Session **BRAVO**

Environmentally friendly GA

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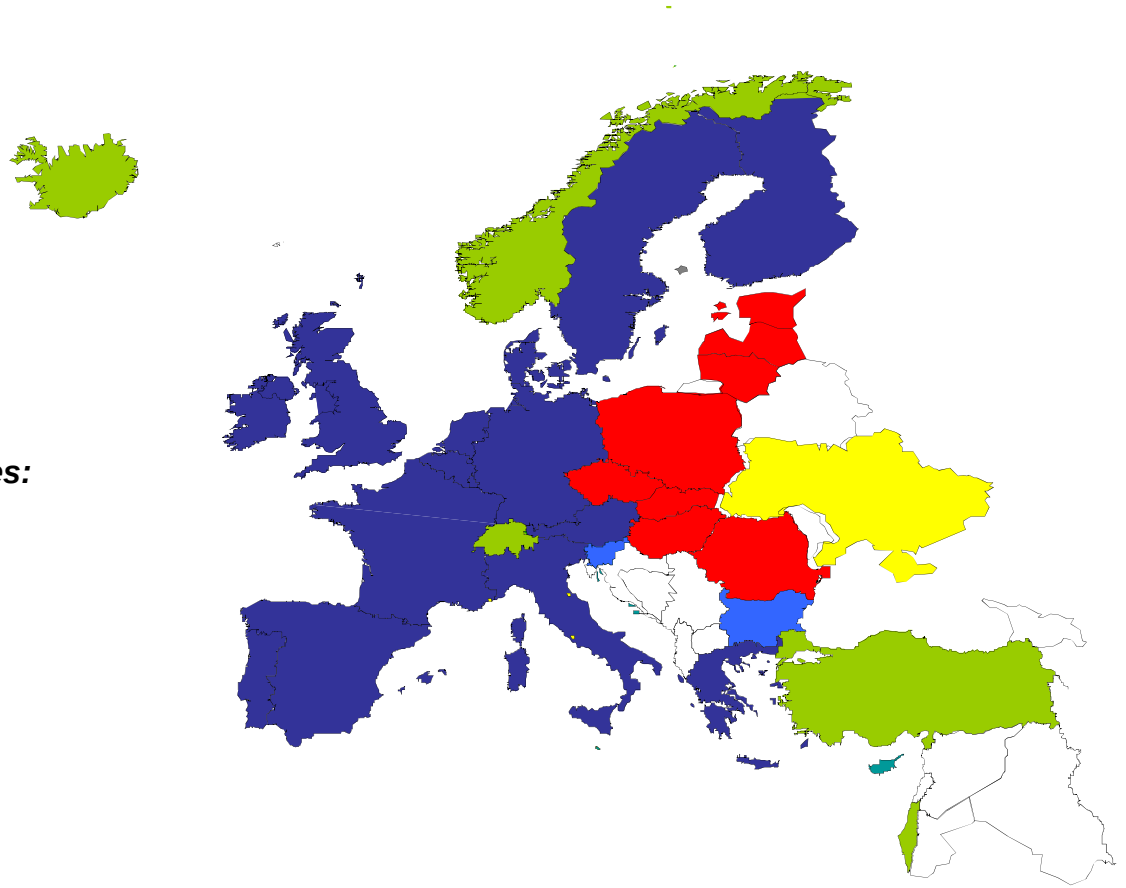
EASN CEE

EU 27

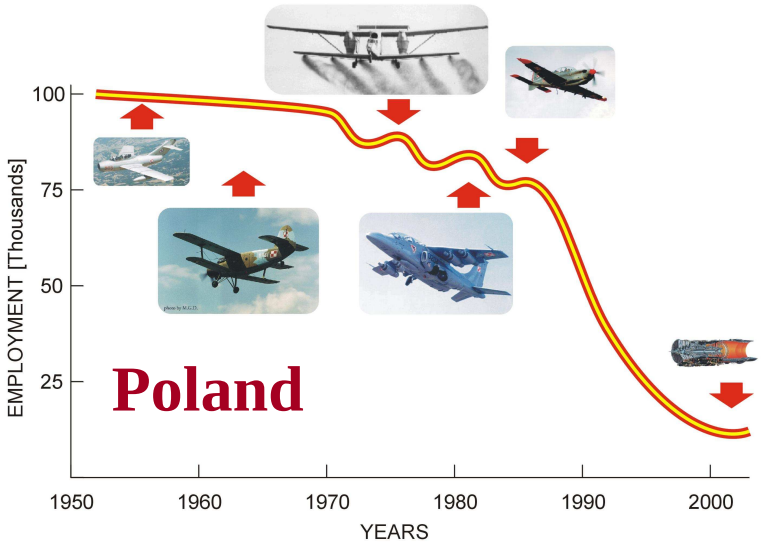
New Member States
- **Bulgaria**
- **Cyprus**
- **Czech Republic**
- **Estonia**
- **Hungary**
- **Latvia**
- **Lithuania**
- **Malta**
- **Poland**
- **Romania**
- **Slovenia**
- **Slovakia**

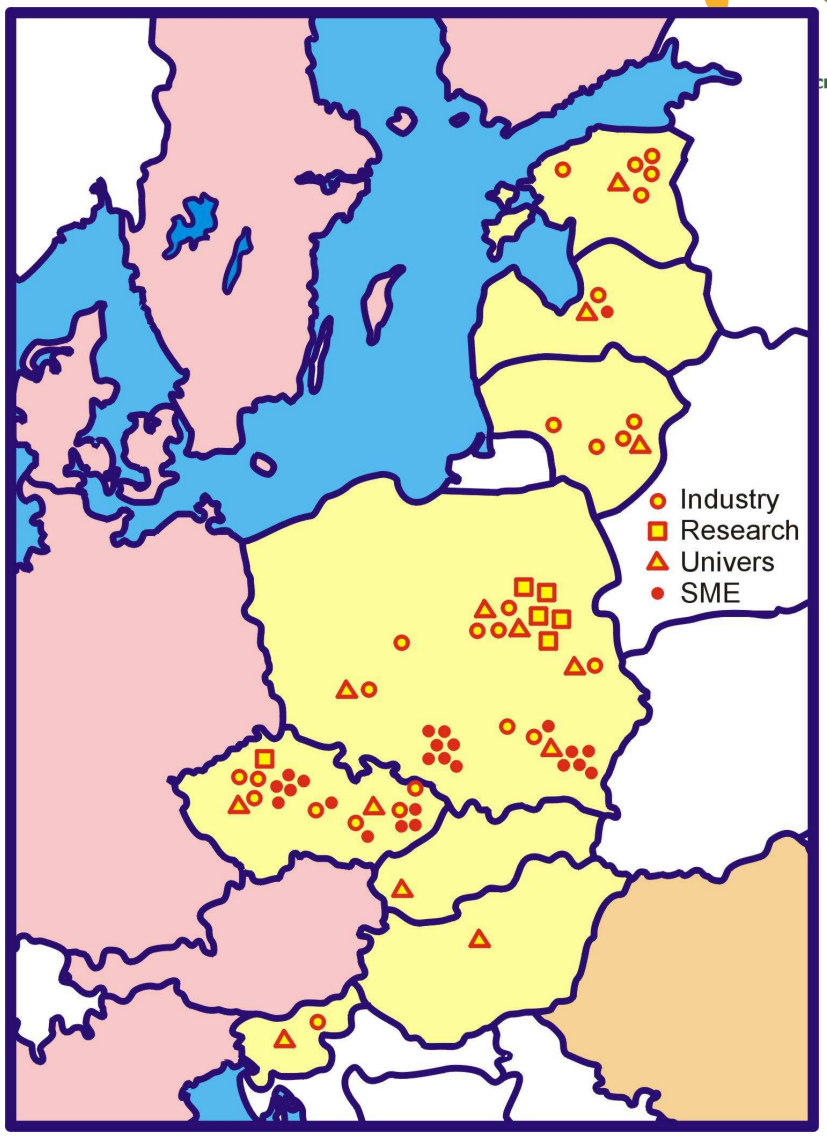
Associated Countries:
- **Island**
- **Israel**
- **Norway**
- **Switzerland**
- **Turkey**

EASN CEE Region
- **Estonia**
- **Latvia**
- **Lithuania**
- **Poland**
- **Czech Republic**
- **Slovakia**
- **Hungary**
- **Romania**



In the CEER there is a high potential in aerospace & a long tradition





Although the European Universities have succeeded to provide top level aeronautics education, a ***series of barriers*** impede Universities fulfilling their indispensable role in the aeronautics research chain at a level which would better reflect the importance and excellence of research work carried out by the European Universities.

Weak points:

- Fragmentation
- Inefficient communication mechanisms
- Lack of incubator mechanisms for developing new knowledge and technological innovation
- Lack of a common University research strategy for the sector of aeronautics
- Lack of a collective University voice in aeronautics research related issues

are the main obstacles to this target

List of institutions registered in the EASN database

Country	Number of Registered institutions
AUSTRIA	3
GERMANY	32
NETHERLANDS	2
SLOVENIA	4
SWITZERLAND	1
CROATIA	1
CZECH REPUBLIC	8
ESTONIA	1
HUNCARY	1
LATVIA	3
LITHUANIA	2
POLAND	17
SLOVAKIA	2
ROMANIA	3
DENMARK	-
FINLAND	3
ICELAND	-
IRELAND	6
SWEDEN	4
UNITED KINGDOM	52

Country	Number of Registered institutions
NORTHERN MARIANA ISLANDS	-
NORWAY	2
CYPRUS	1
GREECE	19
ITALY	24
MALTA	-
BULGARIA	-
ISRAEL	-
SERBIA	4
TURKEY	6
MONTENEGRO	-
BELGIUM	8
FRANCE	49
LUXEMBOURG	-
PORTUGAL	6
SPAIN	9
	TOTAL:272

EASN - membership per country

SE

Greece	19
Cyprus	1
Italy	24
Malta	0
Bulgaria	0
Israel	0
Serbia	4
Turkey	7
Montenegro	0

Σ=44

W

Belgium	8
France	49
Luxembourg	0
Portugal	6
Spain	9

Σ=72

C

Austria	3
Germany	32
Netherland	2
Slovenia	4
Switzerland	1
Croatia	1

Σ=41

NW

Denmark	0
Finland	3
Ireland	6
Sweden	4
United Kingdom	52
Iceland	0
Norway	2

Σ=65

CE

Czech Republic	8
Estonia	1
Hungary	1
Latvia	3
Lithuania	2
Poland	15
Slovakia	2
Romania	3

Σ=34

Σ Σ =256

EASN Interest Groups

• The EASN Interest Groups (IGs) represent the active technological and scientific cells of EASN.

The existing EASN IGs were exploited to:
provide a mechanism for incubating innovation, new technologies and breakthrough concepts
– provide input towards the development of a University Research Strategy for the sector of Aeronautics

An outcome of the activities of the EASN IGs has been suggestion of research subjects relevant to FP6 and FP7 which are expected to lead to new knowledge, innovative concepts and breakthrough technologies.

•In the frame of EASN a number of *22* Interest Groups have been established so far for different research fields resulting from the needs expressed through the EASN network corresponding to the classification of Aeronautics given by the ACARE Taxonomy

Objectives of the Interest Groups

- Enhance closer cooperation between scientists from the European academia with joint scientific and technological interests in Aeronautics and facilitate research cooperation with research establishments, industry and SMEs by focusing on innovative ideas and upstream research
- Identify the capabilities existing across Europe
- Facilitate communication between individuals and stimulate the transfer of know-how
- Provide information on research opportunities
- Promote awareness for scientific and technological aspects in Aeronautics
- The I.G.'s provide the basis for a knowledge incubation mechanism which is urgently needed to achieve Europe's strategic objectives in Aeronautics. A side effect of the I.G.'s has been the submission of several University STREP proposals with a success rate well above the European average.

Warsaw University of Technology

EASN Workshop

Interest Group devoted to
"Light Aircraft Design and Optimisation"
under the umbrella of EASN

Zdobyslaw Goraj: goraj@meil.pw.edu.pl

Warsaw University of Technology

Istambul, May 14-15, 2009

Scope of LADO interest 1/5

Aerodynamic, specific for light aircraft, including novel, sometimes up-stream research, for example

- **Forward swept wing,** offering good CG location, an easy trimming, NLF (natural laminar flow) and beginning of separation close to fuselage. All these features are difficult to obtain in traditional, back swept wing, especially of high aspect ratio;
- **Novel high lift devices,** enabling to fly with low speeds, bellow 115 km/h (according to FAR23 for MTOW < 5700 kg);
- **Novel trends in wing planform** (straight TE, and semi-elliptical LE), offering lower induced drag;

Scope of LADO interest 2/5

Aerodynamic, specific for light aircraft, including novel, sometimes up-stream research, for example:

- **New thick wing sections**, important for hosting extra fuel, but from the other side having negative influence on high critical Much number. Such modern thick wing sections, very often **mission-tailored and customized**, must have high aerodynamic efficiency, limited pitching moment, high maximum lift coefficient $C_{L,max}$, etc;
- **Novel, promising configuration** (U-tail, pushing propellers, pro-green (noise suppression) etc.

Scope of LADO interest 3/5

Light loading structure (ratio of empty weight to MTOW less than 0.5), including

- **Pressurised fuselage** (how to join the wing, sometimes built as a one piece) with fuselage in an optimal way);
- **Structure optimisation** (trade-off between metal, composite and a mix metal-composite).

Avionics, including :

- **Modern navigation systems;**
- **Flight management system with a selflearning option** (one pilot on board, sometimes inexperienced pilot);
- **Pilotless aircraft control in emergency** (fully autonomous aircraft).

Scope of LADO interest 4/5

Modular, affordable design

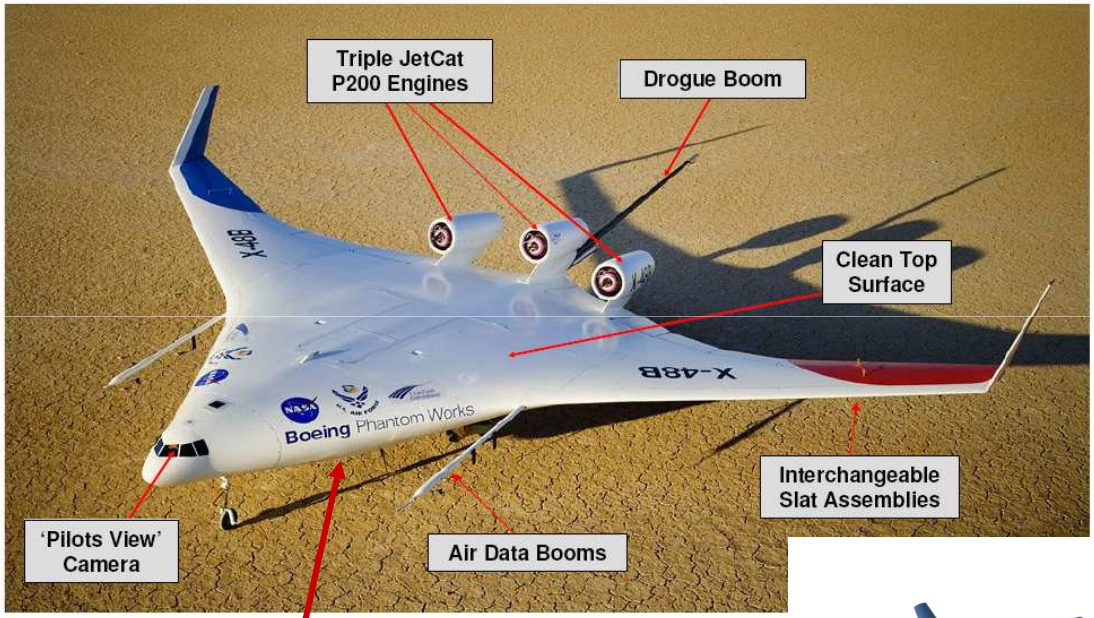
- **wide use of COTS** elements;
- **changing the wing** for the same fuselage, or **changing the fuselage** for the same wing (it enables to develop an aircraft derivate, better suited to a specific mission in a relatively low cost).

Hazardous states and recovery

- **Recovery from hazardous states** (loss of one or two engines, elevator or other lifting surface blockage, going by the pilot beyond a permissible parameter limits);
- **Parachute landing system** in emergency;
- **Redundancy.**

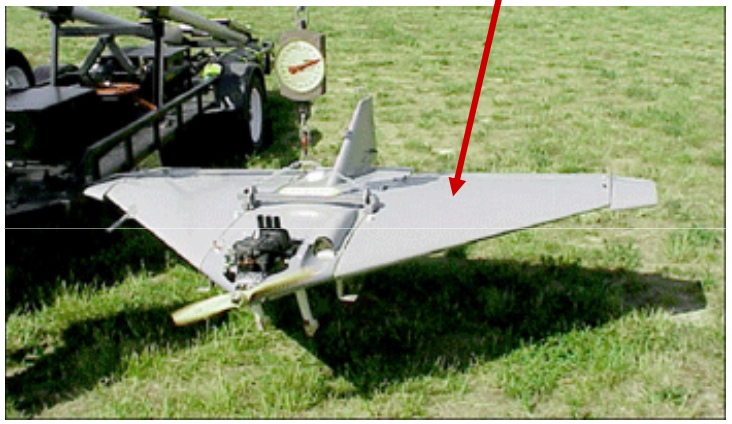
Scope of LADO interest 5/5

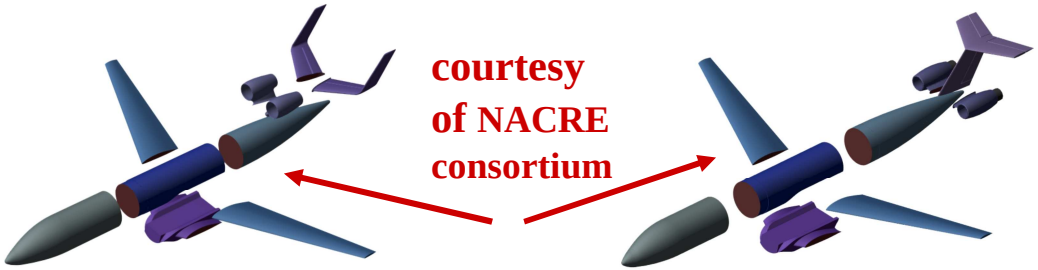
Scaled models as new research tools,
sometimes called as (Innovative Evaluation Platform)



courtesy of X-48 NASA-Boeing HBW

courtesy of Stanford University





courtesy of NACRE consortium

IEP-15

IEP-21

EASN - IG: “Light Aircraft Design and Optimisation” – LADO

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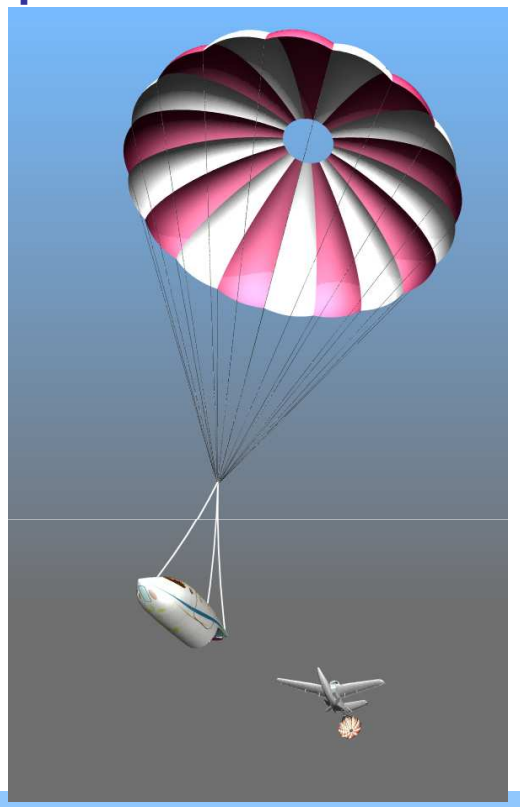


"Towards safer EPATS by means of STOL solution"
- acronym **AEROVAN**

Utility: passenger transport between unprepared, very short runways;
rural areas, mountains, forestry, meadows,
short runways in city centres (150 m)

Cruising speed: 300 km/h

Parameters: span – 15 m; wing area – 32 m2; cabin – 1.4 x 1.6 x 3.7 m

MTOW = 4000 kg

Landing/Take-off run = 150 m

Range = 1200 km

Number of passengers ~ 14

Main objective – to design and optimise a safe and efficient aircraft of increased safety factor - see next slide

AEROVAN – take-off from unprepared runway

Competitors 1 (power [bhp]; travel speed [km/h]; landing run [m])

DHC-6 Twin Otter

2*700 KM; 265 km/h; 150 m

GAF NOMAD

2*450 KM; 311 km/h; 200 m

Cessna 208 Caravan

675 KM; 320 km/h; 400 m

Antonov An-28 SkyTruck

2*960 KM; 250 km/h; 500 m

Quest Kodiak (2007 r)

750 KM; 320 km/h; 250 m

AEROVAN

2*500 KM; 350 km/h; 150 m

Competitors 2 (power [bhp]; travel speed [km/h]; landing run [m])

DHC-2 Beaver

450 KM; 230 km/h; 170 m

AN-2

1000 KM; 230 km/h; 170 m

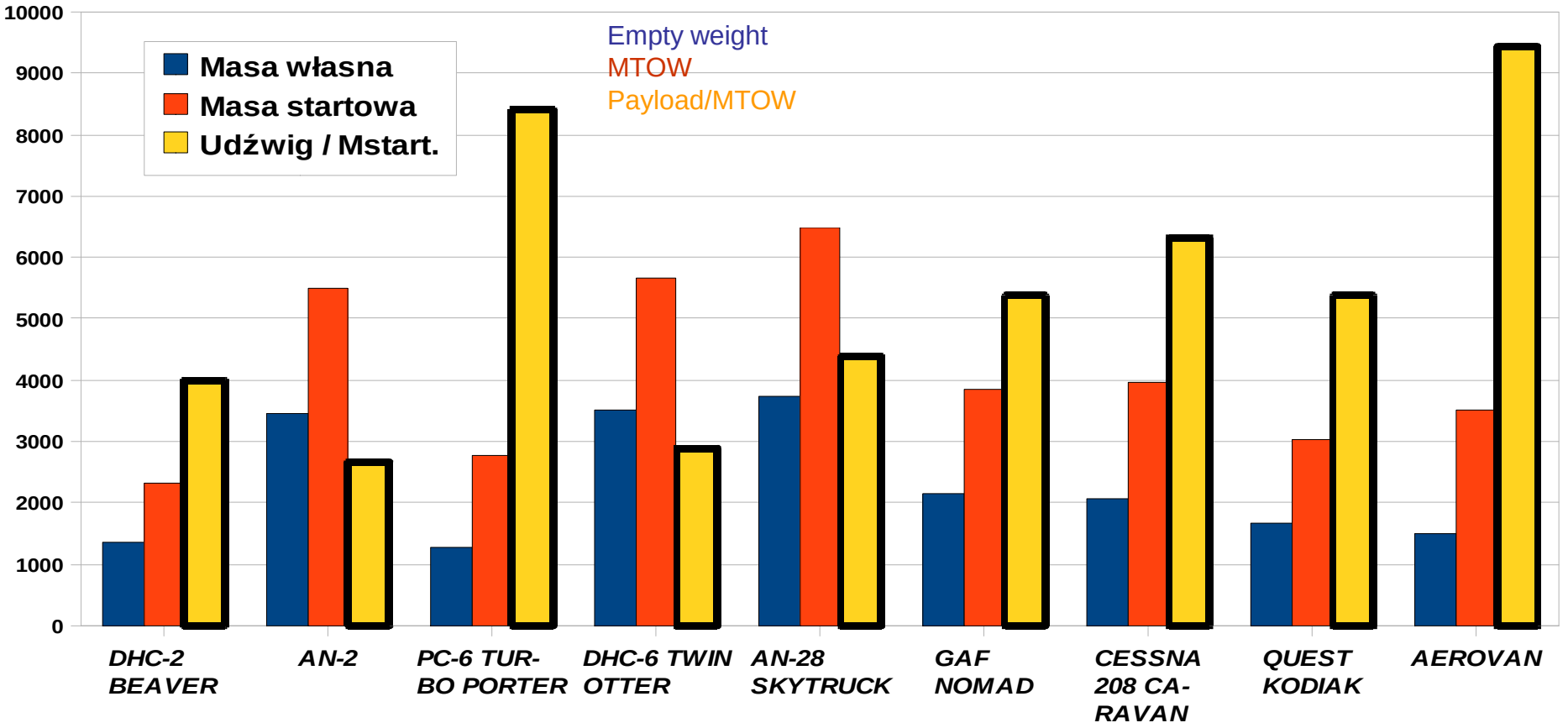
PC-6 TURBO PORTER

550 KM; 232 km/h; 197 m

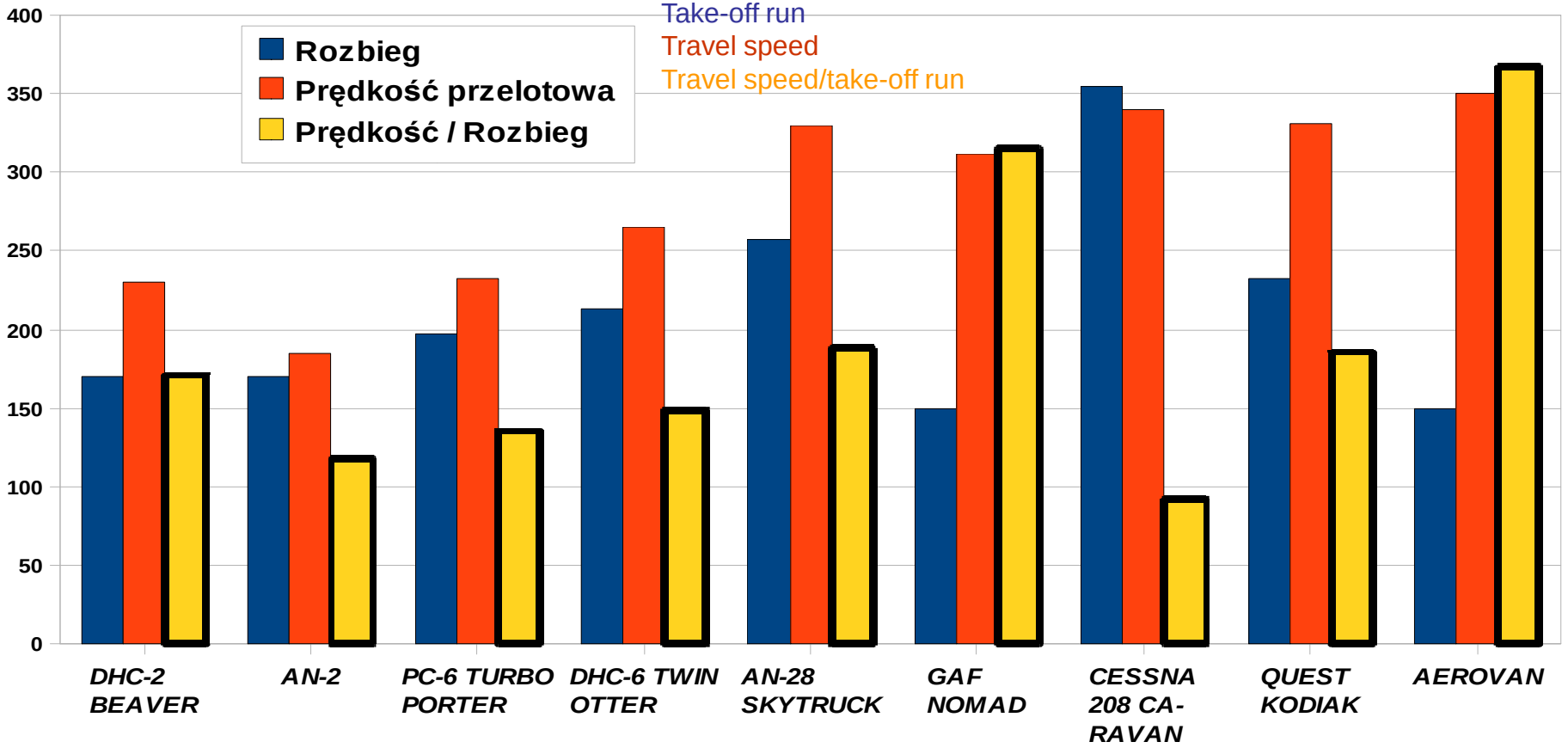
AEROVAN

2*500 KM; 350 km/h; 150 m

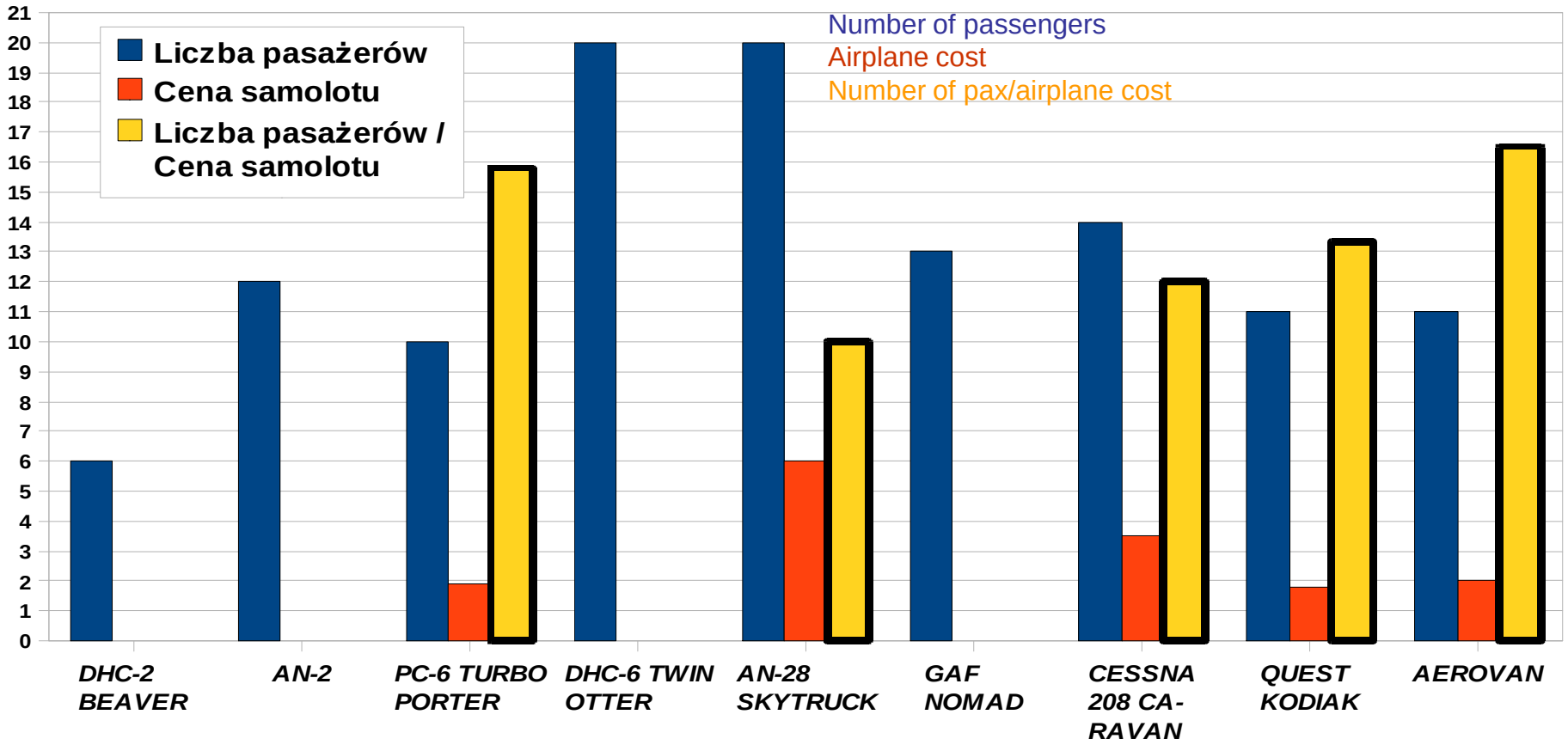
Weights and payloads



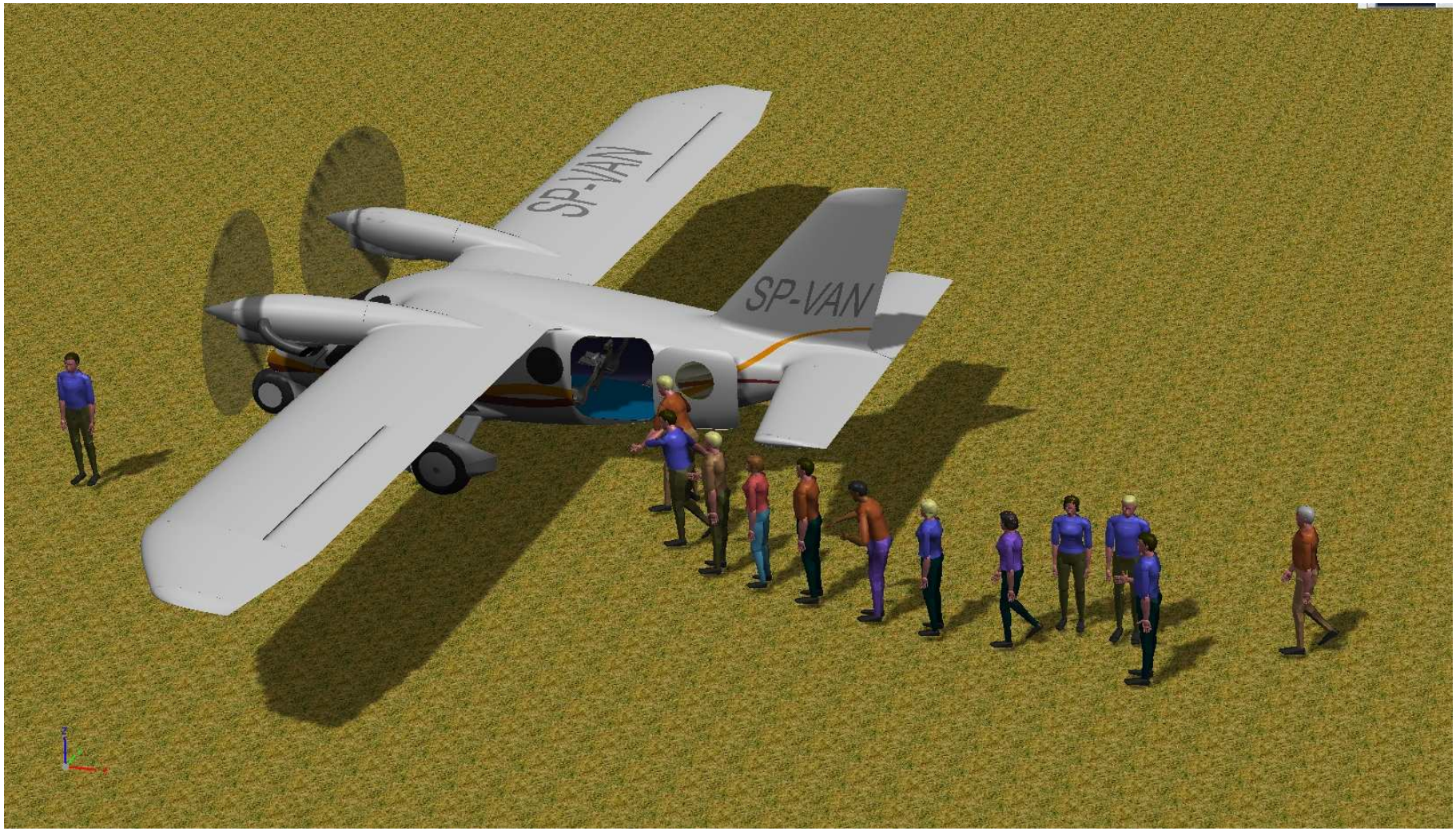
Performance



Number of passengers, airplane cost, passengers per airplane cost



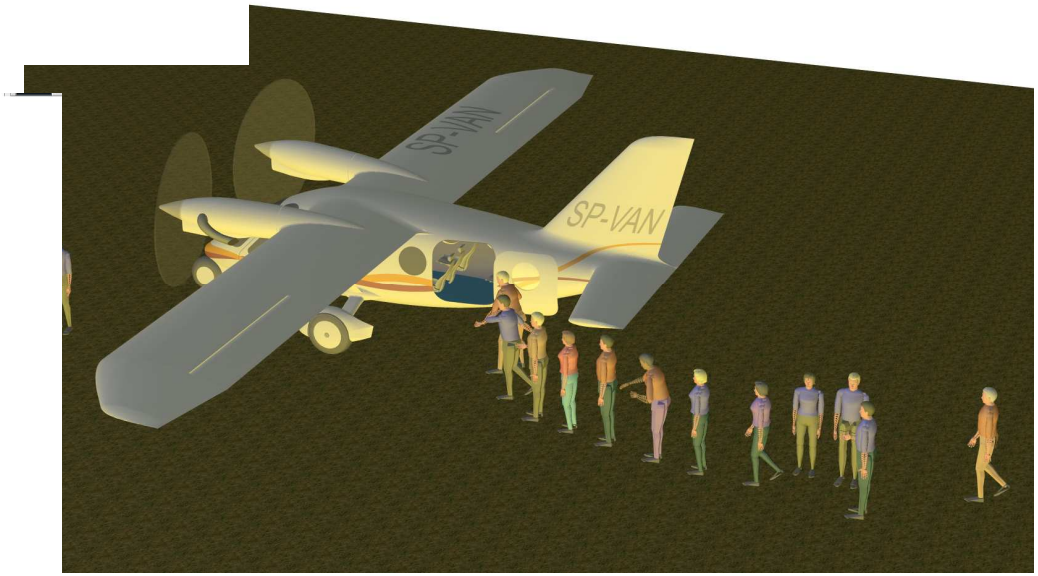
AEROVAN - boarding



"Towards safer EPATS by means of STOL solution"

	General aviation, 1999	Airliners, 1999	Space shuttle 1981-2003	Predator A, 1998-2003	UAV (Israel, MALE & HALE all), 2003	Goal for PATIO
Crash number for 1 mln take-off	25,2	1	20 000	5550	20	5
Crash number for 1 mln flight hours	12,6	0,13	133	555	3	8

Towards safer EPATS by means of STOL solution – via **AEROVAN**



BRAVO - Environmentally friendly GA

Any ideas to maximize energy efficiency and minimize environmental impact of GA

i) novel concepts,
ii) engines, fuels/alternative fuels
iii) systems,
iv) noise and vibration

any other idea

Brainstorming – but under control

- Name/acronym of the idea
- State of the art and beyond (can we minimise environmental impact?)
- Structure of the project
- Consortium, who is behind?
- Are you looking for a partner with a very special expertise?
- any other related business