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# CANCELLED MISSIONS IN THE VOSKHOD PROGRAM

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The origins and the ultimate fate of the Voskhod programme have been the subject of many rumours. This article collects some newly published information in Russia and presents a revised look at the missions which, although planned from as early as 1962, were ultimately never carried out due to a variety of technological and political reasons.

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## 1. INTRODUCTION

Over thirty years ago, the Voskhod program achieved two of the most significant milestones in the history of human spaceflight: the launch of the first multi-person crew into orbit in October, 1964; and the accomplishment of the first extra-vehicular activity (EVA) in space from Voskhod-2 in March, 1965. Following that mission, there was a gap of almost two years prior to the next piloted space mission, Soyuz-1. During this period of apparent inactivity, Chief Designer Sergey P. Korolev, the engineering head of the Soviet space program, passed away in January, 1966. He was replaced as head of the Experimental Design Bureau No. 1 (OKB-1) by his First Deputy Vasiliy P. Mishin. It had long been speculated in the West that there was a third Voskhod mission planned for first half of 1966 which was cancelled following Mishin's appointment. As early as November, 1966, the trade publication *Aviation Week and Space Technology* reported that the "rest of the Voskhod series, which was to have continued with at least five launches through the summer and autumn launching season of 1965" was cancelled by Prime Minister Aleksey N. Kosygin [1]. Over the years, there have been numerous hints from the Soviet media concerning the cancellation of the alleged Voskhod-3 mission, but final confirmation was received in several articles in the late 1980s and early 1990s. These revealed that the USSR did indeed have plans for extensive follow-up missions to Voskhod-2, all of which were obviously never flown. With the available information, a reasonable manifest and timetable can be constructed.

## 2. EARLY STUDIES IN 1962-1963

Planning for follow-on missions to the Vostok-5/6 group flight began much prior to that flight in June, 1963. As early as January, 1962, Korolev was preparing to order the manufacture of eight 3KA type Vostok spacecraft for flight in 1963 [2]. At various points throughout 1962, the Soviet Air Force proposed as many as 10-12 missions, some with clear military objectives. By November, the Air Force had narrowed down its options and issued a document primarily focused on the military applications of the 3KA spacecraft. The plan foresaw:

- (1) the order of 10 Vostok spacecraft;
- (2) equipping the spacecraft with equipment necessary for military needs, such as interception, reconnaissance, and attack;

- (3) extensions of its capabilities to ensure human flight for 11-12 days and a biomedical mission with an animal for up to 30 days;
- (4) the launch of an animal into a very high orbit;
- (5) the performing of special experiments such as manual re-entry, landing of the crew in the return capsule, the depressurisation of the capsule in space, etc. [3].

A somewhat truncated version of this plan was formally approved by the Military-Industrial Commission (VPK), the defense industry management institution, by a decree dated February 8, 1963 which specifically called for the augmentation of the basic Vostok spacecraft to carry out a long duration piloted flight for 10 days and a biomedical animal flight for 30 days. The plan at the time was to carry out four extended Vostok missions following the woman group flight in mid-1963 [4]. Of these, three were meant to perform extended 6-8 and 10 day long missions with cosmonauts, while the fourth was to carry an animal. This VPK document essentially formed the basis for all extended Vostok missions which were planned, until early 1964.

The OKB-1, being the prime designer of the modified vehicles, offered a slightly modified manifest for the programme of flights in July, 1963. At this time, Korolev laid out the following plan:

- (1) 10-11 day flight of an animal to an altitude of 600-1000 kilometres in February-March 1964;
- (2) Three other Vostok spacecraft to be used for flights of cosmonauts on missions lasting up to 10 days. [5]

The first piloted mission was apparently planned for the April-May, 1964 period.

As far as modifications to the 3KA spacecraft, the OKB-1 issued a document in 1963 entitled "On the Possibility of Using the 'Vostok' Ship for Experimental Research on the Prospective Problems of Cosmonautics" which described the essential changes [6]. The primary mission objectives of the extended Vostok missions were listed as:

- (1) performing extended piloted flights up to 10 days;
- (2) performing flights in orbits with apogees up to 1000-



- 1200 kilometres;
- (3) training cosmonauts in realistic conditions of space flight;
  - (4) research work on methods of:
    - (a) observation of objects in space (such as the upper stage of the Vostok launch vehicle) with the aid of TV instruments in the interest of work on problems of docking in space;
    - (b) observation of the Earth's surface with TV instruments;
    - (c) observation of light signals from Earth's surface for receiving data for the solution of problems on the rational use of light systems for space flight;
    - (d) photographing the Earth's surface, the Moon and the stars with the ultimate goal of using this data for assembly in orbit;
    - (e) carrying out radio-communications between spacecraft in orbit and with aircraft and naval vessels;
  - (5) scientific investigations (spectrograms of the upper atmosphere, the study of spectral characteristics of the 'Earth-atmosphere' system, photography with special film and filters, etc.);
  - (6) medico-biological investigations focusing on:
    - (a) investigations on research into extended weightlessness, artificial gravity, blood circulation, muscular tone of the cosmonauts;
    - (b) research on gas exchange, exchange of matter and functions of digestion;
    - (c) research on effects of pharmaceuticals, biological effects of radiation;
    - (d) research on methods of biological and physiological dosimetry;
    - (e) research on chemical and pharmacological effects on animals;
  - (7) performing manual landing of the Return Apparatus with the goal of achieving a more comfortable return;
  - (8) performing the 'exit' of a test animal from the ship into open space [7].

To achieve these goals, the following modifications were to be made to the original 3KA Vostok spacecraft:

- (1) installation of a parachute-reactive system for landing on Earth;
- (2) expansion of biomedical instrumentation;
- (3) installation of equipment for the 'exit' experiment which would include a depressurisable special container

for an animal;

- (4) new scientific experiment instrumentation;
- (5) general improved systems for guidance and control, communications, optical sensors [8].

The air Force itself had been studying options on extending the capabilities of the original Vostok vehicle since March, 1963. By November, there were actual proposals to enable the spacecraft to change orbits. Although the idea remained a priority for the Air Force for several years, modifications for orbit-correction engines never took place.

To support the three piloted missions, eight cosmonauts were grouped together on September 17, 1963 to begin formal training. They were P.I. Belyayev, V.V. Gorbato, Ye. V. Khrunov, V.M. Komarov, A.A. Leonov, G.S. Shonin, B.V. Volynov, and D.A. Zaikin [9]. The Vostok manifest for 1964, finalised in November of 1963 looked as follows:

- |                      |  |
|----------------------|--|
| mission 1:           | a flight of an animal to 30 days into an orbit of 600 kilometres |
| mission 2:           | a flight of a cosmonaut up to 8 days;                            |
| mission 3/mission 4: | group flight of two cosmonauts up to 10 days [10].               |

This original 1963 plan was indefinitely postponed once the interim 3-man Vostok programme was inaugurated in February of 1964. At that point renamed Voskhod, the original 3KA spacecraft was modified into the 3KV article, and it is this vehicle which carried cosmonauts V.M. Komarov, K.P. Feoktistov and B.B. Yegorov into space in October, 1964. A second spacecraft type, the 3KD, was launched in March, 1965 with cosmonauts P.I. Belyayev and A.A. Leonov during which Leonov performed the first extravehicular activity (EVA) in space. Both of these mission were clearly interim missions hastily inserted into the extended Vostok schedule, although preliminary training for the EVA mission began as early as January, 1963 [11]. At that time, the EVA mission appears to have been slated for the Soyuz programme. The original extended Vostok plans, now subsumed under the name Voskhod were finally exhumed once the landmark Voskhod-2 mission was over in March of 1965.

### 3. NEW VOSKHOD MISSIONS IN 1965-1966

In mid-April, 1965 Director of Cosmonaut Training Maj.-Gen. Nikolay P. Kamanin named crews to train for two 'new' Voskhod missions:

- |                   |               |  |
|-------------------|---------------|--|
| <b>Voskhod-3:</b> | <b>prime:</b> | <b>B. V. Volynov/G. P. Katys</b>       |
|                   | backup:       | G. T. Beregovoy/L. S. Dyomin           |
|                   | 2nd backup:   | V. A. Shatalov/Yu. P. Artyukhin        |
|                   | objectives:   | 10-15 day flight, scientific exps      |
| <b>Voskhod-4:</b> | <b>prime:</b> | <b>V. L. Ponomareva/I. B. Soloveva</b> |
|                   | backup:       | V. V. Gorbato/Ye. V. Khrunov           |
|                   | 2nd backup:   | D. A. Zaykin/G. S. Shonin              |
|                   | objectives:   | 10 day flight, EVA by Soloveva [12].   |

Clearly the Voskhod-3 mission was meant to reinstate the original long-duration mission plan dating from 1963. The EVA mission was a new addition to the manifest, resulting from plans to launch an all-woman crew into space in the period 1965-66. In addition to these two flights, a 30 day space mission with an animal was also planned for the series.



### 3.1 Voskhod-3

The primary goal of the third Voskhod mission was to carry out a long duration mission lasting up to two weeks. An extensive series of scientific experiments were prepared for the flight with the active participation of trainee G.P. Katys, who was at the time an employee of the Institute of Automation and Telemechanics of the USSR Academy of Sciences (AN SSSR). He had been a prime contender for the 'scientist' position on the first Voskhod mission in 1964, but had instead served as cosmonaut Feoktistov's backup. Some of the scientific instrumentation for the mission were to be mounted in a special semi-spherical pressurised chamber curved inward into the crew capsule, while others were to be installed on the exterior of the ship for work in conditions of vacuum [13]. A second goal of the Voskhod-3 mission was to carry out the entire flight in a highly elliptical orbit, thereby raising the absolute altitude record for a piloted spaceship. Like the previous two Voskhod missions, plans for the mission included an automated precursor flight for a complete test of the life-support systems of the spacecraft. This automated mission would primarily test out the life support system which was evidently one of the weakest elements in the Voskhod spacecraft. During the one day long Voskhod and Voskhod-2 missions, the failures and malfunctions in the life support system had raised grave concern among many on the capacity of the vehicle to carry out longer duration missions.

### 3.2 Voskhod-4

The Voskhod-4 mission was planned to carry the first all-woman crew into orbit, no doubt to add to the impressive list of Soviet 'space spectaculars.' Trainee I.V. Soloveva, at one time considered for selection as the first woman in space, began training at the time in a craft similar to the one used by cosmonaut Leonov for Voskhod-2. Chief Designer Korolev was clearly resistant to this flight, but was convinced by Kamanin, who had originated the idea [14]. It is interesting to note that the backups for the mission were all male, probably necessitated by the need for EVA-trained individuals on the crews (Gorbatko, Khrunov, and Zaykin had trained in various capacities with the Voskhod-2 prime crew).

### 3.3 The Air Force Mission

In addition to the two missions of Voskhod-3 and Voskhod-4, between March, 1963 and December, 1965, a number of cosmonauts sporadically trained for a mission dedicated solely to military objectives as formulated by the Soviet Air Force. They included at various times (from the 1960 batch) I.N. Anikayev, V.I. Filatyev, G.G. Nelyubov, G.S. Shonin, B.V. Volynov, and (from the 1963 batch) G.T. Dobrovolskiy, A.V. Filipchenko, A.A. Gubarev, V.I. Gulyayev, P.I. Kolodin, A.P. Kuklin, A.N. Matinchenko, L.V. Vorobev, A.F. Voronov, and V.M. Zholobov [15]. Most of these individuals moved over to the Spiral spaceplane or Soyuz programme at the end of 1965 when the Air Force mission was cancelled. Some of the objectives of this military flight were incorporated into the Voskhod-3 mission at the time. In addition, plans for at least three more Voskhod missions had emerged by the fall of 1965.

### 3.4 Voskhod-5

In the spring of 1965, Korolev proposed that a physician from a scientific research institute in the Ministry of Health be included on one of the future Voskhod missions [16]. As a result

in May, 1965 four physicians from the recently established Institute of Medico-Biological Problems (IMBP) were tapped to begin preliminary training for a dedicated biological flight. They were:

Yevgeniy Aleksandrovich Ilyin  
Aleksandr Alekseyevich Kiselev  
Sergey Olegovich Nikolayev  
Yuriy Aleksandrovich Senkevich [17].

The four were not only involved in developing a biomedical experiments programme for the Voskhod-5 mission, but also conducted training in a Voskhod mock-up installed at the Institute premises. Nikolayev apparently did not pass through the initial selection phase, and Ilyin, Kiselev, and Senkevich were grouped together with candidate cosmonauts V. G. Lazarev and A. V. Sorokin to continue training. None of the individuals were approved formally by the State Medical Commission as official cosmonauts at the time. An interesting aspect of the Voskhod-5 mission was a plan to carry out the first medical surgery in orbit using a rabbit as a test subject [18]. The mission was to last five days. Special couches and spacesuits were built for the physicians by engineers at the Plant No. 918 headed by Chief Designer Gay I. Severin (now known as the MZ Zvezda).

### 3.5 Voskhod-6

The Voskhod-6 mission was meant to test the first Soviet autonomous EVA manoeuvring backpack, designated the UPMK or 'combined unit.' Originally meant for use by one of the women cosmonauts on board Voskhod-4, the flight of the unit was delayed to this mission for use by more trained pilots.

The 90 kilogram pack (empty mass) was designed like a motor-scooter and had an autonomous lifetime of four hours [19]. The white horseshoe-shaped UPMK was equipped with 18 solid rocket motors for forward and reverse movement, and 14 air thrusters for angular movement (with six degrees of freedom). Maximum capable velocity relative to Voskhod was to be 32 kilometres per hour. The cosmonaut was to wear the unit around the waist and control movement via two pistol handgrips and a control panel. Total mass with a cosmonaut wearing the Berkut spacesuit was expected to be about 250 kilograms. The unit was in design in 1965-66 at the Plant No. 918, which had designed the ejection seats and spacesuits for the Vostok and Soyuz craft. Cosmonauts Ye. V. Khrunov and A.F. Voronov were designated to begin training on mock-ups of the unit at the TsPK in December, 1965.

### 3.6 Voskhod-7

Plans for the final Voskhod mission in the programme emerged as a result of investigations begun in late 1964. At the time, Korolev asked one of his key engineers at the OKB-1, Boris V. Raushenbakh to begin work on developing a modest system and mission profile to test an artificial gravity system in low Earth orbit [20]. The top-secret project was designated 'IT,' the Russian abbreviation for 'artificial gravity.' Raushenbakh's plan called for the launch of a Voskhod craft (presumably the 3KV) on board the 11A57 launcher into a low-Earth orbit. The 11A57 was an early version of the 'Soyuz' booster and used a basic R-7 missile topped off by the 11A57I upper stage equipped with the initial variant of the RO-9 engine unit [21]. Following insertion into orbit, the 6,370 kilogram Voskhod craft carrying Volynov and Katys would separate from the 30,000 kilogram 11A57I by about 5-10 meters to deploy a tether. At this point a solid fuel engine would fire (it is not clear



if the engine was to be on the Voskhod or the upper stage) to separate the two vehicles to completely unwind the tether to its maximum length of over 1,000 meters. When it was completely unwound, the two craft would slowly begin to rotate around a common axis, initially at about 1.5 degrees per second. In an interesting connection with the human lunar landing programme, Korolev and Raushenbakh planned a simulated gravity of one-sixth of terrestrial loads for the mission. One peripheral objective of the IT project was to generate an electrical current from interactions of the current-conducting tether with the Earth's geomagnetic field. After the initial phase of rotation, the distance between the ship and the upper stage was to be reduced to 300 meters, increasing the angular velocity to about 12 degrees per second, following which the tether was to be disconnected [22]. The crew would then continue their mission in orbit for another 10 to 15 days. A drawing of the spacecraft has been published in a recent Russian book. The actual tether is shown strapped to the side of the spacecraft beginning with an attachment point at the base of the reserve rocket unit, and leading down to the apex of the primary de-orbit engines. The same diagram states that the total time of flight in a tethered mode was to be one to two days [23]. As originally planned, elements of the IT system were to be tested on the long-duration Voskhod-3 mission, followed by a full-fledged artificial gravity mission on Voskhod-7. Although the design of the system originated in the OKB-1, it appears that responsibility for developing an actual working prototype was turned over to the OKB-1 Branch No. 3 headed by Chief Designer Dmitriy I. Kozlov, today known as the Central Specialised Design Bureau (TsSKB) [24].

#### 4. DELAYS

The period following the Voskhod-2 mission was a time of great indecision. There were continuing clashes between Korolev, representing the engineers, and the Ministry of Defense, which through the Air Force and the Strategic Missile Troops (RVSN), had operational control of the space program. In particular, Korolev had always been resentful of the Air Force's complete jurisdiction over the training of cosmonauts, and therefore the selection of crews for particular missions. In August, 1965, the VPK had passed a resolution calling for the formulation of a series of piloted defense-related missions within the next few years [25]. While it is unclear if this document called for flights aboard the Voskhod spacecraft itself or the next generation Soyuz, it nevertheless managed to have an effect on Korolev's relationship with the military. The final months of 1965 were spent in heated arguments between the two sides over details of the mission manifest and crewing. Korolev was apparently concerned that a dedicated military program might divert resources away from the lunar projects, and also bypass the selection of his own engineers from the OKB-1 for space missions.

At this time there was also some discussion concerning the possible installation of orbit-correction engines on board the Voskhod article 3KV which would have been a qualitative leap in abilities. Proposals were circulated between Korolev, Kamanin and Commander-in-Chief of the Soviet Air Force Marshall Konstantin A. Vershinin to this effect, although Korolev was apparently hesitant to approve such a plan, since the installation of such engines could delay the program. The Air Force, and especially Kamanin, was clearly in favour of this proposal, since any advanced military reconnaissance mission would be limited by the lack of engines for changing altitude and inclination.

As the confusion mounted about the course of action to take,

on 1 September 1965, Kamanin met Korolev for in depth discussions on the next few Voskhod missions [26]. According to Kamanin, the crews for the Voskhod-3 mission would be ready for their flight in October and the mission could be reasonably mounted in January, 1966. Korolev, perhaps as a result of political pressure, maintained that this long-duration mission could be flown as early as November, 1965. At the same time, it was decided to delay the Voskhod-4 mission with the female crew members and extend their training program to ensure the success of the flight.

Soon after the meeting between Korolev and Kamanin in early September, the Air Force sent a letter to propose that a flight with *one* cosmonaut for 20 to 25 days should be mounted instead of the 15 day Voskhod-3 flight with *two* cosmonauts. This letter appears to have been a response to the August, 1965 VPK resolution calling for military missions. The longer mission would focus on defense-related goals instead of the planned medical experiments [27]. Korolev was greatly incensed at this "intrusion" into his jurisdiction and actually threatened to prepare his own cosmonauts without the help of the Air Force, thereby circumventing the influence of the Air Force on the human space program. These debates among the upper echelons of the Soviet space program indicate on a larger level the conflicts between the defense and civilian sectors in the arena of space flight. Clearly the inherent confusion had a debilitating effect on the entire program. To make matters worse, the government played an ineffectual role in the conflicts, refusing to lay down timetables for specific missions, something that would have certainly cleared the way for actual work for launching the remaining Voskhod craft.

In the autumn of 1965, a technical conference was held to determine the status of the IT (artificial gravity) experiment [28]. At the meeting it was decided to test the system on two separate missions in the Voskhod program, with the first flying in the spring of 1966. This clearly meant that the system would not be ready for the Voskhod-3 mission then planned for January, 1966. In November, 1965, Korolev informed Kamanin that he had elected to drop the artificial gravity experiments from the mission and instead extended the planned duration of the mission to 15-20 days [29]. The decision to extend the flight time was most likely based on the news that the United States was planning a two-week long Gemini VII mission at the end of the year. The space duration record had been reclaimed by the U.S. with the Gemini V mission in August, 1965, and Korolev was anxious to fly a longer mission as soon as possible.

More changes to the schedule appeared by December, 1965. The TsPK administration removed cosmonaut Katys, the civilian scientist from the Voskhod-3 crew, in favour of Air Force cosmonaut Gorbatko who had previously been training for the Voskhod-4 EVA mission. It seems that the Soviet Air Force continued pressing for military reconnaissance objectives at the earliest possible flight opportunity. Maj.-Gen. Kamanin defends the decision in his memoirs by arguing that the switch was made since Gorbatko was "much better prepared for a 20-day flight" [30]. Not surprisingly, Korolev was once again angered by this decision and decided to propose an all-civilian crew to the governing State Commission in the near future. There were numerous other changes in the crewing of the follow-on Voskhod missions at this time. Of the cosmonauts originally training for Voskhod flights, Artyukhin and Demin were transferred to the new Soyuz program. The crews were accordingly reshuffled. The schedule in December, 1965 looked as follows:



<b>Voskhod-3:</b>	<b>prime:</b>	<b>B. V. Volynov/V. V. Gorbatko</b>
	backup:	G. T. Beregovoy/V. A. Shatalov
	objectives:	15-20 day flight to high altitude
<b>Voskhod-4:</b>	<b>prime:</b>	<b>V. L. Ponomareva/I. B. Soloveva</b>
	backup:	Z. D. Yerkina/T. D. Kuznetsova
	objectives:	10 day flight with EVA by Soloveva
<b>Voskhod-5:</b>	<b>prime:</b>	<b>G. T. Beregovoy/E. A. Ilyin</b>
	backup:	V. A. Shatalov/A. A. Kiselev
	objectives:	5 day flight with physician
<b>Voskhod-6:</b>	<b>prime:</b>	<b>G. S. Shonin/Ye. V. Khrunov</b>
	backup:	D. A. Zaykin/A. F. Voronov
	objectives:	1st use of UPMK in orbit by Khrunov
<b>Voskhod-7:</b>	objectives:	IT experiment
	date:	1967 [31].

## 5. MORE CHANGES

Within a month, the crewing for all the Voskhod missions switched once more with more experienced cosmonaut G. S. Shonin replacing V.V. Gorbatko on the prime crew of Voskhod-3 [32]. Deputy Director of the TsPK, cosmonaut Lt.-Col. Yuriy A. Gagarin himself informed Shonin of his appointment to the prime crew referring to "a difficult flight" that was being planned [33]. This had a repercussive effect on the other crews. Cosmonauts P.I. Kolodin and A.N. Matinchenko, both of whom were also training for the Soyuz program were brought in to fill in backup positions. Additionally, the duration of the Voskhod-4 mission carrying the two women cosmonauts was extended to 20 days. This was once again clearly a response to the success of the Gemini VII flight in December, 1965 during which astronauts Borman and Lovell had flown a record 14 day flight. Finally, scientist Katys was brought back into crew training at the time, filling in the slot next to Beregovoy on the biomedical Voskhod-5 mission [34]. The final manifest for the program in January, 1966 was as follows:

<b>Voskhod-3:</b>	<b>prime:</b>	<b>B. V. Volynov/G. S. Shonin</b>
	backup:	G. T. Beregovoy/V. A. Shatalov
	objectives:	15-20 day flight to high altitude
	date:	spring 1966
<b>Voskhod-4:</b>	<b>prime:</b>	<b>V. L. Ponomareva/I. B. Soloveva</b>
	backup:	Z. D. Yerkina/T. D. Kuznetsova
	objectives:	15-20 day flight with EVA by Soloveva
	date:	late 1966
<b>Voskhod-5:</b>	<b>prime:</b>	<b>G. T. Beregovoy/G.P. Katys</b>
	backup:	V. A. Shatalov/A. A. Kiselev?
	objectives:	5 day flight with physician on board
	date:	1967
<b>Voskhod-6:</b>	<b>prime:</b>	<b>Ye. V. Khrunov/A. F. Voronov</b>
	backup:	V. V. Gorbatko/P. I. Kolodin
	2nd backup:	D. A. Zaykin/A. N. Matinchenko
	objectives:	1st use of UPMK by Voronov [35]
	date:	1967
<b>Voskhod-7:</b>	objectives:	IT experiment
	date:	1967.

This was the final manifest established for the Voskhod program. It is possible that the Voskhod-4 and Voskhod-5 missions were to be switched in sequence. Elements of the artificial gravity experiment were to be tested on one of the early missions, although it is not clear which one. It is known,

however, that cosmonauts, including Gagarin had begun training at the TsPK with the IT system [36]. In addition to the above four flights, a fifth mission with an animal on board was to precede Voskhod-3. It was this mission which, in fact, satisfied the original plans for a long-duration animal mission dating from 1963.

## 6. PREPARATIONS FOR VOSKHOD-3

On 14 January 1966, the very day that the final appointments for the Voskhod program were made by Maj.-Gen. Kamanin, Chief Designer Korolev passed away in a Moscow hospital. His position as head of the OKB-1 was taken by newly appointed Acting Chief Designer Vasiliy P. Mishin. There has been much speculation in the West that the remaining missions in the Voskhod program were cancelled by Mishin immediately following his appointment. This is in fact untrue, and it appears that Mishin elected to continue preparations for the missions and set the launch of Voskhod-3 for March, 1966. The Soyuz program was still at least a year away from its first piloted mission, and the several Voskhod flights would serve to bridge the gap until that point. Additionally, these expeditions would also serve to deflect world-wide attention from NASA's successful Gemini program. Certainly the Voskhod-3 mission, dedicated to regaining the mission duration record claimed by Gemini VII, would be an outstanding publicity victory for the Soviet space program. No doubt, the all-woman flight would also capture the attention of the world public.

The four cosmonauts training for the Voskhod-3 mission completed their training program on February 8, 1966 [37]. Just 10 days later on 18th February, the State Commission under the leadership of Chairman Maj.-Gen. Georgiy A. Tyulin met to discuss the timetable for launching Voskhod-3. Preparations were almost finished at the time for the long duration animal mission. The plan was to carry out a full 25 day mission during which there would be close monitoring of the physiology of two dogs. Based on the results of this mission, Voskhod-3 would be launched into orbit within one or two weeks.

The 3KV-type Voskhod vehicle was launched at 2010 hours GMT (it was a night time launch at Tyura-Tam) on February 22, 1966 and designated Kosmos-110. The craft carried two dogs named Veterok and Ugolek into a highly elliptical initial orbit of 187 x 904 kilometres at a 51.9 degree inclination [38]. There were two significant aspects about the orbit. Firstly, the high apogee of the orbit was an attempt by Soviet scientists to examine the effects of the Van Allen radiation belts on the dogs. Clearly, this was another objective dating from 1963. It was hoped that the ensuing Voskhod-3 craft with cosmonauts Volynov and Shonin would be launched into such an orbit not only to study radiation effects, but also to claim the altitude record for a piloted space vehicle. The second important aspect of the orbit was the use for the first time in the human space program, of the 51 degree inclination. This inclination allowed the 11A57 launcher to insert the heaviest payload into orbit, without having to land in China in case of an abort. The total mass of the vehicle was 5,600 kilograms, 3,000 kilograms of which was the spherical Return Apparatus (SA) [39]. The two dogs were housed in special containers within the SA itself. Veterok served as the experimental specimen while Ugolek was the control animal. Apart from the dogs themselves, there were also various types of yeast preparations, samples of blood serums, protein growths, chlorella, and lysogenic bacteria [40]. Like the previous Voskhod spacecraft, the vehicle was equipped with a reserve de-orbit motor mounted on the SA. Throughout the mission, the two dogs were fed anti-radiation drugs, and food which was delivered by means of tubes in their



stomachs. The flight itself was troubleprone. Due to a "worsening" of the internal atmosphere in the spacecraft, the State Commission opted to curtail the mission fearing that the dogs would perish [41]. A full three days prior to the intended return, a successful re-entry was conducted on March 16, 1966 completing a 21 day 18 hour mission. The animals were found to be in relatively very poor condition, suffering from muscular problems, dehydration, loss of calcium and confusion in readjusting to walking [42].

Throughout the Kosmos-110 mission there were rumours from Moscow that a piloted mission was imminent following its landing. On March 9, 1966, the United Press International (UPI) reported that the USSR would launch a multi-crewed space craft prior to the end of March, 1966 when the 23rd Communist Party Congress was to be held [43]. The rumours were relatively precise and reported that the craft would fly through the Van Allen radiation belts. According to the report, the flight was slated to begin between "now and the end of March" and that the apogee would be 885 kilometres, slightly lower than Kosmos-110. On March 12, 1966, just four days prior to the return of Kosmos-110, the crews of Volynov/Shonin and Beregovoy/Shatalov were given final approval by the State Commission [44]. State Commission approval for crews typically occurs a few days prior to the beginning of a mission; thus the launch of the craft was surely planned for the third week of March, 1966. There was, however, no launch, and the mission was apparently postponed following the return of the Kosmos-110 craft on 16 March.

The exact reasons for the postponement have not been revealed in open Soviet or Russian literature but fairly informed speculation is possible. The poor shape of the dogs who returned from orbit, just four days after State Commission approval, was clearly the primary factor in delaying the mission. The Soviets had a fairly consistent history of being very careful and prudent about allowing prolonged exposure to the space environment without adequate testing. Other speculation rests on the possibility that the death of Academician Norair M. Sisakyan, the Academic Secretary of the Department of Biological Sciences of the USSR Academy of Sciences, forced a delay in the launch [45]. Sisakyan had been closely involved in the Soviet microgravity life sciences effort since 1949, playing an extremely important role in the prior Vostok and Voskhod missions [46]. His passing was announced on March 12, 1966 during the Kosmos-110 flight [47].

During celebrations for Cosmonautics Day on April 12, 1966, Commander-in-Chief of the Soviet Air Force Marshall Vershinin made references to the impending Voskhod-3 mission. He was quoted in *Pravda* as saying that a new spectacular Soviet space mission would see cosmonauts venture out into the Van Allen radiation belts on a long duration flight [48]. Marshall Vershinin did not specify a timetable for the launch of this mission, but the report indicated that the Voskhod-3 mission was still in planning at this point. The UPI, reporting Vershinin's statement, added some more interesting elements to the puzzle. The press agency stated that the flight would be performed in "the next few weeks," thus reiterating the consistent rumours of a high-altitude flight. UPI also added that the flight had originally been scheduled for March, 1966 to coincide with the 23rd Congress, but had been cancelled "at the last minute" [49]. The month of May however passed without any launch, nor any rumours from either the Western press or hints in the Soviet media.

The timing of the rumours seem to indicate that the Voskhod-3 mission with cosmonauts Volynov and Shonin was in fact planned originally for March, 1966, delayed to May, 1966, and then scrapped altogether [50]. A recent Russian source reports,

"Because of the unpreparedness of the ship's life-support system for prolonged flight of two cosmonauts, the flight of 'Voskhod-3' did not take place" [51]. The remaining missions in the Voskhod program were cancelled and all resources diverted to the Soyuz and lunar programs. The exact rationale for cancelling the Voskhod-3 mission, and ultimately the *entire* program, remains obfuscated amidst vague rumours and hints of information published in the Soviet and Russian media. Some sources suggest that it was Chief Designer Mishin himself who was instrumental in terminating the program. As one Russian correspondent noted, he "managed to convince the leaders that the 'old junk' couldn't take the country far and would only increase the lag between the United States and Russia" [52]. In much the same vein, another source suggests that Mishin was concerned about the obsolete design of the Voskhod series, and persuaded the leaders of the Soviet space program to permit him to terminate the program in favour of moving ahead with the much more versatile and advanced Soyuz spacecraft [53]. In what is most likely not a coincidence, Mishin's official appointment as Chief Designer of the OKB-1 was formally approved on May 11, 1966, at the very same time that the Voskhod program was terminated [54]. It may be likely, although still unconfirmed, that Mishin's first job as the official head of the Design Bureau was to cancel the project. Kamanin, on the other hand, in his personal diaries states that the decision to cancel the Voskhod program came not from Mishin but from more powerful individuals. Kamanin recalls that:

*A fully prepared 18-day flight navigated by Boris Volynov on board Voskhod-3 was cancelled. The construction of Voskhods was scrapped as having 'no future' at the insistence of Ustinov, Smirnov, and Pashkov. They believed that we should forge ahead with the construction of Soyuz and N-1 rockets. The result was haste, and haste brought about the death of Komarov..." [55]*

The cosmonauts training for the remaining five missions were apparently disappointed by the cancellation, although some of the objectives of the remaining flights were incorporated into the Soyuz program. Voskhod-3 pilot Shonin recalled that:

*In 1965 preparations were underway for the first long-term spaceflight. Boris Volynov and I were assigned to a twenty-day stay in space. An impressive endurance test for that time! That is why Sergey Pavlovich [Korolev] had many opponents, mostly physiologists, who considered the mission precarious. Nevertheless, the pre-flight activities were in full swing. Boris and I were well prepared and even filled in our flight books...but the sudden death of S. P. Korolev in January, 1966 postponed the start of Voskhod-3. Other postponements followed, and finally the launching was called off. For the mission my task was to initiate several very interesting tasks. I was able to carry out these tasks—though years later—on Soyuz 6. [56]*

## 7. CONCLUSIONS

Some general conclusions can be inferred about the overall Voskhod program from publicly available information:

- (1) Of the original 1963 plans for a post-Vostok series of missions using modified 3KA vehicles, only one mission objective, that of the extended animal flight was carried out in full. The insertion of the two flown Voskhod missions in 1964 and 1965 clearly delayed the fulfilment of the original objectives, and even though some of the original goals were reinstated, none of the piloted missions were carried out.
- (2) The biological results from the Kosmos-110 mission probably necessitated a thorough review of medical



knowledge of long-duration missions and may have prompted a delay in any long-duration flight to the Soyuz program. The Soyuz-9 flight undertaken in 1970 was a part of mission-planning from the beginning of the Soyuz program, and thus may have been formulated due to the cancellation of the Voskhod-3 flight [57].

- (3) The long-duration Voskhod-4 flight of the all-woman crew was also cancelled, but its objectives were never brought to fruition in the Soyuz program. The women cosmonaut group itself was disbanded in October, 1969, and women were not included in cosmonaut training until at least 1980. There are some rumours that the women may have trained for missions in the Soyuz program in the period 1966-69 but these remain unconfirmed.
- (4) Apart from the sole flight of Yegorov in 1964, a Soviet physician did not reach Earth orbit until the flight of cosmonaut Lazarev in Soyuz-12 in 1973. In a fitting irony, he had trained briefly for the cancelled Voskhod-5 mission in 1965-66. The first Soviet physician to carry out a long-duration flight was O. Yu. Atkov on Soyuz-T-10 in 1984. All three of the IMBP physician-trainees (Ilyin, Kiselev, and Senkevich) selected for the Voskhod-5 mission were stood down in 1966 and were not involved in further cosmonaut training. Surgery on a mammal has yet to be carried out in microgravity.
- (5) By 1965, NASA engineers were planning for the use of their first Astronaut Manoeuvring Unit (AMU) on board Gemini IX, then planned for the late spring of 1966 and it seems that the initiative to preempt that milestone with an equivalent Soviet mission was lost. The Voskhod-6 mission with the UPMK could not have been reasonably mounted prior to late 1966 at the earliest. Thus, the flight of the UPMK was delayed until the Soyuz program at best. As it happened, development of the unit was not finished until 1968, at which point

it was put into storage since no missions were anticipated in the near future. The unit was never used in space.

- (6) The military objectives that were to be incorporated into the Voskhod-3 mission were transferred to the more advanced Soyuz program. In fact, without orbital correction engines, the Voskhod craft would have been a poor reconnaissance craft despite the presence of humans on board. The advanced capabilities of the Soyuz would certainly give crews more sophisticated capabilities for reconnaissance. Crews for a military Soyuz mission were formed as early as January 1966, prior to Korolev's death [58]. The cosmonauts were to fly a military variant of the Soyuz craft named 7K-VI that was to be introduced in 1967. As is known, this program was also cancelled following the Soyuz-1 disaster in April, 1967.

In retrospect, examining the flight manifest of the cancelled Voskhod project, it is clear that the Soviets planned for many of the same objectives scheduled for the concurrent U.S. Gemini program. The EVA mission was flown as Gemini IV (June, 1965), the two-week long mission was flown as Gemini VII (December, 1965), the astronaut manoeuvring unit was flown on Gemini IX-A (June, 1966), an artificial gravity experiment and high-apogee flight conducted on Gemini XI (September, 1966). It is tempting to wonder what the effect on public opinion and the U.S. space program in general would have been if any or all of the Soviet missions had been conducted on time. Originally planned as a modest extension of the capabilities of the original Vostok spacecraft in 1962-62, engineers at the OKB-1 continued to formulate plans for the use of the vehicle far into 1966. By that time however, the requirements of the space program were beginning to far outstrip its capabilities. With launches planned in the new Soyuz program by 1967, the newer vehicle certainly offered a better option for engineers. If Chief Designer Mishin had indeed opted to continue the Voskhod program, it certainly would have delayed the Soyuz program even more, thus having a cumulative effect on the piloted lunar program.

## REFERENCES

1. Donald C Winston, "Soviets Revamp Lunar Space Plan," *Aviation Week and Space Technology*, 28 November, 1966, pp. 22-23.
2. N.P. Kamanin, *Skrytyy kosmos: Kniga pervaya*, Infortekst IF, Moscow, p. 88, 1995.
3. *Ibid.*, p. 178.
4. *Ibid.*, pp. 222-223, 224-225.
5. *Ibid.*, p. 313.
6. This document, a scientific-technical 'certificate' has been reproduced in full in, M.V. Keldysh, *Tvorcheskoye naslediyе akademika Sergeya Pavlovicha Koroleva: Izbrannyye trudy i dokumenty*, Nauka, Moscow, 1980, pp. 457-460.
7. *Ibid.*, p. 458.
8. *Ibid.*, p. 459-460.
9. Kamanin, op. Cit., p. 382.
10. *Ibid.* P. 391.
11. Sergey Voevodin, VSA035 newsletter, distributed over the internet Jan. 25, 1993.
12. L. N. Kamanin, "In the Future His Name Will Probably....," *Ogonyok*, No. 7, 9-16 February, 1991, pp. 28-31. See also, Voevodin, op. cit.
13. S. Shamsutdinov and I. Marinin, "Flights Which Never Happened: I," *Aviatsiya I Kosmonavtika*, No. 1, January, 1993, pp. 44-45.
14. Kamanin, "In the Future His Name Will Probably....", op. cit. See also, N. Kuzmichev and V. Nesterova, "The Girls Who Didn't Go," *Sputnik*, December, 1988, pp. 45-51.
15. Voevodin, op. cit.
16. Kamanin, "In the Future His Name Will Probably....", op. cit.
17. Shamsutdinov and Marinin, op. cit. See also, V. Semenov, I. Marinin, and S. Shamsutdinov, *Iz Istoriy Kosmonavtiki: Vypusk I: Nabory V Otryady Kosmonavtov I Astronavtov*, Videokosmos, Moscow, 1995, p. 21.
18. Shamsutdinov and Marinin, op. cit.
19. Neville Kidger, "The Soviet Space 'Back-Pack'," *Spaceflight*, **34**, 82-83, (1992).
20. Mikhail Rebrov, "IT' Project," *Krasnaya Zvezda*, 8 June, 1993, p. 2.
21. T. Varfolomeyev, "Rocket Engines Developed by the KB of S.A. Kosberg Installed on Carriers," *Novosti Kosmonavtiki*, No. 26, Dec. 18-31, 1993.
22. Rebrov, op. cit.
23. G. A. Kustova, ed., *Ot Pervogo Sputnika Do "Energiy" - "Burana" I "Mira"* (Moscow: RKK Energiya, 1994), p. 57.
24. Marinin and Shamsutdinov, op. cit. Note that the length of the tether is described as being 50 meters in the source. It is possible that this was the early version of the system to be flown on Voskhod-3.
25. Kamanin, "In the Future His Name Will Probably....", op. cit.
26. *Ibid.*
27. *Ibid.*
28. Rebrov, op. cit.
29. Kamanin, "In the Future His Name Will Probably....", op. cit.
30. *Ibid.*
31. The listing of crews are based on Voevodin, op. cit., except for the Voskhod-5 crew which is from, Michael Cassutt, ed., *Who's Who In Space: The International Space Year Edition*, MacMillan Publishing Company, New York, 1993, p. 422. The pairings for Voskhod-5 must be



- seen as somewhat speculative.
32. Voevodin, op. cit.
  33. G. S. Shonin, "The Very First Ones," in, V. Mitroshenko, ed., *Pioneers of Space*, Progress Publishers, Moscow, 1989, p. 52.
  34. I. Marinin, "Russian Cosmonaut-Scholars," *Novosti kosmonavtiki*, No. 3, January 29-February 11, 1996, pp. 49-54.
  35. The listing is based on Voevodin, op. cit.
  36. Rebrov, op. cit.
  37. Christian Lardier, *L'Astronautique Sovietique*, Armand Colin, Paris, 1992), p. 148. See also Viktor Mitrashenkov, *Zemlya pod nebom*, Sovetskaya rossiya, 1987, pp. 377-388.
  38. V. P. Glushko, ed., *Kosmonavtika Entsiklopediya*, Sovetskaya Entsiklopediya, Moscow, 1985), p. 485.
  39. Kustova, op. cit., p. 57.
  40. Glushko, op. cit., p. 203.
  41. "30 Years Ago", *Novosti kosmonavtiki*, No. 4, Feb. 12-25, 1996, p. 57.
  42. Raymond H. Anderson, "Gagarin Hints the Soviet Is Near Orbiting Manned Space Station," *The New York Times*, April 9, 1967, p. 31.
  43. "Soviet Is Said to Be Preparing Manned Test of Van Allen Belts," *The New York Times*, 10 March, 1966, p. 15.
  44. Mitroshenkov, op. cit., p. 379.
  45. Peter Pesavento, "An Examination of Rumoured Launch Failures in the Soviet Manned Program. Part 1: Voskhod/1966," *The Journal of the British Interplanetary Society*, **43**, 379-382, (1990).
  46. See for example, Yaroslav Golovanov, *Korolev: Fakty I Mify*, Nauka, Moscow, 1994, p. 546 for his role in early vertical biological flights in the 1950s. See, A. P. Romanov and V. S. Gubarev, *Konstruktory*, Politicheskoy Literatry, Moscow, 1989, pp. 106-111, for an example of his role in the Vostok program. See also, Congressional Research Service, *Soviet Space Programs: 1976-80 (With Supplementary Data Through 1983) Part 2: Manned Space Programs and Space Life Sciences*, GPO, Washington, D.C., 1984, p. 668.
  47. "Dr. Norair Sisakyan, A Soviet Biochemist," *The New York Times*, March 13, 1966, p. 86.
  48. "Soviet Chief Hints at New Space Feat," *The New York Times*, April 13, 1966, p. 55.
  49. Ibid.
  50. The date of cancellation as May, 1966 is confirmed in, Lardier, op. cit., p. 149.
  51. "30 Years Ago", op. cit.
  52. Leonard Nikishin, "Soviet Space Disaster on the Revolution's Anniversary: How and Why Soviet Cosmonaut Komarov Died," *Moscow News*, No. 9, March 1-8, 1992, p. 16.
  53. Shamsutdinov and Marinin, op. cit.
  54. Yu. Mozzhorin, et al., eds., *Dorogi V Kosmos: I*, MAI, Moscow, 1992, p. 121. He had served as Acting Chief Designer from 20 Jan. to 11 May 1966.
  55. L. N. Kamanin, "I Feel Sorry for Our Guys," *Vozdushniy Transport*, No. 12 (2114), 1993, p. 11. Dmitriy F. Ustinov was at the time the Secretary of the Central Committee responsible for defense industry and space issues, i.e. the *de facto* head of the Soviet space program. Leonid V. Smirnov was the Chairman of the Military-Industrial Commission (VPK), the management authority over the entire Soviet defense industry, including the space program. Georgiy N. Pashkov was Smirnov's deputy in charge of space issues. See, Asif A. Siddiqi, "Soviet Space Programme: Part 1 - Organisational Structure 1940s-1950s," *Spaceflight* **36**, 283-286, 1994, and Asif A. Siddiqi, "Soviet Space Programme: Part 2 - Organisational Structure in the 1960s," *Spaceflight* **36**, 317-320, (1994), for an in-depth discussion of their positions and roles.
  56. *Russian Space History*, catalogue for auction sale 6753, Sotheby's, New York, 1996, description for lot 101.
  57. This is suggested in, Mishin, V. P. "Why Didn't We Fly to the Moon," *Tekhnika: Seriya Kosmonavtika, Astronomiya*, 12, Dec., 1990, pp. 3-43.
  58. Voevodin, op. cit.

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