CST
Center of Space Technologies

institute of aviation
warsaw, since 1926

SPACE TECHNOLOGIES DIVISION

research for future

SPACE TECHNOLOGIES DIVISION

The Aviation Institute's Space Technologies Division is one of the few Polish research centers which carry out development works for new rocket technologies for civil applications. High qualified specialists in different fields of knowledge, employed in the Division, are specialized in the designing and testing of rocket engines and launchers using environmental friendly fuels. All the research works are performed with use of CATIA and ANSYS FLUENT professional software.

The scientific and research works in terms of space technologies cover:

- design and testing of hybrid rocket engines,
- design and testing of liquid rocket engines,
- design and testing of solid rocket engines,
- development of environmental friendly fuels technologies,
- production and testing of grains for solid rocket fuel,
- design and testing of launcher technology demonstrators,
- CFD i FEM dedicated software,
- multistage rocket flight dynamic analysis,
- internal ballistics of solid rocket engines analysis,
- optimization of liquid rocket engines combustion chambers.

At present the Division consists of three laboratories:

- Laboratory of Propellants,
- Laboratory of Catalysts,
- Laboratory of Space Propulsion.

The target is to develop propellants for space propulsion, but also for many other potential uses, like silent drives for UAVs, torpedo drives, NOx combustion chamber reduction systems, etc.

Planned research works include the development of an efficient method for the concentration of hydrogen peroxide to HTP class, research of new, liquid rocket oxidants, research of grains of solid propellants, research of heterogeneous catalysts and research of self-ignition of hydrocarbon fuels with HTP.

A system for concentration and purification of hydrogen peroxide

Laboratory of Propellants

The offer of the Laboratory of Propellants:
- preparation of hydrogen peroxide of with a concentration of up to 99.99% for chemical analysis,
- preparation of hydrogen peroxide of HTP class (e.g. 98%+) for propulsion uses (rockets), ~2 liters/week,
- construction materials and hydrogen peroxide compatibility analysis,
- preparation of test samples of some energy materials, e.g. gas detonation initiation (primary explosives and some energy materials, e.g. PETN, RDX, HAN),
- testing of hypergolic fuels with hydrogen peroxide of HTP class,
- preparation of anhydrous red fuming nitric acid.

Vacuum evaporator

Laboratory of Catalysts

The offer of the Laboratory of Catalysts:
- preparation of catalysts for hydrogen peroxide on ceramic carriers, e.g. γ- and α-Al_2O_3,
- annealing of components in a ceramic furnace in a controlled temperature (up to 1100°C),
- drying in a vacuum oven in a controlled temperature (up to 250°C, vacuum 60 Pa, with working chamber dimensions of 415x345x370 mm),
- solvent recovery on a rotary evaporator, Buchi, 4L,
- determination of the dissolved solid content with the use of a spectrophotometer (biogenic compounds, contaminants, cations and anions contents).

Hydrogen peroxide catalysts

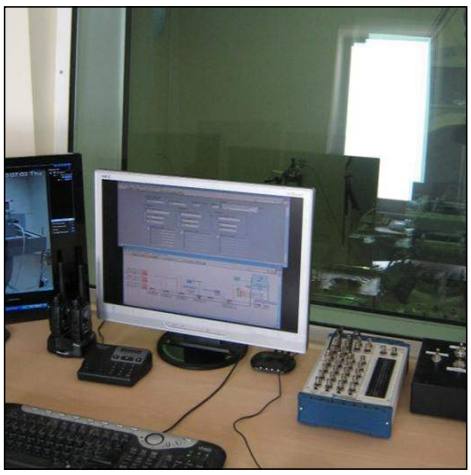
Laboratory of Space Propulsion

The offer of the Laboratory of Space Propulsion:

- development of applications for measurement and data recording using a LabView environment,
- design and testing of liquid, hybrid and solid rocket engines of thrust up to 5 kN,
- design of test stations for measurement of rocket engines' work parameters,
- design of launchers and analysis of their performance,
- preparation of CFD numerical codes for testing flows.

Products

- Hydrogen peroxide of HTP class, with concentration over 70% (up to 99.9%), with purity up to 0.2 ppm TDS,
- catalysts: heterogenic catalyst based on Mn and/or Co oxides on ceramic carriers for an effective HTP decomposition of catalyst beds (for use in gas generators, rocket engines).



Rocket engine control house

Rocket engine test house

Hydrogen peroxide HTP class for propulsion use

Patents

Patent in Polish Patent Office "Method for Obtaining Hydrogen Peroxide, Especially of HTP Class for Propulsion Applications, and an Arrangement for Vacuum Distillation."Aplicable also to the European Patent Office, The Hague, as Method for Obtaining Hydrogen Peroxide, Especially of HTP Class for Propulsion Applications, and an Arrangement for Vacuum Distillation.

Business and Scientific Partners

- ALTA Space,
- Thales Alenia Space,
- DLR,
- ZARM,
- MOOG,
- Airbus Defence and Space,
- MESKO,
- CIRA,
- WB Electronics,
- Jakusz,
- Warsaw University of Technology.

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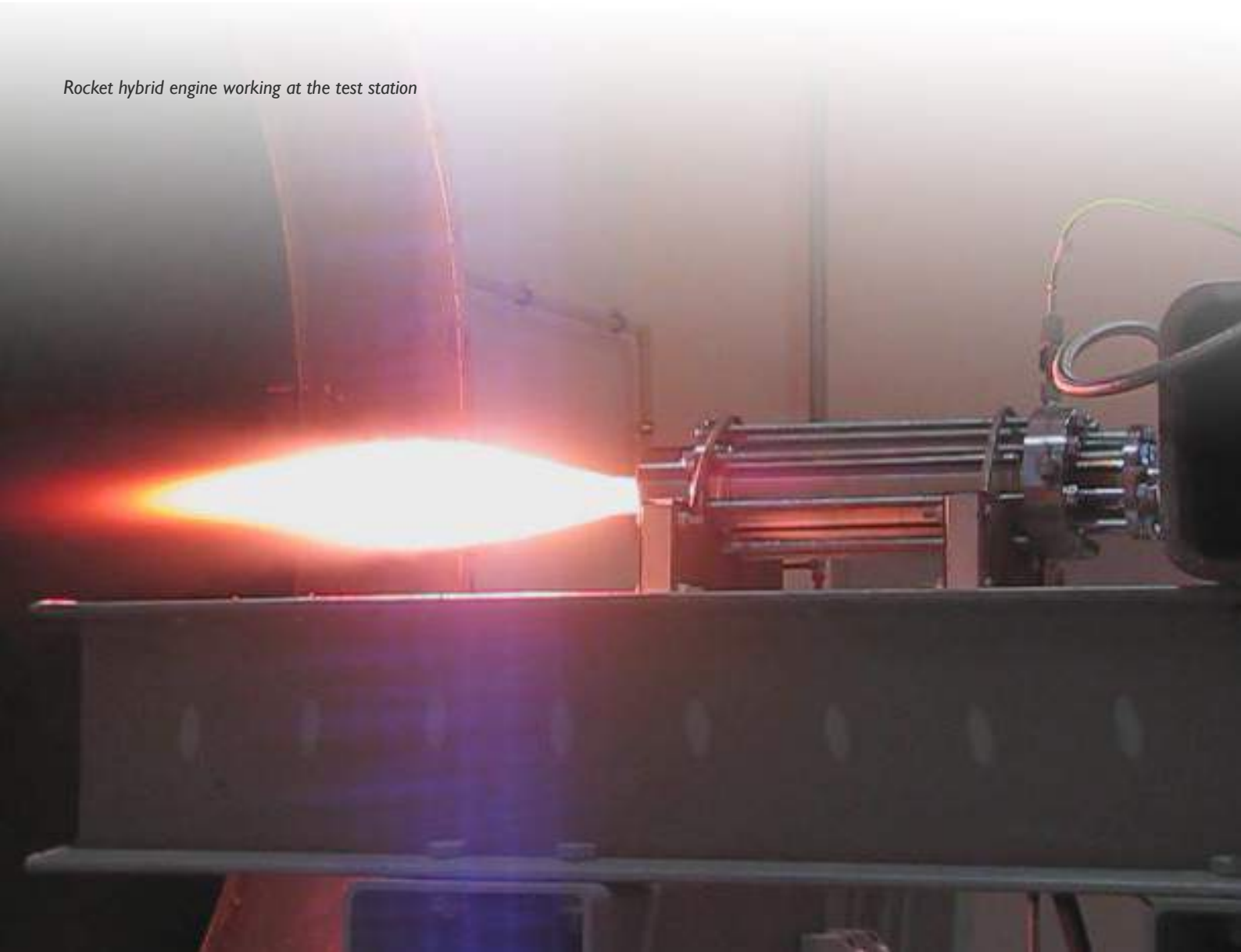

Rocket hybrid engine working at the test station

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