



corporation  
**IVCHENKO**®

## ***Novel propulsion concept of Ivchenko-Progress SE for future aircraft***



**IVCHENKO**  
**PROGRESS**



## YEAR OF CORPORATION ESTABLISHMENT - 2007

	1907 - Cration of Motor Sich JSC	1945 - Cration of Ivchenko-Progress SE
Sphere of activity	Development, production and overhaul of gas-turbine engines for civil and military aviation, industrial gas-turbine drives and power-generating plants, consumer goods.	
Structure	14 structural units located in different parts of Ukraine as well as in China, India, UAE, Algeria	one structural unit located in Zaporozhye
Number of employees	over 21,000	3,100





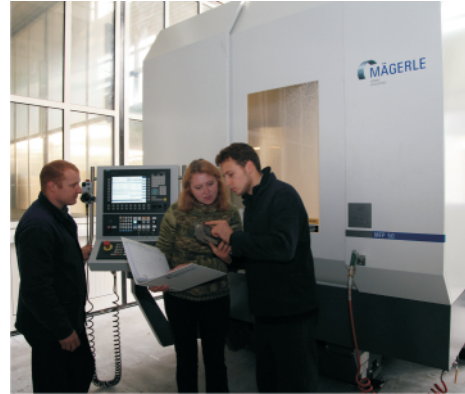
# THE BASIC SPHERES OF ACTIVITIES

corporation  
**IVCHENKO**®

**DESIGN**



**MANUFACTURE**



**OVERHAUL**



**TEST, DEVELOPMENT AND CERTIFICATION**



**PUTTING IN SERIES PRODUCTION  
AND IMPROVEMENT OF  
CONSUMER'S CHARACTERISTICS**



# DIRECTIONS OF ACTIVITY

## **CIVIL AVIATION:** commercial helicopters and aircraft



MSB-2, Mi-2M



Dart-450



An-148/158



An-225

## **STATE AVIATION:** trainers and combat trainers, multipurpose aircraft, military transport aircraft and helicopters



Yak-52-450



Mi-8MT/-17



Mi-24/-35



Mi-26/26T



L-15 LIFT



Be-200



An-70

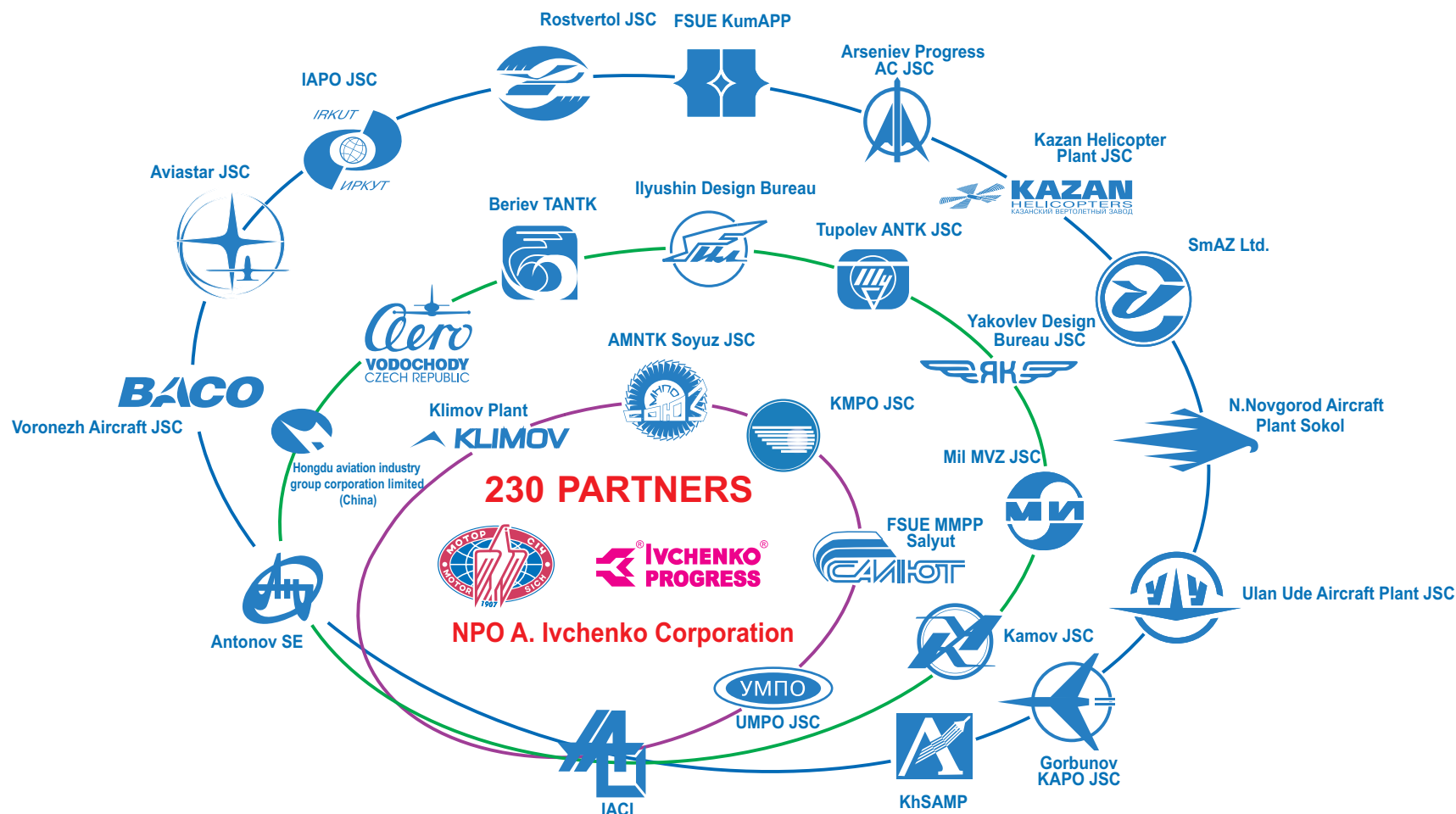


An-124



# PARTNERS OF NPO A. IVCHENKO CORPORATION DESIGNES AND MANUFACTURERS OF AERO-ENGINES AND AIRCRAFT

corporation  
**IVCHENKO**®



Among the partners of NPO A. Ivchenko Corporation are more than **130** designers and suppliers of vendor items and more than **100** suppliers of materials and semi-finished products

# RECOGNITION OF CERTIFICATION AUTHORITIES

**Totally 75 certificates of various types**



**GOSAVIASLUZHBA**

*State Department of  
Aviation  
Transport of Ukraine  
Certificates No. SP 004,  
No. UA.145.0073, No. 0009 and others*



*Bureau Veritas (France)  
Certificate EN 9100:2009 No. FR015515-1,  
EN 9110:2009 No. FR015516-1,  
ISO 9001:2008 No. UA227484*



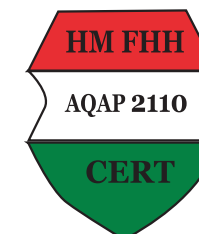
*European Aviation  
Safety Agency  
(Germany)  
Certificate No. 216/2008,  
No. 1702/2003 Part 21A.23(b)2*



*Aviation Register of  
Interstate Aviation Committee  
(ARMAK)  
Certificates No. SPR-11, No. SPR-15,  
No. R-56, No. R-69 and others*



*Federal Air Transport Agency  
(Russia)  
Certificates No. 2021130360,  
No. VR 27.1.4223-2011*



**Certification System of NATO**



# PISTON AND TURBOSHAFT ENGINES FOR LIGHT HELICOPTERS AND ULTRAHEAVY MILITARY TRANSPORT HELICOPTERS

corporation  
**IVCHENKO**<sup>®</sup>



Mi-1



Yak-100



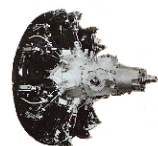
B-10,-11



B-5



G-4



AI-26/GR/GRF  
1945\*



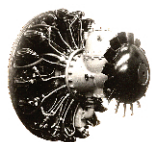
Ka-26



Ka-18



Ka-15



AI-14V  
1951\*



Mi-26T



Mi-26



D-136  
1971\*



Mi-24/35



Mi-14



Mi-8MT/17



Ka-29/31



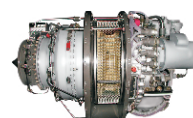
TV3-117VMA  
1980\*



Ka-226



Mi-2M



AI-450  
1994\*



MSB-2



Mi-2M



AI-450M,M1  
2006\*



Mi-26T2



D-136-2  
2010\*



Quest (AVQ)



AI-450M2  
2013\*



Helicopters of take  
off weight up to 15 t.



TV3-117VMA-SBM1V  
series 5,  
TV3-117VMA-SBM2V  
2013\*



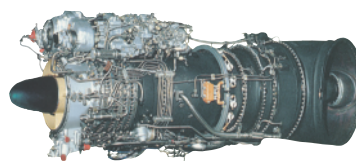
\* - year of project launch

# ENGINES FOR HELICOPTERS

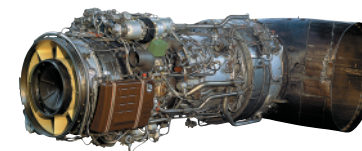
## SERIES-PRODUCED AND OVERHAULED ENGINES



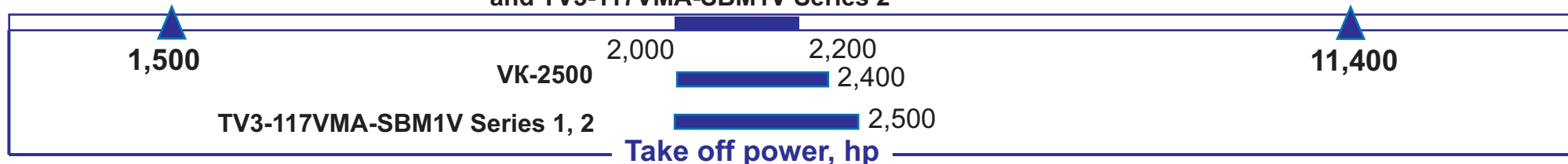
TV3-117VMA-SBM1V,  
Series 4 and 4E



TV3-117V modifications including  
VK-2500, TV3-117VMA-SBM1V  
and TV3-117VMA-SBM1V Series 2



D-136



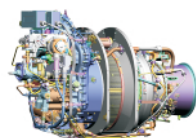
## PROJECTS AND NEW ENGINES



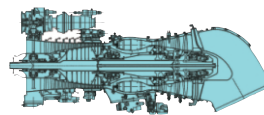
AI-450  
modifications



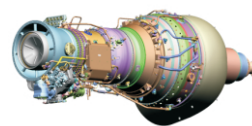
MS-500V  
modifications



NEW  
TURBOSHAFT



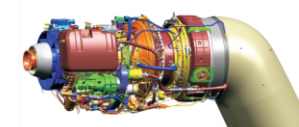
TV3-117VMA-SBM1V  
Series 5



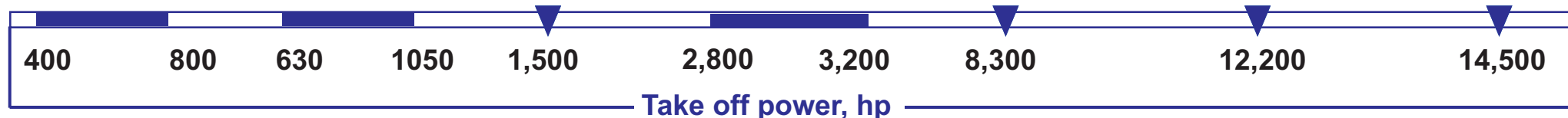
AI-8000V



D-136-2



AI-127





# TURBOPROP ENGINES FOR REGIONAL AND MILITARY TRANSPORT AIRCRAFT, SPECIAL PURPOSE AIRCRAFT AND GA

corporation  
**IVCHENKO**<sup>®</sup>



IL-38



IL-20, IL-22



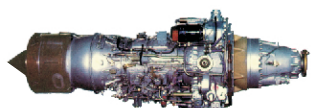
IL-18



An-12



An-10



AI-20A Series 1, 2, 3, 4  
AI-20M Series 6  
1955\*



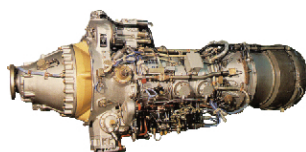
An-30



An-26



An-24



AI-24 Series 2,  
AI-24T, AI-24VT  
1957\*



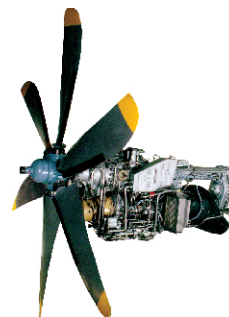
An-70, -70T



D-27  
1985\*



An-140



TV3-117VMA-SBM1,  
TV3-117VMA-SBM1I  
1996\*



EV-55

**ESPOSA** EFFICIENT SYSTEMS  
AND PROPULSION  
FOR SMALL AIRCRAFT



AI-450S2\*\*  
2011\*



DA-50



AI-450S  
2012\*



\*\* - Developed under **ESPOSA** project  
of European 7th Framework Programme

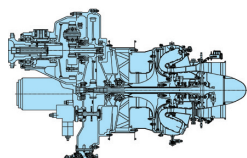
\* - year of project launch

## TURBOPROP AND TURBOPROFAN GAS-TURBINE ENGINES



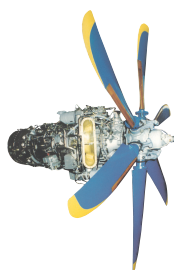
AI-450S

400 to 750  
(295 to 550)



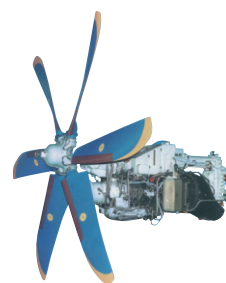
MS-500V-S

950  
(700)



MC-14

1,500  
(1,103)



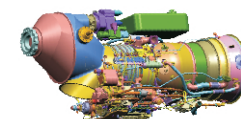
TV3-117VMA-SBM1/2

2,500 to 3,200  
(1,840 to 2,533)



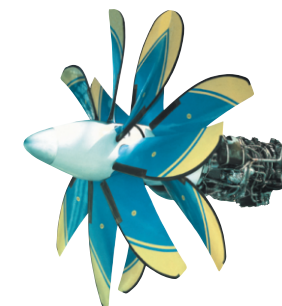
AI-40

3,600  
(2,647)



AI-8000

7600 to 8,300  
(5,588 to 6,102)



D-27

14,000  
(10,295)

Takeoff power, hp (kW)



# TURBOJET BYPASS ENGINES FOR REGIONAL, MILITARY TRANSPORT AND MULTIPURPOSE AIRCRAFT

corporation  
**IVCHENKO**<sup>®</sup>



An-74TK-300



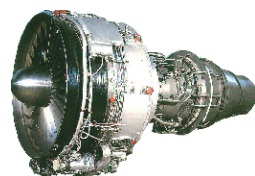
An-74



An-72



Yak-42



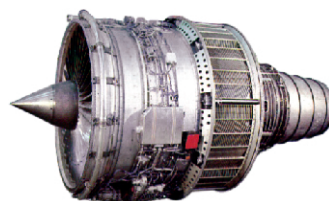
D-36 series 1, 1A,  
2A, 3A, 4A  
1967\*



An-225



An-124



D-18T Series 1, 3  
1972\*



An-178



An-148, -158



Be-200



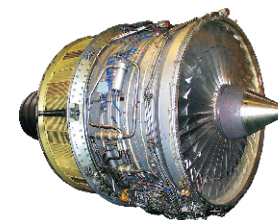
Tu-334



D-436T1,  
D-436TP, D-436-148,  
D-436-148FM/TP-FM  
1991\*



An-124-100M-150



D-18T  
series 3M  
2012\*



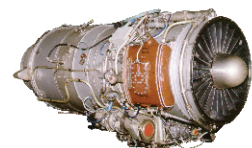
AI-25 Series 2, 2M  
1962\*



M-15



Yak-40



\* - year of project launch

## TURBOFAN ENGINES



**AI-450BP-2**



**AI-25**



**D-36**



**D-436**



**AI-28**



**D-18T**

5.6 to 6.0  
(570 to 610)

14.7  
(1,500)

63.8  
(6,500)

62.8 to 84.4  
(6,400 to 8,600)

73.6 to 98.1  
(7,500 to 10,000)

229.9 to 313.9  
(23,430 to 32,000)

Takeoff thrust, kN (kgf)



# PISTON, BYPASS TURBOJET ENGINES, INCLUDING ENGINES WITH AFTERBURNER, FOR TRAINERS AND COMBAT TRAINERS

corporation  
**IVCHENKO**®



L-39M



Yak-130D



Yak-130



L-15



Yak-12



JL-8



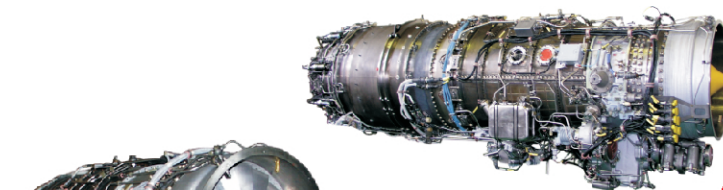
L-59(39MS)



Yak-18



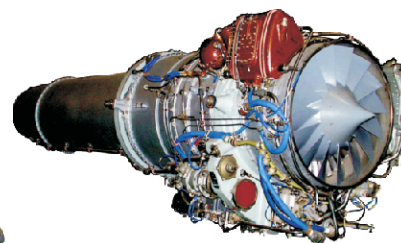
L-39



AI-222-25F  
2005\*



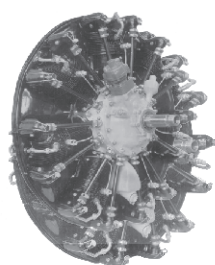
AI-222-25  
1998\*



DV-2  
1980\*



AI-25TL, AI-25TLK,  
AI-25TLSh  
1970\*



AI-14  
1948\*

\* - year of project launch

# ENGINES FOR TRAINERS, COMBAT TRAINERS AND LIGHT COMBAT PLANES



**AI-25TL/TLK**



**AI-25TLSH**



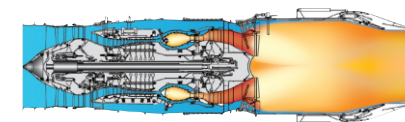
**AI-222-25  
modifications**



**AI-222-28  
modifications**



**AI-222  
versions with  
afterburner**



**AI-9500F**

<b>16.9</b> <b>(1,720)</b>	<b>18.2</b> <b>(1,850)</b>	<b>24.5</b> <b>(2,500)</b>	<b>27.5</b> <b>(2,800)</b>	<b>39.2</b> <b>(4,000)</b>	<b>49</b> <b>(5,000)</b>	<b>88.3</b> <b>(9,000)</b>	<b>98.1</b> <b>(10,000)</b>
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Maximum thrust, kN (kgf)

# ENGINES DESIGNED BY IVCHENKO CORPORATION HAVE BEEN OPERATED IN MORE THAN 100 COUNTRIES OF THE WORLD



**Zaporozhye Machine-Building Design Bureau Progress**  
**State Enterprise named after Academician A.G. Ivchenko**

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69068, Zaporozhye, Ukraine  
Tel.: +38 0(612) 65-03-27;  
Fax +38 0(612) 12-89-22, 65-46-97  
progress@ivchenko-progress.com  
www.ivchenko-progress.com



**Motor Sich JSC,**

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Zaporozhye, 69068, Ukraine  
Tel: +38 (061) 720-44-09  
Fax: +38 (061) 720-50-00  
E-mail: motor@motorsich.com  
www.motorsich.com



# COUNTRIES OPERATING AIRCRAFT POWERED BY IVCHENKO CORPORATION ENGINES

corporation  
**IVCHENKO**®

**IN ALL: 104 COUNTRIES**

AZERBAIJAN  
ALGERIA  
ANGOLA  
ARGENTINA  
ARMENIA  
AFGHANISTAN  
BANGLADESH  
BELARUS  
BULGARIA  
BOLIVIA  
BRAZIL  
BURKINA FASO  
BURUNDI  
CANADA  
CHINA  
CHAD  
COLUMBIA  
CONGO  
COTE D'IVOIR  
CROATIA  
CUBA  
CZECH REPUBLIC  
CYPRUS  
DJIBOUTI  
DR CONGO  
ECUADOR  
EGYPT  
EQUATORIAL GUNEA  
ERITREA  
ESTONIA  
ETHIOPIA  
GAITI  
GEORGIA  
GERMANY  
GHANA

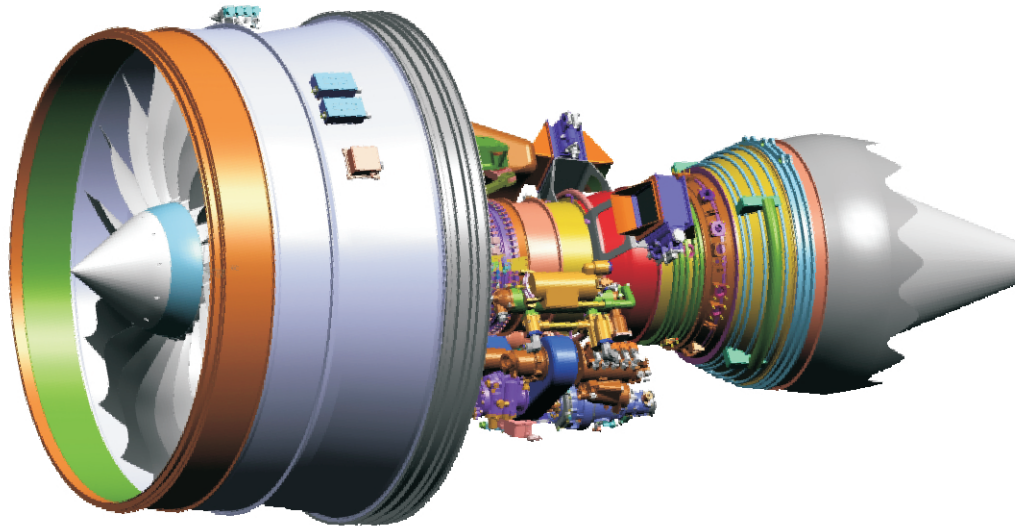
GREECE  
GUINEA-BISSAU  
HUNGARY  
INDIA  
INDONESIA  
IRAN  
IRAQ  
IRELAND  
ISRAEL  
JAPAN  
KAMPUCHEA  
KAZAKHSTAN  
KENYA  
KOREA PDR  
KYRGYZSTAN  
LAOS  
LATVIA  
LIBERIA  
LIBYA  
LITHUANIA  
MACEDONIA  
MADAGASCAR  
MALAYSIA  
MALI  
MEXICO  
MOLDOVA  
MONGOLIA  
MOZAMBIQUE  
NEPAL  
NEW ZEALAND  
NICARAGUA  
NIGER  
NIGERIA  
PAKISTAN  
PALESTINE

PANAMA  
PAPUA(NEW GUINEA)  
PERU  
POLAND  
PORTUGAL  
ROMANIA  
REPUBLIC OF SOUTH AFRICA  
RUSSIAN FEDERATION  
RWANDA  
SENEGAL  
SIERRA LEONE  
SLOVAKIA  
SOMALI  
SOUTH KOREA  
SPAIN  
SRI LANKA  
SUDAN  
SWITZERLAND  
SYRIA  
TADJIKISTAN  
THAILAND  
TURKMENISTAN  
TURKEY  
WESTERN SAHARA  
UGANDA  
UKRAINE  
UNION OF MYANMAR  
UNITED ARAB EMIRATES  
USA  
UZBEKISTAN  
VENEZUELA  
VIETNAM  
YEMEN  
ZIMBABWE

Etc.

***Novel propulsion concept  
of Ivchenko-Progress SE  
for future aircraft***

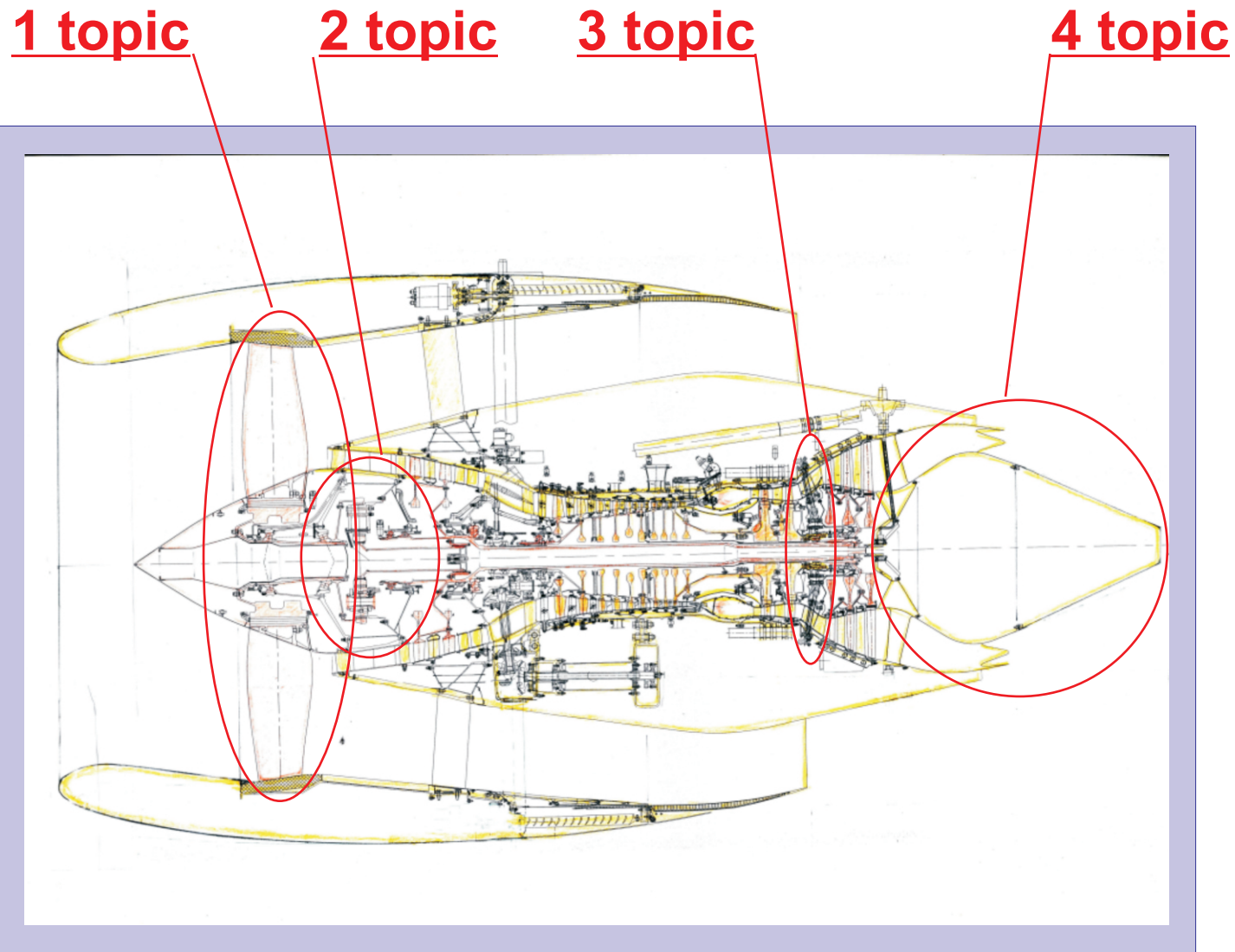
# ADVANCED GEARED TURBOFAN ENGINE



- *The engine is designed to power an advanced passenger and transport aircraft*
- The engine is an ultra bypass engine of the new generation. High thermodynamic cycle characteristics and advanced design offer:
  - SFC by 15...20% lower as compared with existing engines in this thrust class;
  - essentially improved environmental characteristics.
- Application of a reduction gearbox allows to reduce the engine weight, number of airfoils in the gas flow duct and manufacturing content with a high fuel effectiveness ensured.

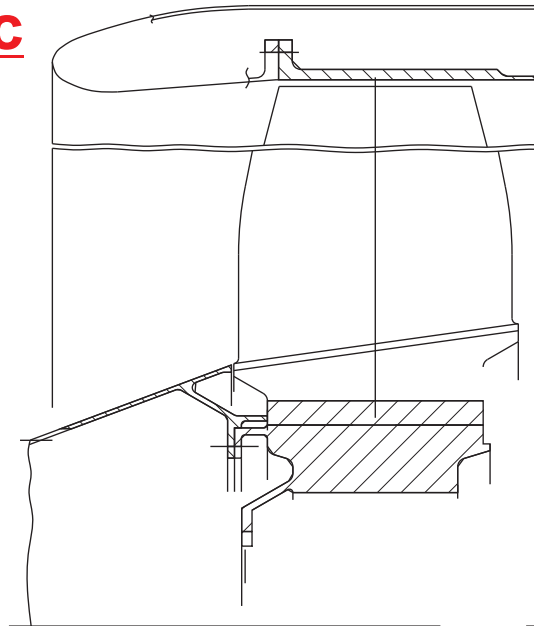


# DESIGN OF A HIGH BYPASS GEARED TURBOFAN ENGINE

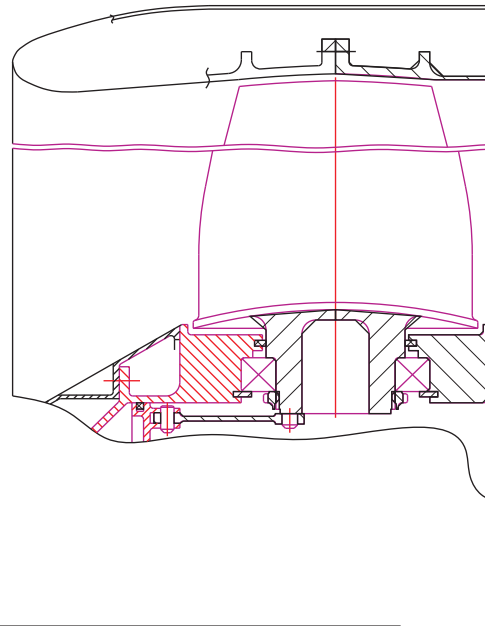


# THE CONTROL SYSTEM FOR THE RIMS OF THE FAN BLADES AND DIRECTING VANES, COMPRESSOR GUIDE VANES

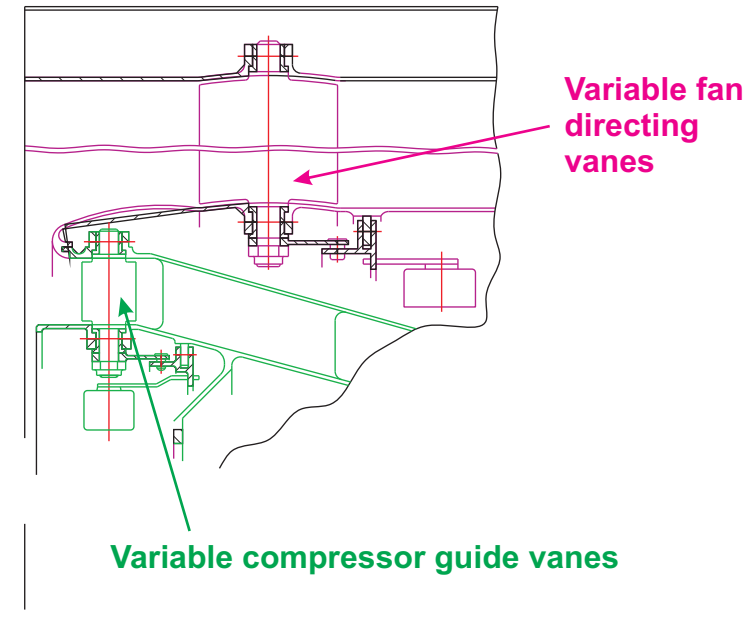
## 1 topic



Conventional fan blade



Variable fan blade



Variable stator vanes

To maintain optimum fan efficiency on all power settings of the engine a control system for the blades and vanes rims (guide and directing vanes) is proposed to be developed.

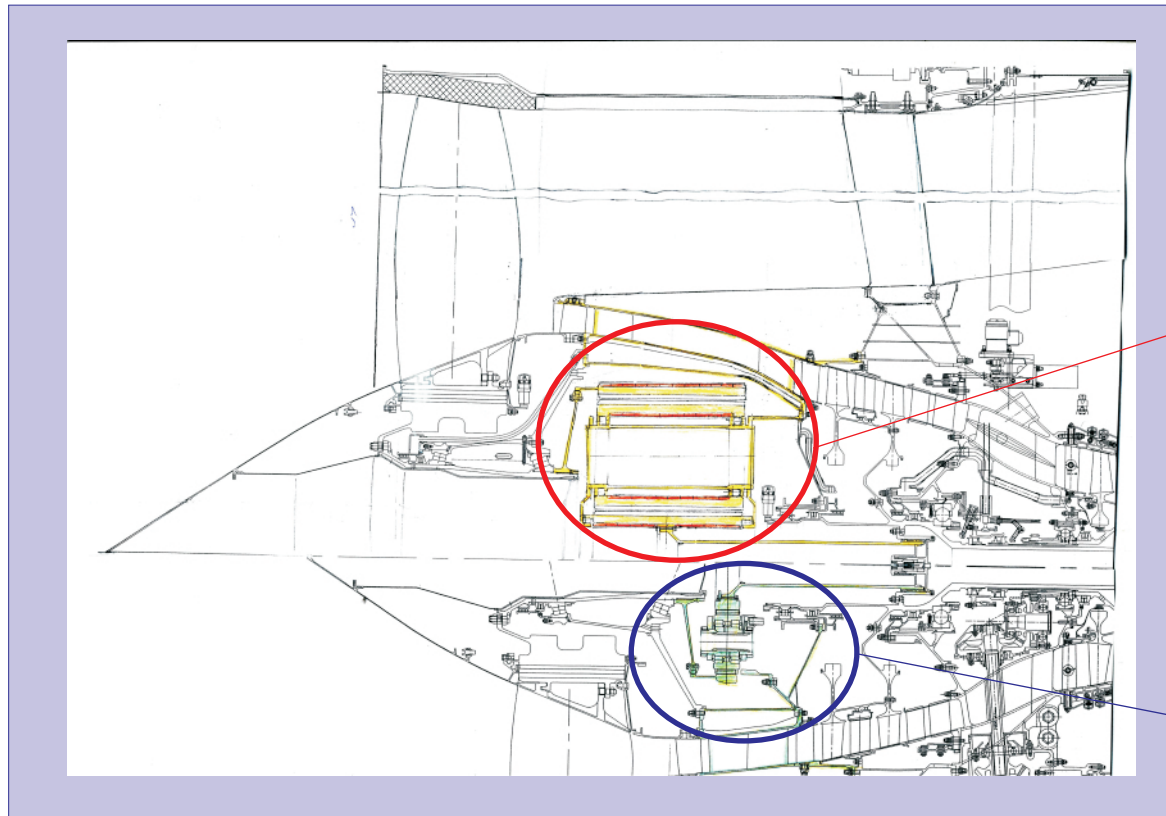
The proposed control system will be relevant for the engine with **bypass ratio exceeding 16 ( $m>16$ )**

### Objectives:

- performing calculations and experimental activities,
- development of control system design,
- manufacturing and testing

# COMPARING THE DESIGNS OF A GEAR-TYPE AND NON-CONTACT MAGNETIC GEARBOX

## 2 topic



**Non-contact magnetic gearbox**

**Reduction gearbox**

The wheels of a non-contact magnetic gearbox should be made of a magnetically conductive material with high magnetic induction permanent magnets attached thereto. In a new gearbox the oil is fed only to lubricate the bearings.

**The absence of contact stresses in the gearbox wheels will favorably affect its reliability and service life.**

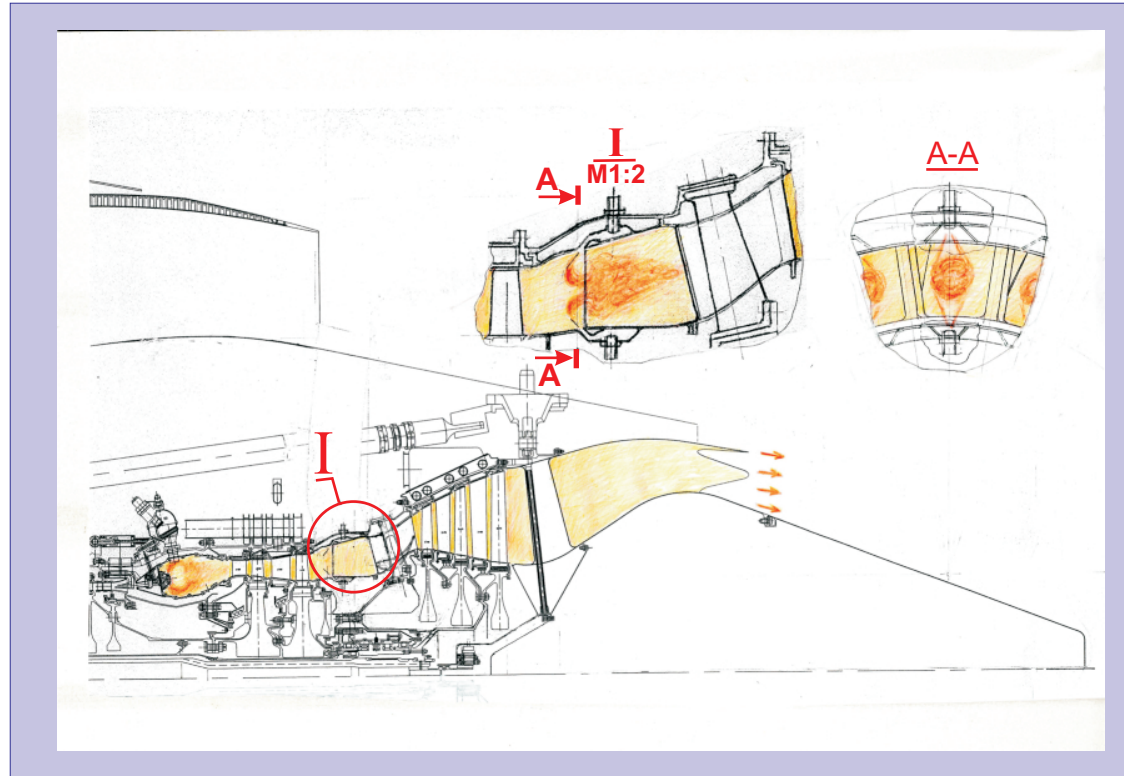
### **Objectives:**

- It is necessary to solve the problem of manufacturing suitable magnets,
- It is necessary to evaluate the affect of increasing the wheels width in such gearbox on the engine weight and cost.



# ADDITIONAL COMBUSTION CHAMBER BEHIND THE GAS GENERATOR (HIGH PRESSURE) TURBINE

## 3 topic



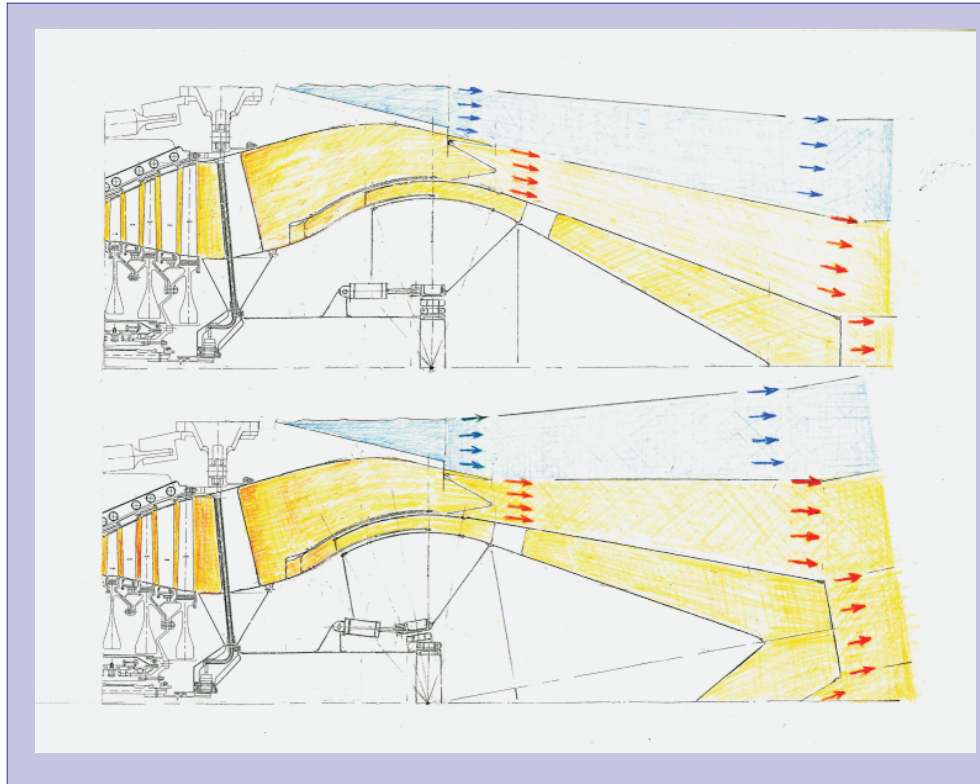
To increase the engine power at takeoff, alternatively, an additional combustion chamber behind a high pressure turbine may be used. It allows to increase the power of a low-pressure turbine to a desired level.

### Objectives:

- performing calculations and experimental activities,
- development of additional combustion chamber design,
- manufacturing and testing the chamber,
- controlling the flow passages of a low pressure turbine and engine jet nozzles, approach of cooling air to the low pressure turbine.

# NOZZLE WITH THRUST VECTORING

## 4 topic



**To balance the aircraft in cruise flight** a nozzle with thrust vectoring can be used that allows to reduce aerodynamic drag by reducing trim drag of the aircraft during the cruise flight.

**In case of failure of one engine at takeoff**, it is possible to create additional compensating yawing moment for the aircraft due to the engine thrust vector control.

### Objectives:

- performing calculations and experimental activities
- development of nozzle design, manufacturing and testing.

# OUR MAIN GOALS FOR CUSTOMER SUCCESS



*Safety*  
*Reliability*  
*Innovation*



*Economy*  
*Efficiency*  
*Modernization*

*We provide power to your fly*







**Contact person:**

**Sergiy Dmytriyev**

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THANK YOU  
FOR ATTENTION!