



# OJSC "ORPE "Technologiya"



**The Experience of the Russian Federation State Research Center OJSC "ORPE "Technologiya" in the International Cooperation on the Development and Production of Polymer Composite Structures and Special Optics for Aerospace Equipment**

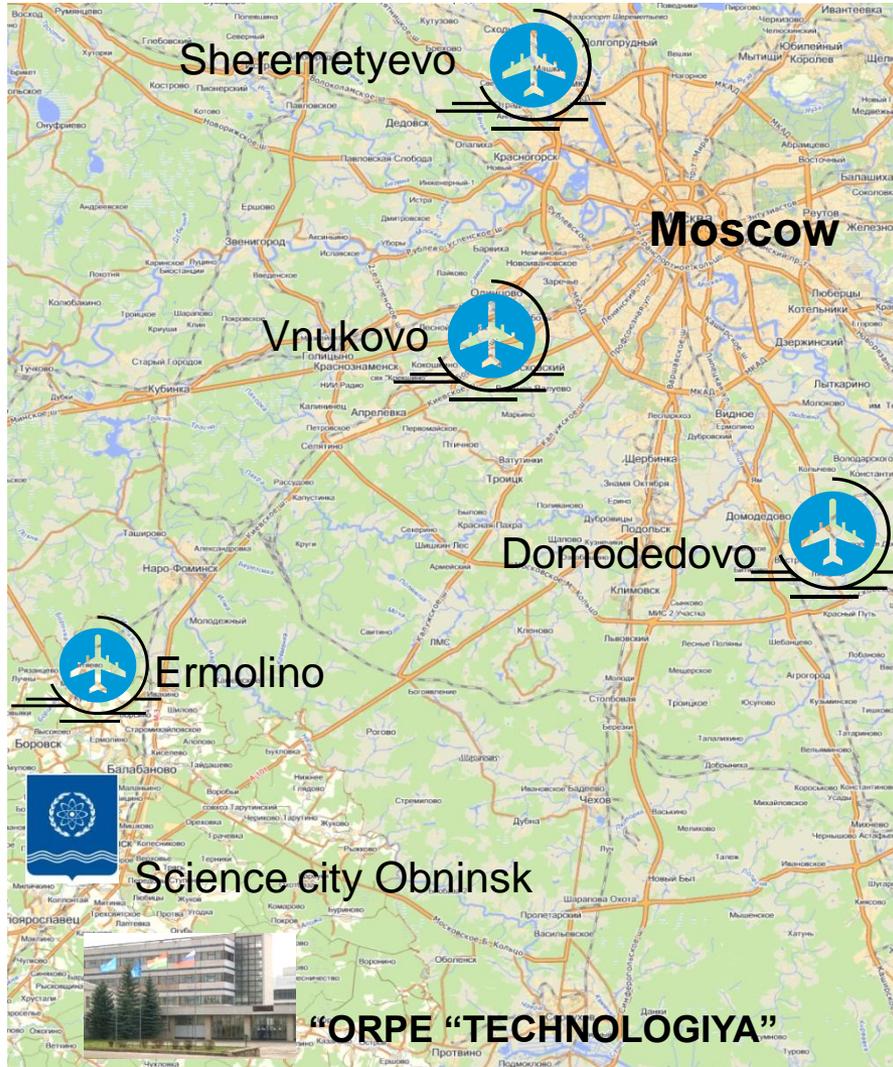
Speaker: Oleg Komissar, General Director of OJSC "ORPE "TECHNOLOGIYA"

Riga, Latvia «Avia-invest 2014» april 10-11



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## LOCATION OF OJSC "ORPE "TECHNOLOGIYA"



### Our Address:

15 Kiev Str., 249035 Obninsk, Kaluga Region, Russia

**Year of Foundation: 1959**

**Number of Employees: 2300**

### Nearest big cities:

Moscow, Kaluga, Tula, Bryansk

### Motor roads:

Kiev high road (M3), Kaluga high road (A101)  
There is a Moscow bigger ring line(A108) 5 km  
off Obninsk Railroad "Moscow-Bryansk-Kiev"

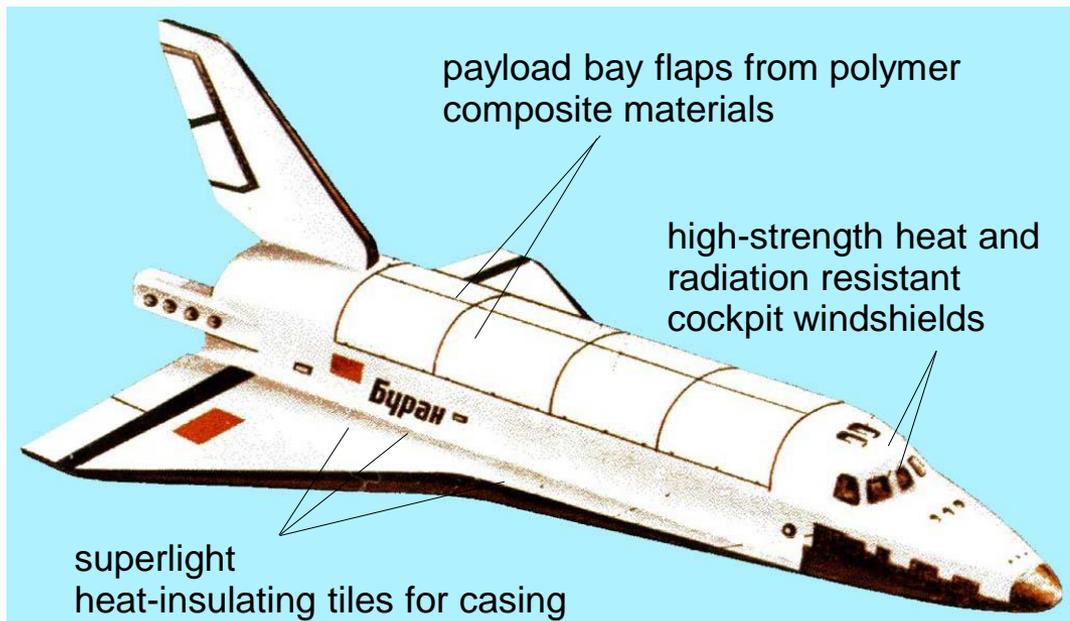
### Nearby airports:

Vnukovo, Sheremetyevo, Domodevo,  
Ermolino (freight airport)



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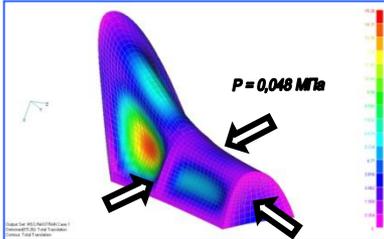
# Space Shuttle "Buran"





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## Areas of Activity



- ☑ Design and analysis of structures UniGraphics, MSC/NASTRAN, MSC/PATRAN, FiberSim
- ☑ Research and development of materials
- ☑ Development of technologies for structure manufacturing
- ☑ Design and fabrication of non-metallic tooling
- ☑ Testing of materials and structures
- ☑ NDE of structure quality
- ☑ Serial production of materials and structures



# ORGANIZATION STRUCTURE OF THE STATE RESEARCH CENTRE OF THE RUSSIAN FEDERATION OJSC ORPE "TECHNOLOGIYA"

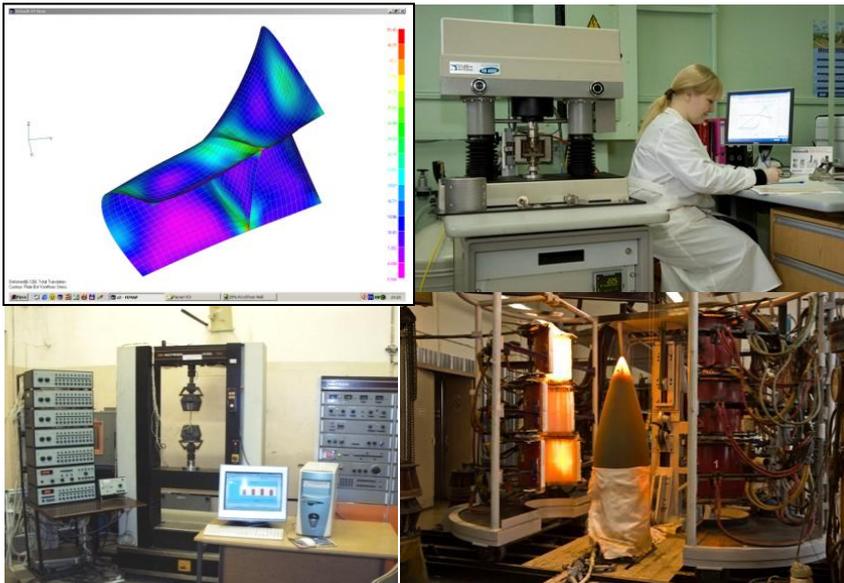
General Director



Enterprise Administration



Research and Development Base



Production Base (Pilot and Production)





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# STAGES OF DEVELOPING QUALITY MANAGEMENT SYSTEM AT ORPE "TECNOLOGIYA"





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# TECHNOLOGIYA'S PRODUCTS FOR AVIATION



## Sport aircrafts:

Sukhoi-26, Sukhoi-29,  
Sukhoi-31, Sukhoi-49



## Helicopters:

Kamov-52, Kamov-60,  
Mil-8 and "ANSAT"



## Blimps



## Passenger aircrafts:

Tupolev-154, Tupolev-204, Tupolev-334,  
Ilyushin-86, Ilyushin-96, Ilyushin-114,  
Yakovlev-40, Yakovlev-42



## Passenger aircrafts:

MS-21



## Ultralight solar aircrafts



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# Development for LVs

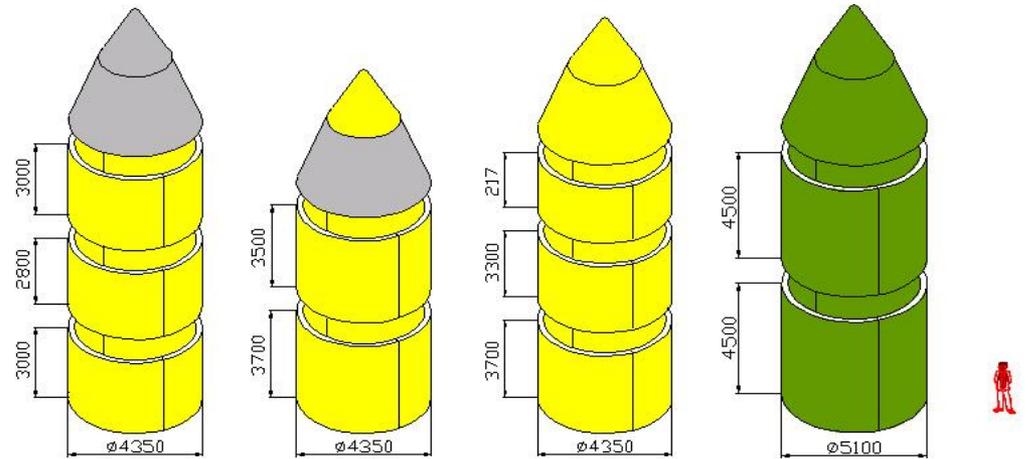
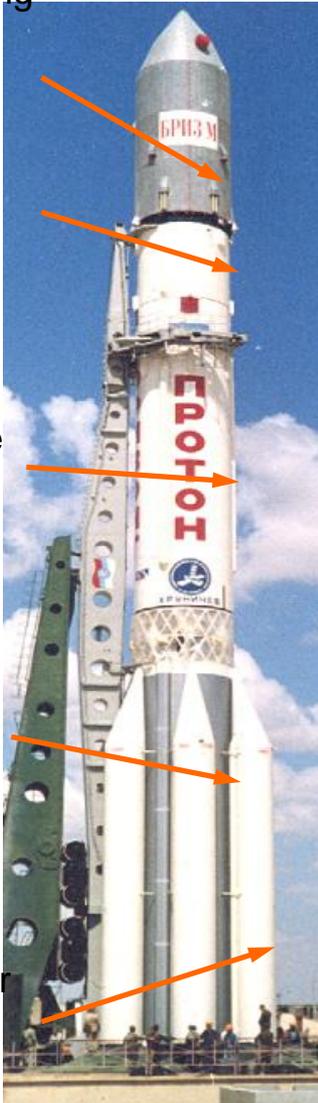
PL fairing

3 stage

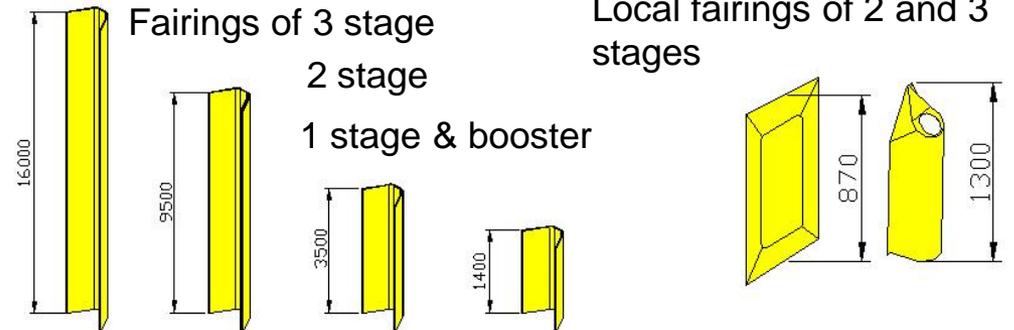
2 stage

1 stage

Booster



Proton-M, Rokot, Angara PL fairing casing





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## Structures for launching vehicles



Biconic shells  
«Proton-M»



Cylindrical shells  
«Proton-M»



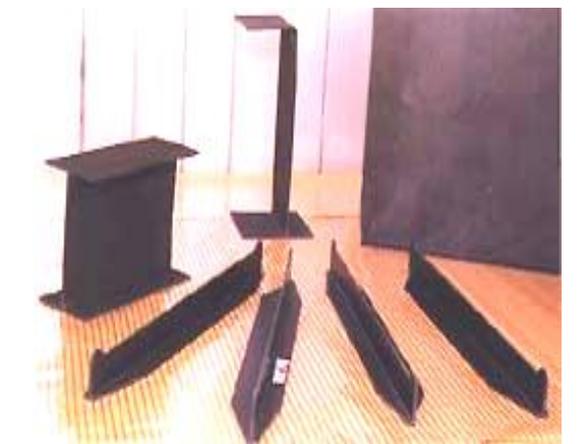
Integral shells  
«Angara»



Component fairing  
«Proton», «Angara»



Airframe fairing  
«Proton-M», «Angara»

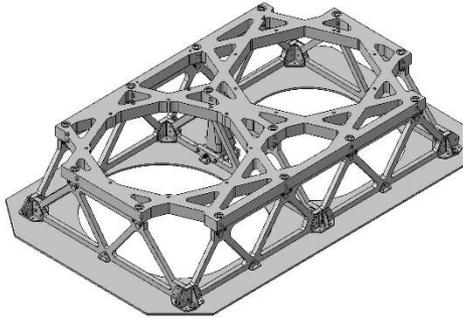


Equipment bay  
components «Rockot»

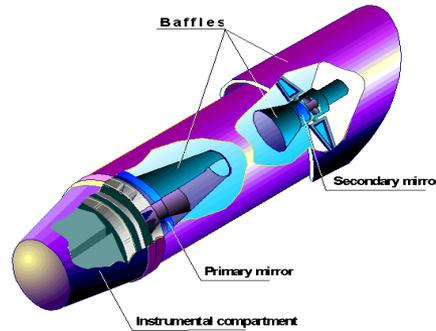


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# DEVELOPMENT IMPLEMENTATION IN SPACE VEHICLES



**"RAMOS" SV:**  
dimensionally stable integral platform



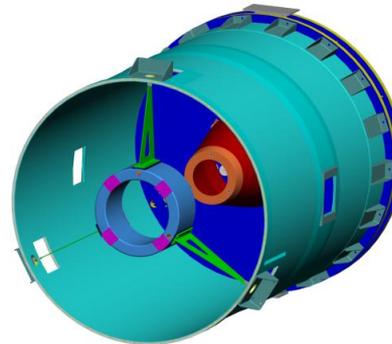
**"Spektr-UF" SV:**  
dimensionally stable structures



**"Kondor" SV:**  
dimensionally stable tubes



**"Spektr-R" SV :**  
dimensionally stable antenna structures for the radio telescope



**Perspective SV:**  
dimensionally stable structures

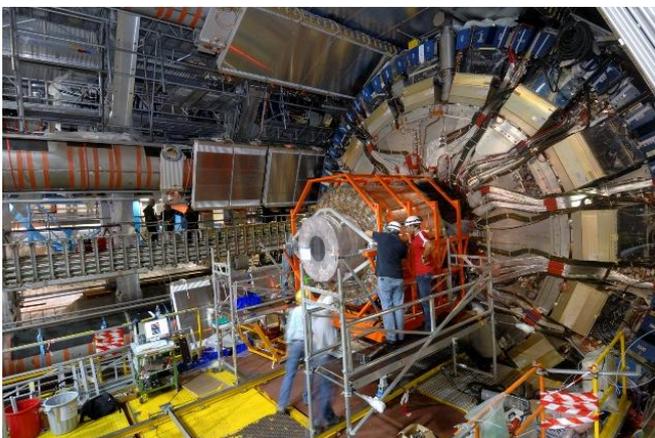
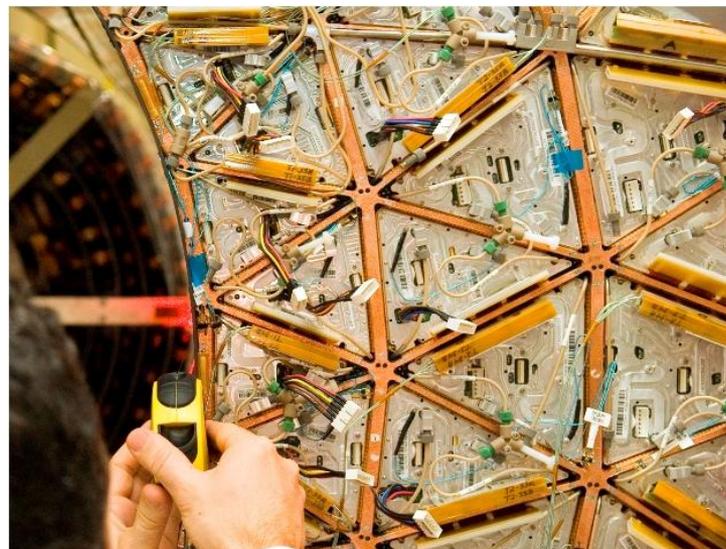
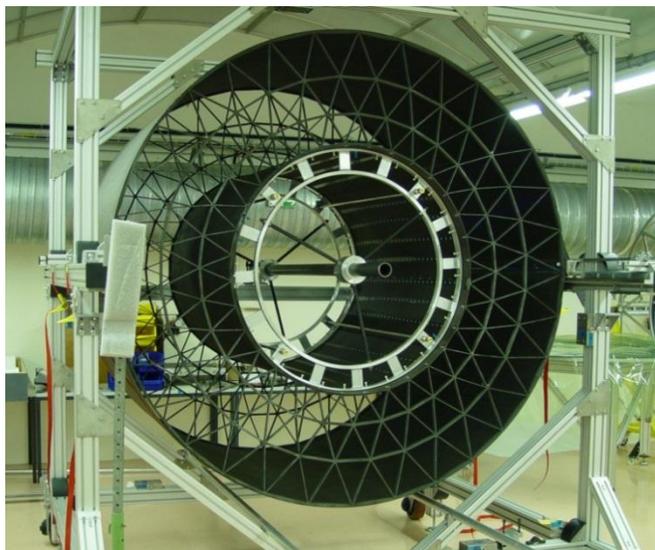


**"Kupon" SV:**  
dimensionally stable honeycomb platform



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# Quality Control of Support Structures for the Atlas ID Project of CERN





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# ATLAS Supplier Award

In recognition of excellent supplier performance

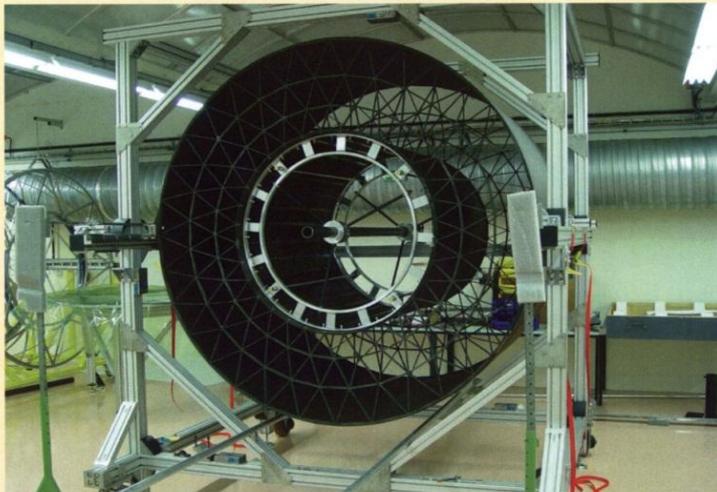
## ATLAS Supplier Award for ORPE Technologiya and RSP Khrunitchev

### Supply of the ATLAS Inner Detector barrel support structure elements

Since 1998, ORPE Technologiya has been actively involved in the development of the design for the Carbon-fibre reinforced plastics elements of the ATLAS Inner Detector support structure. After three years of joint R&D, CERN and ORPE Technologiya launched the manufacturing contract with a tight delivery schedule and very demanding specifications in terms of mechanical tolerances and stability. The contract was successfully completed with the arrival of the last element of the structure at CERN on 8th January 2004.

The barrel support structure comprises one inner cylinder, on which rails supporting the barrel SCT detector will be mounted, two end-frames with triangular cut-outs for the barrel TRT front-end electronics boards and services and precision dowel pins to support the modules themselves, and two outer-cylinder pieces.

In order to meet the specifications, the end-frames have a total thickness of 21 mm, corresponding to about 200 layers of impregnated C-fibre tissue.



They were manufactured as full plates with a diameter exceeding 220 cm and then approximately 90% of the material was machined out before sending the end-frames to RSP Khrunitchev, the only sub-contractor in Russia which accepted to perform the high-risk precision machining of the end-frames. Typical requested tolerances were 0.3 mm on the flatness of the surfaces, 0.3 mm on all the shapes of the triangular cut-outs, and 50-100 microns on the dowel-pin hole positions for a diameter of 3 mm and a depth of 21 mm.

The experience and enthusiasm of ORPE Technologiya have been a key element of the success of this project and the collaboration with this high-tech space-industry oriented company has been extremely fruitful in the R&D phase, where small-scale samples of the structure were manufactured and measured for thermal properties, water absorption and even CO<sub>2</sub> absorption. The measured properties were then entered into complex finite-element analysis models of the complete structure to predict its behaviour over the typical life-cycles expected for the ATLAS Inner Detector during assembly, installation, operation and maintenance.

The total cost of this project has amounted to 760 kCHF for an originally projected cost of 600 kCHF (the over-costs have been borne by Russia). The funding was provided jointly from Russia (60%), UK (20%) and CERN (20%).

The successful in-time delivery of this key component of the Inner Detector fully deserves an ATLAS award given the difficulty of manufacturing the end-frames, which very few companies in the world would have been in a position to do at an affordable cost. The acceptance measurements done at ORPE Technologiya, RSP Khrunitchev and CERN have shown that these elements are all in specification, both from the point of view of their mechanical properties and of the drawing tolerances.

Geneva, March 2004



*P. Jenni*  
Dr. Peter Jenni  
ATLAS Spokesperson

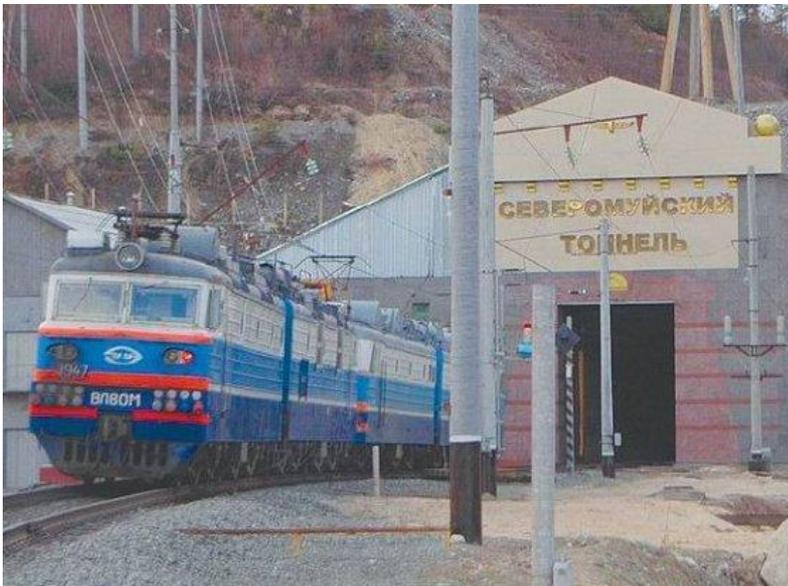


*Juan Antonio Rubio*  
Prof. Juan Antonio Rubio  
CERN Head of Education &  
Technology Transfer Unit



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# POLYMER COMPOSITE GATE FOR SEVEROMUYSK RAILWAY TUNNEL





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# Structural optics



# Application of nano-sized multifunctional coatings to the products made of organic and silicate glass



## Resulting effect :

- abrasion resistance;
- protection against electromagnetic and thermal radiation;
- electrical conductivity;
- lack of glare on the surface;



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## High-strength heated glazing for diesel and electric locomotive cabins

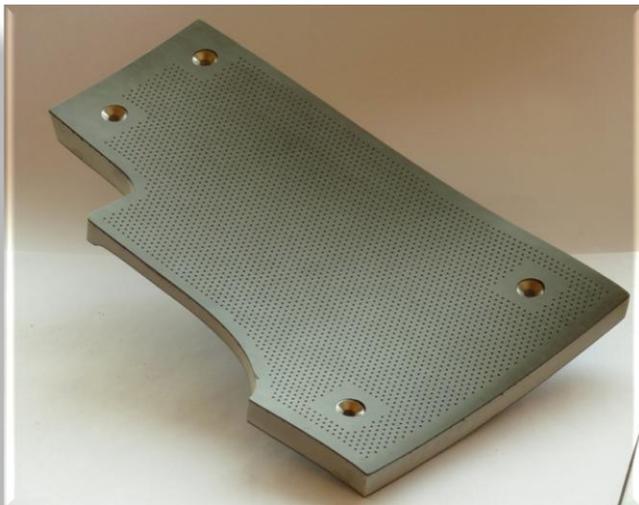




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# Project # 1

## SOUND-SUPPRESSING PANELS FOR THE SAM-146 ENGINE (Snecma)





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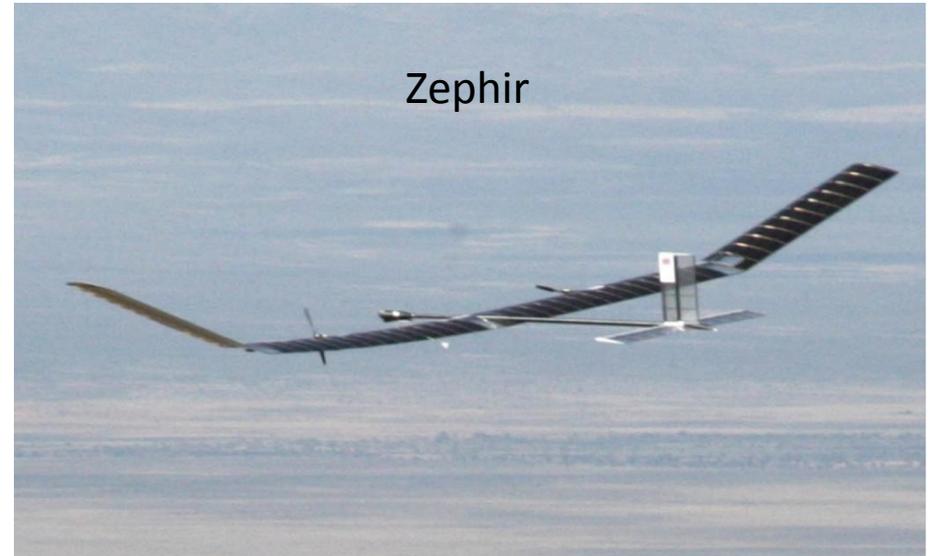
## STRUCTURES FOR THE PD-14 ENGINE

- Sound-absorbing panels
- Lapping paste
- Reverser buckets
- Gas generator panels



## Project # 2

### Aircraft by solar energy



Высота полета: 22 000 м

Скорость: 40 м/с

Длительность: 72 часа

Масса: 400 кг

Размах: 30 м

Двигатели:  $4 \times 3 = 12$  кВт

Площадь крыла: 75 м<sup>2</sup>



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# Синтез инноваций для проекта «Космос - Крыло»

Фотогенирирующая  
часть КА массой  
1,2 кг/м<sup>2</sup>



Углепластиковый  
ультралегкий  
каркас КА  
массой  
0,5 кг/м<sup>2</sup>





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# Project # 3

## Components of fin and stabilizer torsion boxes for the MS-21 aircraft





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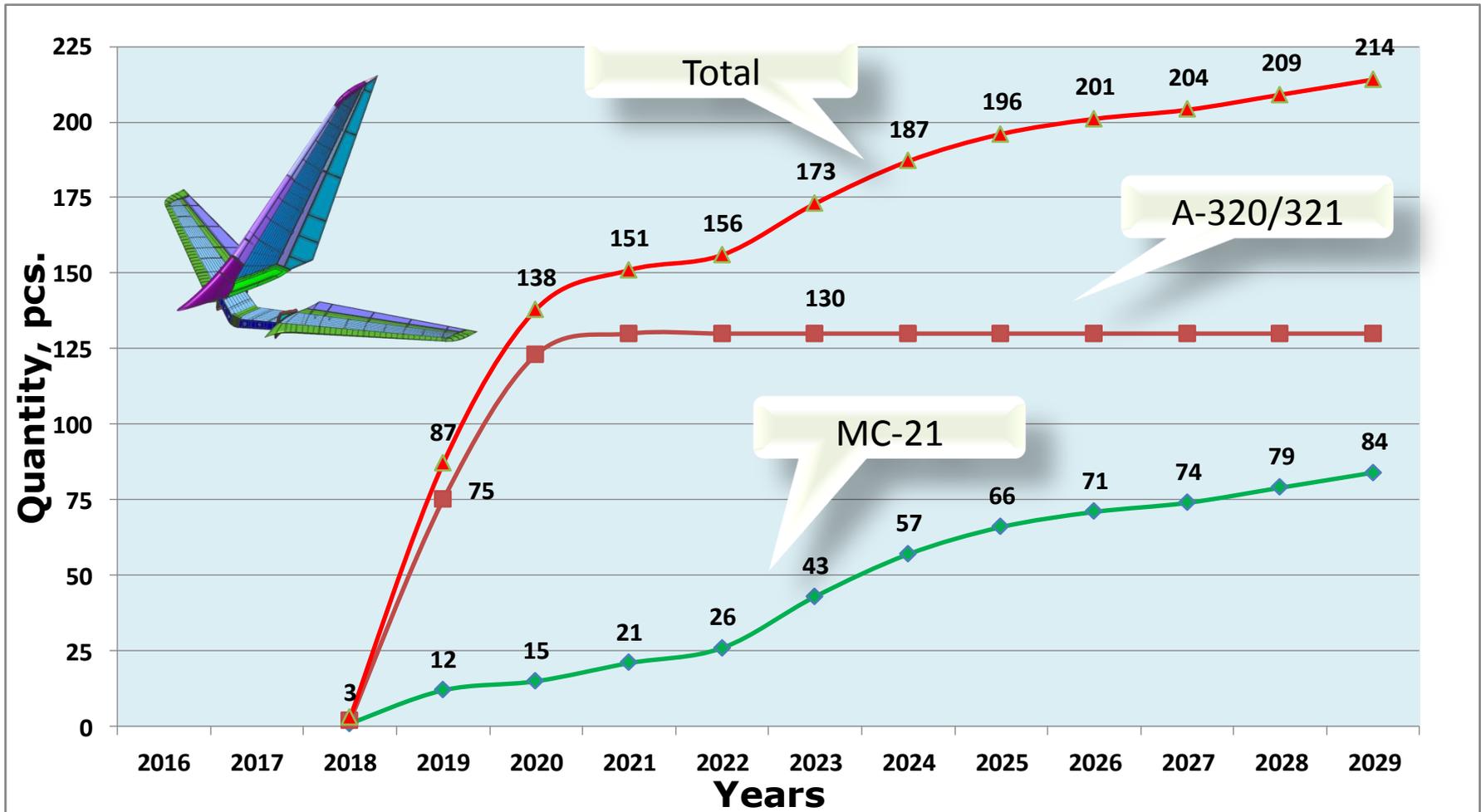
# Automated lay up of polymer composite structures





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# MC-21 & A-320/321 PRODUCTION



***Production facilities should be calculated for rate of 250 units per year.***



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## Project # 4

OJSC "ORPE "Technologiya" proposal for the delivery of cockpit and passenger compartment glazing and nose radomes to repair Airbus airliners being used in Russia





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## Stages of project # 4 realization

**2015** – implementation of auditing and approval of OJSC “ORPE “Technologiya” production by Airbus company. Including in the list of the official Airbus suppliers.

**2016** – receipt of regulatory Airbus documentation on the materials and structures of passenger aircrafts A-320 and A-321: glazing and radioparent fairing.

**2017** – OJSC “ORPE “Technologiya” develops the technology of structures production

**2018** – certification of structures production in accordance with standards. Start of the components production.