

## Encyclopedia Astronautica

### Soyuz 1

Crew: Komarov. Space disaster that put back Soviet lunar program 18 months. Soyuz 1 was to dock with Soyuz 2 and transfer crew. Instead Soyuz 1 solar panel didn't deploy; manual reentry; tangled parachute lines; astronaut killed on impact with earth. Backup crew: Gagarin.

Space disaster that put back Soviet lunar program 18 months. Soyuz 1 as active spacecraft was launched first. Soyuz 2, with a 3 man crew would launch the following day, with 2 cosmonauts spacewalking to Soyuz 1. However immediately after orbital insertion Komarov's problems started. One of the solar panels failed to deploy, staying wrapped around the service module. Although only receiving half of the planned solar power, an attempt was made to manoeuvre the spacecraft. This failed because of interference of the reaction control system exhaust with the ion flow sensors that were one of the Soyuz' main methods of orientation. The decision was then made to bring Komarov back. Re-entry was successful and the drag chute deployed. However due to a failure of a pressure sensor, the main parachute would not deploy. Komarov released the reserve chute, but it became tangled with the drag chute. The descent module crashed into a field near Orenburg at 7 am.

Despite the various failures on the three previous Soyuz 7K-OK test flights (Kosmos 133, Kosmos 140A, and Kosmos 140), Brezhnev and Ustinov pressured Mishin to proceed with an attempt to accomplish the 'all up' manned rendezvous, docking, and crew transfer spectacular that would eventually be accomplished by Soyuz 4 and Soyuz 5. Komarov was the pilot for the Soyuz 1 active spacecraft, which would be launched first. Soyuz 2, with the crew of Bykovsky, Khruonov, and Yeliseyev would launch the following day, with Khruonov and Yeliseyev spacewalking to Soyuz 1 and returning to earth with Komarov. Not only would this mission show the superiority of Soviet technology, compared to that in America just after the Apollo 204 fire, but it would prove several key elements (first orbit rendezvous, crew transfer via spacewalk) of the planned lunar landing mission.

However immediately after orbital insertion Komarov's problems started. One of the solar panels failed to deploy, staying wrapped around the service module. Although only receiving half of the planned solar power, an attempt was made to manoeuvre the spacecraft. This failed because of interference



Soyuz 1 Crash Site



Soyuz 1 Crash Site



Soyuz 1 Crash Site

Komarov  
Komarov before Soyuz 1

0 - A - B - C - D - E - F - G - H - I - J - K - L - M - N - O - P - Q - R - S - T - U - V - W - X - Y - Z - Search Alphabetical Index - Major Articles - People - Chronology - Countries - Spacecraft and Satellites - Data and Source Docs - Engines - Families - Manned Flights - Cancelled Flights - Rockets and Missiles - Rocket Stages - Space Poetry - Space Projects - Propellants - Launch Sites - Any Day in Space History USA - A Brief History of the HARP Project - Saturn V - Cape Canaveral - Space Suits - Apollo 11 - Women of Space - Soviets Recovered an Apollo Capsule! - Apollo 13 - Apollo 18 - International Space Station - Shuttle - N1 - Baikonur - Search - Buran - The Real Moon Landing Hoax - Tereshkova - Russia - LK - The Hard Road to Space - Shenzhou - Apollo CSM - Gagarin - Energia - V-2 - Dynasoar - Soviet Space History - MOL - Vostok 1 - Road to the Stars - Soyuz 1 - Apollo 8 - Babylon Gun - Armstrong - Apollo - Atlas V - Chinese Lunar Base - Polyus - Soyuz - Contact - Space Station Freedom - V-3 - Navstar - Atlas - China - Sea Dragon - Gemini - Mars Expeditions - Your Flight Has Been Cancelled... - Almaz - Delta - Apollo LM - Skylab - Bulava - Lox/Kerosene - Shepard - Hermes - Vandenberg - Why did the Soviet Union lose the Moon Race? - Proton - Lox/LH2 - Titan - Otrag - Solid - Germany - Atlantis - Sputnik 2 - Gun-launched - Saturn I - Nova - Was the Soyuz Design Stolen? - Apollo 7 - Soyuz 7K-LOK - Soyuz - HL-20 - Russian SAMs and ABMs - STS - STS-41-G - N204/UDMH - Jemison - ISS - By Gemini to the Moon! - Third Generation Soviet Space Systems - Apollo 20 - F-1 - Early Russian Ballistic Missiles - UR-700 - Astronaut Statistics - The Wrong Stuff - A Catalogue of Launch Vehicle Failures - Kourou - Skylab - Apollo - Venera - Lunar Bases - Peenemuende - Composite Solid Propellants - Contacting Astronauts and Cosmonauts - SHARP - Soyuz 7K-L1 - Kapustin Yar - Gemini 8 - Lunar Landers - Apollo 9 - RSA - Lenticular Vehicles - Gnom - Sputnik 1 - S-300 - Apollo 17 - Standard SM-3 - Shuguang 1 - Apollo 10 - Cuxhaven - Apollo 12 - Soyuz TMA - Salyut - Sputnik Plus 50 - A9/A10 - Kipper - Navaho - Bio-Suit - Vostok - Manned Space Firsts - Soyuz 11 - Challenger - Big Gemini - The Nedelin Catastrophe - Columbia - CEV - Sriharikota - LM Descent Propulsion - Mir - The Podsadka Problem - Lunar Rovers - Gemini - Von Braun - Apollo 14 - Almaz - Beidou - Redstone - Gemini - LK-700 - Korea South - Komarov - US Space Stations - What did the CIA know and when did they know it? - AJ-260-2 - X-33 - Aldrin - Russian Rocketplanes - Delta IV - RD-180 - Mercury - Ilyushin - Apollo (ASTP) - Vostok - Korolev - Apollo 15 - Soyuz 7K-OK - Iran - TKS - New Generation Crewed - White Sands - SpaceShipOne - Hydrazine - SSME -

of the reaction control system exhaust with the ion flow sensors that were one of the Soyuz' main methods of orientation. The decision was then made to bring Komarov back. The first attempt at retrofire however failed - the automatic systems of the ship could not orient it because at the moment of manoeuvre to retrofire attitude the spacecraft was going through an ion 'pocket' - an area of low density where the sensors could not reliably detect the direction of motion of the spacecraft. A decision was made to make a manual retrofire on the next orbit.

Because the manoeuvre would be happening on the night side of the earth, Komarov could not use the Vzor optical alignment device to orient the spacecraft for retrofire. A method of alignment by sighting the moon through the periscope (anticipating Apollo 13's manual method by several years!) was hurriedly selected. Belyayev personally assured Ustinov that the method was feasible based on his Voskhod 2 experience. Following approval, Komarov was able to accomplish the manual retrofire using this method.

Re-entry was successful and the drag chute deployed. However due to a failure of a pressure sensor, the main parachute would not deploy. Komarov released the reserve chute, but it became tangled with the drag chute, which had not been released as would have normally occurred on deployment of the main chute. The descent module crashed into a field near Orenburg at 7 am.

The local air force commander reported to the control centre only that the cosmonaut would require immediate medical attention, then severed all communication links. Ustinov was told by Kamanin at eleven that Komarov was dead. Ustinov phoned Brezhnev, then in Czechoslovakia, at noon. The world was informed by TASS seven hours later. Komarov's ashes were buried in the Kremlin Wall in a massive ceremony.

Stories prevalent among those who worked at US listening posts in Turkey said that Komarov was infuriated by the balky spacecraft, and went out cursing those who had sent him in such an unready piece of equipment. The Russians claim that the crash site was not thoroughly cleaned up by the recovery teams. A group of Young Pioneers supposedly found some remains of Komarov at the crash site, and gave him a second burial place.

AKA: Rubin (Ruby ).

First Launch: 1967.04.23.

Last Launch: 1967.04.24.

Duration: 1.12 days.

[More... - Chronology...](#)

#### Associated People

- **Komarov Komarov, Vladimir Mikhailovich** (1927-1967) Russian pilot cosmonaut. Flew on Voskhod 1, Soyuz 1. First person to die during spaceflight when the parachute lines of Soyuz 1 tangled and it crashed to earth. Cosmonaut training March 1960 - 3 April 1961. Call sign: Rubin (Ruby). [More...](#)
- **Gagarin Gagarin, Yuri Alekseyevich** (1934-1968) Russian pilot cosmonaut. Flew on Vostok 1. First person in space. Due to his fame, the Soviet leadership did not want to risk him on another flight, but later relented. Died in a 1968 MiG trainer crash while requalifying for flight status. [More...](#)

#### Associated Countries

- **USSR** USSR [More...](#)

#### Associated Spacecraft

Credit: RKK Energia



Soyuz 1 crash site  
Credit: RKK Energia



Soyuz 1 training.  
Gagarin and Komarov during Soyuz 1 training.  
Credit: RKK Energia

Mir - UR-700M - N2O4/MMH - Mir-2 - von Braun - Delta IV Heavy - Resnik - Man-high - Mars 5NM - Taming the Fire - X-15A - Almaz OPS - Jules Verne Moon Gun - Plesetsk - Treaty - SALT 1 - J-2 - CZ - Discovery - CXV - Barbarian MM - Lucid - L1 Launch Windows - Yang Liwei - Ares - Skylon - Apollo Lunar Landing - Ariane 5 - German Diaspora - A9/A10/A11/A12 - Titan 2 - MiG 105-11 - Tsien - Shuttle MMU - Yang Liwei - Salyut 1 - Voskhod 3 - A7L - The Space Explorers - Moon Race! - German Civilian Rocketry - Kamanin Diaries - Apollo 16 - Soyuz TM - V-2 VTOHL - Enterprise - Luna - Minotaur - Paris Gun - Raketenflugplatz - Tu-2000 - H-2 HTOHL - Tian Jiao 1 - DC-X - Molniya-1 - Cooper - Project Orion: Its Life, Death, and Possible Rebirth - Ley - Vostok 6 - CEV - Grissom - MOOSE - DSE-Alpha - STS-1 - Mercury - Black Mesa - Jiuquan - Project 921-2 - Shenzhou-5 - Quick Facts - LK-3 - Mars 5M - MK-700 - CZ- NGLV - Ride - Key Meetings in Soviet Spaceflight - S-400 - NK-33 - Gemini Lunar Surface Rescue Spacecraft - X-30 - BOR-4 - X-38 - TMK-1 - DLB Lunar Base - Chang Cheng 1 - R-7 - Pegasus - PSLV - Orion - Salyut 7 - Soyuz - Kummersdorf - The Year in Space - 2005 - Uragan Space Interceptor - Lunar L3 - Chertok's Memoirs - Apollo Spacecraft Systems Development Diaries - Von Braun Mars Expedition - 1952 - Mars Direct - Gemini 4 - Gemini 3 - Skylab's Untimely Fate - Priroda - Lunar Orbiters - Jupiter - Black Brant - Winged - Navaho - Saturn IB - Tsiklon - Voskhod 2 - RD-170 - Rescue - Apollo LRV - Leonov - Manned Circumlunar - Space Station 1984 - Gemini 7 - VLS - Lunokhod - A9/A10/A11 - Insat - Aries - Gemini 6 - RD-0120 - Tu-2000 - R-16 - Mercury MR-3 - IMIS 1968 - Double Base Solid Propellants - Apollo 19 - Man-In-Space-Soonest - RS-68 - Boris Chimp 504 - Nerva - X-43 - Von Braun Mars Expedition - 1969 - Burya - Mercury Space Suit - R-1 - Voskhod 1 - Gemini 9 - Lunar Flyers - RD-0410 - R-2 - MAKS - Von Braun Station - Collins - Gemini 5 - Apollo LM Truck - Vanguard - Apollo D-2 - Zenit - Chawla - R-5 - Space Cruiser - R-11 - Winkler - Space Station - Spiral OS - Winged Gemini - Chang-Diaz - Young - Lovell - Meteosat - Luch - GSLV - R-36M - Shuttle C - Goddard - Swigert - Rombus - Cost, Price, and the Whole Darn Thing - Voyager - Bomarc - Glonass - Nike Hercules - Gemini Lunar Lander - Orion OLV - Gemini 12 - Echo - Soviet Mars Propulsion - Nuclear Thermal - Terrier - Nebel - Rockoon - European Space Stations - Titov - Shuttle EMU - ESRO - Pioneer 10-11 - A4b - Orlan - Aerobee - Chinese Manned Space Program: Behind Closed Doors - Saturn V - Apollo 204 - Countdown to the Launch of Shenzhou-5 - White - Gemini Agena Target Vehicle - RL-10 - UR-100N - Soyuz 5 - Mercury MA-9 - H2O2/Kerosene - Belokonyov - Luna Ye-8 - Mattingly - Surveyor - Nowak - Sullivan - V-2 - UR-100 - Gemini 11 - Sputnik 3 - Topol - HOTOL - Gemini LOR - Apollo ALSEP - Chinese Manned Spacecraft - Zarya - McAuliffe - Nitric acid/UDMH - LK-1 - Salyut 6 - A3 - Progress - Anders - Kosmos 3 - Apollo

**Soyuz 7K-OK** Russian manned spacecraft. 17 launches, 1966.11.28 (Cosmos 133) to 1970.06.01 (Soyuz 9). Development of a three-manned orbital version of the Soyuz, the 7K-OK was approved in December 1963. [More...](#)

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#### See also

- **Manned spaceflight** Category of spacecraft. [More...](#)

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#### Associated Manufacturers and Agencies

- **MOM** Russian agency overseeing development of spacecraft. Ministry of General Machine Building (Moskva, Russia), Moscow, Russia. [More...](#)

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#### Associated Programs

- **Soyuz** The Soyuz spacecraft was designed in 1962 for rendezvous and docking operations in near earth orbit, leading to piloted circumlunar flight. Versions remained in production into the 21st Century as a space station ferry, resupply craft, and lifeboat. After the retirement of the American space shuttle in 2011, it became the only means for regular human access to space. [More...](#)

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#### Associated Launch Sites

- **Baikonur** Russia's largest cosmodrome, the only one used for manned launches and with facilities for the larger Proton, N1, and Energia launch vehicles. The spaceport ended up on foreign soil after the break-up of Soviet Union. The official designations NIIP-5 and GIK-5 are used in official Soviet histories. It was also universally referred to as Tyuratam by both Soviet military staff and engineers, and the US intelligence agencies. Since the dissolution of the Soviet Union the Russian Federation has insisted on continued use of the old Soviet 'public' name of Baikonur. In its Kazakh (Kazak) version this is rendered Baykonur. [More...](#)

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## Soyuz 1 Chronology

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### 1963 November 30 - .

- **1964 Flight Plans** - . *Nation: USSR. Program: Vostok; Soyuz. Flight: Vostok 7; Vostok 8; Vostok 9; Soyuz 1; Soyuz 2A. Spacecraft: Voskhod; Soyuz A; Soyuz B; Soyuz V.* Four Vostoks are planned for 1964, one of these with dogs and other biological specimens, which will fly for ten days at altitudes of up to 600 km. This is to be followed by an eight day manned flight, then two Vostoks on a ten-day group flight. The altitude for these latter flights will be decided after the results of the dog flight. Then, by the end of the year, the first Soyuz flights will be made. Two to three of the new spacecraft are being prepared. Therefore the crews must start training for circumlunar flights and cislunar navigation. Kamanin decides that he must select 3-4 navigators, 1-2 mathematicians, and 2-3 astronomers to make up a training group of cosmonaut-navigators for these flights.

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### 1965 April 20 - .

- **Cosmonaut tours** - . *Nation: USSR. Related Persons: Tereshkova; Nikolayev. Program: Lunar L1. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz A.* The demand for cosmonaut appearances is constant; over 90% of such requests have to be denied. Tereshkova and Nikolayev are especially in demand - France wants them for two or three days, and there are also requests from Mongolia, Finland, Norway, Greece, Iran, Rumania, USA, Czechoslovakia, Yugoslavia, and many others. As far as progress on cosmonaut trainers, General Ponomaryov, who has no interests in space, is hampering development efforts. So far his interference has delayed completion of the docking trainer by six months.

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### 1965 June 26 - .

- **Poor progress on space trainers** - . *Nation: USSR. Related Persons: Dementiev; Titov; Smirnov. Program: Voskhod; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Voskhod 3; Voskhod 4; Voskhod 5; Voskhod 6. Spacecraft: Soyuz A; Spiral OS; TMK-E; TMK-1; LK-1.* Titov and Kamanin visit LII to review the status of simulator construction. The engineers haven't had any time to even consider trainers for winged spacecraft. The Soyuz trainer will only be completed by July 1966, and the trainer for the new Voskhod configuration is still on paper only. Simulators for manned lunar or planetary flights have not even been discussed yet. It is clear that Kamanin is going to have to go up the chain of command to Dementiev and Smirnov to get resources allocated for the work to be accelerated.

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### 1965 August 18 - .

- **Soyuz development program reoriented; Soyuz 7K-OK earth orbit version to be built in lieu of Soyuz A.** - . *Nation: USSR. Program: Soyuz; Lunar L1. Flight: Soyuz A-1; Soyuz A-2; Soyuz A-3; Soyuz A-4;*

Direct 2-Man - Black Powder Solid Propellants - Woomera - The Foundations of the Space Age - Soyuz A - H2O2 - Ariane - Whitson - China - USAF - NASA - Korolev - Baikonur LC1 - Rocketdyne - France - Soyuz 11A511U - Spacelab - Von Braun - Dual Keel Space Station - 1985 - USSR - Lunar L1 - Buran - Power Tower Space Station - 1984 - Flight Telerobotic Servicer - Japan - STS-51-L - Wallops Island - Soviet Manned Lunar Projects - MOM - US-A - Space Station Fred - Voskhod - Kosmos 11K65M - ALSS Lunar Base - HS 601 - HS 376 - F-1A - ESA ACRV - Tiangong - Chinese Space Station - X-Prize - Phantom Cosmonaut - Project Horizon - Female - CZ - Chinese Cargo Spaceship -

Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. *Spacecraft: Soyuz A; Soyuz 7K-OK; Soyuz B; Soyuz V; LK-1.* Military-Industrial Commission (VPK) Decree 180 'On the Order of Work on the Soyuz Complex--approval of the schedule of work for Soyuz spacecraft' was issued. It set the following schedule for the new Soyuz 7K-OK version: two spacecraft to be completed in fourth quarter 1965, two in first quarter 1966, and three in second quarter 1966. Air-drop and sea trails of the 7K-OK spacecraft are to be completed in the third and fourth quarters 1965, and first automated docking of two unmanned Soyuz spacecraft in space in the first quarter of 1966. Korolev insists the automated docking system will be completely reliable, but Kamanin wishes that the potential of the cosmonauts to accomplish a manual rendezvous and docking had been considered in the design. With this decree the mission of the first Soyuz missions has been changed from a docking with unmanned Soyuz B and V tanker spacecraft, to docking of two Soyuz A-type spacecraft. It is also evident that although nothing is official, Korolev is confident he has killed off Chelomei's LK-1 circumlunar spacecraft, and that a Soyuz variant will be launched in its place.

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#### 1965 August 20 - .

- **Soyuz crews** - . *Nation: USSR. Related Persons: Korolev; Gagarin; Nikolayev; Bykovsky; Komarov; Artyukhin; Demin; Feoktistov; Volynov; Katys; Beregovoi. Program: Voskhod; Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz 7K-L1 mission 1; Soyuz 7K-L1 mission 2. Spacecraft: Voskhod; Soyuz 7K-L1.* Kamanin calls Korolev, finds he is suffering from very low blood pressure (100/60). Kamanin suggests that candidates for the commander position in the first two Soyuz missions would be Gagarin, Nikolayev, Bykovsky, or Komarov. Korolev agrees basically, but says that he sees Bykovsky and Nikolayev as candidates for the first manned lunar flyby shots. Kamanin suggests Artyukhin and Demin for the engineer-cosmonaut role on the first Soyuz flights, but Korolev disagrees, saying Feoktistov has to be aboard. However Korolev agrees with Kamanin's selection for the next Voskhod flight - Volynov/Katys as prime crew, Beregovoi/Demin as backups. Later Kamanin corresponds with Stroeve over modification of an Mi-4 helicopter as a lunar lander simulator.

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#### 1965 August 28 - .

- **Korolev secretly puts Voskhod production on back burner.** - . *Nation: USSR. Related Persons: Korolev. Program: Voskhod; Soyuz. Flight: Gemini 5; Voskhod 3; Voskhod 4; Voskhod 5; Voskhod 6; Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK; Voskhod.* It is becoming clear that in order to ever get Soyuz into space it is necessary to clear all decks at OKB-1. After Voskhod-2 the Soviet manned space plans are in confusion. The Americans have flown Gemini 5, setting a new 8-day manned space endurance record - the first time the Americans are ahead in the space race. They rubbed salt into the Soviet wound by sending astronauts Cooper and Conrad on a triumphal world tour. This American success is very painful to Korolev, and contributes to his visibly deteriorating health. In the absence of any coherent instructions from the Soviet leadership, Korolev makes a final personal decision between the competing manned spacecraft priorities. Work on completing a new series of Voskhod spacecraft and conducting experiments with artificial gravity are unofficially dropped and development and construction of the new Soyuz spacecraft is accelerated. The decision is shared only with the OKB-1 shop managers. One of Korolev's "conspirators" lays on Chertok's table the resulting new Soyuz master schedule. The upper left of the drawing has the single word "Agreed" with Korolev's signature. The only other signatures are those of Gherman Semenov, Turkov and Topol - Korolev has ordered all other signature blocks removed. Chertok is enraged. The plan provides for the production of thirteen spacecraft articles for development and qualification tests by December 1965! These include articles for thermal chamber runs, aircraft drop tests, water recovery tests, SAS abort systems tests, static and vibration tests, docking system development rigs, mock-ups for zero-G EVA tests aboard the Tu-104 flying laboratory, and a full-scale mock-up to be delivered to Sergei Darevskiy for conversion to a simulator. Chertok is enraged because the plan does not include dedicating one spaceframe to use as an 'iron bird' hot mock-up on which the electrical and avionics systems can be integrated and tested. Instead two completed Soyuz spacecraft are to be delivered to OKB-1's KIS facility in December and a third in January 1966. These will have to be used for systems integrations tests there before being shipped to Tyuratam for spaceflights.

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#### 1965 September 1 - . *LV Family: N1. Launch Vehicle: N1 1964.*

- **Voskhod/Soyuz crewing plans** - . *Nation: USSR. Related Persons: Korolev; Gagarin; Nikolayev; Bykovsky; Komarov; Kolodin; Artyukhin; Matinchenko; Anokhin; Volynov; Katys; Ponomaryova; Solovyova. Program: Voskhod; Soyuz; Lunar L3. Flight: Voskhod 3; Voskhod 5; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: LK-1; LK; Soyuz 7K-LOK; Soyuz 7K-L1; Voskhod.* Kamanin meets with Korolev at 15:00 to discuss crew plans. As Soyuz pilot candidates, Kamanin proposes Gagarin, Nikolayev, Bykovsky, Komarov, Kolodin, Artyukhin, and Matinchenko. Korolev counters by proposing supplemental training of a supplemental group of engineer-cosmonauts from the ranks of OKB-1. He calls Anokhin, his lead test pilot, informs Korolev that there are 100 engineers working at the bureau that are potential cosmonauts candidates, of which perhaps 25 would complete the selection process. Kamanin agrees to assist OKB-1 in flight training of these engineer-cosmonauts. Kamanin again proposes Volynov and Katys as prime crew for the Voskhod 3 12-15 day flight. Korolev reveals that, even though Kamanin will have the crew ready by October, the spacecraft for the flight may not yet even be ready by November - Kamanin thinks January 1966 is more realistic. The discussion turns to the female EVA flight - Ponomaryova as pilot, Solovyova as spacewalker. It is decided that a group of 6 to 8 cosmonauts will

begin dedicated training in September for lunar flyby and landing missions. Korolev advises Kamanin that metal fabrication of the N1 superbooster first article will be completed by the end of 1965. The booster will have a payload to low earth orbit of 90 tonnes, and later versions with uprated engines will reach 130 tonnes payload. Korolev foresees the payload for the first N1 tests being a handful of Soyuz spacecraft.

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#### 1965 September 22 - .

- **Tereshkova manoeuvres** - . *Nation: USSR. Related Persons: Tereshkova; Ponomaryova; Korolev; Feoktistov. Program: Voskhod; Soyuz. Flight: Voskhod 3; Voskhod 5; Soyuz 1. Spacecraft: Soyuz 7K-OK.* Tereshkova confides to Kamanin that Ponomaryova is not ready for her scheduled spaceflight. Kamanin does not believe it - he has heard it from no other cosmonauts, and he has spoken to Ponomaryova often over the years. Flight plans for 1965-1966 are reviewed. The pluses and minuses of each cosmonaut in advanced training for Voskhod flights is reviewed. The latest plan for the Voskhod-3 flight is for a 20-day flight with two cosmonauts (in an attempt to upstage the planned Gemini 7 14-day flight). This is followed by another tense phone call from Korolev, then Feoktistov complaining about inadequate VVS support for the Soyuz landing system trials at Fedosiya (no Mi-6 helicopter as promised; incorrect type of sounding rockets for atmospheric profiles; insufficient data processing capacity; inadequate motor transport). When Kamanin appeals to Finogenov on the matter, he is simply told that if "Korolev is unhappy with our facilities, let him conduct his trials elsewhere". Without the support of the VVS leadership, it is up to Kamanin to try to improve the situation using only his own cajoling and contacts.

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#### 1965 November 24 - .

- **Kamanin and Korolev** - . *Nation: USSR. Related Persons: Korolev; Tyulin; Afanasyev, Sergei; Pashkov; Smirnov. Program: Voskhod; Soyuz; Lunar L1. Flight: Voskhod 3; Voskhod 4; Voskhod 5; Voskhod 6; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Voskhod; Soyuz 7K-OK; Soyuz 7K-L1.* Kamanin has his first face-to-face meeting with Korolev in 3 months - the longest delay in three years of working together. Their relationship is at low ebb. Despite having last talked about the next Voskhod flight by the end of November, Korolev now reveals that the spacecraft are still incomplete, and that he has abandoned plans to finish the last two (s/n 8 and 9), since these would overlap with planned Soyuz flights. By the first quarter of 1966 OKB-1 expects to be completing two Soyuz spacecraft per quarter, and by the end of 1966, one per month. Voskhod s/n 5, 6, and 7 will only be completed in January-February 1966. Korolev has decided to delete the artificial gravity experiment from s/n 6 and instead fly this spacecraft with two crew for a 20-day mission. The artificial gravity experiment will be moved to s/n 7. Completion of any of the Voskhods for spacewalks has been given up; future EVA experiments will be conducted from Soyuz spacecraft. Korolev says he has supported VVS leadership of manned spaceflight in conversations with Tyulin, Afanasyev, Pashkov, and Smirnov.

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#### 1965 November 30 - .

- **Problems with the Igla system for Soyuz** - . *Nation: USSR. Related Persons: Gagarin; Mnatsakanian; Korolev. Program: Voskhod; Soyuz. Flight: Voskhod 3; Voskhod 4; Voskhod 5; Voskhod 6; Soyuz 1; Soyuz 2A. Spacecraft: Voskhod; Soyuz 7K-OK.* After a meeting with Kamanin, Korolev tells Chertok in confidence that Gagarin is training for a flight on a Soyuz mission. Chertok responds that it will take him at least a year to complete training, but that doesn't matter, since Mnatsakanian's Igla docking system will not be ready than any earlier than that. Korolev explodes on hearing this. "I allowed all work on Voskhod stopped so that the staff can be completely dedicated to Soyuz. I will not allow the Soyuz schedule to slip a day further". Turkov had been completing further Voskhods only on direct orders from the VPK and on the insistence of the VVS. Aside from military experiments, further Voskhod flights were meant to take back the space endurance record from the Americans. Korolev has derailed those plans without openly telling anyone in order to get the Soyuz flying.

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#### 1965 December 4 - .

- **Voskhod trainers** - . *Nation: USSR. Related Persons: Volynov; Gorbatko; Popovich. Program: Voskhod; Soyuz. Flight: Voskhod 3; Soyuz 1; Soyuz 2A. Spacecraft: Voskhod; Soyuz 7K-OK.* At LII Kamanin reviews progress on the Voskhod trainer. It should be completed by 15 December, and Volynov and Gorbatko can then begin training for their specific mission tasks. The Volga docking trainer is also coming around. Popovich is having marital problems due to his wife's career as a pilot. Popovich will see if she can be assigned to non-flight duties.

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#### 1965 December 20 - .

- **Falling behind** - . *Nation: USSR. Related Persons: Korolev. Program: Voskhod. Flight: Gemini 7; Voskhod 3; Voskhod 4; Voskhod 5; Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1. Spacecraft: Voskhod.* Gemini 7 has landed. The Americans achieved every manned spaceflight objective they had set for themselves in 1965, and made 50% more launches than the Soviet Union. On the other side, the Russians have only been able to fly Voskhod 2. Korolev promised that three Voskhod and two Soyuz

spacecraft would be completed in 1965, and that two of each would fly before November 7. The year has ended, and not a single spacecraft has been delivered. Kamanin calls Korolev, who says that the unfinished Voskhods will not be completed, and that the four completed spacecraft will be used for long-duration flights. All of his bureau's energies will be concentrated on developing Soyuz spacecraft to perfect space docking and to perform lunar flyby missions.

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**1965 December 31** - . *LV Family: N1. Launch Vehicle: N1 1964.*

- **Daunting year ahead** - . *Nation: USSR. Program: Voskhod; Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1; Soviet Lunar Landing. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1; Soyuz 7K-LOK; LK.* Kamanin looks ahead to the very difficult tasks scheduled for 1966. There are to be 5 to 6 Soyuz flights, the first tests of the N1 heavy booster, the first docking in space. Preparations will have to intensify for the first manned flyby of the moon in 1967, following by the planned first Soviet moon landing in 1967-1969. Kamanin does not see how it can all be done on schedule, especially without a reorganization of the management of the Soviet space program.

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**1966 January 6** - .

- **No sign of Soviets catching up in space** - . *Nation: USSR. Program: Voskhod. Flight: Gemini 8; Gemini 10; Gemini 11; Voskhod 3; Voskhod 4; Soyuz 1; Soyuz 2A. Spacecraft: Voskhod; Soyuz 7K-OK.* Kamanin reviews the American and Soviet space plans as known to him. In 1965 the Americans flew five manned Gemini missions, and the Soviets, a single Voskhod. In 1966, the Americans plan to accomplish the first space docking with Gemini 8, demonstrate a first-orbit rendezvous and docking with Gemini 10, demonstrate powered flight using a docked Agena booster stage with Gemini 11, and rendezvous with an enormous Pegasus satellite. Against this, the Soviets have no program, no flight schedule. Kamanin can only hope that during the year 2-3 Voskhod flights and 2-3 Soyuz flights may be conducted.

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**1966 January 8** - .

- **Space trainers** - . *Nation: USSR. Related Persons: Tyulin; Mozzhorin; Korolev. Program: Voskhod; Soyuz. Flight: Voskhod 3; Voskhod 4; Voskhod 5; Soyuz 1; Soyuz 2A. Spacecraft: Voskhod; Soyuz 7K-OK.* Tyulin and Mozzhorin review space simulators at TsPK. The 3KV and Volga trainers are examined. Tyulin believes the simulators need to be finished much earlier, to be used not just to train cosmonauts, but as tools for the spacecraft engineers to work together with the cosmonauts in establishing the cabin arrangement. This was already done on the 3KV trainer, to establish the new, more rational Voskhod cockpit layout. Tyulin reveals that the female Voskhod flight now has the support of the Central Committee and Soviet Ministers. He also reveals that MOM has promised to accelerate things so that four Voskhod and five Soyuz flights will be conducted in 1966. For 1967, 14 manned flights are planned, followed by 21 in 1968, 14 in 1969, and 20 in 1970. This adds up to 80 spaceflights, each with a crew of 2 to 3 aboard. Tyulin also supports the Kamanin position on other issues - the Voskhod ECS should be tested at the VVS' IAKM or Voronin's factory, not the IMBP. The artificial gravity experiment should be removed from Voskhod and replaced by military experiments. He promises to take up these matters with Korolev.

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**1966 January 24** - .

- **New space schedules** - . *Nation: USSR. Related Persons: Korolev; Afanasyev, Sergei; Petrovskiy; Chelomei; Malinovskiy. Program: Voskhod; Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1; Soviet Lunar Landing. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1; Soyuz 7K-LOK; LK.* The VVS General Staff reviews a range of documents, authored by Korolev before his death, and supported by ministers Afanasyev and Petrovskiy. The schedules for the projects for flying around and landing on the moon are to be delayed from 1966-1967 to 1968-1969. A range of other space programs will similarly be delayed by 18 to 24 months. An institute for tests of space technology will be established at Chelomei's facility at Reutov. The IMBP will be made the lead organization for space medicine. Responsibility for space technology development will be moved from MOM to 10 other ministries. 100 million roubles have been allocated for the establishment of new research institutes. Kamanin is appalled, but Malinovskiy favours getting rid of the responsibility for these projects. The arguments over these changes - which reduce the VVS role in spaceflight - will be the subject of much of Kamanin's diary over the following weeks.

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**1966 February 19** - .

- **Soyuz trainer** - . *Nation: USSR. Program: Soyuz; Voskhod. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* A meeting is held with the Deputy Minister of MAP, OKB-1 leaders, and 20 developers of subsystems to nail down completion of the Soyuz trainer. It was supposed to be completed by 31 March, with cosmonaut training to start 15 April. In fact OKB-1 has not even begun work on it, and they only consider it long-term work. MOM in fact has insisted that the trainers be finished early, so that they can be used as development tools by the engineers in cooperation with the cosmonauts. OKB-1 engineers don't see it that way.

1966 March 12 - .

- **Voskhod/Soyuz crews** - . *Nation: USSR. Related Persons: Tyulin; Mozzhorin; Beregovoi; Katys; Ponomaryova; Solovyova; Gagarin; Voronov; Nikolayev; Gorbato; Bykovsky; Matinchenko; Komarov; Kolodin; Zaikin; Khrunov; Popovich; Artyukhin. Program: Voskhod. Flight: Voskhod 4; Voskhod 5; Soyuz 1; Soyuz 2A.* Tyulin and Mozzhorin review with Kamanin crewing plans. Even though the missions of Voskhod 4 and 5 are not yet clear, Tyulin wants to settle on Beregovoi and Katys for Voskhod 4, and Ponomaryova and Solovyova for Voskhod 5. Since October 1965 six crews have been in training for Soyuz flights: Gagarin -Voronov, Nikolayev-Gorbato, Bykovsky-Matinchenko, Komarov-Kolodin, Zaikin-Khrunov, and Popovich-Artyukhin. But these are just nominal groupings, and firm crew assignments by mission have not yet been made.

1966 May 11 - . *LV Family: N1. Launch Vehicle: N1.*

- **Mishin selected as Korolev's replacement after four-month delay** - . *Nation: USSR. Related Persons: Korolev; Ustinov; Mishin; Okhapkin; Keldysh; Babakin; Mozzhorin; Khrushchev. Program: Lunar L3; Lunar L1. Flight: Soyuz 1; Soyuz 2A. Spacecraft: LK; Soyuz 7K-LOK.* From 1963-1965 Ustinov was both head of the Soviet for the National Economy and the First Secretary of the Presidium of Soviet Ministers. He supported civilian space projects and instructed the military to co-operate in them. But after Khrushchev was ousted, Ustinov had less influence with the Ministry of Defence.

After the death of Korolev in January, a letter was sent to the Central Committee requesting that Mishin be appointed director of OKB-1. Ustinov tried to line up support for Mishin, but by the time of the first Saturn IB orbital flight on 26 February 1966, no decision had been made. America was progressing on the path to the moon, but Russia was stalled. An alternate that had been considered was Sergei Okhapkin, another Deputy Chief Designer at TsKBEM. But Okhapkin knew only spacecraft, he had never developed complete launch-booster-spacecraft systems. By the time Mishin was appointed, it was clear that the race was lost. The American's planned their first Saturn V launch in September 1967 and their first manned flight in 1968. Mishin could not expect trials of the LK lunar lander until 1969 at the earliest. There were insufficient funds allocated, and the schedule had no allowance for test flight failures. Ustinov, Morozhin, and Keldysh pointed fingers as to who had presented such unrealistic schedules to the Politburo. Keldysh now supported unmanned robot lunar landers in development by Babakin. Even these would not land until 1970, allowing three years of flight trials to achieve reliability. Khrushchev, it seemed, was to blame for such enormous unaffordable projects. This in turn put Ustinov in danger, as Khrushchev's point man for space.

1966 May 15 - .

- **Soyuz 7K-OK flight preparations.** - . *Nation: USSR. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* *Summary:* Decree 144 'On assessing preparations for flights of the 7K-OK spacecraft' was issued..

1966 June 21 - .

- **Mishin asserts himself** - . *Nation: USSR. Related Persons: Leonov; Tyulin; Burnazyan; Mishin; Anokhin; Frolov; Makarov; Volkov; Gagarin; Nikolayev; Bykovsky. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4.* Gagarin and Leonov visit Kamanin, who is on vacation at his dacha. They tell him of manoeuvres by Tyulin, Burnazyan, and Mishin in his absence. A VPK resolution will name crews for Soyuz missions that will consist of "invalid" engineers from OKB-1 (Anokhin, Frolov, Makarov, Volkov) instead of trained, flown cosmonauts (Gagarin, Nikolayev, Bykovsky).

1966 July 2 - .

- **Soyuz crew manoeuvres** - . *Nation: USSR. Related Persons: Rudenko; Mishin; Tsybin; Tyulin; Dolgopolov; Yeliseyev; Volkov; Anokhin; Makarov; Grechko; Komarov; Gorbato; Khrunov; Bykovsky; Voronov; Kolodin; Gagarin; Nikolayev; Smirnov; Ustinov; Malinovskiy. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK.* Kamanin is back from leave and orients himself. VVS General Rudenko has been visited by Mishin, Tsybin, and Tyulin. They want to replace Kamanin's crews for the first Soyuz mission in September-October with a crew made up of OKB-1 engineers: Dolgopolov, Yeliseyev, and Volkov as the prime crew, Anokhin, Makarov, and Grechko as back-ups. Kamanin believes this absurd proposal, made only three months before the planned flight date, shows a complete lack of understanding on the part of OKB-1 management of the training and fitness required for spaceflight. Kamanin has had eight cosmonauts (Komarov, Gorbato, Khrunov, Bykovsky, Voronov, Kolodin, Gagarin, and Nikolayev) training for this flight since September 1965. Yet Mishin and Tyulin have been shopping this absurd proposal to Smirnov, Ustinov, and Malinovskiy, who do not know enough to reject it.

1966 July 4 - .

- **Soyuz simulators** - . *Nation: USSR. Related Persons: Mishin; Burnazyan; Keldysh. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK.* The 7K-OK simulator consists of a mock-up of the BO living compartment and SA re-entry capsule only. The interiors are not yet fitted out with equipment, and development of the optical equipment to allow the cosmonauts to train with

simulated dockings is proceeding very slowly. Mishin has promised a dozen times to speed up the work on the trainers, but produced nothing. Meanwhile Mishin is proceeding to train his cosmonaut team for Soyuz flights in September. It is said that he has other leaders, including Burnazyan and Keldysh, on his side.

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#### 1966 July 6 - .

- **State Commission on Manned Spaceflight** - . *Nation: USSR. Related Persons: Komarov; Belyayev; Dolgopolov; Grechko; Makarov; Bugrov; Bykovsky; Nikolayev; Yeliseyev; Anokhin; Kubasov; Volkov; Mishin; Tyulin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4.* Tyulin heads a meeting that brings the Soyuz crewing dispute into the open. The opposing crews are represented as follows:
  - Soyuz s/n 3: VVS: commander: Komarov; backup Belyayev. MOM: commander: Dolgopolov; backup Grechko. Flight engineer: VVS: open; MOM: Makarov, Backup: Bugrov.
  - Soyuz s/n 4: VVS: commander: Bykovsky; backup Nikolayev. MOM: commander: Yeliseyev; backup Anokhin. Flight engineer: VVS: open; MOM: Kubasov, Backup: Volkov.

Kamanin is furious. Mishin and Tyulin think an engineer can be trained to be a spacecraft commander in three months, without passing a flight physical, without being a qualified pilot, without screening and training on the centrifuge or zero-G aircraft, and without parachute training. They put no value in six years of VVS experience in cosmonaut training. They give no weight to the years of general training, spaceflight experience, and ten months of Soyuz-specific training his candidates have already had. He notes that the United States trains crews for a minimum of one to two years before a flight. Kamanin says this decision will not stand.

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#### 1966 July 9 - .

- **Struggle for space leadership** - . *Nation: USSR. Related Persons: Vershinin; Rudenko; Malinovskiy; Smirnov; Ustinov. Program: Soyuz; Voskhod. Flight: Voskhod 3; Voskhod 4; Voskhod 5; Voskhod 6; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Voskhod.* In the previous days Kamanin has been preparing Vershinin and Rudenko for the struggle to ensure the Ministry of Defence's interests in space are preserved and defended. Malinovskiy, Smirnov, and Ustinov must be convinced of the righteousness of the VVS position on space crew preparation and training. At the beginning of 1966, Kamanin thought 1966 would be the year Russia would leap ahead again in the space race. At that time four manned Voskhod and four manned Soyuz flights were expected. Now the year is half over, and it is clear that the only remaining Voskhod flight will not go ahead, and it will be luck if even two Soyuz missions are flown. Instead of a year of triumph, 1966 will see the USA pulling far ahead in the space race. This is the fault of the incredibly poor management of the Soviet space program by Ustinov, Smirnov, Keldysh, and Malinovskiy -- but even more fundamentally due to the inept management of OKB-1 and TsUKOS. The Voskhod program was delayed, then destroyed by OKB-1's insistence on inclusion of their poorly thought-out and developed experiment in artificial gravity. VVS was always opposed to this experiment, yet OKB-1 dragged the program out for years trying to perfect it. Flights of the Soyuz spacecraft could already have occurred in 1962-1963, had Korolev not ignored VVS recommendations and insisted on perfecting a fully automatic rendezvous and docking system. Development of this system delayed the Soyuz project a minimum of three years.

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#### 1966 July 20 - .

- **Heated exchange with Mishin** - . *Nation: USSR. Related Persons: Mishin; Severin; Darevskiy; Komarov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Yastreb.* Kamanin and VVS officers spend more than two hours in a heated exchange with Mishin and his staff at OKB-1. Mishin is attacked for delays in completion of Soyuz; his demand that OKB-1 cosmonauts be trained in VVS zero-G aircraft without any agreement on this having been reached; the lack of work on spacesuits for the Soyuz flights by Severin; and above all his "illegal" training of his own cosmonauts. Mishin responds with wild attacks against the competence of Kamanin's cosmonauts, saying that his engineers could better guide a spacecraft to a docking than Kamanin's pilots. Finally things cool down, and Mishin agrees to submit to Kamanin a list of OKB-1 candidates for cosmonaut training within two to three days. Kamanin agrees to consider how they may be prepared for flight on a two-month schedule.

Later Kamanin's group visits Darevskiy at MAP and reviews the status of Soyuz trainer completion. He promises to have them completed by the end of August. Finally Kamanin confronts Komarov over statements he made in Japan. Komarov admits telling the world press that the Soviet Union will, at the scheduled time, fly an automated spacecraft around the moon and return it to earth, to be followed by a dog flight, then a manned circumlunar flight. Kamanin has already had the Central Committee and Soviet Ministers calling him about this unauthorised disclosure.

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#### 1966 July 25 - .

- **VVS Victory on Soyuz crew issue** - . *Nation: USSR. Related Persons: Tyulin; Mishin; Malinovskiy; Khrunov; Gorbatko; Voronov; Kolodin; Severin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Yastreb.* Tyulin advises Kamanin that Ustinov has instructed Mishin to accept that Soyuz spacecraft will be commanded by a VVS pilot cosmonaut, with OKB-1 providing cosmonauts for

the engineering support role. Mishin is to immediately send four candidates from OKB-1 to Kamanin for cosmonaut training. Kamanin feels this is only a 50% victory, and vows to accelerate submission of the letter from Malinovskiy to the Central Committee, demanding that the support cosmonaut seats also be filled by trained VVS engineer cosmonauts (e.g. Khrunov, Gorbatko, Voronov, and Kolodin). Meanwhile spacesuit designer Severin informs Kamanin that OKB-1 has insisted that the outer hatch of Soyuz will remain at 660 mm diameter, even though he has told them for a long time that the minimum diameter for a cosmonaut in spacesuit with a life support system backpack is 700 mm. Kamanin agrees to support him, but notes the change can only be made in later spacecraft; it is too late to change the first production run.

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#### 1966 July 26 - .

- **Soyuz hatch problem** - . *Nation: USSR. Related Persons: Sharafutdinov; Shcheglov; Skvortsov; Komarov; Khrunov; Gorbatko; Mishin; Tsybin; Severin; Alekseyev, Semyon; Anokhin; Yeliseyev; Smirnov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK; Yastreb.* Training of the new cosmonaut cadre is reviewed. English language courses are proving to be a particular problem. There have been some potential washouts - Sharafutdinov has done poorly in astronomy, Shcheglov suffered an injury at the beach, Skvortsov damaged his landing gear on a MiG-21 flight.

At 15:00 a major review is conducted, with Komarov, Khrunov, Gorbatko, Kamanin, and other VVS officer meeting with OKB-1 leaders Mishin, Tsybin, Severin, Alekseyev, Anokhin, and other engineers. Film is shown of the difficulties in the zero-G aircraft of cosmonauts attempting to exit from the 660 mm diameter hatch. In four sets of ten attempts, the cosmonaut was only to get out of the hatch half the time, and then only with acrobatic contortions - the inflated suit has a diameter of 650 mm, only 10 mm less than the hatch. Mishin finally concedes the point. But installation of the hatch in Soyuz s/n 3 and 4 is not possible - the spacecraft are essentially complete, and to add the hatch would delay their flight 6 to 8 months. Then Mishin makes the astounding assertion that Gorbatko and Khrunov are not adequately trained to be engineer-cosmonauts, and without this he will not allow them into space. He suggests OKB-1 engineers Anokhin and Yeliseyev instead. After outraged response, Severin finally sinks this suggestion by pointing out that no space suit has been prepared for Anokhin, and that it will take two to three months to make one. Kamanin is astounded that Mishin has pushed Anokhin all the way up to Smirnov and the VPK without even knowing he could not possibly fly due to this restriction. It again points out their poor management. Finally Mishin agrees that spacecraft s/n 5 and 6 and on will have 720 mm hatches. The ECS for the suits for those missions will have to be changed from a backpack configuration, with the equipment rearranged around the waist of the cosmonaut. The crews for the flight will be an experienced VVS pilot cosmonaut as commander, and (Kamanin realizes he may have to concede) a VVS engineer as flight engineer cosmonaut. They will have to complete training by 1 October 1966.

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#### 1966 July 30 - .

- **Beregovoi pushed for Soyuz mission** - . *Nation: USSR. Related Persons: Mishin; Rudenko; Beregovoi; Gagarin; Anokhin; Khrunov; Volynov; Shonin; Tsybin; Tyulin; Burnazyan; Keldysh; Malinovskiy; Zakharov; Krylov; Vershinin. Program: Soyuz; Voskhod. Flight: Voskhod 3; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK; Yastreb.* Mishin, Rudenko, and others have met with Beregovoi and support his selection as commander for the first Soyuz mission. Kamanin does not believe he is fit for the assignment, due to his age, his height and weight (that are the limit of the acceptable for the Soyuz). Gagarin reports that during a visit to OKB-1 the day before, he discovered that they were still going all out to prepare their own crews and train their own cosmonauts for Soyuz flights. Kamanin reassures him that the full power of the VVS, the General Staff, and the Ministry of Defence is behind the position that only VVS pilots will command the missions. Mishin is gloating over the latest spacesuit tests. Khrunov tried exiting from the Soyuz hatch in the Tu-104 zero-G aircraft. Using his full dexterity and strength, he had more success than in earlier tests. But Kamanin notes that designing a spacecraft hatch only 10 mm wider than the cosmonaut is hardly the basis for practical spaceflight or training. Later Kamanin plays tennis with Volynov and Shonin. Their Voskhod 3 flight is still not officially cancelled. They have been fully trained for the flight for months now, but no go-ahead is given. On Saturday, Tsybin presents to the General Staff OKB-1's concept for training of engineer cosmonauts. Tyulin, Burnazyan, and Keldysh have approved the plan, except they have substituted VVS engineer cosmonauts for those from OKB-1 for the first Soyuz flights. So this is the result of months of controversy - a position that there is no fundamental opposition to cosmonaut candidates from OKB-1. Kamanin sees the absolute need for his draft letter to be sent from the four Marshals (Malinovskiy, Zakharov, Krylov, and Vershinin) to the Central Committee. Mishin continues to "assist" the situation - it has been two weeks since he promised to submit the names and documentation for his candidates to the VVS, and he has done nothing.

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#### 1966 August 3 - .

- **Sea tests of Soyuz** - . *Nation: USSR. Related Persons: Mishin; Gagarin; Brezhnev; Ustinov; Smirnov; Anokhin; Yeliseyev; Volkov; Kubasov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK.* Mishin sends a letter to Kamanin, linking acceptance of his eight cosmonaut candidates from OKB-1 to continuation of sea recovery tests of the Soyuz capsule at Fedosiya.

Kamanin's early hopes for Mishin have been dashed - not only is he no Korolev, but his erratic management style and constant attempts to work outside of accepted channels and methods, are ruining the space program. Later Gagarin briefs Kamanin on the impossibility of meeting Brezhnev, who has flown south for vacation without reacting to Gagarin's letter. Most likely, the letter will be referred to Ustinov, who will pass it to Smirnov, with instructions to suppress this "revolt of the military". Gagarin requests permission to resume flight and parachute training in preparation for a space mission assignment. Kamanin agrees to allow him to begin three months before the mission to space. This will be no earlier than 1967, as Gagarin will not be assigned to the first Soyuz flights.

Kamanin decides to smooth over matters with OKB-1. He calls Mishin, and then Tsybin, and agrees to begin processing of Anokhin, Yeliseyev, Volkov, and Kubasov as soon as he receives their personnel files and security clearances. Mishin promises to deliver the Soyuz mock-up of the Tu-104 zero-G aircraft soon - it slid from 20 July, then from 7 August.

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#### 1966 August 5 - .

- **Showdown on spacesuits** - . *Nation: USSR. Related Persons: Litvinov; Mishin; Tsybin; Bushuyev; Severin; Komarov; Bykovsky; Nikolayev; Gagarin; Khrunov; Gorbatko; Anokhin; Yeliseyev; Alekseyev, Semyon. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4. Spacecraft: Soyuz 7K-OK; Yastreb.* At a meeting at LII MAP Zazakov, Litvinov, Mishin, Tsybin, Bushuev, Severin, Alekseyev, and Komarov spar over the hatch and spacesuit problem. Severin only agrees to modifying the ECS under immense pressure, but the modified suit will not be ready until November. Severin could not get Mishin to agree to an increased hatch diameter from Soyuz s/n 8 - Mishin will only "study the problem". An arrangement of the ECS around the waist of the cosmonaut is finally agreed. Mishin and Litvinov categorically rejected any modification of the hatch in the first production run of Soyuz.
- In turn, Factory 918 insisted on a final decision on Soyuz crews. They cannot build 16 of the custom-built spacesuits for all possible candidates for the flights (8 from VVS and 8 from OKB-1). It was therefore agreed that the commanders of the first two missions would be Komarov and Bykovsky, with Nikolayev and Gagarin as their backups. It was finally decided to assume that the other crew members would be either Khrunov and Gorbatko from the VVS, or Anokhin and Yeliseyev from OKB-1.

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#### 1966 August 10 - .

- **Soyuz schedule has been delayed again** - . *Nation: USSR. Related Persons: Mishin; Demin; Tereshkova; Gagarin; Tyulin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz s/n 5/6. Spacecraft: Soyuz 7K-OK.* Soyuz s/n 1 and 2 will be flown unpowered by October 1966 Manned flights aboard Soyuz s/n 3, 4, 5, 6 will not take place until the first quarter of 1967. Later Mishin tours the cosmonaut training centre - the first time in his life he has visited the place. Mishin admires the new construction from Demin's balcony on the 11th floor of cosmonaut dormitory, then goes to Tereshkova's apartment on the seventh floor, and then Gagarin's apartment. Mishin insists on drinking a toast of cognac on each visit. Tyulin reveals this is a peace mission - they want to normalize relations and get on with cosmonaut training. At Fedosiya the auxiliary parachute of a Soyuz capsule failed to open during a drop test. Kamanin believes that the Soyuz parachute system is even worse than that of Vostok. His overall impression of the Soyuz is poor: the entire spacecraft looks unimpressive. The small dimensions of hatch, antiquated communication equipment, and inadequate emergency recovery systems are only the most noticeable of many discrepancies. If the automatic docking system does not function, then the entire Soviet space program will collapse in failure.

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#### 1966 September 2 - .

- **Cosmonaut military program training groups** - . *Nation: USSR. Related Persons: Volynov; Shonin; Beregovoi; Shatalov; Titov; Kuklin; Filipchenko; Popovich; Gubarev; Artyukhin; Gulyayev; Belousov; Kolesnikov; Belyayev; Matinchenko; Demin; Zaikin; Vorobyov; Lazarev. Program: Voskhod; Almaz. Flight: Soyuz 7K-L1 mission 1; Soyuz 7K-L1 mission 2; Soyuz 7K-L1 mission 3; Soviet Lunar Landing; Voskhod 3; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz s/n 5/6. Spacecraft: Soyuz VI; Spiral OS; Almaz OPS; Voskhod.* Kamanin organises the cosmonauts into the following training groups:
  - Voskhod: Volynov, Shonin, Beregovoi, Shatalov.
  - Spiral: Titov, Kuklin, Filipchenko, Beregovoi, Shatalov.
  - Soyuz VI: Popovich, Gubarev, Artyukhin, Gulyayev, Belousov, Kolesnikov
  - Almaz: Belyayev, Shonin, Matinchenko, Demin, Zaikin, Vorobyev, Lazarev

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#### 1966 September 2 - .

- **Cosmonaut civilian program training groups** - . *Nation: USSR. Related Persons: Gagarin; Komarov; Nikolayev; Bykovsky; Khrunov; Gorbatko; Voronov; Kolodin; Volynov; Dobrovolsky; Zholobov; Leonov; Shatalov. Program: Soyuz; Lunar L1; Lunar L3. Flight: Soyuz 7K-L1 mission 1; Soyuz 7K-L1 mission 2; Soyuz 7K-L1 mission 3; Soviet Lunar Landing; Voskhod 3; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz s/n 5/6. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1; Soyuz 7K-LOK; LK.* Kamanin organises the cosmonauts into the following training groups:
  - Soyuz 7K-OK: Gagarin, Komarov, Nikolayev, Bykovsky, Khrunov, Gorbatko, Voronov, Kolodin

- o L1: Volynov, Dobrovolskiy, Voronov, Kolodin, Zholobov, Komarov, Bykovskiy
- o L3: Leonov, Gorbato, Khrunov, Gagarin, Nikolayev, Shatalov

Rudenko agrees with Kamanin's plan, except he urges him to assign more cosmonauts to the Soyuz 7K-OK group, and include OKB-1 cosmonauts in the 7K-OK, L1, and L3 groups, and Academy of Science cosmonauts in the L1 and L3 groups.

These cosmonaut assignments were in constant flux, and many cosmonauts were assigned to train for more than one program - resulting in multiple claims in later years that 'I was being trained for the first moon flight'.

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#### 1966 September 7 - .

- **Cosmonaut group leaders** - . *Nation: USSR. Related Persons: Volkov; Grechko; Kubasov; Popovich; Belyayev; Severin; Khrunov; Gorbato; Anokhin; Yeliseyev; Pravetskiy. Program: Soyuz; Almaz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-L1; Soyuz VI; Almaz OPS; Yastreb.* Volkov, Grechko and Kubasov believe they can complete cosmonaut training in two months. Of course they know space technology, but Kamanin informs them that, with intensive training, they might be ready in one or two years. Popovich is assigned as leader of the Soyuz VI military spacecraft training group, and Belyayev as head of the Almaz military orbital station training group. Kaminin tells Severin to complete spaceuits for Khrunov and Gorbato, but to ignore Mishin's orders to prepare suits for Anokhin and Yeliseyev. Anokhin has already been rejected due to his age and health, and Yeliseyev is still being tested. Kamanin reviews draft test programs for the UR-500K/L1 and N1-L3. He lines out statements inserted by Pravetskiy on joint training of cosmonauts by the MOM, Ministry of Public Health and VVS.

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#### 1966 October 27 - .

- **Soyuz launch plans** - . *Nation: USSR. Related Persons: Ustinov; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A.* Ustinov chairs a VPK meeting on the readiness of the Soyuz spacecraft for flight. The first unmanned launch of the spacecraft will not be possible until 20 November. Mishin considers a manned flight impossible before 10 January 1967, but Ustinov orders preparations for a 20 December 1966 launch date. Mishin attempts to blame the delay on crew training. But it is OKB-1 and Mishin who failed to deliver the necessary training equipment for the TBK-60 chamber, Tu-104 aircraft, and the Volga docking simulator.

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#### 1966 October 31 - .

- **Soyuz crews have only 40 days for flight training.** - . *Nation: USSR. Related Persons: Komarov; Bykovskiy; Gagarin; Nikolayev; Khrunov; Gorbato; Kubasov; Volkov; Yeliseyev. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A.* First snow of the winter in Moscow. The training of Soyuz crews has to be completed within 40 days, but there is still no assurance the trainers will be ready by 15 November. Komarov will command the active spacecraft, and Bykovskiy the passive. Gagarin and Nikolayev are their back-ups. The 20 December flight date can only be met if Khrunov and Gorbato serve as flight engineers. Training of Kubasov, Volkov and Yeliseyev in 40 days is impossible. Yet there is still no agreement on the crew composition.

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#### 1966 November 3 - .

- **Soyuz parachute fails in drop test.** - . *Nation: USSR. Related Persons: Komarov; Bykovskiy; Khrunov; Gorbato; Tyulin; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* In a test of the reserve parachute at Fedosiya, the Soyuz capsule was dropped from the aircraft at 10,500 m. The drogue chute deployed normally, as did the main parachute. They were then jettisoned and the reserve parachute deployed normally. However descent on both main and auxiliary chutes occurs only with noticeable pulsations of their cupolas, with the capsule revolving at one RPM. In this case it finally led to failure of the lines of the reserve chute at 1500 m, after which it crashed to earth. Contributing to the problem was the jettison of the remaining hydrogen peroxide reaction control system fuel from the capsule during the descent. It is normally expected that 30 kg of the 70 kg load of propellant will remain after re-entry. When this was vented, it burned the parachute lines. Each line will normally carry a load of 450 kg, but after being burnt by the peroxide, they can be torn apart by hand. Meanwhile there is still no agreement on crew composition. Komarov, Bykovskiy, Khrunov and Gorbato can be ready for flight by 10 December. However the VPK representatives, Tyulin and Mishin insist that their OKB-1 candidates be flown in stead of Khrunov and Gorbato.

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#### 1966 November 11 - .

- **Soyuz crew dispute drags on** - . *Nation: USSR. Related Persons: Mishin; Yeliseyev; Kubasov; Volkov; Makarov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Kamanin visits OKB-1. Mishin certifies that unmanned Soyuz s/n 1 and 2 will fly by 26 November, and the manned spacecraft s/n 3 and 4 by the end of December. The departure of cosmonauts for the range must take place not later than 12-15 December. There remains only 30 days for training of the crews, the member of which have still have not been agreed. Mishin ignores common sense and still insists on the preparation of

only his own engineers (Yeliseyev, Kubasov, Volkov, Makarov). The argument over the Soyuz crews continues without resolution up to the Central Committee level, then back down through the VPK and State Commission, over the next week.

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#### 1966 November 17 - .

- **VVS told to surrender on crew assignments issue.** - . *Nation: USSR. Related Persons: Rudenko; Kerimov; Kirillov; Kuznetsov; Bykovsky; Komarov; Khrunov; Yeliseyev; Zakharov; Mishin. Program: Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1.* Kamanin is at Tyuratam for the first Soyuz launch. He and Rudenko are accommodated in the new hotel at Area 2. It has all conveniences - a local telephone, radio and television with Moscow programs, even a promise to install an HF telephone that will allow secure communications with Moscow. Also there for the launch are Kerimov, Kirillov, Kuznetsov, Bykovsky, Komarov, Khrunov, and Yeliseyev. Rudenko reports that he has been chewed out by Marshal Zakharov. Zakharov told him "What are you and Kamanin doing, blocking OKB-1 candidates from flight? If Mishin wants to send his people to the Moon, let him do it and do not interfere!"

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#### 1966 November 18 - . *LV Family: N1. Launch Vehicle: N1.*

- **N1 facilities tour** - . *Nation: USSR. Related Persons: Rudenko; Mishin; Komarov; Bykovsky; Khrunov; Yeliseyev; Gagarin; Nikolayev; Gorbatko; Kubasov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Rudenko and Kamanin meet with Mishin at Area 31 (18-20 kilometers east of Area 2). Launch preparations are reviewed, and Mishin satisfies them that the two Soyuz will be launched on 26-27 November. The State Commission will meet officially tomorrow at 16:00. For today, they tour the N1 horizontal assembly building at Area 13. Korolev planned the N1 as early as 1960-1961. It will have a takeoff mass of 2700-3000 tonnes and will be able to orbit 90-110 tonnes. The first stage of rocket has 30 engines, and the booster's overall height is 114 m. The construction of the assembly plant, considered a branch of the Kuibyshev factory, began in 1963 but is still not finished. Two factory shops are in use, and the adjacent main assembly hall is truly impressive - more than 100 m in length, 60 m high, and 200 wide. Work on assembly of the ground test version of the rocket is underway. Assembly will be completed in 1967, and it will be used to test the systems for transport to the pad, erection of the booster, servicing, and launch preparations. The booster is to be ready for manned lunar launches in 1968. The construction site of the N1 launch pads occupies more than one square kilometre. Two pads are located 500 meter from each other. Between and around them is a multi-storied underground city with hundreds of rooms and special equipment installations.
- Only late in the night Rudenko and Mishin finally agree that the crews for the first manned Soyuz flights will be: Basic crews: Komarov, Bykovsky, Khrunov, Yeliseyev; Back-up crews: Gagarin, Nikolayev, Gorbatko, Kubasov. Meanwhile poor weather in Moscow is delaying zero-G training for the flight. In the last week only one weightless flight on the Tu-104 was possible - and a minimum of 24 flights need to be flown before the launch. It was therefore decided to ferry one Tu-104 to Tyuratam and train the cosmonauts here - it made its first flight today.

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#### 1966 November 19 - .

- **First Soyuz Launch Commission** - . *Nation: USSR. Related Persons: Malinovskiy; Grechko; Zakharov; Vershinin; Ustinov; Serbin; Smirnov; Pashkov; Keldysh; Afanasyev, Sergei; Petrovskiy; Kerimov; Mishin; Rudenko; Krylov; Pravetskiy; Kurushin; Ryazanskiy; Mnatsakanian; Tkachev. Program: Soyuz; Lunar L1; Lunar L3. Flight: Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1; Soyuz 7K-L1 mission 2; Soyuz 7K-L1 mission 3; Soviet Lunar Landing. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* Rudenko has reached agreement with Mishin that L1 and L3 crews will also consist of a VVS pilot as commander, and an OKB-1 flight engineer. Kamanin is depressed. Despite the support six marshals (Malinovskiy, Grechko, Zakharov, Krylov, Vershinin and Rudenko), Mishin has won this argument with the support of Ustinov, Serbin, Smirnov, Pashkov, Keldysh, Afanasyev, and Petrovskiy. Later the State Commission meets, for the first time in a long time at Tyuratam. Kerimov chairs the session, with more than 100 attendees, including Mishin, Rudenko, Krylov, Pravetskiy, Kurushin, Ryazanskiy, Mnatsakanian, and Tkachev. All is certified ready. Launch of the active spacecraft is set for 26 November, and the passive vehicle on 27 November.

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#### 1966 November 20 - .

- **Soyuz first flight plan** - . *Nation: USSR. Related Persons: Feoktistov; Rudenko; Pravetskiy; Komarov; Bykovsky; Khrunov; Yeliseyev. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK; Yastreb.* Feoktistov briefs the State Commission on the flight plan for the upcoming mission at 10:00. Each spacecraft will be in space for four days, and will demonstrate orbital manoeuvre, rendezvous and automatic spacecraft docking. If the passive vehicle can be placed in orbit within 20 kilometres of the previously launched active spacecraft, then docking can be accomplished on the first or second orbit of passive vehicle. If they are more than 20 kilometres apart, then 24 hours will be needed to manoeuvre the spacecraft to a rendezvous. Kamanin and Rudenko take a zero-G flight aboard the Tu-104 (Pravetskiy was bumped at the airfield "due to space limitations"). The Tu-104 needs good visibility of the horizon in order to fly the zero-G parabola. The aircraft is accelerated to maximum speed and then

pulls up into a sharp climb (going from 7,000 to 10,000 m). At the end of the climb 20-25 seconds of weightlessness is available for training the cosmonauts. Komarov, Bykovsky, Khrunov and Yeliseyev are aboard today. Khrunov practiced moving from the BO living module of the passive vehicle to that of the active spacecraft. Yeliseyev practiced exiting and entering the BO hatches with his bulky spacesuit and 50- kilogram ECS system strapped to his leg.

Mishin receives an encrypted telegram from Okhapkin and Tsybin. They propose that one of the cosmonauts on the first mission will back away from the docked spacecraft on a 10-m long safety line and film the other cosmonaut moving from one spacecraft to the other. Kamanin believes only Khrunov (with more than 50 Tu-104 weightless flights), has enough training to accomplish the task. After a sauna with Rudenko and an attempt to watch a film (aborted due to projector failure), Kamanin takes a walk in a drizzly, evocative night. He visits the cottages used by Korolev and the cosmonauts for the first missions. A light burns in Korolev's cottage - Mishin is working late. Kamanin recalls his many confrontations with Korolev, but also remembers how well he managed people compared to Mishin. Even if he had already decided personally what to do, he took the time to listen to other opinions and everyone felt their views had been considered.

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#### 1966 November 21 - .

- **Soyuz crews agreed officially** - . *Nation: USSR. Related Persons: Kerimov; Mishin; Rudenko; Kamanin; Yeliseyev; Anokhin; Feoktistov; Komarov; Bykovsky; Khrunov; Gagarin; Nikolayev; Gorbatko; Kubasov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1; Soyuz 7K-LOK.* The weather continues to deteriorate, and Kamanin considers moving the Tu-104 and cosmonauts to Krasnovodsk in order to get the 24 necessary zero-G flights before launch. At 11:00 the State Commission meets at Area 31. Present are Kerimov, Mishin, Rudenko, Kamanin, Komarov, Bykovsky, Khrunov, Yeliseyev, Anokhin and others. Mishin describes the status of preparations of Soyuz s/n 1, 2, 3, 4 for launch. He notes that the L1 and L3 lunar spacecraft are derived from the 7K-OK, and that these flights will prove the spacecraft technology as well as the rendezvous and docking techniques necessary for subsequent manned lunar missions. Feoktistov and the OKB-1 engineers say a launch cannot occur before 15 January, but Mishin insists on 25 December. That will leave only 20 days for cosmonaut training for the mission, including the spacewalk to 10 m away from the docked spacecraft. Faced with the necessity for the crews to train together as a team prior to flight, Mishin at long last officially agrees to the crew composition for the flights: Komarov, Bykovsky, Khrunov, and Yeliseyev as prime crews, with Gagarin, Nikolayev, Gorbatko, and Kubasov as back-ups. However a new obstacle appears. KGB Colonel Dushin reports that Yeliseyev goes by his mother's surname. His father, Stanislav Adamovich Kureytis , was a Lithuanian sentenced to five years in 1935 for anti-Soviet agitation. He currently works in Moscow as Chief of the laboratory of the Central Scientific Research Institute of the Shoe Industry. Furthermore Yeliseyev had a daughter in 1960, but subsequently annulled the marriage in 1966.

Later Feoktistov works with the crews on spacecraft s/n 1 to determine the feasibility of the 10-m EVA. The cosmonauts suggest a telescoping pole rather than a line be used to enable the cosmonaut to be in position to film the joined spacecraft. Bushuyev is tasked with developing the new hardware.

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#### 1966 November 22 - .

- **Crash efforts to make manned Soyuz flight by end of December** - . *Nation: USSR. Related Persons: Yeliseyev; Mishin; Kubasov; Rudenko; Khrunov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A.* Faced with the possibility Yeliseyev will be bumped from the crew, Mishin requests accelerated training of Kubasov as a substitute. Kamanin asks the KGB for a definitive ruling on Yeliseyev's fitness. It will only be possible to meet a 25-29 December manned flight date by curtailing certain tests and supplementing the existing preparation and test staff with about 100 military staff from the Tyuratam range and 50 additional industrial technicians. Rudenko and Mishin have backed away from the agreement on the "final" crew compositions. Now they propose to assign as second cosmonauts the best two of Khrunov, Yeliseyev, and Kubasov. Kamanin adamantly opposes this latest deviation to plan.

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#### 1966 November 24 - .

- **Apollo program delays give Soviets opportunity to leapfrog Americans** - . *Nation: USSR. Related Persons: Komarov; Bykovsky; Khrunov; Yeliseyev. Program: Soyuz; Voskhod. Flight: Voskhod 3; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz s/n 5/6; Soyuz s/n 7. Spacecraft: Soyuz 7K-OK; Voskhod.* Komarov, Bykovsky, Khrunov, and Yeliseyev have completed zero-G training in the Tu-104 at Tyuratam, and need to get back to Moscow to complete simulator training. But continued bad weather at Moscow means that they will have to be flown by Il-14 to Gorkiy, and then get to Moscow by train. Kamanin notes reports on NASA's reorganised flight program for the Apollo program. Under the new schedule, the first attempt at a manned lunar landing will be possible in the first half of 1968. The first manned flight of the Apollo CSM has slipped from December 1966 to the first quarter of 1967. This makes it possible that the Soviets can make 3 to 5 manned spaceflights before the first Apollo flight - the flights of Soyuz s/n 3 and 4 in December 1966, Voskhod 3 in January 1967, and Soyuz s/n 3 and 4 in February 1967.

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#### 1966 November 25 - .

- **Soyuz launch commission** - . *Nation: USSR. Related Persons: Gagarin; Nikolayev; Gorbatko; Kolodin; Belousov; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK; Yastreb.* Gagarin, Nikolayev, Gorbatko, Kolodin and Belousov arrive at Tyuratam for Tu-104 zero-G training, while the prime crews successfully arrive at Moscow for simulator training. The State Commission meets. After extensive detailed reports, Mishin certifies that the boosters and spacecraft at 09:00 on 26 November. S/N 2 would be launched first, on 28 November at 14:00, followed by s/n 2 24 hours later. The go-ahead is given for launch. In zero-G tests, the reserve cosmonauts find it is necessary to grip the handrail from above with both hands to move easily with the ECS strapped to the leg. The previously approved method, with one hand on top, the other below the handrail, was only good with the ECS configured as a backpack. The hardest part of the EVA will be getting on the spacesuits beforehand, especially in achieving a seal between the gloves and the suit

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#### 1966 November 26 - .

- **Soyuz vehicles rolled out to pads for dual launch** - . *Nation: USSR. Related Persons: Mishin; Vershinin; Rudenko. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The boosters were rolled out to the pads over eight hours late, at 17:30. There were delays in integrating the spacecraft in its fairing with the rocket, due to the much greater length of the Soyuz fairing and SAS abort tower (making the whole vehicle 46 m long). There was even concern that the assembled rocket would topple over in its horizontal carriage due to the forward centre of gravity. Mishin is getting out of control - publicly screaming at his staff. He demeans the competence of the cosmonauts and extols the quality of his own engineer-cosmonauts in front of the leadership. He yet again insists on crew changes. Kamanin discusses Mishin's public hysterics and tantrums with Rudenko. Rudenko agrees that the man is unstable and unsuitable, but says that he has powerful forces behind him on the Central Committee and Council of Ministers. No one except Vershinin dares oppose him. Rudenko's only course is to let the State Commission and government decide who will fly.

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#### 1966 November 28 - .

- **Cosmos 133** - . *Nation: USSR. Related Persons: Mishin; Rudenko; Kerimov; Gagarin; Nikolayev; Belyayev; Yegorov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Four years behind Korolev's original promised schedule, the countdown is underway for the first Soyuz spacecraft. A new closed circuit television system allows the rocket to be observed from several angles during the final minutes. Mishin, as per tradition, personally stays with the rocket until the last moment. Rudenko, Kerimov, and Kamanin observe the launch from the bunker, while Gagarin, Nikolayev, Belyayev and Yegorov observe from the observation post. The launch is perfect, within 0.2 seconds of the 16:00 launch time. The separation of the first stage strap-ons can be seen with the naked eye in the clear sky. The spacecraft is given the cover designation Cosmos 133 after launch. By 22:00 the spacecraft is in deep trouble. For unknown reasons the spacecraft consumed its entire load of propellant for the DPO approach and orientation thrusters within a 15-minute period, leaving the spacecraft in a 2 rpm spin. At the insertion orbital perigee of 179 kilometres, the spacecraft will have a life of only 39 orbits. It is decided to attempt to stop the spin on the 13th orbit using other thrusters and the ion flow sensors to determine attitude. Then the re-entry sequence will be commanded on the 16th orbit, with the spacecraft to use solar sensors to orient itself for retrofire on the 17th orbit.

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#### 1966 November 29 - .

- **Cosmos 133 fails to land on first attempt** - . *Nation: USSR. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* At 10:00 the re-entry command sequence is transmitted, but there is some doubt if the sequence was correct. Mishin decides to abort the landing attempt. Later telemetry shows that the command sequence was indeed correct. Attempts are made on orbits 18 and 19 to orient the spacecraft using data from the ion flow sensors, but these were not successful. After orbit 20 the spacecraft's orbital track no longer passed over Soviet ground stations, and another attempt for a solar-oriented re-entry would have to wait for orbit 32. But the spacecraft would possibly decay out of orbit before that time. Commands were transmitted to the spacecraft to raise its orbit, but from orbits 20 to 29 there was no tracking that allowed verification if the manoeuvres had been made. After an uncertain night, telemetry was received in the morning that showed the spacecraft had accepted all three commands for firing of the engines using the ion flow sensors for orientation. However on the first manoeuvre, the engines cut off after 10 seconds, after 13 seconds on the second, and 20 seconds on the third. In all three cases the spacecraft became unstable as soon as the engine firing began, developing large angular oscillations, which resulted in the engines being automatically shut down prior to delivering the total planned total impulse.

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#### 1966 November 30 - .

- **Cosmos 133 lost on re-entry** - . *Nation: USSR. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* At 09:00 Cosmos 133 appears above the horizon of tracking stations on Soviet territory, but does not respond. On the next orbit, the 30th, it accepted and acknowledged receipt of a command sequence. On the 32nd orbit the retrofire command sequence was transmitted to the spacecraft and accepted. The sequence began on the 33rd orbit, but the engine again cut out after a few seconds

firing. The sequence was transmitted for a re-entry with orientation using the ion flow sensors on the 34th orbit, and the spacecraft finally headed to earth. PVO radars tracked the capsule during re-entry from stations at Krasnodar, Gurevym, and Aktyubinsk, with the final track being 200 kilometres southeast of Orsk. Landing should have been at 14:32 Moscow time. There are reports of reception of the homing beacon and sightings of the parachute from areas around Orsk, but by nightfall the capsule has not been found. It is possible the capsule was destroyed by its APO self-destruct system. It is decided the search will be resumed in the morning. Four State Commissions are formed and charged with determining the causes of the failures by 6 December. Meanwhile preparation of spacecraft s/n 3 and 4; will continue, and s/n 1 will be removed from the pad and stored in readiness in the MIK for a possible launch in mid-December.

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#### 1966 December 1 - .

- **No sign of Cosmos 133** - . *Nation: USSR. Related Persons: Mishin; Kerimov; Gagarin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The search for the wreckage of Cosmos 133 continues without success. Mishin and Kerimov agree with Kamanin's opinion that if a cosmonaut had been aboard instead of a mannequin, the mission could have been successful. Kamanin has temporarily removed Gagarin from flight status after he missed a Tu-104 flight debriefing, then a 22:30 curfew, and did not show up at the Cosmonaut Dormitory at Tyuratam until 14:00 the next day. While on his escapade he also was found to have driven an automobile while intoxicated.

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#### 1966 December 6 - .

- **Cosmos 133 probably self-destructed** - . *Nation: USSR. Program: Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A; Soyuz 7K-L1 mission 1. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* The wreckage of Cosmos 133 has not been found. NII-4 has calculated, based on PVO tracking data that the re-entry capsule probably passed over Orsk at 70 to 100 kilometres altitude. The APO self-destruct system sensed the overshoot and exploded. The fragments would have fallen into the Pacific Ocean east of the Marianas Islands. Further searching is called off. Meanwhile, with only three months to go before the first flight of the L1 circumlunar spacecraft, the VPK has finally woken up to the total lack of preparation for location and recovery of the returning space capsule if it comes down outside of Soviet territory.

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#### 1966 December 7 - .

- **Soyuz and L1 crew assignments.** - . *Nation: USSR. Related Persons: Rudenko; Mishin; Kerimov; Komarov; Bykovsky; Khrunov; Yeliseyev; Gagarin; Nikolayev; Gorbatko; Beregovoi; Shatalov; Leonov; Volynov; Kubasov; Makarov; Volkov; Grechko; Yershov. Program: Soyuz. Flight: Soyuz 7K-L1 mission 1; Soyuz 7K-L1 mission 2; Soyuz 7K-L1 mission 3; Soyuz 1; Soyuz 2A; Soyuz s/n 3/4; Soyuz s/n 5/6; Soyuz s/n 7. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* Rudenko, Mishin, Kerimov and Kamanin agree on crews for upcoming flights. Komarov, Bykovsky, Khrunov, and Yeliseyev are assigned to Soyuz s/n 3 and 4; Gagarin, Nikolayev, Gorbatko, and Kubasov to Soyuz s/n 5 and 6, with Beregovoi, Shatalov, Volkov, and Makarov trained as back-ups. For Soyuz s/n 7, which will conduct space welding experiments with the Vulkan furnace, the commander will be either Komarov, Bykovsky, Gagarin, Nikolayev, Beregovoi, or Shatalov. The other two crewmembers will be either Lankin and Fartushniy from the Paton Institute, VVS cosmonaut Kolodin, or an engineer from OKB-1.

Crews for the L1 must be named in order to complete the five-month training program in time. Eight L1's are being completed to the manned configuration, but Mishin believes it is necessary to plan for only six manned missions. It is decided to train nine crews. Spacecraft commanders will be Komarov, Bykovsky, Nikolayev, Gagarin, Leonov, Khrunov, Volynov, Beregovoi, and Shatalov. Flight engineers will be Yeliseyev, Kubasov, Makarov, Volkov, and Grechko. Komarov, Bykovsky or Nikolayev will command the first circumlunar flight. Mishin promises to name the OKB-1 candidates for that flight by 8 December. Mishin and Kerimov agree that training of cosmonaut-researchers from the Academy of Sciences may begin, although both Mishin and Rudenko expressed doubts about cosmonaut candidate Yershov.

The failures of Cosmos 133 have been narrowed to entangled thrust vector vanes in the main engines and a single defective approach and orientation thruster. It is agreed to set the unmanned launch of Soyuz s/n 1 for 18 December as a final functional check of all systems. If this is successful, the date will then be set for the manned launch of Soyuz s/n 3 and 4. Flight control will be conducted from Yeypatoria.

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#### 1966 December 8 - .

- **Soyuz parachute problems unresolved** - . *Nation: USSR. Related Persons: Beregovoi; Shatalov; Volkov; Makarov; Mishin.* *Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The newly named crew for Soyuz s/n 7 begin zero-G training on the Tu-104 (Beregovoi, Shatalov, Volkov and Makarov). A review will be held of the SAS emergency recovery system in Vladimirovka tomorrow. VVS engineers are worried about the hydrogen peroxide venting which has burned parachute lines on two occasions. It is not believed that Soyuz s/n 1 can complete all tests to verify the systems that failed on s/n 2 before 18 December. It is clear that Mishin cannot resist the pressure from the leadership to

hurry, and is cutting out pre-launch tests, with an inevitable decrease in the chances for mission success. TsNII-30 has been given until the end of December complete plans for search and recovery of returning lunar spacecraft. But Mishin and OKB-1 have not provided the necessary trajectory data for such planning.

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#### 1966 December 9 - .

- **Soyuz State Commission** - . *Nation: USSR. Related Persons: Mnatsakanian; Tsybin; Mishin; Smirnov. Program: Soyuz. Flight: Voskhod 3; Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The investigative committees unanimously concluded that the problems with Cosmos 133 were not due to any fundamental design defects, but rather poor pre-launch quality control and testing which did not reveal the problems. All Soyuz 7K-OK spacecraft will be reworked to remove the problems by 15 December. The go-ahead is given to launch Soyuz s/n 1 between 15-18 December. Only Mnatsakanian, designer of the automatic docking system, objects to the idea of a single spacecraft test flight. Tsybin reports that over four hundred system and subsystem qualification tests have been completed on Soyuz. However some vacuum tests in the TBK-60 chamber, and tests of the back-up parachute system and emergency recovery system will not be completed until 10 January 1967. Tsybin is ordered to accelerate the work so that the entire spacecraft is qualified for manned flight by 5 January. Mishin states that, assuming the flight of s/n 1 is successful, the manned flight of Soyuz s/n 3 and 4 can begin by 29 January 1967. Kamanin is reminded that Smirnov's cancellation of the Voskhod 3 launch in June, based on the promise that Soyuz would fly by October, has instead resulted in almost two years without a Soviet manned spaceflight.

Later Kamanin learns that Malinovsky is dying of cancer and will not return to work. Kamanin prays for his own health in the remaining five to seven years until his retirement. He will be able to retire peacefully only once Soviet voyages to the lunar surface have become routine.

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#### 1966 December 12 - .

- **Second Soyuz rolled out to pad** - . *Nation: USSR. Related Persons: Mishin; Smirnov; Kerimov; Tyulin; Rudenko. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A.* At Tyuratam, the staff views American films on the Gemini program. Kamanin notes the use of manual methods for rendezvous and docking, and the use of an umbilical cord to supply oxygen to the spacewalker as opposed to an autonomous backpack. Despite over a hundred training sessions, American astronauts have experienced pulse rates of over 160 per minute, immense fatigue and overwhelming perspiration on their spacewalks. Three of their four EVA's were curtailed because of these and other unforeseen complications. This clearly indicates how Mishin, Smirnov, Kerimov, Tyulin, and Rudenko have underestimated the danger and difficulty of this work. The booster for Soyuz s/n 1 has been erected at Area 31 and the missile crews have gone home for the weekend. Kamanin credits Mishin for being ahead of schedule for the first time ever - he believes he can launch on 14 December.

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#### 1966 December 14 - .

- **Soyuz SAS firing destroys booster and pad** - . *Nation: USSR. Program: Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The second attempt to launch a Soyuz spacecraft ends tragically. The State Commission had met at Area 31 at 11:00. Mishin reported complete readiness for launching, which was set for 16:00 local time. Fifteen minutes before launch the observers move to the observation post 300 metres from the pad. At the ignition command, a smaller-than-usual amount of flame and smoke appeared, and the rocket did not rise. Several seconds later orders to flood the pad with water were given. The fire subsided, and the rocket remained on the pad, steaming more than usual. Over a half hour later, the order to clear the area is given, and Kamanin goes to phone the airfield from the Cosmonaut Dormitory to cancel the planned takeoff of the aircraft that was to take the flight control team to Yevpatoriya. As Kamanin ascends the staircase to the dormitory's second floor, he hears a muffled explosion, runs outside, and sees a large parachute descending 600 to 700 m beyond the MIK assembly building. He understands immediately that the booster has exploded and the capsule has been hurled away from the pad by the SAS escape tower. From the third floor of the dormitory the burning rocket could be seen on the pad. Kamanin orders everyone away from the windows before the first stage blows, and two seconds later there is a flash, and a series of powerful explosions blow out all the windows and shower everyone with plaster from the ceiling. The dormitory was 700 m from the pad, but buildings even a kilometre from the pad were damaged. Telephone communications with the bunker and pad were cut, and the fate of Mishin, Kerimov, and Kirillov, and others near the pad was unknown. It is clear further Soyuz flights will be delayed by several months, especially due to the need to repair the pad for the two-spacecraft mission. In fact, the entire Soviet lunar flight schedule is questionable now.

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#### 1966 December 15 - .

- **Soyuz failure in detail** - . *Nation: USSR. Related Persons: Kerimov; Mishin; Kirillov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Kerimov, Mishin, and Kirillov were nearly scared to death but escaped unharmed. A fuller account of yesterday's events is available. At the command "ignition", only the second stage engines of the core vehicle ignited; the first stage strap-ons did not,

therefore the rocket did not develop enough thrust to move an inch. On the order to flood the pad, all power was cut off to the rocket and equipment. 35-40 minutes after shutdown of the booster and the flooding, only steam and oxygen vapour were rising from the pad. Mishin and Kirillov emerged from the bunker and approached the rocket. They decided the danger was past, and gave the command for the service gantries to be raised, to protect the rocket from wind gusts. As the gantry arms reached the upper stage, and personnel were climbing up to service the rocket, one arm tilted the dislocated rocket more than seven degrees from the vertical. At such an angle the SAS abort sequence was activated. The solid rockets of the SAS abort motor suddenly ignited, pulling the Soyuz capsule 600 m into the sky, but also setting the third stage of the rocket on fire. This immediately alerted Mishin, Kerimov, and Kirillov to take cover in the bunker, while others were able to run to 100 to 200 m from the pad in the two minutes before the first stage exploded. A Major Korostylev and a group of soldiers decided instead to take cover behind the concrete wall of the pad, and paid for this decision with their lives or severe injuries. A preliminary accident commission meeting was convened at 09:00 at Area 2. An oxygen bypass valve failure several seconds after the ignition command is blamed for the shutdown of the first-stage engines. Although final acceptance tests of the SAS tower only began at Vladimirovka on 10 December, it is noted that the SAS system has actually just passed its most realistic test - it saved the Soyuz capsule, which landed 300 meters from the pad. Examining the blackened and smoking pad later, it is estimated it will take at least six months to get it back into operation.

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#### 1966 December 16 - .

- **Manned Soyuz flights delayed to March** - . *Nation: USSR. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The State Commission sets a new schedule, with the launch of a single unmanned Soyuz planned for 15 January 1967. Spacecraft s/n 3 and 5 will be prepared in parallel for this flight. The booster will be prepared at Area 2, and the spacecraft at Area 31. Launch of two manned Soyuz spacecraft will take place in March at the earliest.

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#### 1966 December 16 - .

- **Soyuz post-mortem** - . *Nation: USSR. Related Persons: Afanasyev, Sergei; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Kamanin views film of the Soyuz SAS failure and subsequent first stage explosion. The film is of little help, being taken from far away and the camera jiggling. Afanasyev arrives in Tyuratam that evening and is domiciled in the house in Area 17 used by Khrushchev and DeGaulle during their stay. Kamanin leaves for Moscow, but ends up having to take the train from Kuibyshev due to sustained poor weather. Meanwhile Afanasyev heads the State Commission at Tyuratam. Mishin bravely confesses that OKB-1's design of the SAS system had fundamental errors in logic. It was found that after power was removed from the SAS during the booster deactivation process, the gyroscopes would slowly rise to the stops of their supports, which in turn would trigger firing of the abort rocket. It had previously been thought there were only three ways to fire the SAS: by command from the flight director, when the flight angle of the rocket dropped below seven degrees, or when the combustion chamber pressure dropped below a specific level. The subsequent fire in the booster was inevitable since the separation of the descent module of Soyuz from the instrument compartment was accomplished by firing 32 squib charges. The commission hears with alarm that a test of the SAS on 11 December at Vladimirovka also started a small fire for about a minute, but it was restricted to the Soyuz instrument module since the dummy third stage was not fuelled. This was considered insignificant at the time, but the failure to report it prior to the launch attempt of 14 December is now seen as a major failure of communications. Mishin's resolve to accept the blame does not last long - he soon tries to blame the engine manufacturer. However Glushko's representative proves that the first stage shut down because of a failed oxygen valve in the Block G strap-on. Normally this could be repaired and the launch reattempted within three days. The reason for the catastrophe was the defective logic of Mishin's SAS system.

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#### 1966 December 20 - .

- **Americans have understood true purpose of Cosmos 133 mission** - . *Nation: USSR. Related Persons: Gagarin; Nikolayev. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Kamanin meets with key personnel of the TsPK and explains the reasons for the Soyuz incident, noting inadequate understanding of the abort systems. Kamanin orders improved medical examination of cosmonauts immediately after flight at the recovery site. Gagarin and Nikolayev request that the Soyuz crews now be allowed to take leave. Reports in the American press show that their experts have correctly interpreted the true nature of Cosmos 133 as a manned precursor mission. The American press alleges that there were two other explosions of the spacecraft in the USSR during September and October.

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#### 1966 December 22 - .

- **Recent failures blamed on Mishin** - . *Nation: USSR. Related Persons: Vershinin; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK. Summary:* Vershinin has explained to the General Staff that recent Soviet space failures were due to poor development and testing by industry, and the personal deficiencies of Mishin..

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**1966 December 23 - .**

- **SAS abort system modifications ordered** - . *Nation: USSR. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK. Summary:* The State Commission finds that the 14 December uncommanded SAS escape tower firing was the fault of the system designers. They directed that a number of the modifications of the SAS be made..
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**1967 January 17 - .**

- **Manned space plans reviewed** - . *Nation: USSR. Related Persons: Gagarin; Nikolayev; Komarov; Bykovsky; Beregovoi; Shatalov; Khrunov; Yeliseyev; Kubasov; Kolodin; Volkov; Leonov; Popovich; Belyayev; Volynov; Klimuk; Makarov; Voronov; Rukavishnikov; Artyukhin; Gorbatko; Grechko; Sevastyanov. Program: Lunar L1; Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1. Summary:* At a meeting of the VPK Military-Industrial Commission and Chief Designers current manned space plans are reviewed.. *Additional Details: [here....](#)*
- 

**1967 March 12 - .**

- **Spiral and Soyuz training** - . *Nation: USSR. Related Persons: Titov; Nikolayev. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Spiral OS; Soyuz 7K-OK.* Titov visits Kamanin on leave from test pilot duties at Vladimirovka. Titov will spend a year training as a test pilot on MiG-21, Su-7, and Su-9 aircraft. He flies well, and has matured and changed for the better over the last two years. Kamanin has talked to him 3 or 4 times about his future plans. Titov has bound his future with the Spiral spaceplane programme. *Additional Details: [here....](#)*
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**1967 March 16 - .**

- **Soyuz state commission** - . *Nation: USSR. Related Persons: Mishin; Gagarin; Smirnov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The Soyuz 1/2 crews had planned to depart for Baikonur on 30 March, but Mishin wants to push this forward to the night of 17/18 March. This disrupts all of Kamanin's training plans and shows the poor planning and work of Mishin and his followers. A Soyuz state commission is held. Kamanin doesn't trust Mishin. The spacecraft is unreliable and incompletely tested. But it is decided all the conditions exist for a launch of the mission on 20-25 April. The question of Gagarin flying on the mission is brought up. The Communist Party says he is too valuable to risk on further spaceflights. Kamanin is against making him a living 'museum exhibit'. Smirnov agrees to raise the matter with the Politburo.
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**1967 March 20 - .**

- **Soyuz 1 preparations** - . *Nation: USSR. Related Persons: Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The cosmonauts have given up on further training at Baikonur due to the incomplete state of the spacecraft and returned to Moscow. Kamanin wanted to confront Mishin on the issue - this was all his fault, six days wasted - but Mishin never even showed up on the plane for the flight to Baikonur.
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**1967 March 22 - .**

- **L1 flight scenario undecided** - . *Nation: USSR. Related Persons: Kerimov; Mishin; Gagarin; Leonov; Volynov; Makarov. Program: Lunar L1. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-L1.* Kerimov argued with Mishin that without any logical reason his demand that the cosmonauts go to the cosmodrome for training has disrupted their preparation schedule. Later Kamanin met with Gagarin, Leonov, Volynov, and Makarov, all selected as pilots for L1 lunar flybys. The L1 flight scenario was still open. Variant 1 would involve launch of two spacecraft, with transfer of one to two crew to the translunar spacecraft in earth orbit. Variant 2 would be a direct flight to the moon. *Additional Details: [here....](#)*
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**1967 March 23 - .**

- **L1 State Commission** - . *Nation: USSR. Program: Lunar L1; Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-L1; Soyuz 7K-OK.* A State Commission is held on the impending L1 translunar flights. A major issue is the L1 tracking/recovery radio beacon and the Zarya-3 deep space communications system. Launches of prototype L1P spacecraft are planned for April and May, with the first all-up L1 in June. All commission members are confident a Soviet man will be the first around the moon by the end of the year. The State Commission also considers the pending Soyuz 1 / Soyuz 2 flight.
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**1967 April 1 - .**

- **Manual docking for Soyuz 1/2** - . *Nation: USSR. Related Persons: Ustinov; Komarov. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* Ustinov reviews the cosmonauts. Kamanin urges that a manual docking be allowed on the Soyuz 1/2 mission - he had argued the same point with

Korolev before his death. Komarov says he can accomplish a manual docking from 350 km range (once the Igla automatic system has brought him there from 23 km range). There follows a discussion of an all-female flight. Four female cosmonauts would be assigned to the mission, and Kamanin would need 5 to 6 months to complete their training. The mission is designated 'Voskhod-6'.

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#### 1967 April 12 - .

- **Chaos at Area 31.** - . *Nation: USSR. Related Persons: Kerimov; Mishin; Grechko, Andrei. Program: Soyuz; Lunar L1. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The cosmonauts began work at 10:30 in the morning, and didn't complete work until 23:30 at night. They spent 16 hours working on Cosmonaut's Day, due to the criminally chaotic performance of TsKBEM. The cosmonauts have to train simultaneously for the Soyuz and L1 missions. Kamanin warns Kerimov about the unacceptable situation. Grechko arrives to head the state commission. The launch of Soyuz 1 is set for 24-25 April - there will be only eight days to fix all of the problems. The energy and optimism of Korolev is sorely missed. Mishin was a poor deputy, and a worse leader - his constant mistakes and stupidity delay work and aggravate people. The cosmonauts have to keep in shape by playing tennis, but there is only one court at Tyuratam - a second court is to be built eventually (!)

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#### 1967 April 14 - .

- **Huge blow-up at Tyuratam.** - . *Nation: USSR. Related Persons: Ustinov; Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The cosmonauts are completely trained, ready for launch at any time with four hours notice. Then Mishin calls Ustinov and tells him that their training is what is holding up the Soyuz 1 launch! From the point of view of the military quality assurance inspectors, there are 100 unresolved discrepancies on Soyuz 1 - the spacecraft is a piece of shit.

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#### 1967 April 16 - .

- **Soyuz 1 is moved to the integration hall.** - . *Nation: USSR. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* The Soyuz 2 crew trains from 15:00 to 20:00 - they had to wait due to problems with the spacecraft, but then the training went all right. The argument continues on whether to do an automatic or a manual docking. The design bureau wants to use the Igla automatic system; the cosmonauts want to do it manually. They have done 800 dockings in the simulator, so they should know best, in Kamanin's opinion. They want to let the automatic system take the spacecraft up to 50 to 70 m from the target, then use manual maneuvering to proceed to dock. The number two valve on the Soyuz 1 spacecraft's nitrogen tank was inadvertently opened during preparation. It was said not to be serious, but the problems are getting on everyone's nerves.

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#### 1967 April 20 - .

- **Soyuz 1/2 State Commission.** - . *Nation: USSR. Related Persons: Mishin. Program: Soyuz. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK.* 150 people attend. The readiness of the spacecraft and launch vehicles are confirmed. The final responsibilities and schedule are approved. Everything is go. Afterwards there is a meeting with Mishin. He is mainly worried about two things that could cause them to scrub the launch of the second Soyuz: a failure of the Igla automatic docking system or the solar panels on Soyuz 1.

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**1967 April 23** - . 00:35 GMT - . *Launch Site: Baikonur. Launch Complex: Baikonur LC1. LV Family: R-7. Launch Vehicle: Soyuz 11A511. LV Configuration: Soyuz 11A511 U15000-04.*

- **Soyuz 1** - . *Call Sign: Rubin (Ruby). Crew: Komarov. Backup Crew: Gagarin. Payload: Soyuz 7K-OK s/n 4. Mass: 6,450 kg (14,210 lb). Nation: USSR. Related Persons: Komarov; Gagarin. Agency: MOM. Program: Soyuz. Class: Manned. Type: Manned spacecraft. Flight: Soyuz 1; Soyuz 2A. Spacecraft: Soyuz 7K-OK. Duration: 1.12 days. Decay Date: 1967-04-24. USAF Sat Cat: 2759. COSPAR: 1967-037A. Apogee: 223 km (138 mi). Perigee: 197 km (122 mi). Inclination: 50.8000 deg. Period: 88.70 min. Space disaster that put back Soviet lunar program 18 months. Soyuz 1 as active spacecraft was launched first. Soyuz 2, with a 3 man crew would launch the following day, with 2 cosmonauts spacewalking to Soyuz 1. However immediately after orbital insertion Komarov's problems started. One of the solar panels failed to deploy, staying wrapped around the service module. Although only receiving half of the planned solar power, an attempt was made to manoeuvre the spacecraft. This failed because of interference of the reaction control system exhaust with the ion flow sensors that were one of the Soyuz' main methods of orientation. *Additional Details: [here](#)...**

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#### 1967 April 24 - .

- **Crash of Soyuz 1. Cosmonaut Vladimir Mikhailovich Komarov is killed at age 40.** - . *Return Crew: Komarov. Nation: USSR. Related Persons: Komarov. Program: Soyuz. Flight: Soyuz 1.* The decision was made to bring Komarov back due to an undeployed solar panel which reduced electrical power and blocked orientation sensors. Re-entry was successful and the drag chute deployed. However due to a flaw during manufacture, the parachute compartment housing was too rough and the main parachute

would not deploy. Komarov released the reserve chute, but it became tangled with the drag chute. The descent module crashed into a field near Orenburg at 03:24 GMT. *Additional Details:* [here....](#)

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#### 1967 April 26 - .

- **Komarov state funeral.** - . *Nation:* [USSR](#). *Related Persons:* [Komarov](#). *Program:* [Soyuz](#). *Flight:* [Soyuz 1](#). *Summary:* Komarov's ashes are interred in the wall of the Kremlin..

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#### 1967 April 27 - .

- **State Commission on Soyuz 1 crash.** - . *Nation:* [USSR](#). *Related Persons:* [Ustinov](#); [Smirnov](#); [Serbin](#); [Afanasyev](#), [Sergei](#); [Gagarin](#). *Program:* [Soyuz](#). *Flight:* [Soyuz 1](#). *Spacecraft:* [Soyuz 7K-OK](#). Ustinov convened the commission at noon. The work was to be completed by 15 May, and the final report issued by 25 May. The members of the commission would be Ustinov, Smirnov, Serbin, Afanasyev, the Chief Designers, and Gagarin. 22 members would work in seven subcommittees that would:
  - Investigate design and test of the spacecraft structures
  - Investigate design and test of the landing and parachute systems
  - Investigate design and test of the orientation and guidance systems
  - Study the performance of the tracking, communications, and flight ground control systems
  - Investigate design and test of the launch system
  - Analyse the contents of the Mir-3 flight data recorder, telemetry, and space-to-earth communications
  - Review the design and as-built documentation for the spacecraft, subsystems, training program, flight plan, and the on-board flight log

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#### 1967 May 5 - .

- **Gagarin and Leonov want Mishin cited in Soyuz crash report.** - . *Nation:* [USSR](#). *Related Persons:* [Gagarin](#); [Leonov](#); [Mishin](#). *Program:* [Soyuz](#); [Lunar L1](#). *Flight:* [Soyuz 1](#). Gagarin and Leonov meet with Kamanin. They discuss the complete inadequacy of Mishin - his excitability, poor knowledge of the Soyuz spacecraft and the details of its operation, his lack of cooperation in working with the cosmonauts in flight and training activities. They urge that these facts be documented in the Komarov crash commission report. Problems are discussed with getting an additional Tu-104 for zero-G/one sixth-G training. Three are needed, and only two have been made available. Even these two can only be used for 23 flights up to 10 August, after which they must be sent away for ejection seat modifications.

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#### 1967 May 7 - .

- **Soyuz return-to-flight plans.** - . *Nation:* [USSR](#). *Related Persons:* [Mishin](#); [Feoktistov](#). *Program:* [Soyuz](#). *Flight:* [Soyuz 1](#). *Spacecraft:* [Soyuz 7K-OK](#). Aboard Mishin's aircraft, he discusses his plans with Kamanin. He plans to launch two unmanned Soyuz spacecraft in the second half of July. An automated docking will be attempted, but the mission will be considered successful if the spacecraft rendezvous in space and approach to within 50 to 70 m of each other. He expects to follow this in August with a manned rendezvous, docking, and crew transfer mission. Two further pairs of spacecraft will be available by November 1967. This means a total of eight crews, including back-up crews, will have to be trained. He wants Feoktistov to fly on one of these missions. Kamanin tells Mishin that it will take two to three months to prepare Feoktistov for flight and will be too disruptive to flight training. After arriving at Fedosiya they attend a Soyuz 1 State Commission meeting from 10:00 to 13:00. Tests of the Soyuz parachute system are to be conducted beginning 14 May, on two mass models and one Soyuz mock-up.

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#### 1967 May 15 - .

- **Soyuz parachute test results.** - . *Nation:* [USSR](#). *Program:* [Soyuz](#); [Lunar L1](#). *Flight:* [Soyuz 1](#). *Spacecraft:* [Soyuz 7K-OK](#); [Soyuz 7K-L1](#). In the first drop, the reserve parachute didn't open. In the second test, it did inflate, but only after a delay of twenty seconds. TsAGI studies show the drogue chute is creating an area of turbulence in the wake of the capsule, and the reserve chute is deploying right into that zone of chaotic air, preventing it from inflating. Tests on the parachute show that while it was designed to deploy with 1.8 tonnes of drag force from the drogue chute, it actually requires 3-4 tonnes of force to pull the packed parachute out of the container and allow parachute deployment. The parachute fails at 8 tonne load. The Soyuz parachute system is supposed to have a reliability of 95% ... and this essential problem was unknown...

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#### 1967 May 20 - .

- **LII Soyuz parachute findings** - . *Nation:* [USSR](#). *Program:* [Soyuz](#); [Lunar L1](#). *Flight:* [Soyuz 1](#). *Spacecraft:* [Soyuz 7K-OK](#); [Soyuz 7K-L1](#). The drop of the Soyuz 1 mock-up at Fedosiya was cancelled due to the great likelihood of loss of the spacecraft and the low likelihood of obtaining any new data as a result. The LII assessment of the parachute system has been completed:

The likely cause of non-deployment of the primary parachute on Soyuz 1 was insufficient drag force created by the drogue chute to pull it out of the container (the drogue needs to produce 3 tonnes of force, but tests show only 1.1 to 1.8 tonnes of force are being produced at an ambient pressure of 0.67 atmospheres)

- The reliable operation of the reserve parachute and the drogue parachute at the same time was never demonstrated in trials. The chance of them getting tangled was actually very likely.

LII's recommended changes:

- Remove the reserve parachute and have a system of two main parachutes, with landing possible even if one of the main chutes does not deploy
- Develop through extensive actual testing reliable inflation of the drogue chute
- Add controls to allow manual parachute deployment by the crew, with appropriate cockpit instruments
- Increase the jettison time of the heat shield from 60.7 seconds to 100 seconds after parachute deployment to allow the full interval for operation of the automatic landing system.

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**1967 May 22** - .

- **LII Soyuz parachute recommendations impractical.** - . *Nation: USSR. Related Persons: Mishin. Program: Soyuz; Lunar L1. Flight: Soyuz 1. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* The conclusions of the LII study are found to be sound, but it would take months or even years to implement such an extensive spacecraft redesign. Mishin is still under orders to fly a manned mission around the moon by the 50th Anniversary of the Russian Revolution in October.

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**1967 May 26** - .

- **Soyuz 1 Commission report is reviewed.** - . *Nation: USSR. Related Persons: Afanasyev, Sergei; Kerimov; Tyulin; Gagarin. Program: Soyuz; Lunar L1. Flight: Soyuz 1. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* Afanasyev, Kerimov, and Tyulin object to Kamanin's conclusion that problems exist with the automated landing system and that a manual backup is needed. They want to find fault only with the parachute. The findings of VVS LII, and TsAGI are discussed. Later Kamanin has an unpleasant conversation with Gagarin. He wants to remove control of the manned flight control centre away from the MOM. Kamanin believes this is contrary to the interests of the Ministry of Defence.

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**1967 May 29** - .

- **Soviet of Chief Designers.** - . *Nation: USSR. Related Persons: Beregovoi; Volynov; Tkachev. Program: Soyuz; Lunar L1. Flight: Soyuz 1. Spacecraft: Soyuz 7K-OK; Soyuz 7K-L1.* Tkachev, chief designer of parachute systems, rejects the findings of the Soyuz 1 state commission. His objections are overruled. The final decision is to adopt the conclusions of the commission in their entirety. Two unmanned Soyuz flights will take place in August, followed by manned flight in September. However the manned flights will go ahead only if the unmanned flights are entirely 'clean' - without any deviations. Beregovoi and Volynov are to head the first two crews.

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