command Module.

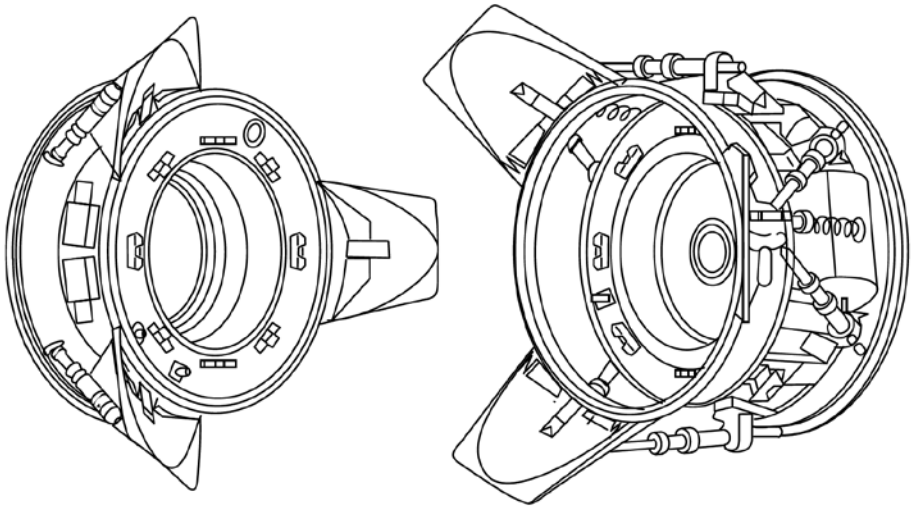
# Docking Module (Cont.)

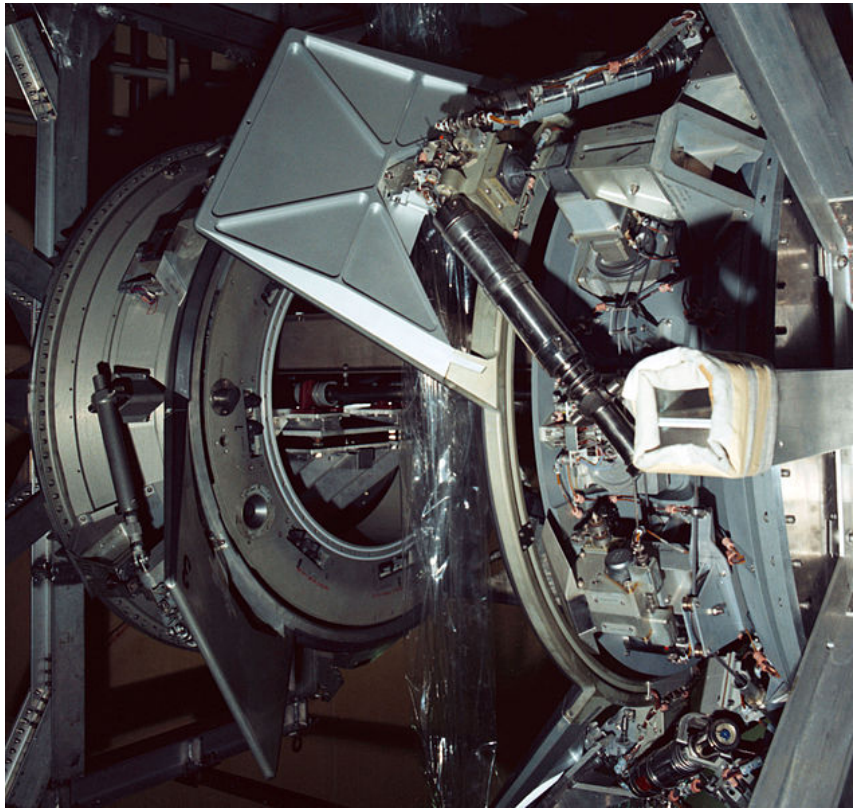
- The Docking Module had other necessary systems such as:
  - VHF/FM Transceiver
  - Environmental control system
  - Communications
  - Lighting
  - Electrical power
  - Control and display panels
  - Storage compartments
- The Docking Module was built in the US

# Androgynous Peripheral Docking System

- Neither the US or USSR had used such a system before
- Requirement was that either side of the system could be active
- The US and USSR systems were slightly different  in design
  - The US system used shock absorbers to absorb the docking impact
  - The Soviet unit used a gear system
- NASA equipped the space shuttle with Russian-built APDS units for the shuttle-Mir and International Space Station program dockings.

# Androgynous Peripheral Docking System





# US Launch Booster

- On the American side the Apollo spacecraft was launched with a Saturn 1B rocket
  - This rocket had been planned to be used in the Skylab program and was adequate to boost the Apollo Space Craft to Low Earth Orbit
  - The rocket was launched from a Saturn 5 Mobile Launch Platform
    - Since the Saturn 1B was much smaller than the

    Saturn 5 a platform was built to bring the spacecraft up

    to the Crew Access Arm

# Saturn 1B

# USSR Preparations

- Add the APDS docking system to the Soyuz
- Modify the life support system so it could accommodate three people
- Add solar arrays to the Soyuz
- The USSR had a number of test flights of the modified Soyuz
  - Two flights were unmanned (Cosmos 638 & Cosmos 672)
  - One precursor manned flight
    - Crew was composed of: Anatoly Filipchenko and  Nikolai Rukavisnikov

## US Crew

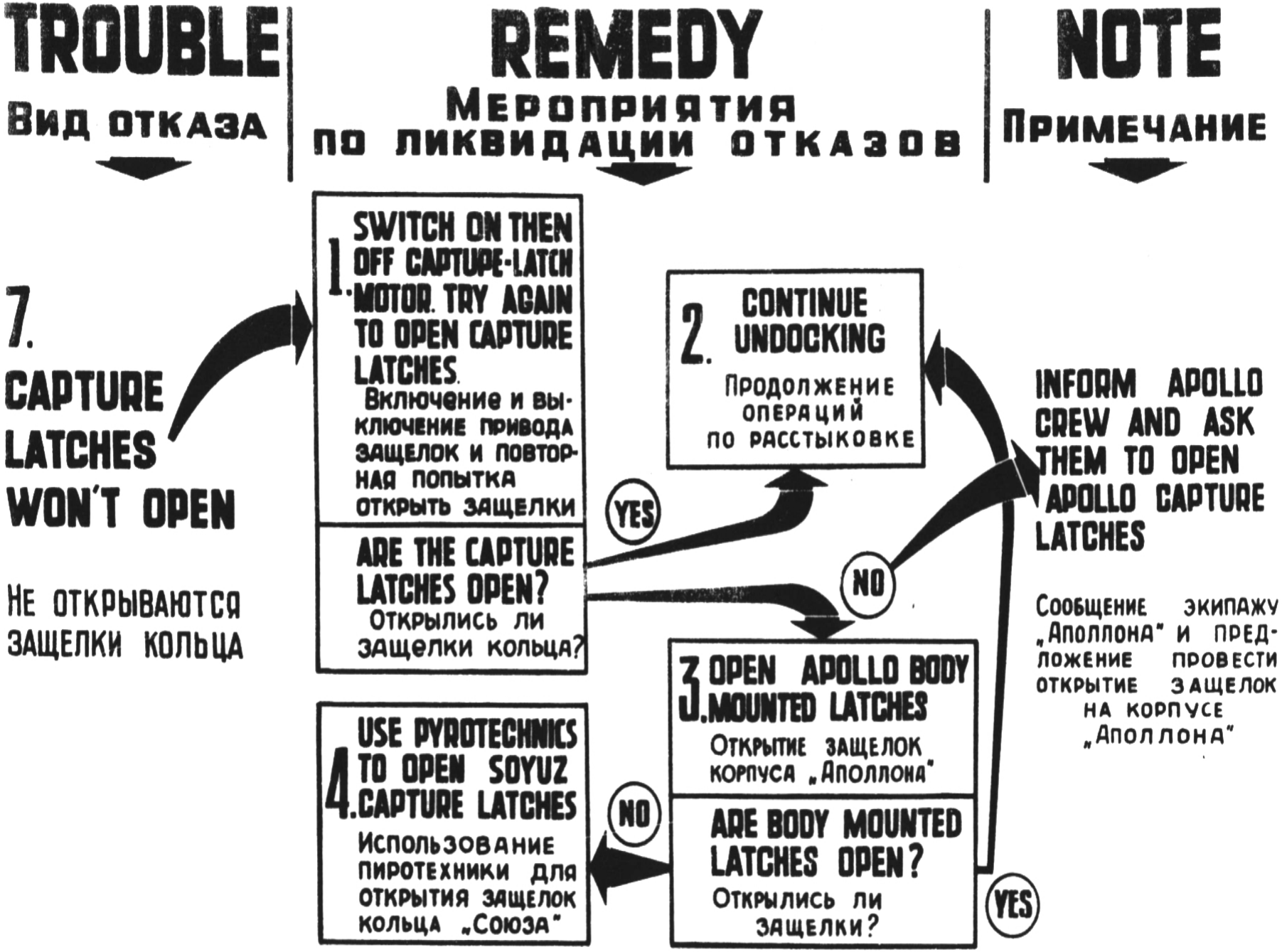
Tom Stafford
Deke Slayton
Vance Brand

## Soviet Crew

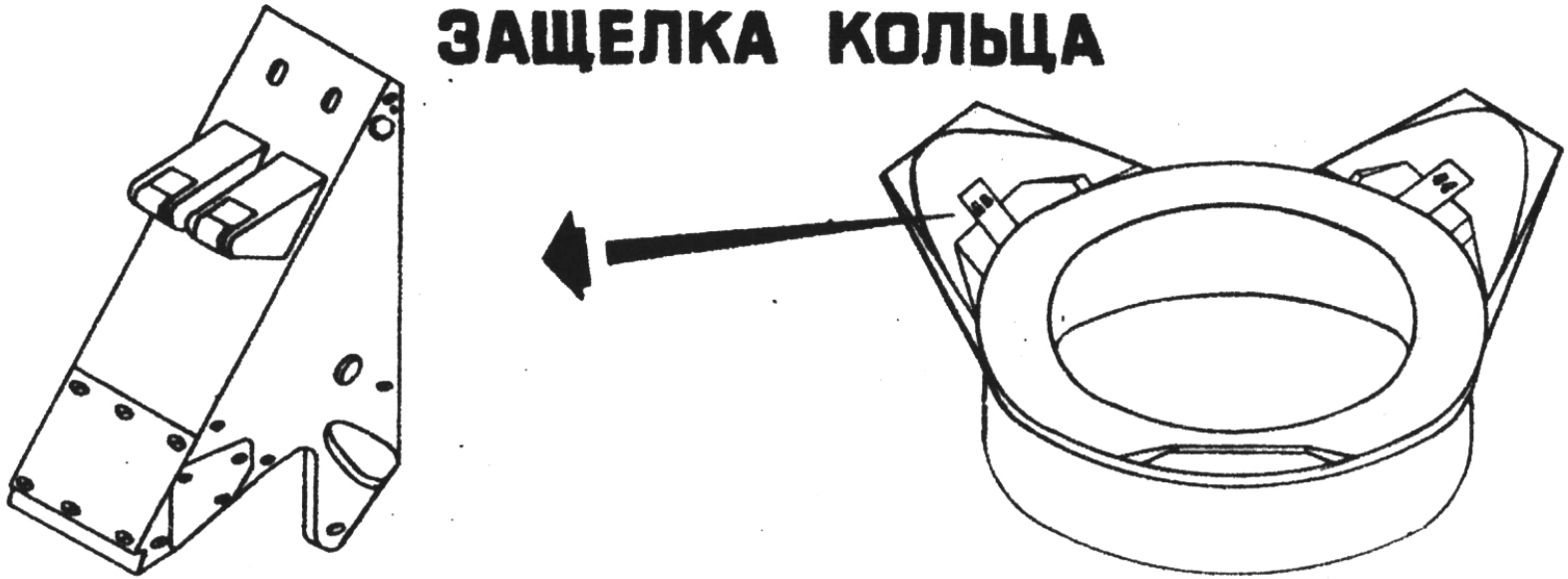
Alexey Leonov
Valerey Kubasov

# Communications

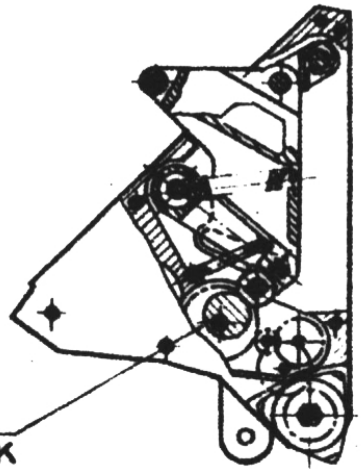
- Both of the crews studied the other crew's language
- When the Russians spoke to the Americans, they spoke in English
- When the Americans spoke to the Russians, they spoke in Russian
- The normal and emergency procedures communication was kept as simple as reasonable and tried to follow these rules:
  - Tell the other crew what has happened or has been done
  - Indicate the significance of the item
  - Indicate what the other crew needs to do
- As an example, if a rocket thruster failed during the Command Module's approach to the Soyuz the communication might be:
  - "We have lost a thruster"
  - "We will stop the approach"
  - "Contact Moscow."


TROUBLE
Вид отказа
REMEDY
Мероприятия по ликвидации отказов
NOTE
Примечание
7. CAPTURE LATCHES WON'T OPEN
Не открываются защелки кольца
1. SWITCH ON THEN OFF CAPTURE-LATCH MOTOR. TRY AGAIN TO OPEN CAPTURE LATCHES.
Включение и выключение привода защелок и повторная попытка открыть защелки
ARE THE CAPTURE LATCHES OPEN?
Открылись ли защелки кольца?
YES
2. CONTINUE UNDOCKING
Продолжение операций по расстыковке
NO
INFORM APOLLO CREW AND ASK THEM TO OPEN APOLLO CAPTURE LATCHES
Сообщение экипажу „Аполлона" и предложение провести открытие защелок на корпусе „Аполлона"
3. OPEN APOLLO BODY MOUNTED LATCHES
Открытие защелок корпуса „Аполлона"
ARE BODY MOUNTED LATCHES OPEN?
Открылись ли защелки?
YES
NO
4. USE PYROTECHNICS TO OPEN SOYUZ CAPTURE LATCHES
Использование пиротехники для открытия защелок кольца „Союза"

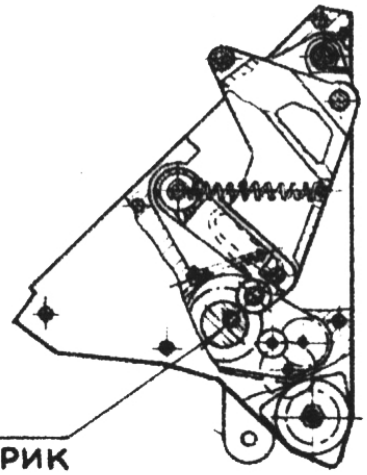
# CAPTURE LATCH
## ЗАЩЕЛКА КОЛЬЦА



ЗАКРЫТА
**LOCKED**




ОТКРЫТА
**UNLOCKED**



# Crew Training

- A number of trips were made by astronauts to Star City and Cosmonauts to the Johnson Space Center to become familiar with each others hardware and procedures
  - Cosmonauts to JSC in July ‘73, April ‘74, Sept. ‘74, Feb. ‘75
  - Astronauts to Star City in November ’73, April 74, April ’75
- The trips had the following focus:
  - Orientation
  - Normal procedures
  - Emergency procedures
- The trips were from two to three weeks long
  - A trip was made to the US launch site in Florida and the Soviet launch site at Baikonur

# Crew Training (Cont)

- There were quite a few social activities included in each trip
- Since a three week trip would normally include the travel time over and back that meant there might be 12 working days in the trip
- Given the fact that when each crew was in the other's country there was a requirement for interpretation, which took time. Twelve working days meant there was really only time for an orientation and not a deep understanding.
- As part of the mission control team I had a fourth visit to the control center.
- There were four integrated simulations which included the crews and the two mission control centers.

Soyuz Launch
July 15, 1975
1220 UTC
Baikunor
Cosmodrome

Saturn 1B
Launch
July 15,1975
1950 UTC
Kennedy
Space Center