

Past and Recent Polish Activities on Space Research

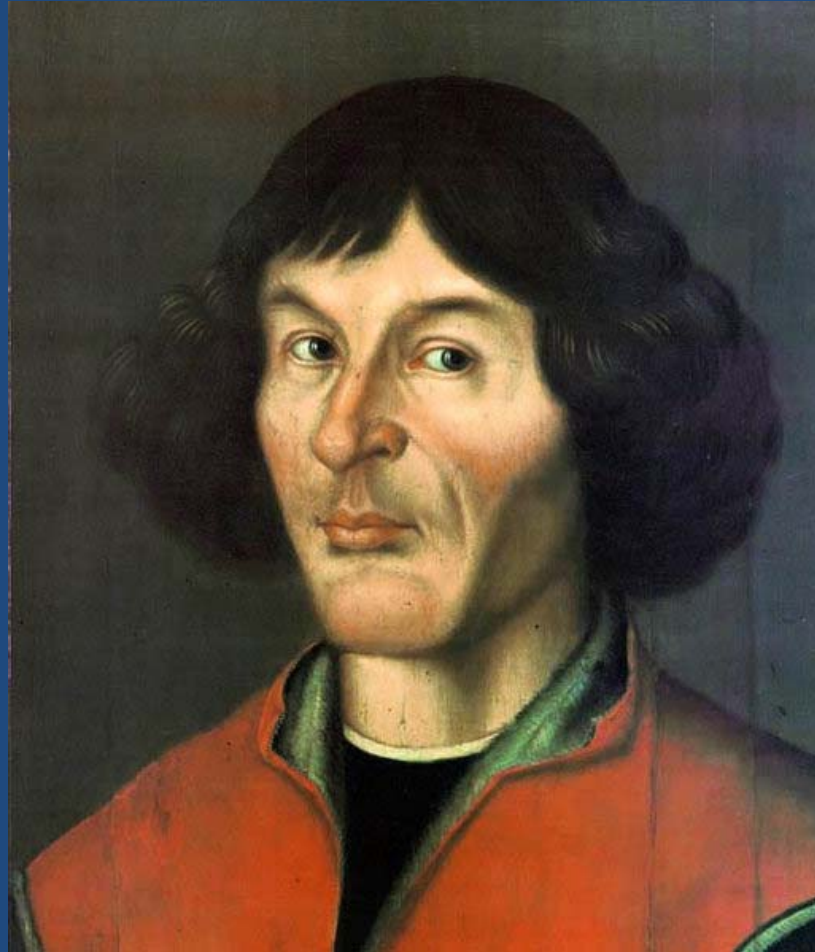
Piotr Wolański

Committee on Space Research

Polish Academy of Sciences

Warszawa – 16 -12-2009

**Mikołaj Kopernik (1473-1543),
Polish Astronomer, Mathematician and Economist**



„De revolutionibus orbium coelestium”

Jan Heweliusz

1611 - 1687



- Build largest telescope (50 m)
- Author of first map of the Moon
- From 1664 member of the Royal Society of London

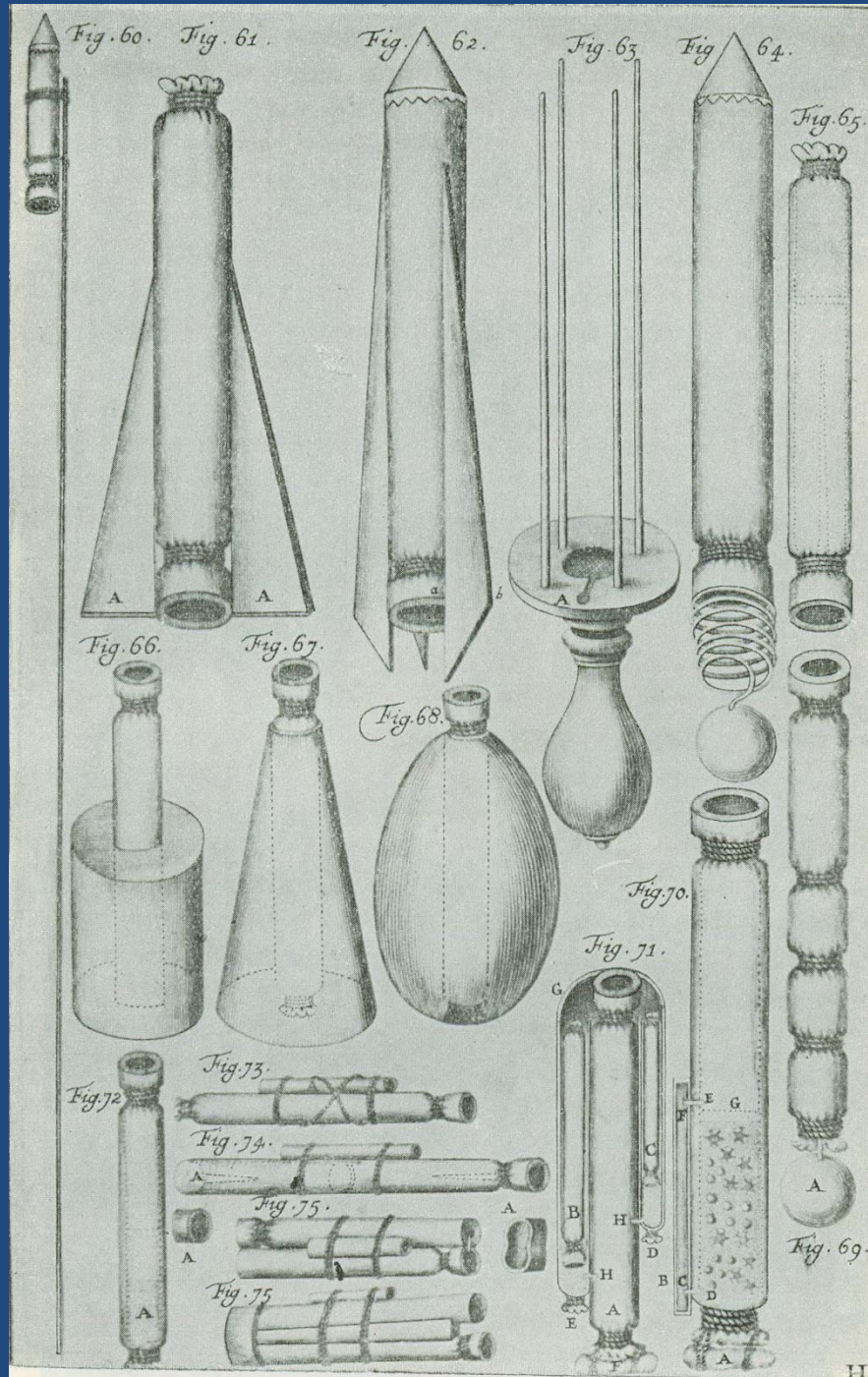
First map of the Moon by J. Heweliusz



Kazimierz Siemienowicz

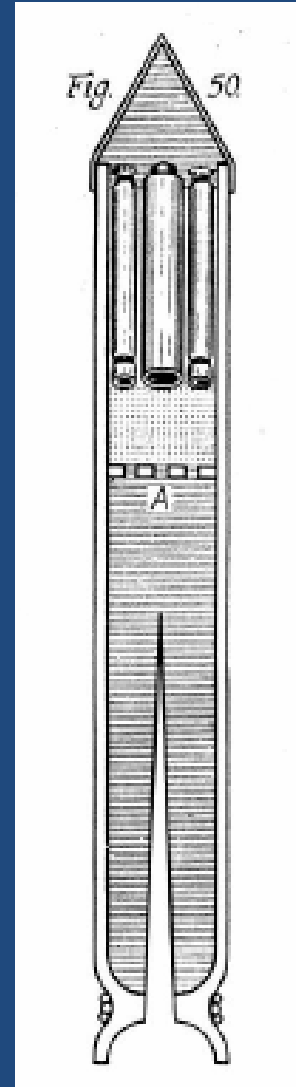
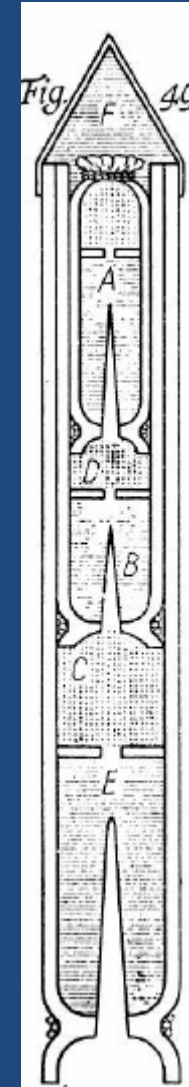
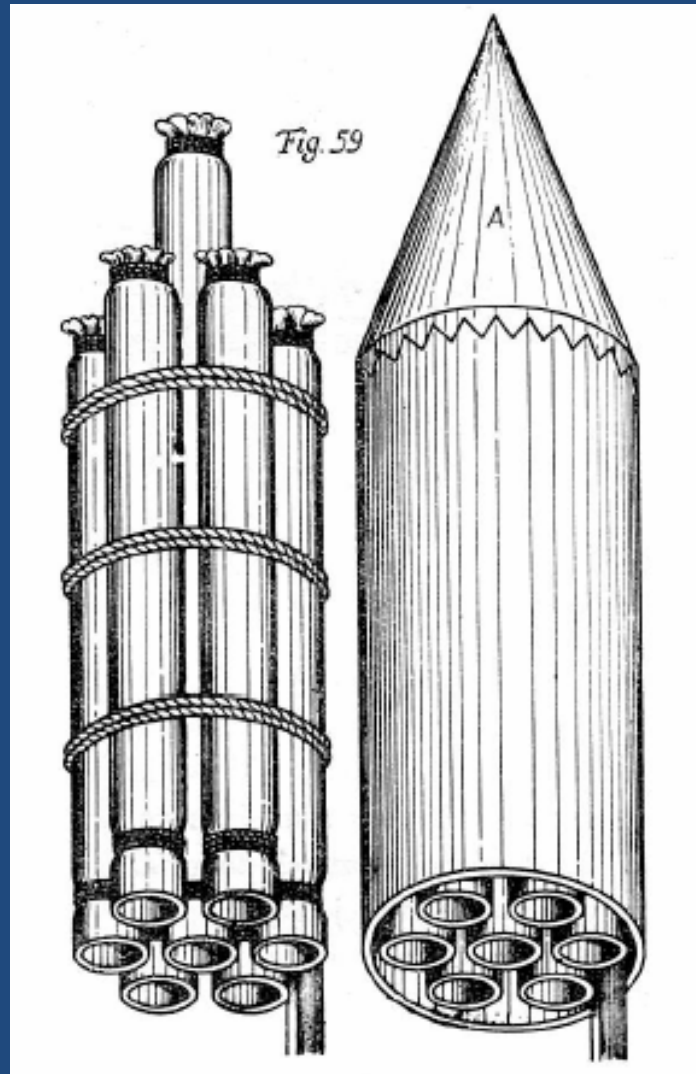
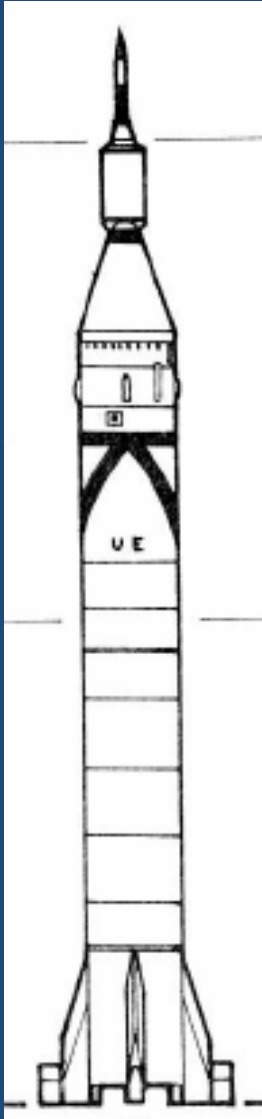


(1600 – 1651)



Page from his book:
*"Artis Magnae
 Artilleriae pars
 prima"* ("Great Art of
 Artillery, the First
 Part"),
 first printed in
 Amsterdam
 in 1650,
 was translated to
 French in 1651,
 German in 1676 and
 Dutch in 1729 and
 finally Polish in 1963.

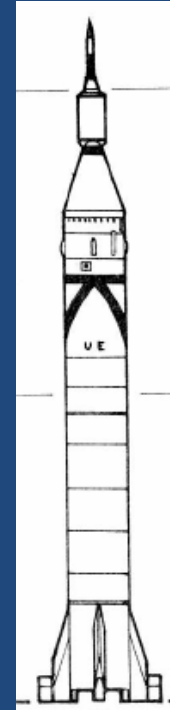
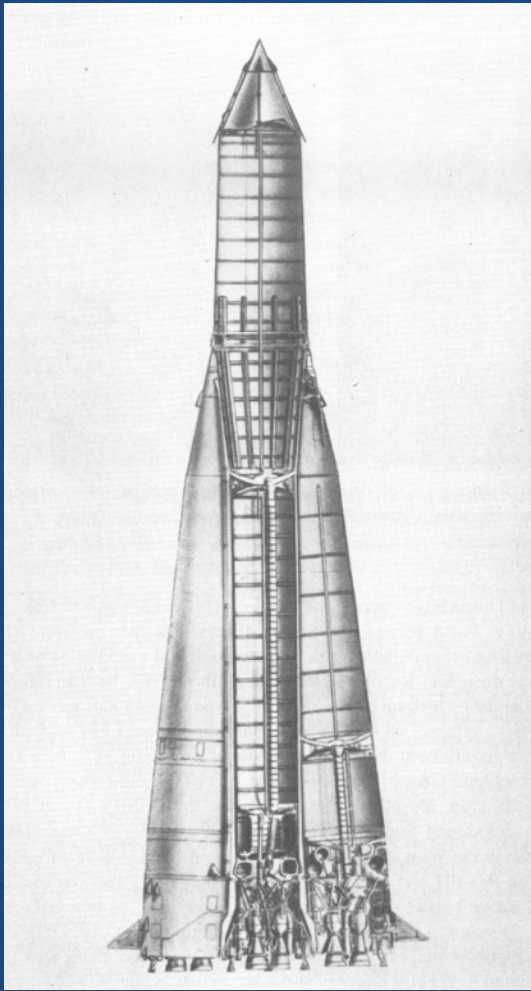
K. Siemienowicz ideas introduced into practical applications



Rocket Propellants

1853 - Ignacy Łukasiewicz first obtained kerosene from crude oil – today's commonly used as the rocket fuel

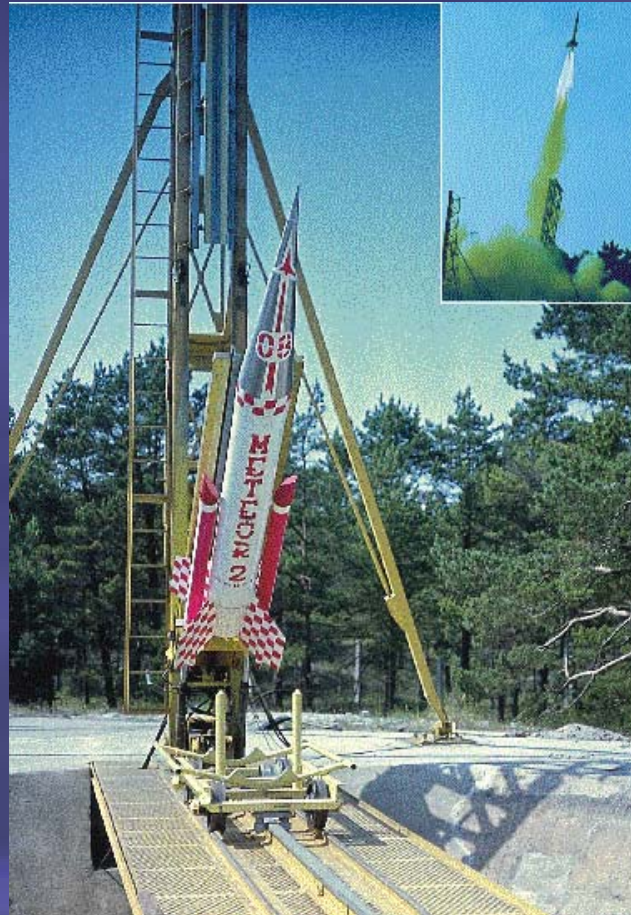
1883 - Karol Stanisław Olszewski and Zygmunt Wróblewski were first which obtained liquid oxygen – most commonly used liquid rocket engines oxidizer



Sputnik-1 and Explorer-1 Rockets

(used ideas of K. Siemienowicz, all engines of Sputnik-1 rocket were propel by liquid oxygen and kerosine)

Initial way into space



"METEOR -2" reach altitude of 105 km



INSTITUTE OF AVIATION
WARSAW, POLAND

1926

Space applications

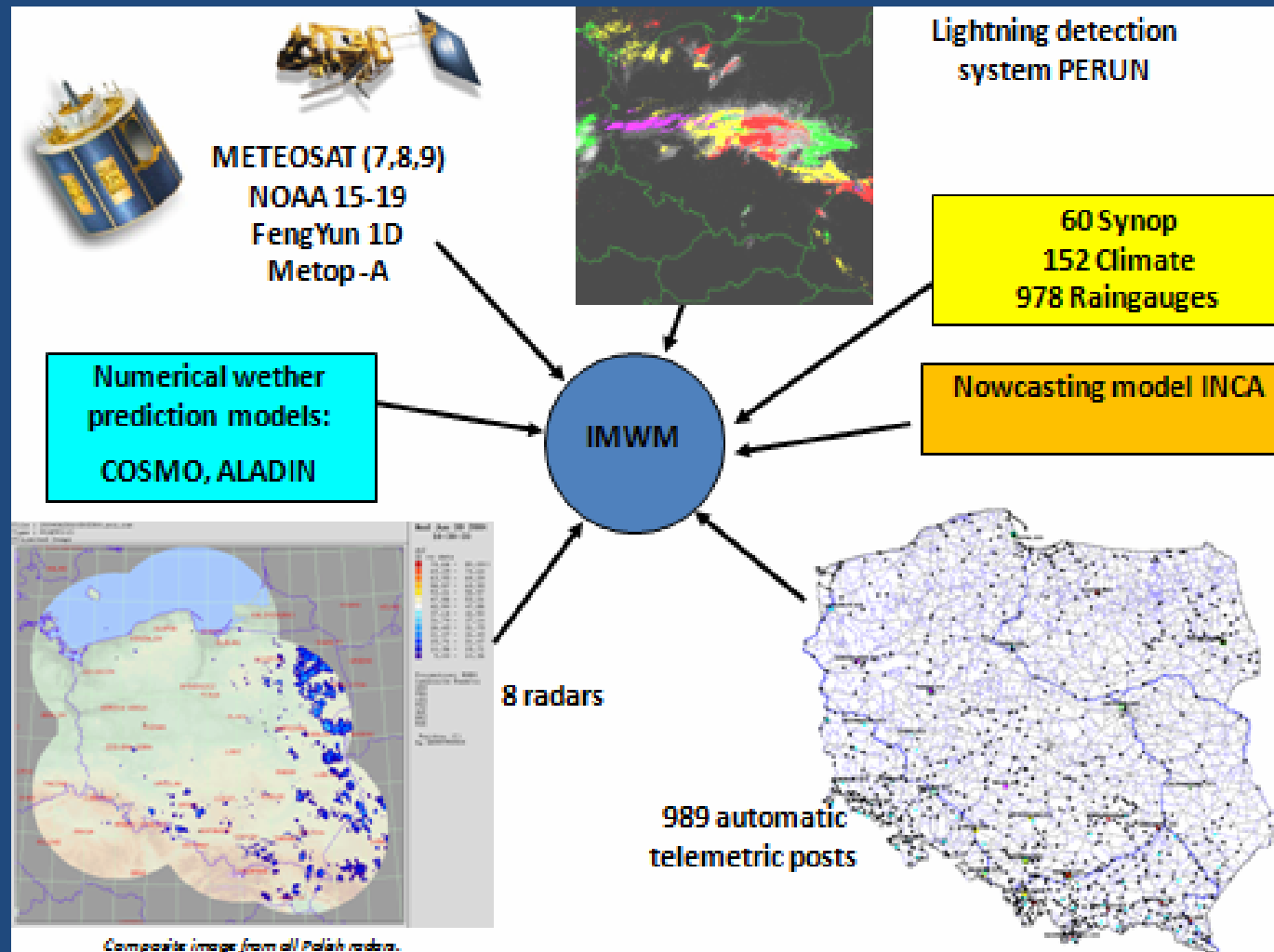
- **Meteorology**
- **Telecommunication**
- **Remote Sensing**
- **Geodesy and Navigation**

METEOROLOGY

Institute of Meteorology and Water Management
use satellites data for more then 40 years

Applications:

- weather forecast
- snow and ice cover
- atmospheric data and ozone monitoring
- water level and land temperature
- vegetations
- radiation balance





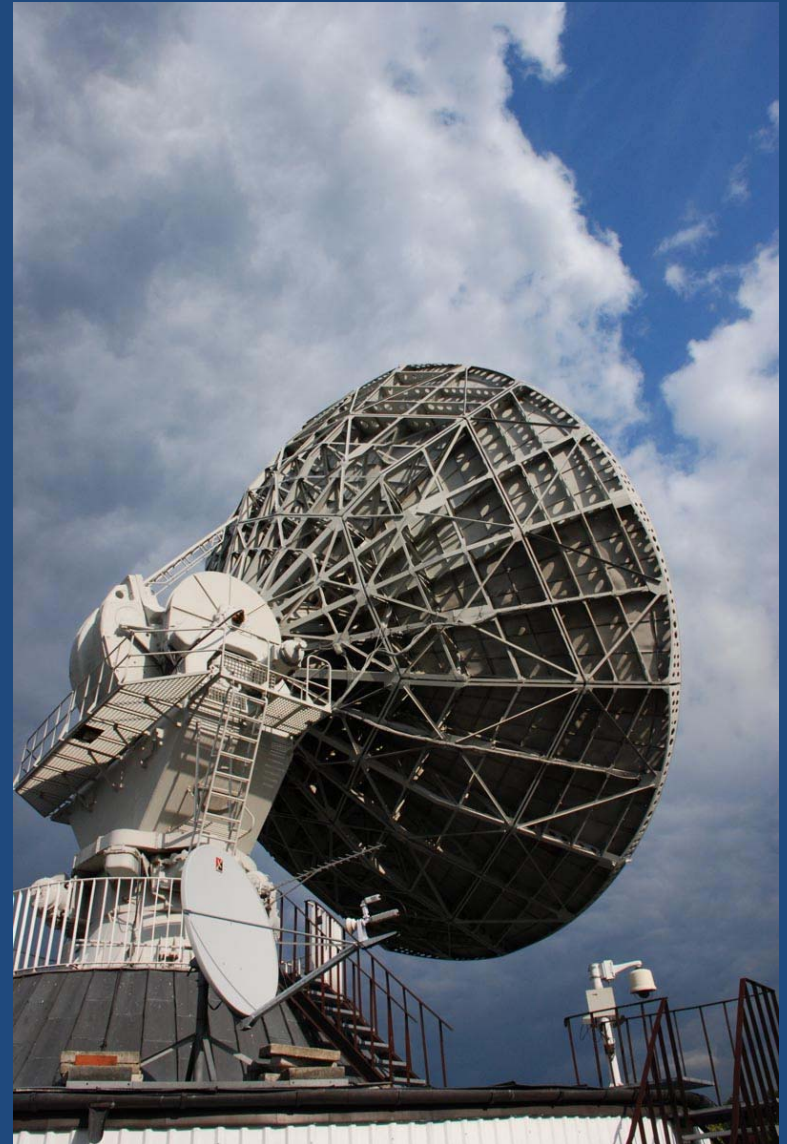
PSARY

Satellite Services Centre of Telekomunikacja Polska

The centre offered services in:

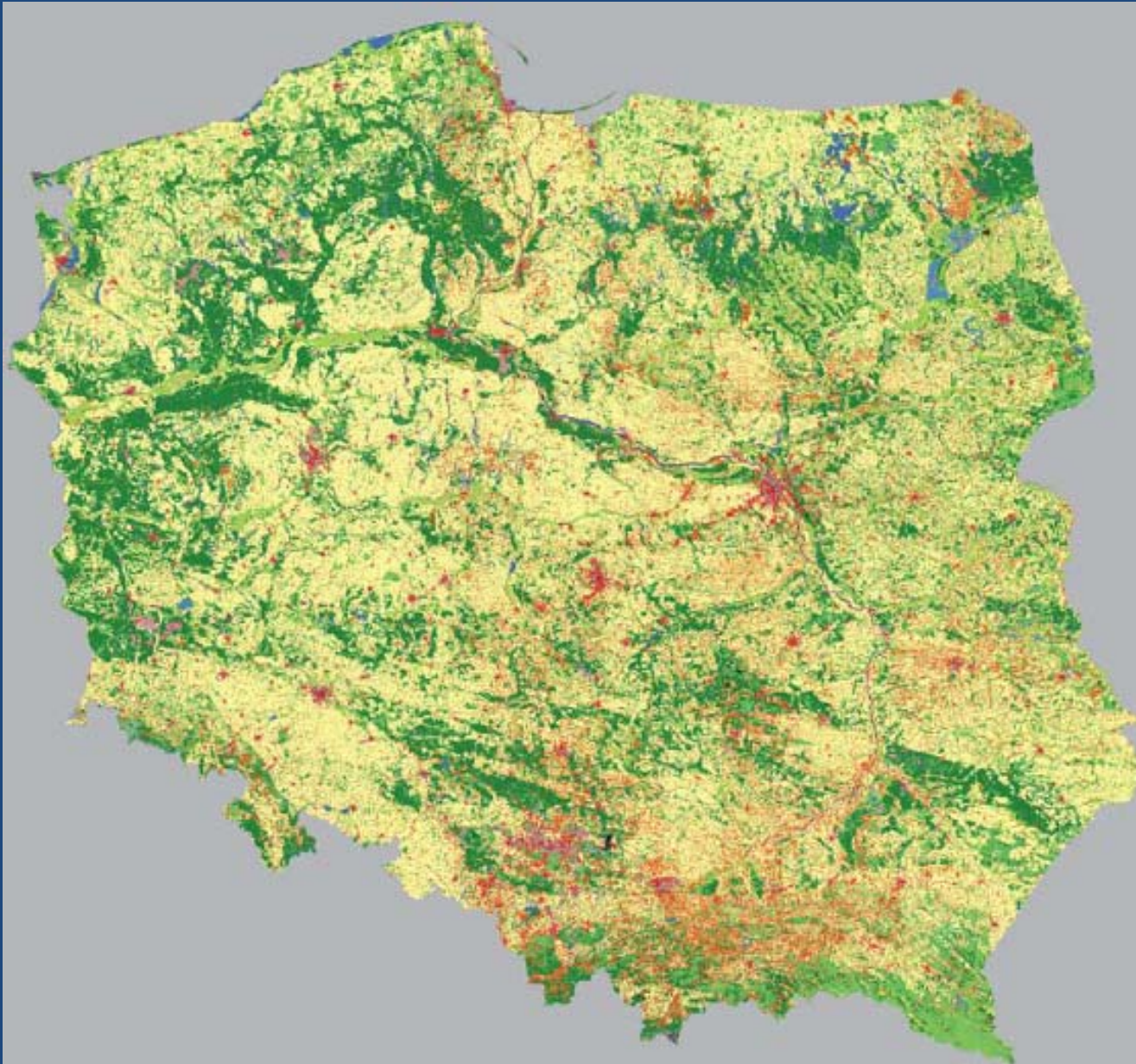
- 1. VSAT data transmission,**
- 2. Voice, telefax, and data transmission in Inmarsat system,**
- 3. Capacity lease of space segment,**
- 4. Operator services for satellite ground stations.**

Psary



Remote Sensing

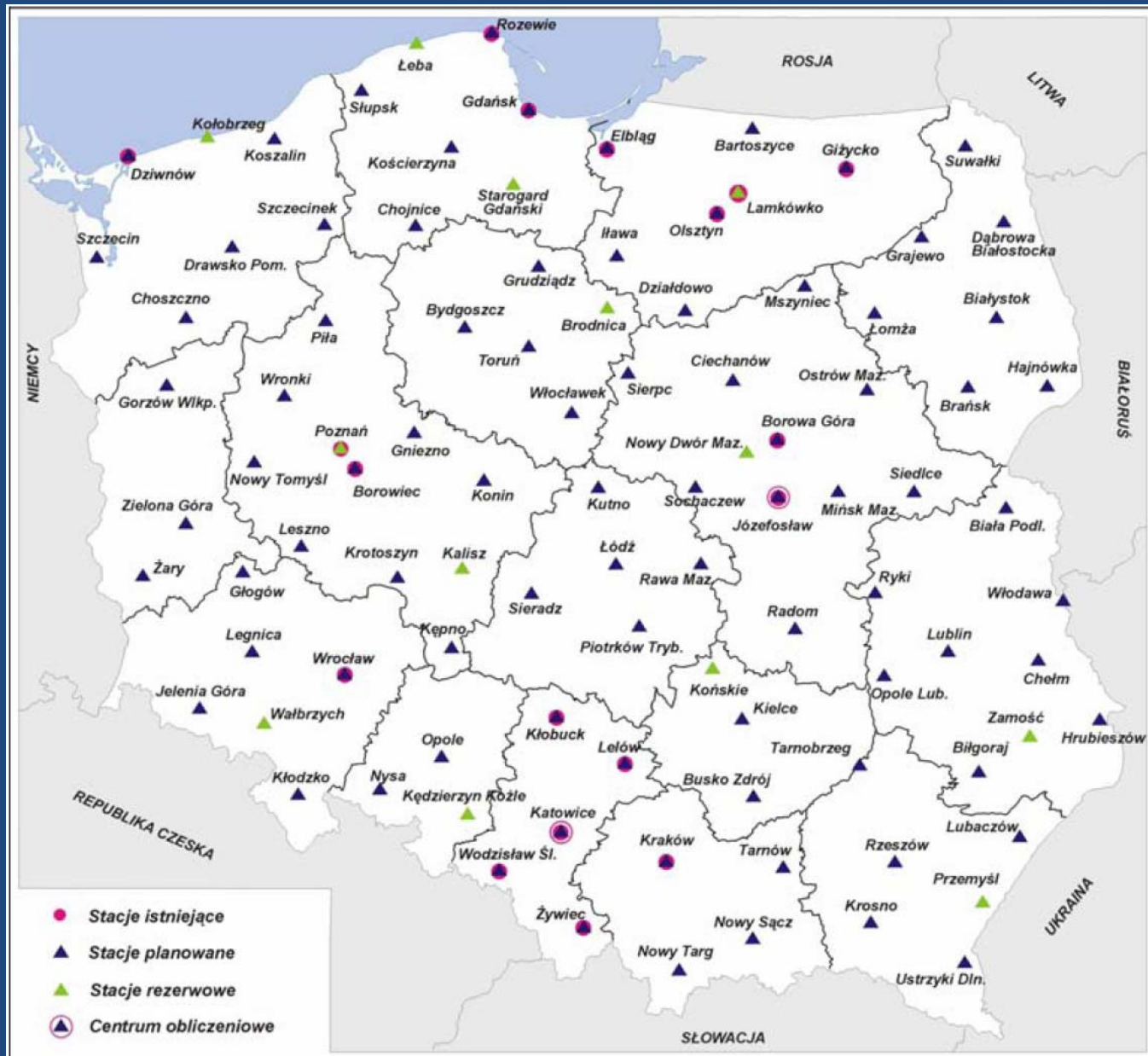
Land use in Poland based on Landsat data IG&C – 1976-81



Laser Ranging Station - Borowiec



Polish segment of EUPOS





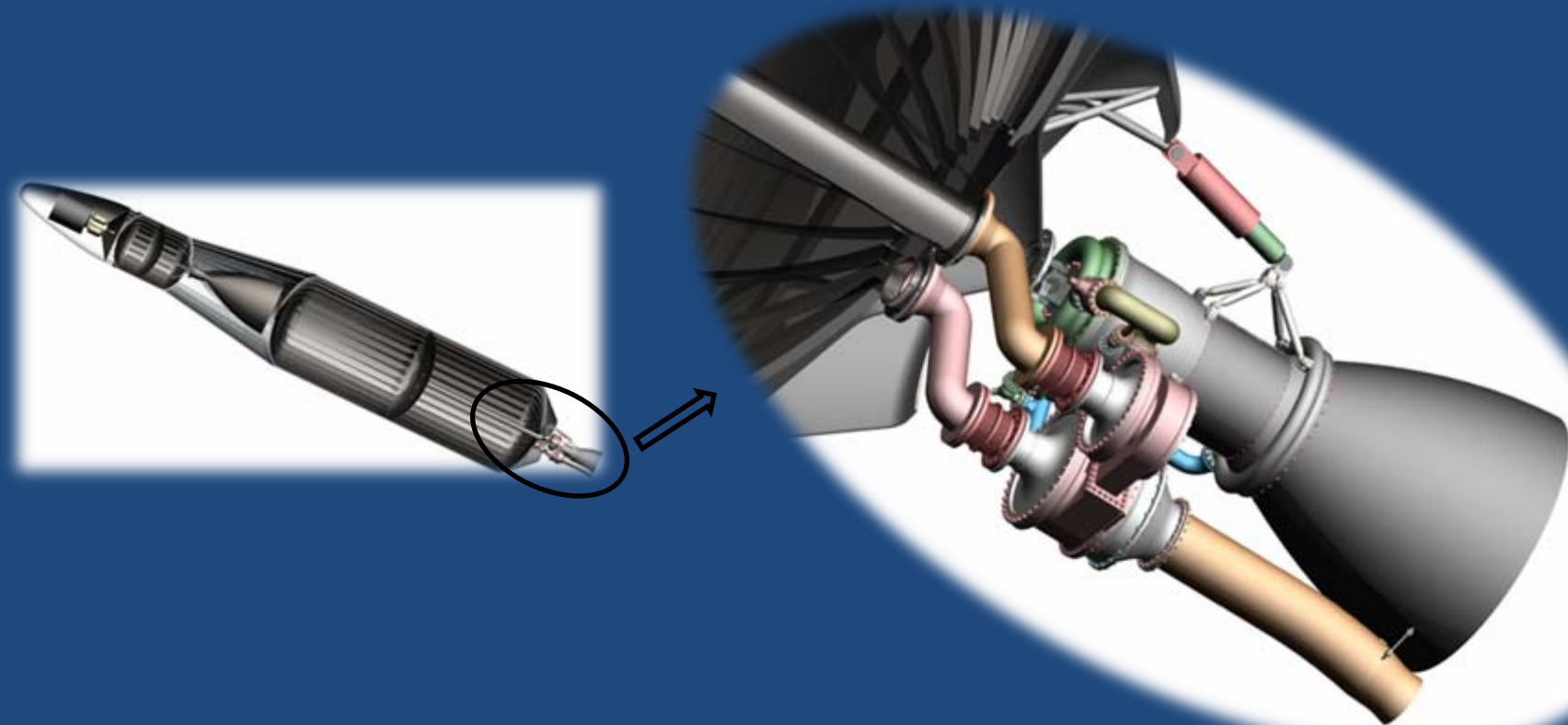
INSTITUTE OF AVIATION

Warsaw, POLAND

<http://www.ilot.edu.pl>

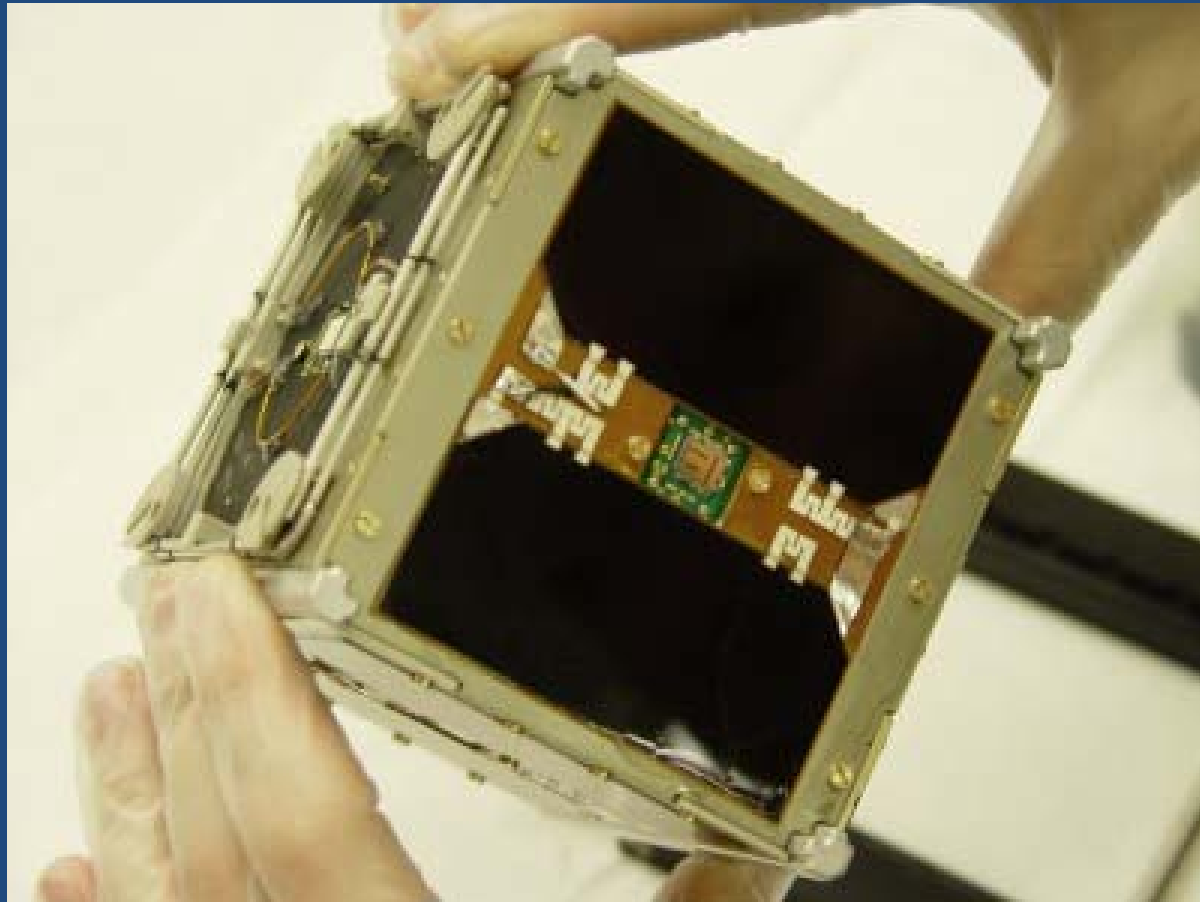
SPACE TECHNOLOGY DEPARTMENT

DESIGN OF LIQUID ROCKET ENGINES

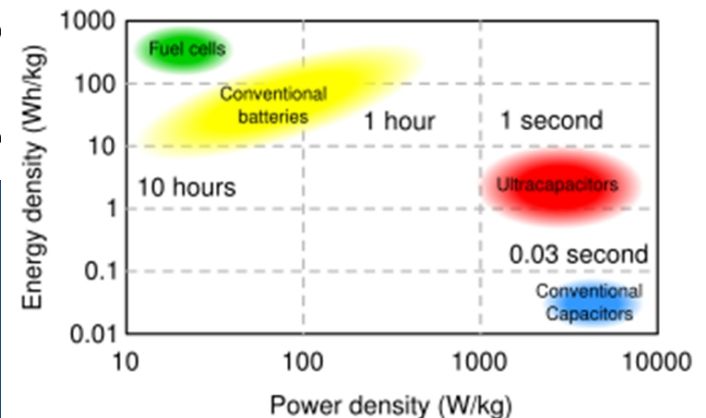
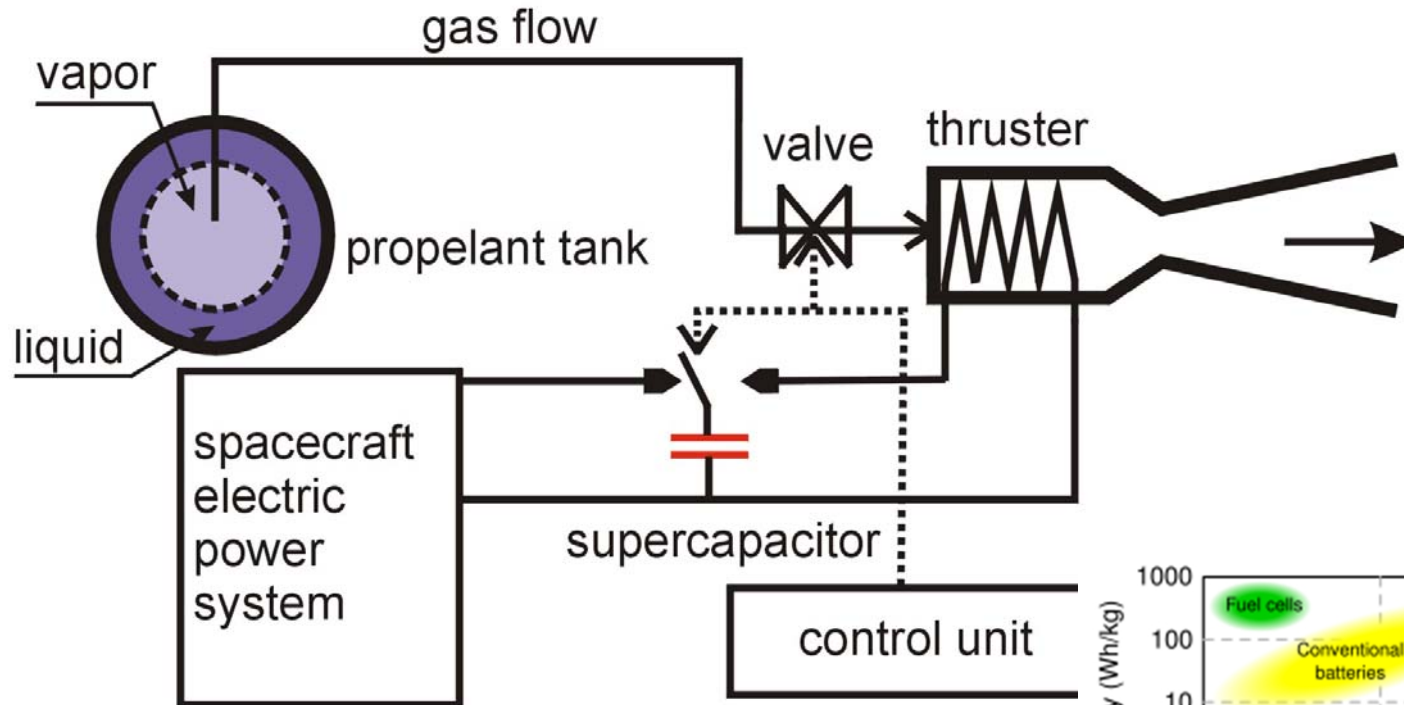


Warsaw University of Technology

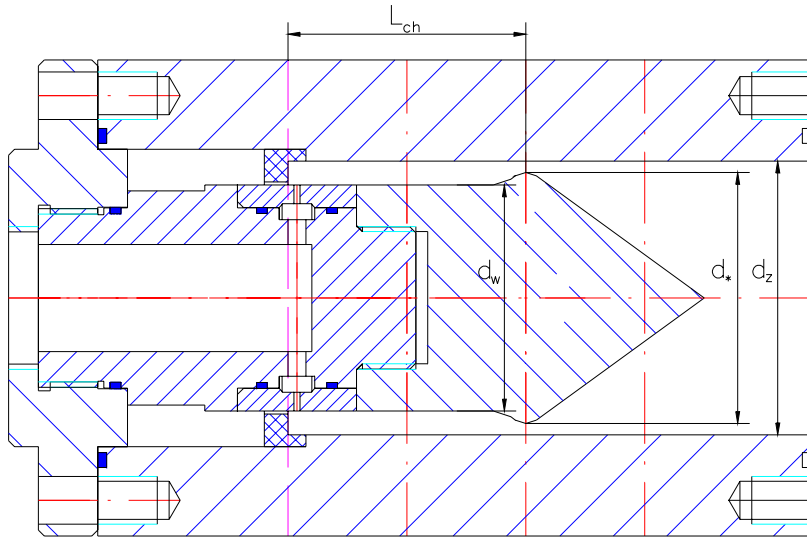
PW-SAT



Gas Resistojet Thruster



ROTATING DETONATION – ROCKET ENGINE

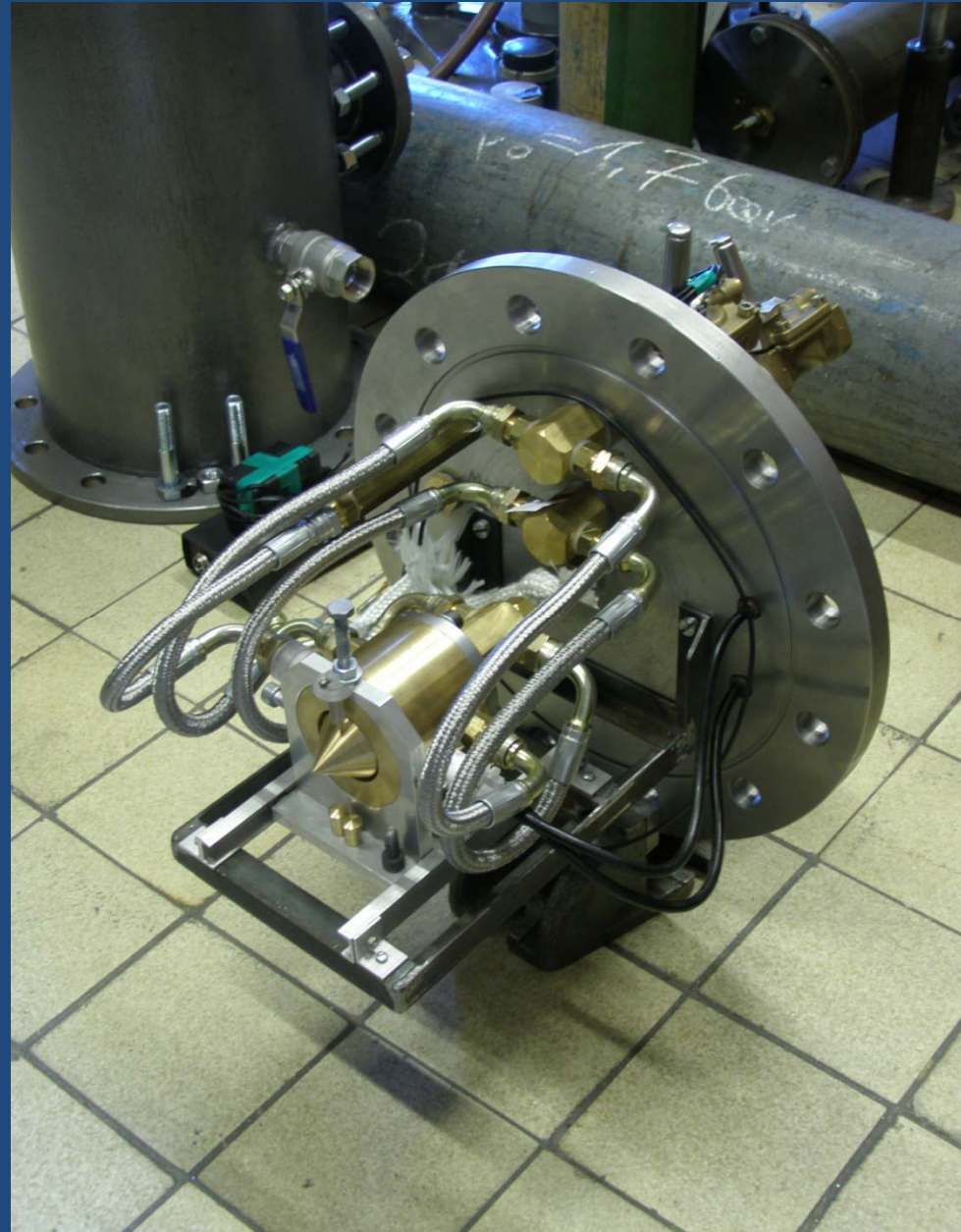


d_w – inner diameter of the channel,

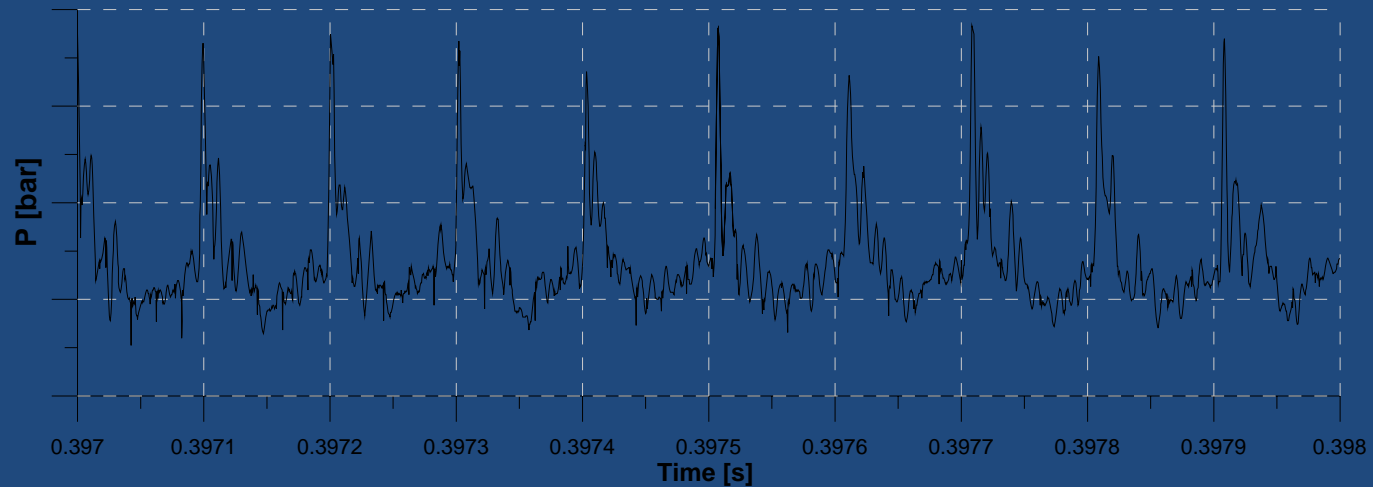
d_z – outer diameter of the channel

d_* - throat diameter

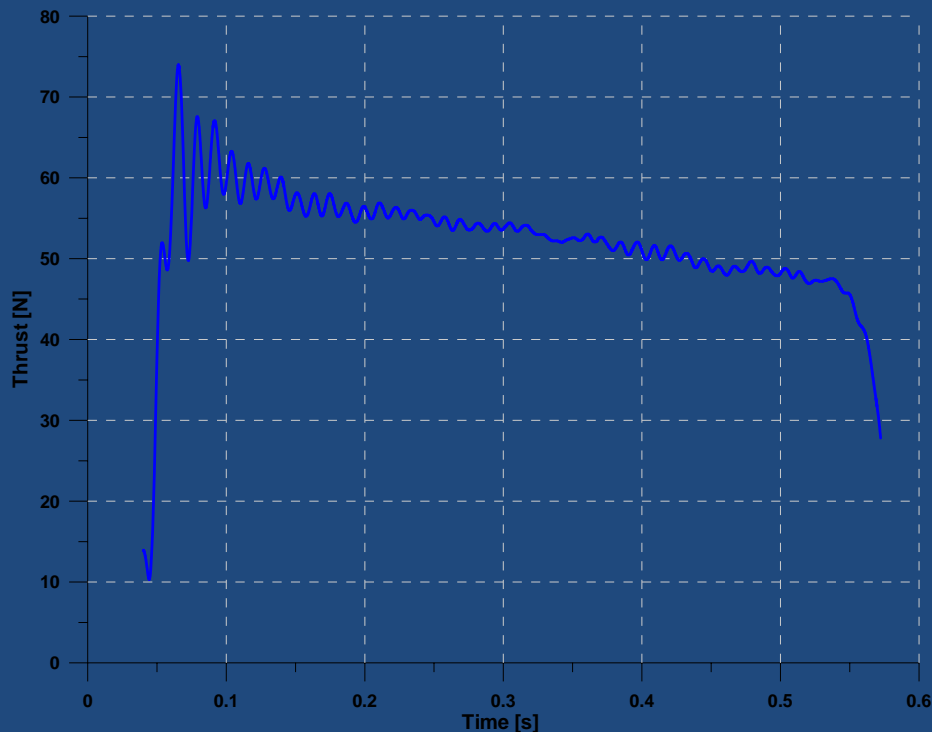
L_{ch} – channel length



THRUST and PRESSURE vs TIME



Pressure vs time



Methane-Oxygene mixture,
initial conditions $p=0,05\text{bar}$;
nozzle 77deg

Thrust vs time

Conclusions

- Poland have big traditions in Space Research
- Application of Space Technologies such as: Meteorology, Telecommunication, Remote Sensing and Geodesy and Navigation are commonly applied in Poland
- Recently research in Space Technology were reactivated and we are slowly integrating with ESA and EU space projects

Thank you for your attention!