Space activities of Ukraine

Rzeszów, Poland
June 24, 2016

Ukrainian State Space Agency

- Governmental organization responsible for space policy
  - develops and implements national space policy
  - organizes international cooperation
  - coordinates space-related companies, educational institutions and organizations
- 26 state-owned enterprises & institutions with ~21,000 employees
- 4 scientific institutions

Key facts of Ukrainian Space Industry

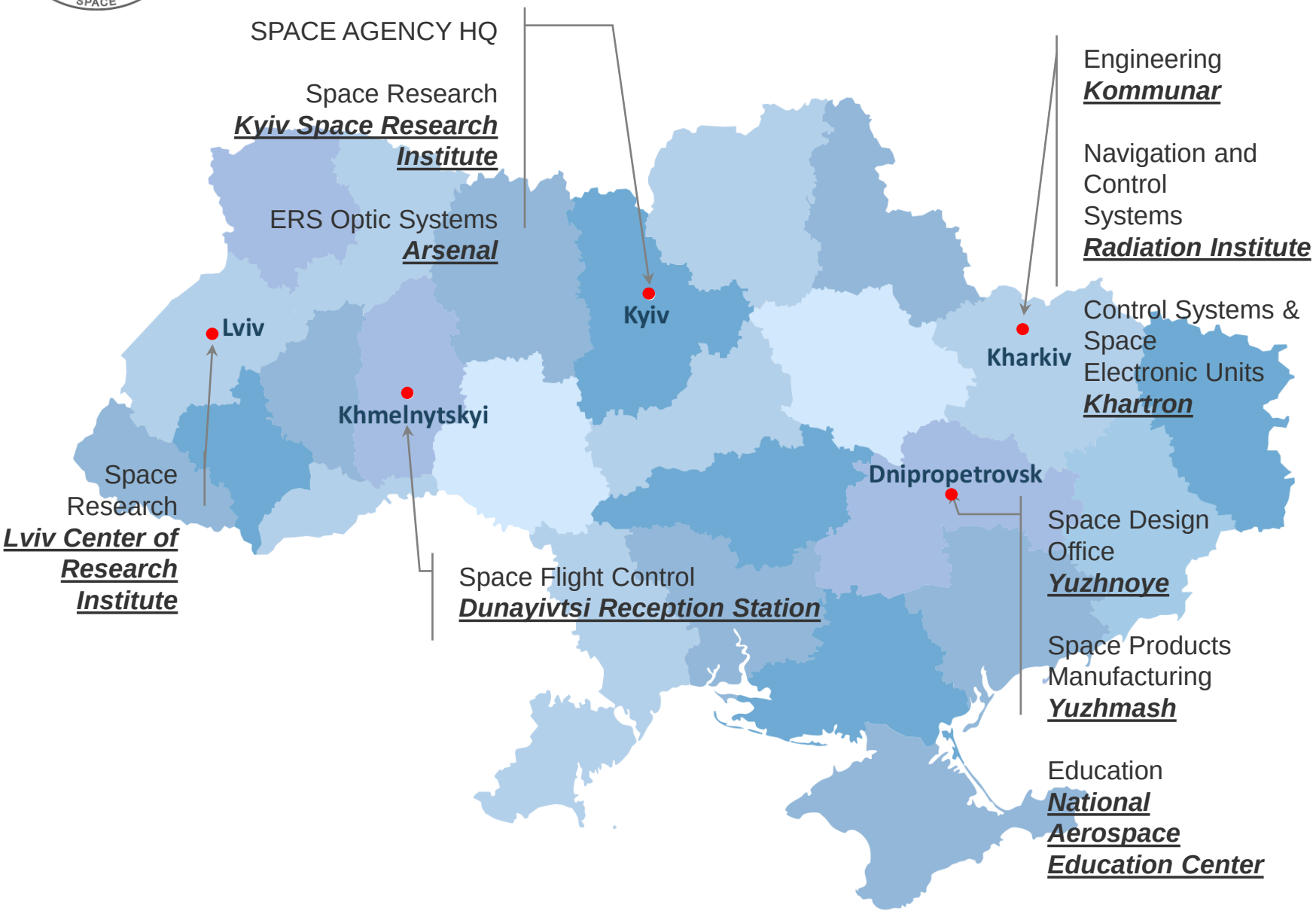
147 launches of vehicles of Ukrainian design & production

378 spacecrafts delivered to orbits by launch vehicles designed & produced in Ukraine for the needs of 25 countries

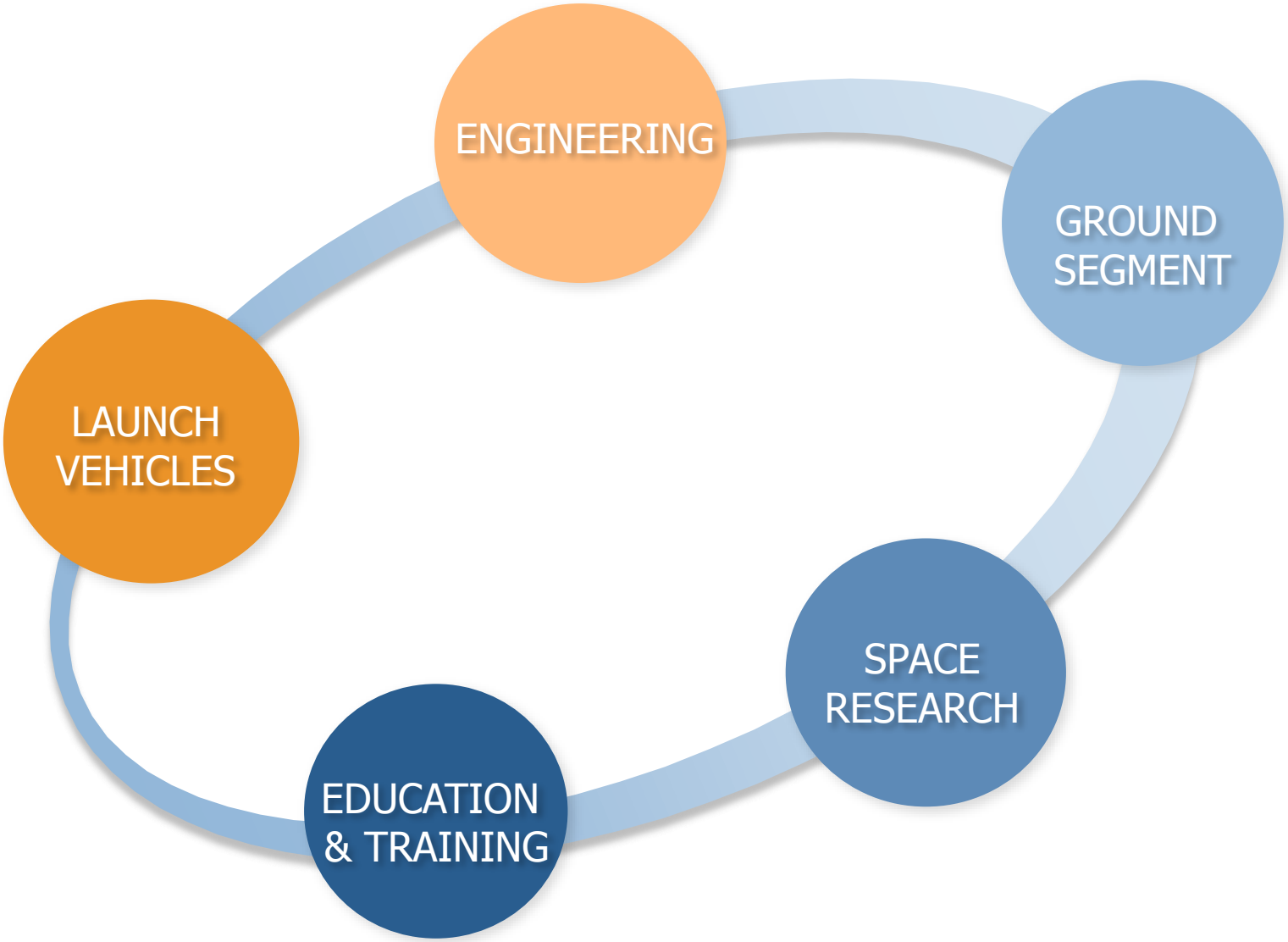
28 spacecrafts designed by Yuzhnoye and manufactured by Yuzhmash for Ukraine

4 international launch pads used for Ukrainian launch vehicles

Ukrainian Space Centers



Competences & Expertise



Launch Vehicles

Designed and manufactured

Contributed to design & manufacture

Zenit-3SL

Zenit-3SLB

Cyclone-4

Antares

Vega

Cyclone – 4 Project

Major Parameters:

5 Third Stage
Engines RD-861K
Thrust 7,91 ts
Specific impulse 330 sec.

7 Second Stage - 11S692
Engines 1+RD-262+RD-856 VE
Thrust 941 kilonewtons (212,000 lbf)
Specific impulse 318 sec

8 First Stage - 11K69
Engines 1 RD-261 + RD-855 Vernier engine
Thrust 3,032 kilonewtons (682,000 lbf)
Specific impulse 301 sec. Fuel N2O4/UDMH

The planned payload capacity of the Cyclone-4 is 5,500 kilograms (12,000 lb) to a 500 kilometer circular low Earth orbit, or 1,700 kilograms (3,700 lb) to geosynchronous transfer orbit

1 – Main fairing

2 - Spacecraft

3 – SC adapter

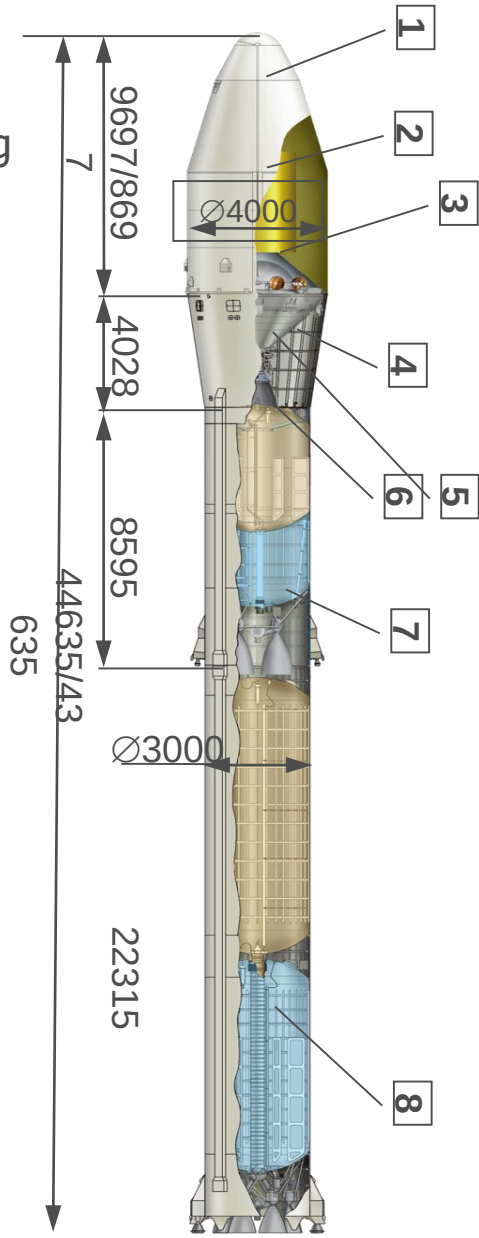
4 – Main unit transition adapter

5 – 3rd stage

6 – inter-stage module

7 – 2nd stage

8 – 1st stage



LV Technology in International Projects

ANTARES (TAURUS-II)

Participation in development of the space rocket system (first stage) for delivery of spacecrafts into circular elliptic orbits in the range of 300-2000 km altitude

Participation in NASA's COTS Program - cargo delivery to ISS

VEGA Launch Vehicle

Three solid-propellant stages and a liquid-propellant upper module for altitude and orbit control, and satellite release.

Cruise engine designed by Yuzhnoye SDO

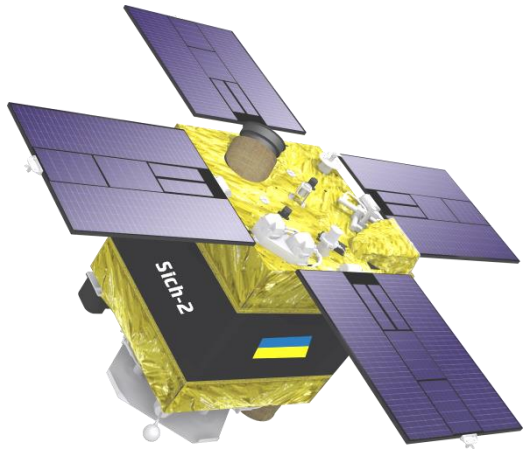
Launch performance

Compatible with payload masses ranging from 300 kg to 2500 kg

Benchmark - for 1500 kg into a 700 km-altitude polar orbit

Engineering

- Design and production of hardware and software for space industry:
  - navigation and control systems
  - space electronic units
  - optic systems
  - radar systems

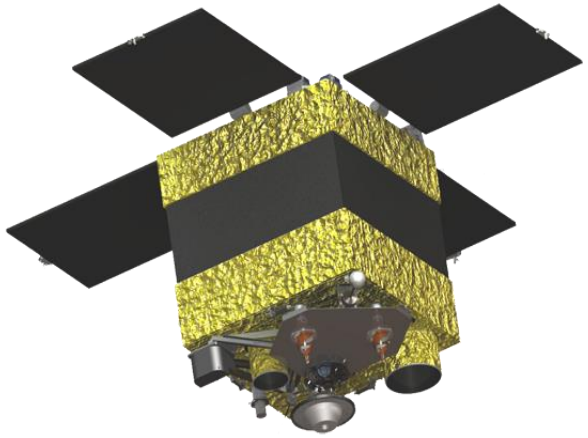


Sich-2 SC

- Design and Manufacture of Earth Remote Sensing Satellites and Space Research Systems; Joint ERS

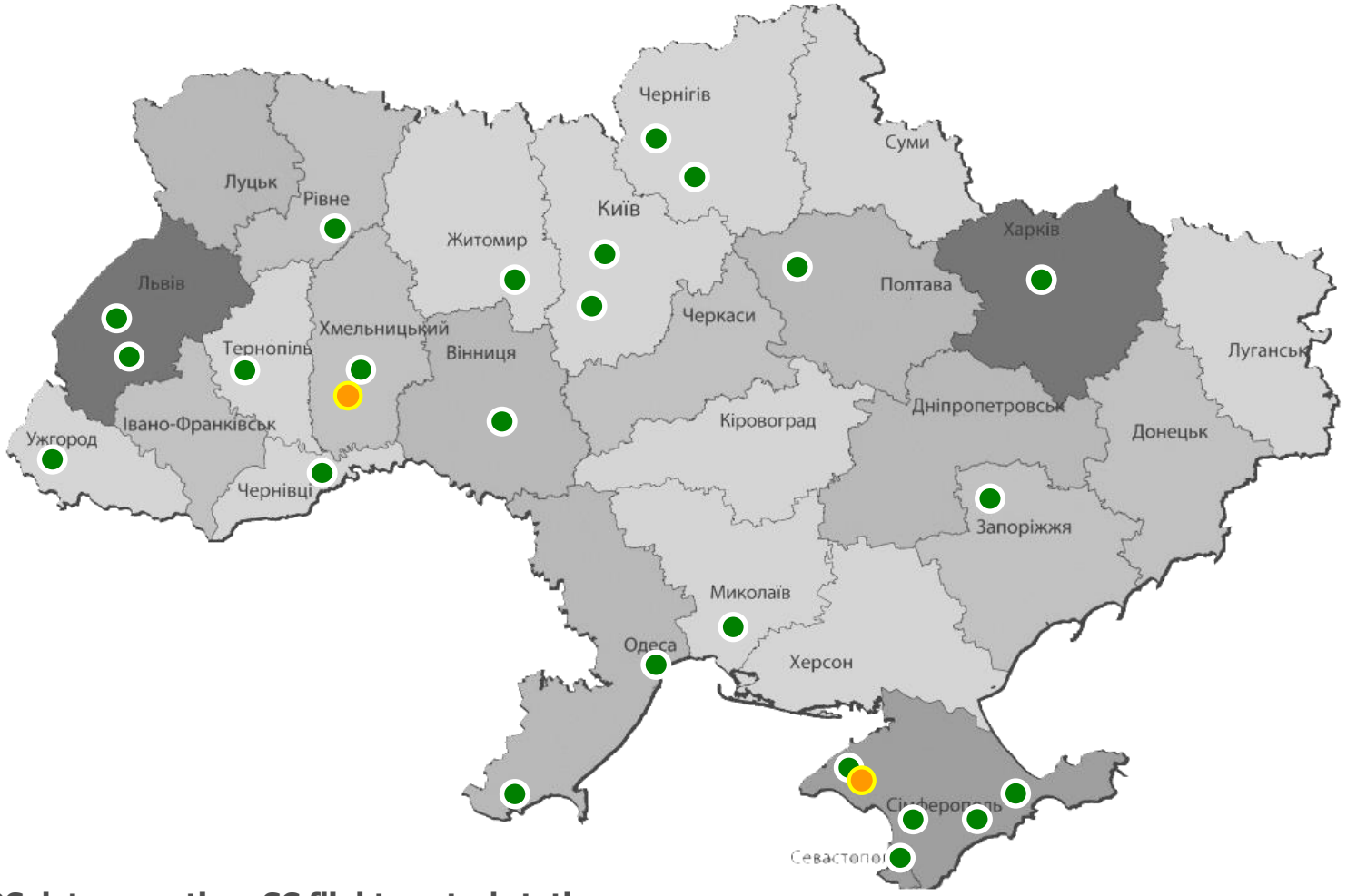
Earth Remote Sensing Satellite Sich-2.1

Design objective: reception and provision of optoelectronic EO data
- spatial resolution 8m,
- multispectral and panchromatic bands,
- system productivity 29,5 K sq.km per day;



Launching date IV quart. 2017

Ground Reception/Transmission Station Network



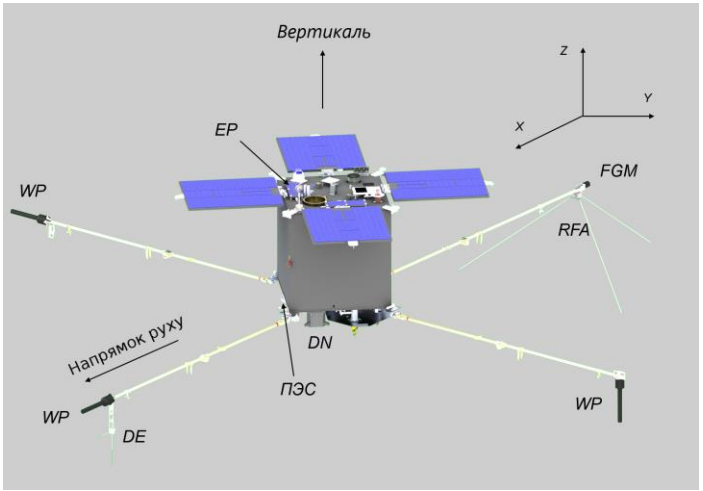
- ERS data reception; SC flight control stations
- Supplement to GNSS stations

Space Research

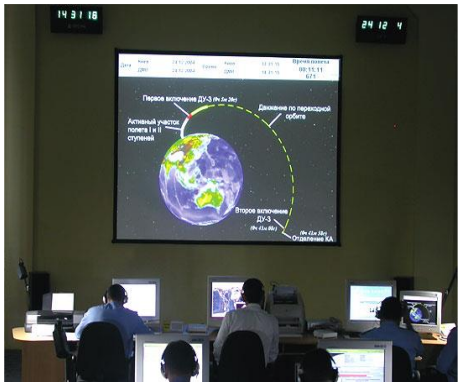
- Research of near-earth space, plasma physics, solar physics
- Development of space informational systems and technologies, aerospace data processing
- Space material science, development of on-board units
- Problems of dynamic systems control

IONOSAT Mission

- Ionosat-Micro Experiment to be conducted on board of Microsat-M SC as part of Ukrainian Space Program 2013-2017
- Goal - to find interdependence of ionospheric disturbances with the processes on the Sun, in the magnetosphere, the atmosphere and the inner shell of the Earth



Ground Infrastructure



National Space Facilities Control and Test Center

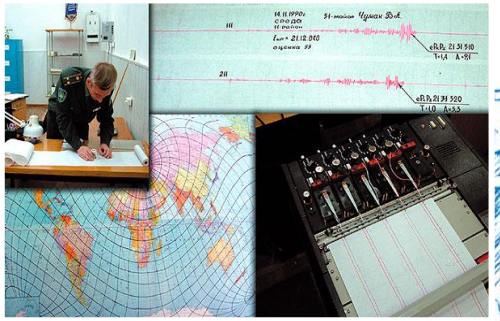
Satellite network for TV broadcasting

Data reception, processing & archiving from GNSS

Data processing & archiving from ERS satellites

Trajectory- and tele-measurements, flight control programs

Center of Terrestrial Monitoring



Education & Training

- Education for Ukrainian and foreign students:
  - Design and construction of spacecraft
  - Engines and spacecraft power plants
  - Systems for automatic control and monitoring
  - Spacecraft manufacture technology
  - Manufacture management in space industry
- Long- and short-term training courses in a relevant field

International Cooperation

- 13 International organizations
  UN COPUOS, CEOS, IADC, IMSO, Intersputnik, ISO TC 20 – Aviation and Space Technology, GEO, CTBTO, EUTELSAT, ISECG, SMPAG, IAF, IAA
- International regimes of non-proliferation and export control: MTCR, Wassenaar Arrangement, Hague Code of Conduct
- 20 countries
- International Agreements with EU and ESA

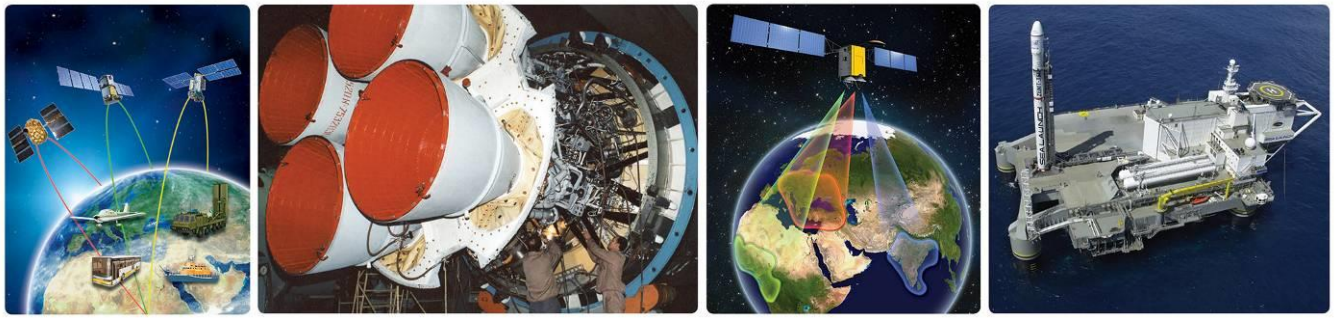
Concept of the Space Program of Ukraine 2018-2022

- Earth Remote Sensing

- Optoelectronic space systems Sich 2-1, Sich 2M
- Unified on ground segment

- Upgrade of space telcon and navigation systems

- Lybid-2 SC development
- Development of the Coordinate-Time and Navigational Support System
- Upgrade of the Space Situation Monitoring and Analysis System



Concept of the Space program of Ukraine 2018-2022

- Execution of space research
  - Study of solar-terrestrial and seismic-ionospheric relations
  - Space research within international programs
  - Development and launching of Aerosol-UA spacecraft
  - Elaboration and execution of scientific-educational programs
- Execution of space activities for the benefit of national security and defense
- Development of space systems
  - Provision of nondependent access to space (development of light-class LV)
  - Development of promising space rocketry
  - Technological support of space rocketry
- Broader international cooperation

Areas of cooperation

- Development of Launch Vehicles (ultralight class LV);

- Scientific space research, participation in the Horizon 2020 Program;

- Space Surveillance and Tracking;

- Instrumentation and advanced matterials;

- Development of ERS satellites;

- Education and advanced training of specialists;

- Defense technology.

Thank you!