**Base R-7 Rocket Tech Dossier**

|  |  |
| --- | --- |
| Number of stages | 2 |
| Length of the vehicle | * 28 meters (without warhead or upper stages) * 31.07 meters (an original R-7 8K71 ICBM with a warhead) |
| Diameter | 10.3-11.2 meters at the base of four strap-on boosters |
| Weight (fueled) | 280 tons (empty weight: 27 tons) |
| Fuel | Kerosene T-1 |
| Oxidizer | Liquid Oxygen |
| Weight of propellant | 253 tons |
| First launch | 1957 |
| Launch sites | Tyuratam (two pads), Plesetsk (four pads) |
| Flight range: | 8,500-8,800 (8,000) km |
| Warhead type (single): | KB-11-developed - 5,300-5,500-kg, 7.27-meter, 3-5 megaton, thermonuclear |
| Accuracy | 2.5-5.0 kilometers (max. deviation 10 kilometers) |
| Officially in armaments | R-7 (8K71) since January 20, 1960 until mid-1960s |
| Stage 1 | Four strap-on booster (Blocks B, V, G, D) |
| Stage 1 weight | 170 tons |
| Stage 1 length | 19.2 meters |
| Stage 1 diameter | 2.68 meters |
| Stage 1 burn time | 104-130 seconds from launch |
| 1st stage propulsion | * 1 x four-chamber main engine RD-107 (8D74) * 2 x one-chamber steering engines |
| Stage 2 | Core (Block A) |
| Stage 2 weight (fueled) | 93.36 tons |
| Stage 2 dry weight | 6.465 tons |
| Stage 2 length | 28 meters |
| Stage 2 diameter | 2.95 meters |
| Stage 2 burn time | 285-320 seconds |
| 2nd stage propulsion | * 1 x four-chamber main engine RD-108 (8D75) * 1 x four-chamber steering engine |
| Launch system | ground-based: Tyulpan (8U215) |
| Storage time (fueled) | 30 days |
| Readiness time | 2 hours |

**The R-7 development team:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Element** | **Developer** | **Chief-designer** | **Location** |
| Overall design | OKB-1 | S. P. Korolev | Podlipki (Korolev) |
| Production (initial) | Zavod No. 88 | - | Podlipki (Korolev) |
| Production (serial) | Zavod No. 1 Progress | D.I. Kozlov | Kyibushev (Samara) |
| Propulsion units (both stages) | OKB-456 | V. Glushko | Moscow |
| Control system | NII-885 | N. Pilugin | Moscow |
| Launch complex (surface) | KB-59 Kompressor | V.P. Barmin | Moscow |

|  |
| --- |
|  |

**Early milestones in the R-7 program (Phase I of flight testing and orbital launch attempts):**

**First test mission**

The first R-7 missile (Number 5L) arrived to Tyuratam on March 3, 1957. After pre-launch processing at Site 2, it was rolled out to the launch pad at Site 1 in the yearly hours of May 5, 1957. Key officials in charge of the program, walked by the transporter/erector all the way to the launch pad, starting a long tradition of future Soviet space launches.

**1957 May 15,** 19:01 Moscow Time: The first R-7 lifted off from Baikonur. It was programmed to fly a standard test distance of 6,314.5 kilometers, however failed and crashed 3,197 kilometers downrange, deviating 12.6 kilometers from the nominal flight path. Western sources suggested that the vehicle failed after around 20 seconds, however post-Cold War Russian memoirs revealed that although the fire in the tail section of the rocket developed shortly after the launch, controlled flight went on until T+98 seconds and the emergency shutdown of the engines took place around 100 seconds after liftoff.

**Problems with the second rocket**

During June 10-11, 1957, there were three attempts to launch the R-7 rocket (Number M1-6). However the missile remained on the pad due to technical problems. It was ultimately removed from the pad and eventually used as a training vehicle.

**Third rocket, second launch**

**1957 July 12,** 15:53: The R-7 rocket (Number M1-7) lifted off from Baikonur. The vehicle disintegrated at 32.9 seconds in flight. Its debris crashed about seven kilometers downrange (four kilometers, according to other sources).

**Flight 3: almost a success**

**1957 Aug. 21**, 15:25: The R-7 rocket (Number M1-9) launch from Baikonur. Flight went normally, but the warhead disintegrated at the altitude of around 10 kilometers over Kamchatka Peninsula. Despite a mishap at the end of the mission, on August 27, 1957, TASS officially announced "...the creation of a long-range multistage ballistic missile in the Soviet Union." The announcement went largely unnoticed in the West.

**Flight 4**

**1957 Sept. 7,** 14:39: The R-7 (Number M1-10) was launched from Baikonur. Flight went normally, but the warhead section apparently collided with the core stage during the separation and disintegrated again during the reentry.

**Sputnik**

**1957 Oct. 4,** 22:28:34 Moscow time (00:28:34 local time on October 5): The R-7 rocket (Number 8K71PS) launched world's first artificial satellite PS-1 or Sputnik-1 from Baikonur.

**Laika**

**1957 Nov. 3,** 05:30:42 Moscow time: The R-7 rocket launched Sputnik-2 carrying dog Laika onboard from Baikonur. Laika died three days after the launch from overheating of her cabin. The spacecraft had no reentry system onboard.

**More tests**

On Dec. 22, 1957: The R-7 rocket (8K71 Number 11) arrived to Baikonur. Its first launch attempt took place on Dec. 31, 1957, but it was scrubbed.

**1958 Jan. 30,** 00:15: Test launch of the R-7 rocket (8K71 Number 11) with the M1-12 warhead.

1958 March 12, 22:30: The attempt to launch the R-7 rocket (8K71 Number 6), which was removed from the pad in June 1957, failed again shortly after ignition of the first stage engines. The launch was aborted safely and the rocket was shipped back to the manufacturer.

**1958 March 29, 17:40:** Launch of the 8K71 (No. 10) with the M1-6A warhead, which became the first to reach its impact area without disintegrating in the air.

**1958 April 4, 18:30:** Launch of the 8K71 (No. 12) with the B1-11 warhead. Slight overflight of the target with some flight control problems.

**1958 April 27, 12:01:** Launch of the 8A91 B1-2 launch vehicle, carrying the Object D satellite. The rocket disintegrated 96.5 seconds after the launch.

**1958 May 15, 10:00:35.5:** Launch of the 8A91 No. B1-1 rocket, carrying a second version of the Object D satellite. After successful orbital insertion, it was announced by the USSR as the Third Artificial Satellite, or Sputnik-3. (51)

Test launches of the R-7 ICBM and its upgraded version known as R-7A continued in Baikonur during 1958 and 1959. According to one source, the test flights during the second half of 1958 and the entire 1959 apparently carried payloads code-named Sliva (plum) and Grusha (pear).

*Written by Anatoly Zak; Last update: September 21, 2012*

*All rights reserved*