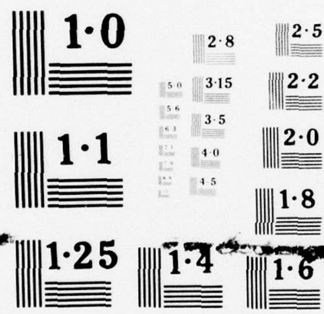
AD-A045 074 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 22/2
INITIATION OF 'VENERA', (U)
MAY 77 N YEVGEN'YEV
UNCLASSIFIED FTD-ID(RS)I-0566-77 NL

| OF |
ADA
045074

END
DATE
FILMED
11-77
DDC



NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

AD-A045074

FTD-ID(RS)I-0566-77

1

FOREIGN TECHNOLOGY DIVISION

INITIATION OF "VENERA"

by

N. Yevgen'yev

Approved for public release;
distribution unlimited.

ACCESSION for		
NTIS	White Section	X
DDC	Buff Section	☐
UNANNOUNCED		☐
JUSTIFICATION		
BY		
DISTRIBUTION/AVAILABILITY CODES		
Dist.	AVAIL. and/or SPECIAL	
A		

FTD- ID(RS)I-0566-77

EDITED TRANSLATION

FTD-ID(RS)I-0566-77 12 May 1977

FTD-77-C-000527

INITIATION OF "VENERA"

By: N. Yevgen'yev

English pages: 6

Source: Pravda, Nr. 147(18560), 27 May 1969, PP. 1-3.

Country of origin: USSR
Translated by: SCITRAN
F33657-76-D-0390
Requester: AEDC/DYF
Approved for public release; distribution unlimited.

THIS TRANSLATION IS A RENDITION OF THE ORIGINAL FOREIGN TEXT WITHOUT ANY ANALYTICAL OR EDITORIAL COMMENT. STATEMENTS OR THEORIES ADVOCATED OR IMPLIED ARE THOSE OF THE SOURCE AND DO NOT NECESSARILY REFLECT THE POSITION OR OPINION OF THE FOREIGN TECHNOLOGY DIVISION.	PREPARED BY: TRANSLATION DIVISION FOREIGN TECHNOLOGY DIVISION WP-AFB, OHIO.

Initiation of "Venera" - By N. Yevgen'yev

The Soviet space stations "Venera-5" and "Venera-6" successfully completed their flight, smoothly descending into the atmosphere of the planet Venus. How were these automatic stations prepared for the long journey? What tests were carried out? These topics are discussed in this article.

All the instruments, units and systems of the stations were subjected to vibration tests. The scientific equipment, the parachute system, the radio equipment, the electric power sources, antennas, the heat control system and all the other instruments and units placed in the apparatus were tested, moreover, for the effect of large linear overloads of several hundred units. But the apparatus will experience these overloads during flight with its entry into the atmosphere of Venus. The velocity of entry into the atmosphere will be comparable to the velocities of meteors, which are easily observed in our terrestrial atmosphere in the form of "falling stars". The enormous temperatures that result will be taken by the heat shield of the apparatus and the heat flow will be skillfully drained away so that the metallic body will experience almost no increase in temperature.

The factory tests were made to verify the calculations of the designers. These tests were carried out on a specially produced apparatus -- ~~double~~ a duplicate of those which will be sent on the long space journey. The tests revealed various small deficiencies in the design of the instruments. After the parts were replaced with stronger ones, the tests were repeated until the designer was convinced that his equipment would not fail.

Before the instruments were mounted in the automatic interplanetary stations, instrument duplicates were also produced for carrying out tests -- for all possible overloads that "Venera-5" and "Venera-6" would later experience. The instruments were spun in a centrifuge producing overloads which no one would be capable of enduring. The operability of the instruments with vibration was checked during the tests on a vibration stand. A weak similarity of this test can be represented by the analogy: a person rushing over a cobblestone road in a truck so that the teeth chatter like a machine gun is forced to quietly tell some story and write some lines in a notebook.

All the instruments were subjected to climatic tests. This means that they are placed in a temperature chamber with a temperature greater than 50^{0} and the operability is tested under tropical conditions. They are then cooled to 50^{0} below and they must function correctly inspite of the arctic temperatures. They are then sent to the shock stand and to the vacuum chamber, and the operators determine their "feelings" with the help of test panels.

The reserve tests then begin. For example, the instruments of the orientation system must operate continuously during the entire flight, that is, about 130 days. The tests lasted twice as long to verify that they will reliably work their time in flight.

After severe and rigorous tests, after having been given a start in life, the instruments, like in a relay race, passed it on to their "twins" mounted in the "Venera-5" and "Venera-6" stations. And those that passed through the crucible of tests, like honored veterans, remain on earth.

It would seem that the requirements have been satisfied, but there is still more. A copy of the automatic interplanetary station is fabricated at the factory, as alike the "Venera-5" as two drops of water. The only difference is that in addition to each instrument and unit, in every section in as many places as possible are patched heat sensors, the web of leads from which are reduced to a single cable. This station, called the "heat model" at the factory, is placed in a thermal vacuum chamber to carry out heat tests.

Scientists assume that space is an ideal black body. It absorbs any radiation with nothing left, nothing reflected: light, radio waves, x-rays, etc. It also absorbs heat rays emitted by the space station. It is in this sense that scientists consider space as the blackest body. Without a special heat control system, the space station is unable to hold its heat for a long time since there are no perfect heat insulators. Even in such a good heat insulator as a thermos bottle, hot tea eventually cools. Thus, if the station is not provided with a special system, then it simply will freeze.

In drawing such an unattractive picture, we have intentionally not said a word about the sun. At the orbit of the earth, the sun sends about 1200 kilocalories per hour to each square meter, and twice as much at the vicinity of Venus -- about 2400 kilocalories. The space station will be warmed by this heat and one even has to think how to get rid of the excess.

The thermal vacuum chamber, where the heat model is placed for testing the thermal mode of the station is an entire industrial installation. Its basis is a large tank, whose diameter and length are about twice the dimensions of the space station. A very hard vacuum is produced in this tremendous chamber, next to which a person appears small. It is true that 10 billion times more molecules remain than in space, but this is not terrible for the heat tests. There will be no convective transfer of heat. The wall of the chamber is wound inside with the network of tubes, to which black strips are soldered. If one looks inside, neither the walls or tubes are visible, and the strips merge into a continuous wall. The absorption coefficient of the strips is high -- up to 0.99. Liquid nitrogen is let into the tubes and then it is real space in the chamber -- cold and black. An imitator of the sun is placed in the chamber -- a special device capable of giving a heat flow analogous to the heat flow ~~of~~ from the sun. The ~~value~~ magnitude of this flow can be varied as the solar flow varies with the flight from the earth to Venus. The special device forms the flow so that the rays are incident on the heat model parallel to the beam similar to that in space onto the "Venera-5" and "Venera-6".

The test group begins to carry out the radio communications sequence with the heat model. intervals are made between the sequences -- the so-called duty mode, when the receivers waiting the signal, the orientation system and the heat regulation system are operating. The artificial sun increases the heat flow day by day, imitating the approach of the station toward the planet Venus.

The silent concentrating experimentors in white coats carefully watch the recorders recording the temperature of various parts of the heat model. Attention of the heat sensors is turned to the moving chart paper. Then a scarcely audible rustling of lips, like an incantation, is muttering: "On the engine $+15^{\circ}$, on the solar batteries +35, transmitters +30 ...". The flow of numbers from the recorders is overwhelming, like a flood, but they tell the specialists much and in a clear language.

There are often specialists of various types here at the thermal vacuum chamber, they are interested in the feelings of their systems. There are also radio operators, electronic engineers and specialists in the control system and the orientation system. The testing itself lasts not days but months. The heat model is "launched" from earth, the correction sequence is carried out and the flight is "completed" at Venus.

The actuators of the orientation system begin to be tested in turn. For several hours, the "Venera-5" and then its sister "Venera-6" are thoroughly tested for hermeticity of all systems. The orbital section, the parachute and instrument sections of the apparatus, the pressurized orientation system, the fuel tank pressure feed system for the correcting engines -- all must be sealed.

And then the station is again surrounded by testors. The web of wires connecting the station to the test panels is again pulled to the multitude of junctions. These are the final electrical tests or, as is said, the clean set of tests. The station is again "examined" for performance of the communications sequences: it passes with assurance the last tests of the "clean set". Tests of "phi zero" begin in turn -- these are tests to check the instrumental time delays. Radio signals are sent to determine the distance to the automatic interplanetary station from the earth. The station receiver catches this signal and directs it through a number of instruments of the radio set and then returns the signal to earth with the help of the transmittor. It returns some time after being sent off, having traversed the "station — earth" path twice, out and back. Half this time multiplied by the velocity of propagation of the radio waves gives the distance to the station. But to determine the accurate distance, it is necessary to know the true time of propagation of the radio signal. For this purpose, the time spent by the signal passing through the radio instrument of the "Venera-5" is subtracted from the time spent from the time the signal is sent to the station until its return to earth. The former is called the "instrumental delay time".

And then the time arrives for filling the correcting engines. The tanks in a special position are filled with the fuel components. The fuelers, after finishing their work, return the correcting engines. The assemblers quickly and skillfully mount them on the station. Subject to the smooth easy motions of the hands of the assemblers, the antenna and solar battery panels are turned and tightly fastened to the body of the station. Then the station standing with widely stretched antennas and solar battery panels suddenly shrinks and begins to look compact and small in volume. Strong latches firmly clamp the antennas and panels. Only after the separation of the station from the rocket carrier will the latches free these units, the antennas and solar batteries will open under the action of springs to the working position.

The heat specialists finally check the optical coefficients of reflection and absorption of radiant energy. The station is picked up lightly by the edge and is carried smoothly to the rocket carrier. The assembly brigade with professional skill connects the electrical junctions and connects the station through the separation system to the last stage of the rocket carrier.

The station along with the rocket is carefully packed onto the fitters and waits a moment for removal to the launch site. On the cold and dark winter morning of the following day, we go to take the rocket to the launch site.

The gate is flung open and a diesel locomotive carrying the frosty air behind it moves into position. The locomotive moves slowly to the fitters -- a soft bump and the automatic coupler connects them firmly together. A hollow vibrating signal and slowly, as if reluctantly, the rocket moves from the station from the assembly-test frame. The scene is very imposing: people following behind the train, walking as if pygmies together with Goliath, quietly emerging from the gates.

This is the last terrestrial journey of the rocket and station. Slowly, as if trying to remember Earth, not very attractive in such weather, it moves to the launch site. The fitters carefully, as a mother with a loved child, raises the rocket with the station to the vertical position. The rocket is lowered precisely onto the supports and clamps of the launch structure, the last stop on its native planet Earth. After several days the station is sent off from this station with an effective sound and light accompaniment onto the long journey for which it had so long been prepared.

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER FTD-ID(RS)I-0566-77	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) INITIATION OF "VENERA"		5. TYPE OF REPORT & PERIOD COVERED Translation
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) N. Yevgen'yev		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Foreign Technology Division Air Force Systems Command U. S. Air Force		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 27 May 1969
		13. NUMBER OF PAGES 6
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

22

DISTRIBUTION LIST

DISTRIBUTION DIRECT TO RECIPIENT

ORGANIZATION	MICROFICHE
A205 DMATC	1
A210 DMAAC	2
B344 DIA/RDS-3C	8
C043 USAMIIA	1
C509 BALLISTIC RES LABS	1
C510 AIR MOBILITY R&D LAB/FIO	1
C513 PICATINNY ARSENAL	1
C535 AVIATION SYS COMD	1
C557 USAIIC	1
C591 FSTC	5
C619 MIA REDSTONE	1
D008 NISC	1
H300 USAICE (USAREUR)	1
P005 ERDA	1
P055 CIA/CRS/ADD/SD	1
NAVORDSTA (50L)	1
NAVWPNSCEN (Code 121)	1
NASA/KSI	1
[redacted]	[redacted]
AFIT/LD	1

ORGANIZATION	MICROFICHE
E053 AF/INAKA	1
E017 AF/RDXTR-W	1
E404 AEDC	1
E408 AFWL	1
E410 ADTC	1
E413 ESD	2
FTD	
CCN	1
ETID	3
NIA/PHS	1
NICD	5