

THE UNION OF SOVIET SOCIALIST REPUBLICS
THE USSR TCHKALOV CENTRAL AERO CLUB

RECORDS FILE
ON THE SPACE FLIGHT
BY THE USSR CITIZEN
GERMAN STEPANOVICH TITOV
Made on August 6-7, 1961
IN THE SPACESHIP "VOSTOK-2"

MOSCOW
1961

THE USSR TCHKALOV CENTRAL AERO CLUB

CARD OF GENERAL DATA

1. Records: world record of space flight duration, world record of space flight distance, world class record of orbital space flight duration, world class record of orbital space flight distance.
2. Pilot: German Stepanovich Titov, sports certificate No. 354/8 dated September 25, 1957.
3. Citizenship: citizen of the USSR.
4. Type of vehicle: rocket one.
5. Trade-mark of vehicle: "Vostok-2".
6. Brief characteristics of vehicle: the vehicle consists of a multi-stage carrier-rocket and a spaceship. The spaceship has a pilot's compartment with hatches and portholes which houses the pilot and his outfit, and an instrumentation compartment to place the control and communication gear in, and a compartment with the retrorocket.
7. Identifying marks (brief description): "USSR — VOSTOK-2".
8. Number and data of spaceship book: Book No. 4, dated June 29, 1961.
9. Engines of vehicle:
 - a) Type: Liquid-propellant rocket power plant;
 - b) Trade-mark: "Vostok";
 - c) Power characteristics: Total maximum useful thrust of all the stages is 600000 kg;
 - d) Number of motors: 6.



V. A. Plavin,



N. P. Brital,

sports commissars of the USSR
Tchkalov Central Aero Club

THE USSR TCHKALOV CENTRAL AERO CLUB

S T A T E M E N T

on weighing of spaceship-sputnik "Vostok-2"

On the 5th of August, 1961, we, the undersigned Vladimir Alexeyevich PLAXIN, sports commissar of the USSR Tchkalov Central Aero Club, Vladimir Ivanovich BODRIKOV and Nina Michailovna TERESHENKOVA, calculating engineers, drew up a statement to the following effect:

On the 5th of August, 1961, we weighed the payload of 4731 kilogrammes mounted on the space rocket "Vostok".

The payload consisted of a spaceship-sputnik with pilot-cosmonaut German Stepanovich TITOV in his full space flight outfit to be put in orbit around the Earth. The payload weight did not include the weight of the final carrier-rocket stage.



V. A. Plaxin,
sports commissar of the USSR
Tchkalov Central Aero Club



V. I. Bodrikov,
N. M. Tereshenkova,
calculating engineers

THE USSR TCHKALOV CENTRAL AERO CLUB

S T A T E M E N T

on the launching of rocket with the spaceship
"Vostok-2"

On the 6th of August, 1961, I, the undersigned Vladymir Alexeyevich PLAXIN, sports commissar of the USSR Tehkalov Central Aero Club, bear witness to the starting of the rocket carrying the "Vostok-2" spaceship with the identifying marks of "USSR—Vostok-2", controlled by the pilot-cosmonaut German Stepanovich TITOV. The launching was made at 6.00 a. m. Greenwich mean time from a cosmodrome in the vicinity of the station of Baikonur.

The take-off of the rocket took place at 6 h. 00 min. 00 sec. a. m. Greenwich mean time.

The geographical coordinates of the launching place are in the latitude of 47° 22' North and the longitude of 65° 25' East.



V. A. Plaxin,
sports commissar of the USSR
Tchkalov Central Aero Club

THE USSR TCHKALOV CENTRAL AERO CLUB

S T A T E M E N T

on the landing of the spaceship "Vostok-2"

On the 7th of August, 1961, I, the undersigned Nikolai Petrovich BRITAL, bear witness to the fact that at 7.18 a. m. Greenwich mean time the pilot-cosmonaut German Stepanovich TITOV and the spaceship "Vostok-2" which had the identifying marks of "USSR — Vostok-2" landed in the vicinity of the village Krasny Koot, Saratov region, the USSR.

The geographical coordinates of the place of landing are in the latitude $50^{\circ} 51'$ North, the longitude $47^{\circ} 01.5'$ East.



N. P. Brital,
sports commissar of the USSR
Tchkalov Central Aero Club

THE USSR TCHKALOV CENTRAL AERO CLUB

S T A T E M E N T

on the defining of flight duration of the spaceship
"Vostok-2" with the pilot-cosmonaut
German Stepanovich TITOV
August 6-7, 1961

We, the undersigned Vladymir Alexeyevich PLAXIN and Nikolai Petrovich BRITAL, sports commissars of the USSR Tchkalov Central Aero Club, have drawn up the following statement:

On the basis of the statement of the launching of the rocket with the spaceship "Vostok-2" and of the landing of the spaceship and its pilot-cosmonaut we have established the following:

The total flight duration of the pilot-cosmonaut German Stepanovich TITOV, from the moment of launching the rocket with the "Vostok-2" spaceship to the moment of landing, is 25 hours 18 minutes.



V. A. Plaxin,

N. P. Brital,

*sports commissars of the USSR
Tchkalov Central Aero Club*

THE USSR TCHKALOV CENTRAL AERO CLUB

S T A T E M E N T

on the defining of flight distance
of the spaceship "Vostok-2" with the pilot-cosmonaut
German Stepanovich TITOV
August 6-7, 1961

We, the undersigned Vladymir Alexeyevich PLAXIN and Nikolai Petrovich BRITAL, sports commissars of the USSR Tchkalov Central Aero Club, and Alexandra Ivanovna SRAGOVICH, department chief of the Coordinating Computation Centre, have drawn up the following statement:

On the basis of studying the results of data processing of the measurements taken during the spaceship "Vostok-2" flight by the Coordinating Computation Centre we have established the following:

The flight distance of the spaceship "Vostok-2" with the pilot-cosmonaut German Stepanovich TITOV on board amounts to 703150 km.




V. A. Plaxin,

N. P. Brital,

sports commissars of the USSR
Tchkalov Central Aero Club



A. I. Sragovich,

department chief of the
Coordinating Computation Centre

THE COORDINATING COMPUTATION CENTRE

"MOSCOW — COSMOS"

Results of data processing of orbital measurements
obtained during the spaceship "VOSTOK-2" flight and
of defining the flight distance.

August 6-7, 1961

The data processing of the orbital measurements obtained during the spaceship "VOSTOK-2" flight on the 6-7 August, 1961, on M-20 and „Strela" electronic computers in accordance with the technique given in "The Records File on the First Space Flight by the USSR Citizen Yuri Alexeyevich Gagarin Made on April 12, 1961, in the "VOSTOK" Spaceship" has made it possible to establish the following:

1. The spaceship "VOSTOK-2" was put in an earth-satellite orbit with a period of revolution of 88.46 minutes.

2. The maximum altitude reached by the spaceship "VOSTOK-2" during its flight in an earth-satellite orbit (the apogee distance from the Earth's surface) was 244,000 metres.

3. The minimum altitude of the orbit of the spaceship "VOSTOK-2" was 183,000 metres.

4. The orbit inclination was $64^{\circ}56'$.

The defining of flight distance according to the given orbital measurements made in accordance with the technique set forth below has made it possible to establish the following:

Maximum flight distance from the point of launching to the point of landing amounts to 703150 km.

Appendix: The technique of defining the flight distance of the spaceship "VOSTOK-2".

Gagarin

A. I. Sragovich,

department chief of the
Coordinating Computation Centre

Technique of flight distance determination of the spaceship "Vostok-2"

The flight distance of the spaceship was calculated on M-20 and "Strela" electronic computers.

The flight distance was defined as the sum of distances of three flight phases:

$$L = L_p + L_o + L_d, \text{ where}$$

L —total flight distance;

L_p —flight distance from the launching point to the point of cutting off the last stage of the booster;

L_o —flight distance from the point of cutting off the last stage of the booster to the point of firing the retrorocket;

L_d —flight distance from the point of firing the retrorocket to the point of landing the spaceship and the cosmonaut.

For each phase distance was estimated according to the formula:

$$L = \int_{t_a}^{t_b} \sqrt{V_x^2 + V_y^2 + V_z^2} dt, \text{ where}$$

t_a, t_b —time of beginning and finishing of the movement on a given phase;

V_x, V_y, V_z —spaceship velocity vector components in the Cartesian coordinates.

V_x, V_y, V_z of the powered flight phase were estimated from the movement equations of the rocket-carrier of the spaceship "VOSTOK-2". The time of finishing the powered flight was defined from the telemetering data received from the spaceship during this phase.

Besides, a correction was introduced to the actual coordinates of the powered flight finishing in accordance with measurement data of spaceship movement parameters made by ground metering stations.

In the Earth-satellite orbital flight phase V_x, V_y, V_z were defined from solving boundary problem about the point movement in the gravitation field of the rotating Earth. The initial data for the boundary problem solution were the results of measurements of the spaceship movement parameters. In this solution the technique was used that was given in "The Records File on the First Space Flight by the USSR Citizen Yuri Alexeyevich Gagarin Made on April 12, 1961, in the

Spaceship "VOSTOK" (section "Technique of Orbit Elements Determination of the Spaceship "VOSTOK").

In the phase from the moment of firing the retrorocket till landing the values of V_x , V_y , V_z were estimated by solving the movement equations according to the parameters of the initial phase and introducing corrections to the actual coordinates of the landing point. The flight distance was defined in the coordinate system that made translational movement in space together with the centre of the Earth.

Срагович

*A. I. Sragovich,
department chief of the
Coordinating Computation Centre*

REPORT

on the arrangement of the spaceship-sputnik "Vostok-2", its special equipment and flight program

The spaceship is a guided rocket vehicle. It carried the following major systems and units:

1. Manual spaceship flight and descent control systems by means of which the cosmonaut can determine his position relative to the Earth surface, manually control the spaceship attitude, and fire the retrorocket.

Controllers are provided which allow the cosmonaut to vary the cabin humidity and temperature.

2. Optical orienting unit used by the cosmonaut to determine the local horizon and the direction of flight.

3. Automatic attitude control system which provides when used the alignment of the retrorocket axis on the Sun (prior to the firing of the retrorocket).

4. Flight control system that provides automatic control of the systems on board, their switching and changing of work regimes, etc.

5. Retrorocket used for changing the value and direction of the spaceship velocity vector to start reentry.

6. Radio equipment for the communication of the cosmonaut with the Earth on HF and UHF.

7. Radio equipment to control the spaceship orbit.

8. TV-system for observing the state of the cosmonaut from the Earth.

9. Instruments for monitoring and recording the physiological functions of the cosmonaut in flight.

10. Radiotelemetering equipment, self-contained recording system and sensors which provide control and registration of functioning the spaceship-borne systems in flight.

11. Life support system (air conditioning system, cabin pressure-control system, food and water supply system and a system for the removal of the products of body activity).

12. Spaceship thermocontrol system providing the maintenance of the desired thermal regime in the spaceship compartments.

13. Landing system.

14. Cosmonaut seat.

15. Electropower sources.

16. TL antennas of the spaceship radio systems.

The cosmonaut is placed in a special seat in the cabin of the spaceship. This seat provides the most favourable conditions for the cosmonaut under accelerations. The cosmonaut can leave the spaceship using this seat by necessity.

There are three portholes in the cabin, through which it is possible to observe the surrounding space.

One of the portholes carries an optical orienting unit. All the portholes possess shutters with actuators which are closed by the cosmonaut when the sun rays fall on his face.

The cosmonaut is dressed in a special space suit which protects him and permits him to work even in case of the cabin's decompression.

The "Convas" cinematographic camera for shooting a film from the spaceship and an optical device (with 3 and 5 times enlargement) for the visual observing of the Earth surface through portholes were set on board of the spaceship "Vostok-2".

Konstantinov

*P. F. Konstantinov,
engineer*

FLIGHT PROGRAM

1. Spaceship take-off at 6 a. m. Greenwich mean time on August 6, 1961.
2. Flight plan: 17 circles around the Earth and landing in the beginning of the 18th circle on the territory of the USSR in the latitude of 51° North. Normal flight landing is accomplished using automatic attitude control system.
3. In case the cosmonaut feels bad or some on-board apparatus fails the spaceship is landed ahead of the prescheduled time by means of manual controls or automatic systems.
4. During the flight the cosmonaut performs the following operations:
 - maintains radio communication with the Earth;
 - makes entries in the logbook and records his impressions on a tape recorder;
 - monitors the functioning of the spaceship's systems;
 - tries to control the spaceship with the manual control system;
 - shoots a film and makes observations through portholes at his discretion;
 - takes food and water;
 - introspects and makes physical exercises.



*G. S. TITOV,
the pilot-cosmonaut of the USSR*

R E P O R T

by Major German Stepanovich TITOV
the pilot-cosmonaut of the USSR
on the flight in the spaceship "VOSTOK-2"
August 6-7, 1961

The launching of the carrier-rocket with the spaceship-sputnik "Vostok-2" with me on board took place at 6.00 a. m. Greenwich mean time on the 6th of August, 1961.

During the powered flight I withstood g-loads, noise and vibrations quite well without any unpleasant feelings. In the course of the powered flight I made observations through the portholes and watched the instruments, maintaining two-way radio communication with the Earth.

After the cut-off of the last stage weightlessness set in. The instruments showed that the spaceship had been put into orbit. Besides, the confirmation came from the Earth that the spaceship had been put into a prescribed orbit. After that I began fulfilling the predetermined program of the flight.

Soon the spaceship entered the Earth's shadow. Before emerging from the shadow it was possible to distinguish the Earth from the sky. The Earth that was not sunlit differs from the sky by its light greyish colour. It was possible even to notice the direction of movement by displacement of this grey shroud. That the Earth did not seem a black gap was apparently due to the Moon which though being "on the wane", still reflected sunlight to the Earth.

While in the shadow (at 7.00 a. m. Greenwich mean time), I switched on the spaceship flight manual control.

To control the spaceship is easy and convenient. At any moment it can be oriented in any attitude and directed any way necessary.

During the seventh circle in accordance with the program of scientific observations I switched on the spaceship manual control once more. Simultaneously I made observations through portholes and maintained radio communication with the Earth on HF and UHF that was reliable during the whole period of flight.

Even when at the greatest distance from the USSR ground stations I could maintain communication with them, listen to their information and sent them mine.

Besides two-way communication equipment the spaceship carried the broadcasting receiver by means of which I listened to broadcasting from Moscow and other radio stations.

During the second circle I reported to the Central Committee of the CPSU, to the Soviet Government and to comrade Nikita Sergeevich Khrushchev on the course of the flight and soon received comrade N. S. Khrushchev's telegram in reply.

During the flight I radioed welcomes to my friends, Moscovites, and to the peoples of Europe, Asia, Africa, North and South America and Australia.

While observing the Earth from space, it is possible to distinguish rivers, mountains, tilled fields (reaped, ploughed and unreaped fields differ by colour). I had a good view of the clouds. They are easily distinguishable from snow by shadow, thrown by them on the Earth's surface.

I saw twice the crescent through the portholes. It is the same as we saw it from the Earth.

During the whole period of the flight normal climatic conditions were maintained in the cabin: pressure equal to atmospheric, normal temperature, usual gas composition of the air and no smells. While in flight, the conditioning system functioned very well.

About 9.30 a. m. Greenwich mean time I had my dinner and during the sixth circle I had my supper. I had not a good appetite. Perhaps it was due to unusual prolonged feeling of weightlessness and some excitement. Yet I had to fulfil the program. I also had to use a sanitary device that functioned normally.

Since the seventh circle till the twelfth one in accordance with the program I had to sleep and to rest. This was fulfilled precisely. My sleep was not sound. Sometimes I awoke. I woke up at the beginning of the thirteenth circle.

During the flight I made physical exercises and all kinds of introspection according to the program drawn up by doctors.

The flight program was fulfilled completely.

In accordance with the flight program at the beginning of the 17th circle the automation was switched on providing the descending and landing of the spaceship in a prescribed area.

The spaceship was oriented, the retrorocket was fired, and the spaceship transferred to descending trajectory. Before descending I did not close the shutters of portholes and observed bright luminescence of air flowing around the spaceship while entering dense-layer atmosphere and the change of colours of this luminescence with the velocity and altitude.

When g-loads appeared weightlessness ceased. There was no sharp transition. I felt that my state became usual. After passing zones of high temperatures and g-loads the landing system began functioning.

In this flight the landing system with separating the cosmonaut seat from the spaceship was used by me. At low altitude I separated from the spaceship with the seat. After that the parachute system began functioning by means of which I performed landing. The spaceship landed well nearby. The landing took place at 7.18 a. m. Greenwich mean time on the seventh of August, 1961.

At present I feel fine. I have not noticed any changes and divergences in my organism.



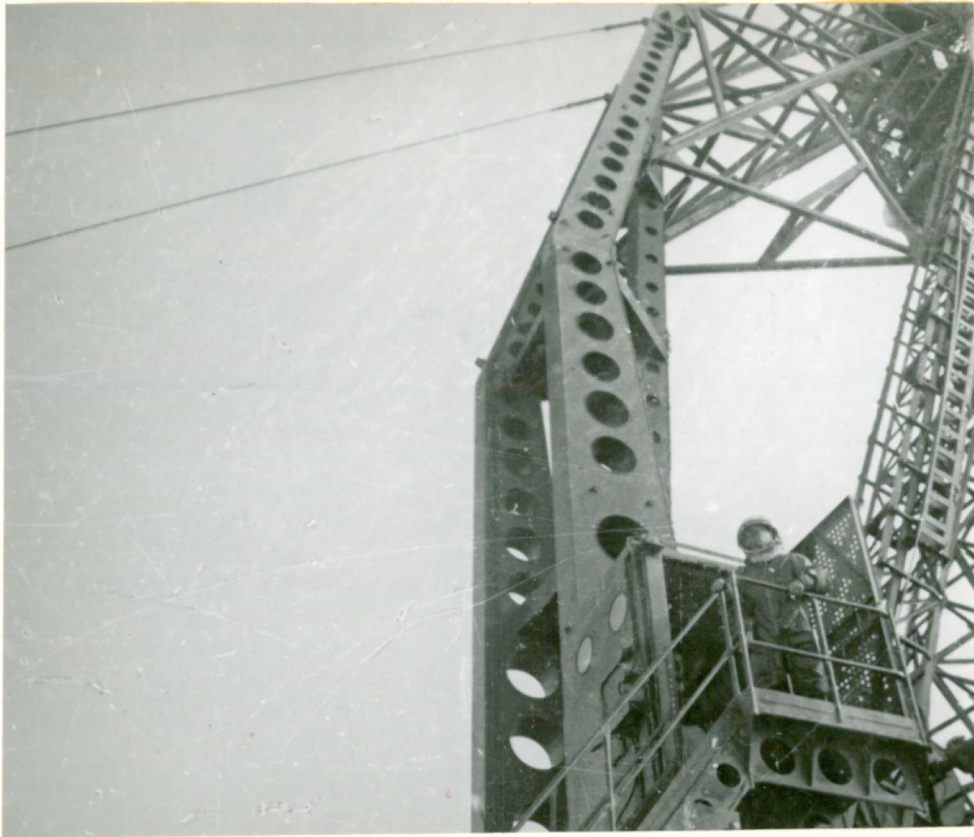
G. S. TITOV,
the pilot-cosmonaut of the USSR.



Pilot-cosmonaut of the USSR
major German Stepanovich TITOV



Pilot-cosmonaut German Stepanovich TITOV
on the way to the cosmodrome



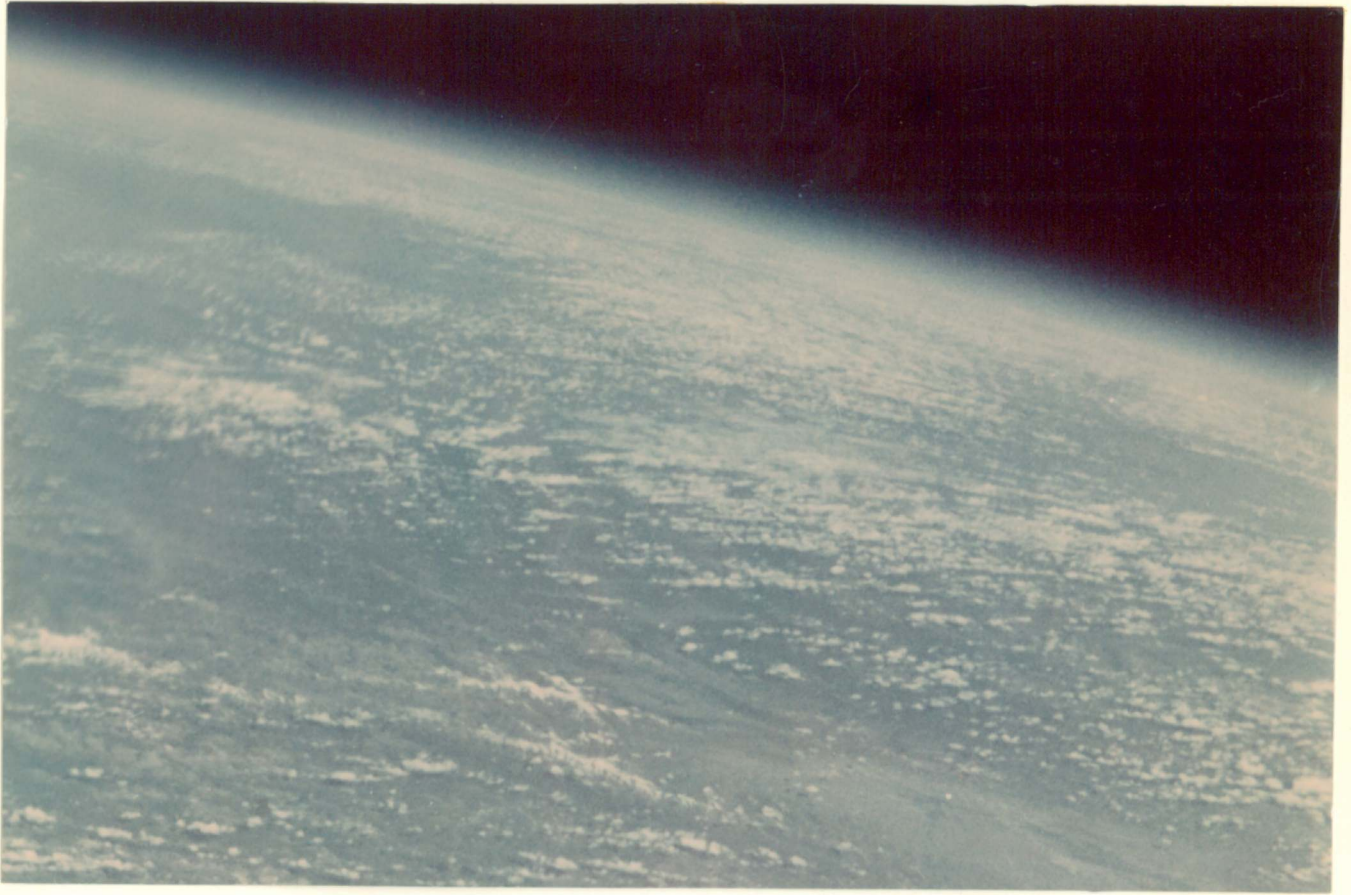
Pilot-cosmonaut G. S. TITOV before the entering
the spaceship "Vostok-2"

P I C T U R E S

taken for the first time with the movie camera
from the spaceship-sputnik "Vostok-2"
by pilot-cosmonaut G. S. TITOV
on 6-7th August, 1961



View of horizon before the spaceship's
going out of the Earth's shadow



View of horizon on the illuminated
side of the Earth



View of horizon on the illuminated
side of the Earth

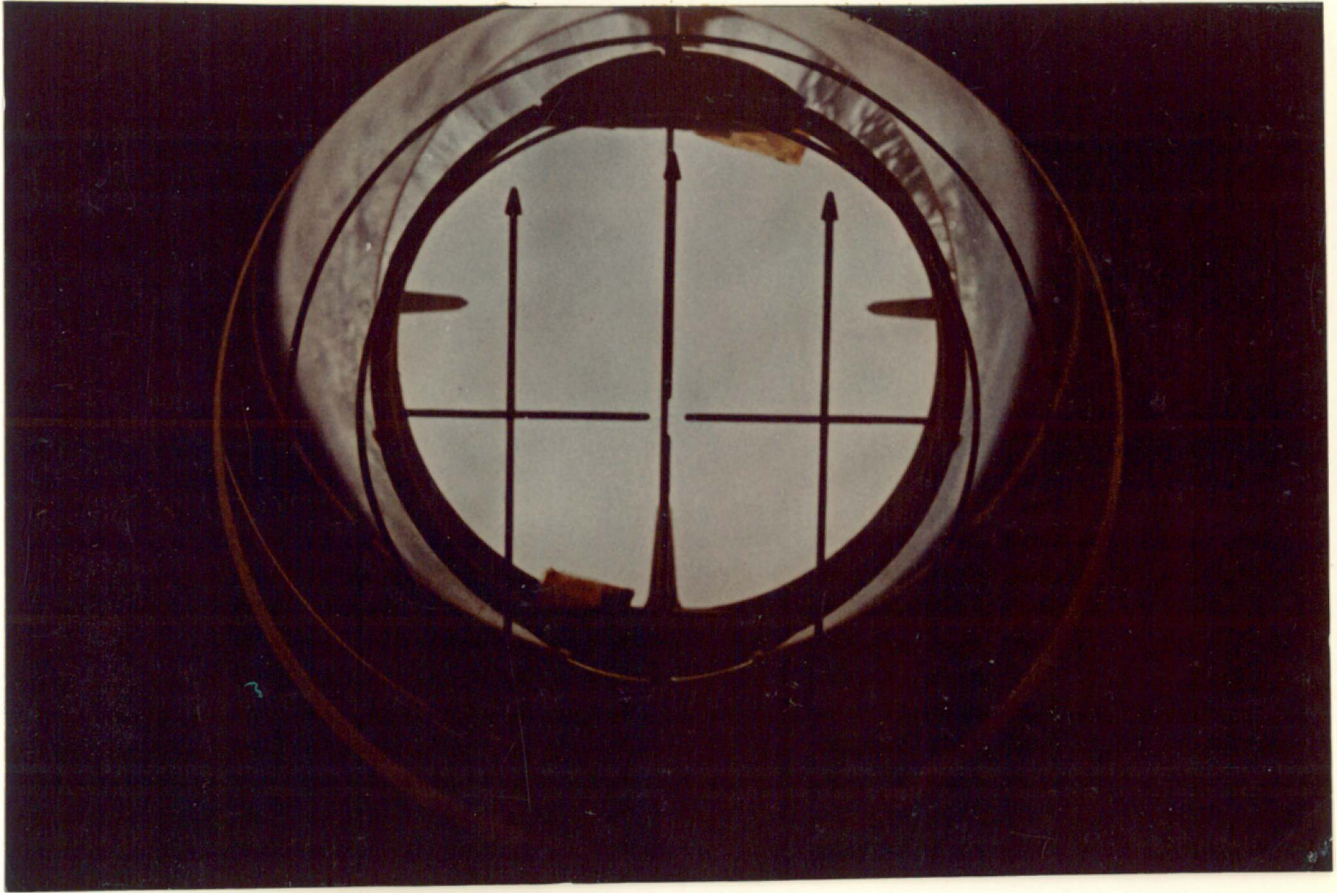


Photo taken through the optical orienting unit