



## Space parachute systems



From the beginning of the rocket and space technology development the parachute systems are successfully used to recover or to decelerate space vehicles at high velocities.

### Usage of the parachute system as part of a space vehicle provides the following:

- vehicle recovery with high reliability;
- compactness;
- maximum acceleration restriction during the recovery system operation.

Taking into account the mentioned features the staff of FSUE "NII parachutostroyeniya" was engaged in development of recovery systems for for all space vehicles constructed in the frames of the national programs of space exploration.

### FSUE "NII parachutostroyeniya" has developed the following parachute systems:

- for recovery of the manned space vehicles "Vostok", "Voskhod", "Soyuz";
- for the unmanned vehicles "Cosmos", "Luna", "Mars", "Venera";
- for the space vehicle "Bion", used in biological objects researches;
- for deceleration of the space vehicle "Buran";
- for recovery of the boosters of the rocket-launcher "Arian-5".

Space vehicles mass - from 30 to 3.500 kg; boosters mass - up to 40.000 kg.

### During design and development of these Systems, the following problems have been solved:

- Parachute systems' deployment at the vehicles subsonic and supersonic (Mach number  $M < 3$ ) speeds;
- functioning of the systems in the altitude range from  $H = 0-1$  km to  $11=40-50$  km;
- ensurance of the parachute system operation in the atmospheres of the Earth, Mars and Venus.

Recovery systems provide the specified in Technical Specification space vehicles descent rate and non-exceeding of the given overloads at the parachute system operation.

### Relative mass of the Parachute Systems is:

- not more than 6-8% at descent velocity of about 7 m/s.
- not more than 2-3% at descent velocity of 25-30 m/s.

All Parachute Systems are highly reliable in the operation. To secure a specific required landing velocity of the abject various redundancy schemes are applied.

FSUE "NII parachutostroyeniya" proposes cooperation with you in developing and manufacturing of recovery parachute systems for any types of space vehicles and modules to be returned to the Earth or landed on the other planets of the Solar system (Mars, Venus, Jupiter).