



# ACADEMICIAN PILYUGIN CENTER

## INTEGRATED INERTIAL/SATELLITE SYSTEM OF NAVIGATION AND ORIENTATION FOR SPACE LAUNCHERS

The Integrated Inertial/Satellite (GLONASS+GPS) System is intended for operation as a part of GNC systems for prospective launch vehicles, including manned vehicles. Operation of the Integrated System is based on the innovative information-security technology that provides high-quality navigation data to perform guidance of space launchers. The software of the Integrated System is approved during flights of the FREGAT and DM-03 upper stages.



- Inertial Sensors Assembly**
- weight 19 kg
  - power consumption 60 Wt
  - overall dimension  $\varnothing 530 \times 225$  mm
  - home-produced components



- Electronic Unit**
- weight 13 kg
  - power consumption 60 Wt
  - overall dimension  $\varnothing 380 \times 238$  mm
  - home-produced components

### Structure

- Redundant strapdown Inertial Sensors Assembly containing the array of six skewed FOGs and accelerometers (input axes of the sensors are normal to the faces of a dodecahedron to ensure increased two-failure tolerance)
- Electronic Unit containing the triplicate-redundant computer, six accelerometer converters, three input-output units and three-channel power supply
- Dual-redundant GLONASS+GPS Navigation Equipment including the 24-channel jamproof Receiver

### Orbit injection accuracy achieved by Integrated System (low circular orbits and intermediate transfer orbits)

- period $\Delta T$	$\leq 0,7$ sec
- inclination $\Delta I$	$\leq 0,15$ arc.min
- eccentricity $\Delta e$	$\leq 0,0001$

### Operational modes

- Self-testing with checkout of inertial and GLONASS+GPS navigation equipment
- Initial self-aligning
- Solution of guidance and navigation tasks with the use of GLONASS+GPS measurements to correct trajectory parameters