

SPUTNIK

50 years ago : Start of the Space Age

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1 Introduction

In 1957, the cold war is opposing the two world's superpowers. The Soviet Union and the United States of America. One of the most critical point for both sides at this moment is to develop ballistic missiles powerfull enough to strike on the other side if necessary. Two sides, two project leaders : Wernher Von Braun for Washington and Sergei Korolyov for Moscow. Von Braun is the builder of the German's V2 during the second world war. Korolyov is the leader of the Jet Propulsion Research Institute. If Von Braun is well known as the leader of the american rocket program, the Soviet Union hides Korolyov's identity, to protect him. Nobody except a few people in USSR knows his name, but he his the man who will build the rocket that will send the first ever human made object to orbit earth : Sputnik

2 Sputnik 1

Sputnik 1 (which means 'Satelite 1' or more literally 'Co-traveler 1'), the first satellite of the Soviet Union's 'Sputnik program'. It has been launched 50 years ago, on October 4, 1957, during the Internationnal Geophysical year (IGY). The IGY was held by the International Council of Scientific Unions, to promote the study and understanding of the Earth.

The initial project of the USSR was to launch 'Object D', an about 1000 Kg satellite, including 200 to 300 Kg of scientific instruments. Unfortunately, the complexity of the design and problems in following exact specifications caused delays. By the end of 1956 it became clear, that plans for 'Object D' were not to be fulfilled in time. Fearing the U.S. would launch a satellite before them, the USSR decided the creation and launch of a simple, light (100 kg), and easy to construct satellite, repalcing the complex, heavy scientific equipment in favour of a simple radio transmitter. On February 15, 1957 the Council of Ministers of the USSR approved this; Sputnik-1 was born.

2.1 Technical specifications

'Sputnik's ID'

- Chief constructor : M.S.Khomyakov.
- Size : 58.5 cm diameter sphere.
- Weight : 83.5 Kg
- Material : mostly Aluminium
- Planned orbite:
 - Altitude between 223 and 1450 Km
 - Revolution period : 101.5 min
- Launcher : R-7 Rocket
- Launched : October 4, 1957 at 19:28:34 UTC

Scientific aims

Sputnik carried a radio transmitter broadcasting at 20.005 and 40.002 MHz. The satellite was filled with dry nitrogen at a pressure of 1.3 Atm. It contained also a temperature regulation system. Temperature and pressure were encoded in the duration of radio beeps, which also indicated that Sputnik had not been hit and punctured by a meteorite. The satellite provided data about the radio-signal distribution in the ionosphere and gave informations about the high atmospheric layers density, via measurements of its orbital change.

2.2 Launcher : R-7 semyorka Rocket

Drawn by Sergei Korolyov, The R-7 Rocket was the first intercontinental ballistic missile. Its main aim was to have a missile powerful enough to reach the United-States. The rocket has been modified to carry Sputnik to become 8K71PS or Sputnik Rocket. The launch of Spunik was of course not the first try of the R-7. The Soviet Union launched five R-7 before. The three first attempts failed, but the fourth and fifth succeeded, except the atmospheric re-entry. Thus, the rocket was not ready for its military purpose, but was however already suitable for satellites launches. Because the 'military rocket' needed a long redesign, the soviet union used this delay to launch Spunik-1 and Sputnik-2.

R-7 Specifications

- Total mass: 267 tons
- Total liftoff thrust: 3.89 MN
- Propellants: Lox/Kerosene
- burn time
 - stage 0 (boosters) : 120 sec. (2 min.)
 - stage 1 : 310 sec. (5 min. 10 sec.)

2.3 4th October 1957...Launch and mission of sputnik

Sputnik was launched at 19:28:34 UTC from Baikonur Cosmodrome at Tyuratam. The flight worked as planned and after 314.5 seconds, Sputnik separated from the second stage of the rocket. At the same time, the first 'beep-beep' has been heard. Reception lasted for two minutes, while Sputnik was above the horizon. After that, the signal shutted down and all the people involved had to wait 90 minutes to ensure that the satellite had made one orbit around the earth. It was a succes, for the first time, a human made object was orbiting the earth ! At this moment, the Telegraph Agency of the Soviet Union (TASS) transmitted: 'As result of great, intense work of scientific institutes and design bureaus the first artificial Earth satellite has been built'. The second stage of the rocket had also reached Earth orbit and was visible from the ground due to its reflective panels deployed after releasing the satellite. The 'beep beep' has

been heard by thousands of amateur radio stations and became famous all over the world. Sputnik was orbiting the Earth at a speed of about 29000 Km/h and burned up when reentering Earth atmosphere on January 4, 1958 after 3 month in orbit and travelling about 70 millions kilometers.

3 The ‘Sputnik crisis’

3.1 shock!

The succes of Spunik has been a surprise for the rest of the world, and stunned and alarmed America. If the USSR was able to launch a satellite around the earth, they could sent a ballistic missiles that could carry nuclear weapons from Europe to the United-States ! Moreover, because the Sovietic Space program was really secret, nobody had planed such a succes so soon. John Logsdon, the chairman of the Space Policy Institute at The George Washington University said : ‘Our movies and television programs in the fifties were full of the idea of going into space. What came as a surprise was that it was the Soviet Union that launched the first satellite. It is hard to recall the atmosphere of the time’

3.2 Americans are late

As the Soviets are already planning Sputnik-2 with dog Laïka on board, the Americans are struggling with their Vanguard Rocket. Their firts attempt to but a satellite into orbit is a failure with a worldwide TV broacasted explosion after a lift of of a few meters. America then realize that their Space program is late compared to the Soviet one. The first American succes is on february 1, 1958, when satellite Explorer-1 reaches Earth orbit.

3.3 The start of the ‘space race’

The ‘Spunik crisis’ led to the creation of the NASA, and to a major increase in US government spending on scientific research and education. This was the start of the ‘space race’. Both world’s superpowers had to be the first to strike in each step of the space conquest. The USSR sent the first astronaut in space, Yuri Gagarin, on April 12, 1961. The race reached its maximum intensity almost 12 years after Sputnik, when Neil Armstrong stepped onto the moon. The Soviets never made it there. This Space race has been one of the more evident fact of the cold war. The decisions were taken politicaly rather than scientificaly, opposing Capitalism and communism. However, the space exploration done has given a lot of informations to sciences and leded to major discoveries.

4 Conclusion : What about the future?

The space race stopped with the end of the cold war, and the space exploration has become a more international matter. But today, Sputnik's 50th anniversary raises questions about future of space exploration : Without Sputnik, Americans might probably never have made it to the moon. The space race has been an incredible motivation, and now, those who were involved at the beginning and others who are key to future explorations are frustrated : they think that the golden age of Space exploration is behind us, and that Space exploration does not progress as fast as it used to. Do we need a new 'Sputnik-like' event to pep up Space exploration? What could it be?

5 Bibliography

- Webpages
 - http://en.wikipedia.org/wiki/Sputnik_1
 - <http://history.nasa.gov/sputnik/index.html>
 - <http://www.nasa.gov/externalflash/SpaceAge/>
 - <http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1957-001B>
- Movie
 - Space Race (BBC)