

# ***Advanced turboprop, propfan and turbojet bypass engines for GA and light airplanes***



# HISTORY



ZAPOROZHYE MACHINE-BUILDING DESIGN  
BUREAU PROGRESS STATE ENTERPRISE  
NAMED AFTER ACADEMICIAN A.G. IVCHENKO  
(SE IVCHENKO-PROGRESS)

Foundation date:

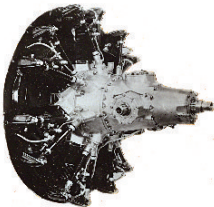
*May 5, 1945*

Over a whole past period, engine manufacturing plants have produced more than **80,000** aircraft gas turbine and piston engines, turbostarters and industrial plants.

Today, the engines designed by SE IVCHENKO-PROGRESS power **57** types of flying vehicle in **109** countries.

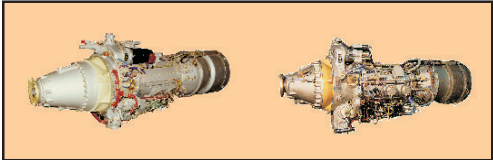
Over the years, SE IVCHENKO-PROGRESS engines logged more than **300** million flight hours.

# HISTORY



## 1-st stage

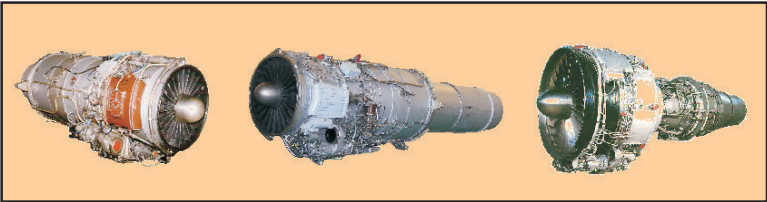
Piston engines:  
AI-26, AI-14, AI-4



Turboprops:  
AI-20, AI-24  
APU: AI-8

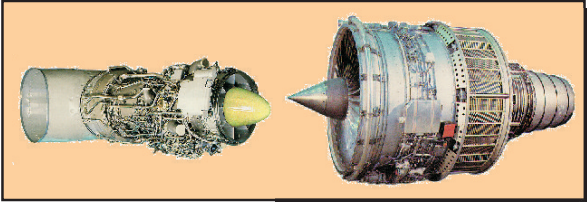
## 2-nd stage

Turbofans:  
AI-25, AI-25TЛ, D-36  
APUs: AI-9, AI-9V



## 3-rd stage

Turbofans with high  
power and thrust:  
D-136, D-18T



## 4-th stage

D-27 propfan,  
TV3-117VMA-SBM1 turboprop, D-436 turbofan,  
AI-22 turbofan, AI-222 turbofan, AI-450 turboshaft,  
AI-450 turboprop, SPM-21 turbofan



# DIRECTIONS OF ACTIVITY

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



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



# THE BASIC SPHERES OF ACTIVITIES

**DESIGN**



**MANUFACTURE**



**OVERHAUL**



**TEST AND DEVELOPMENT**



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



# INTERNATIONAL RECOGNITION OF CERTIFICATION AUTHORITIES



**Totally 60 certificates of various types**



*Bureau Veritas (France)  
Certificate No. 213617,  
No. 010-UKR and  
No. 010-UKF*



*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-15,  
No. R-3, No. R-69 and others*



**ГОСАВИАСЛУЖБА**

*State Department of  
Aviation  
Transport of Ukraine  
Certificates No. VR 0036,  
No. TD 0005 and others*

## *Advanced Small Gas Turbine Engine*

### **Our Tasks:**

Optimisation of thermodynamical cycle and digital engine design

Small centrifugal compressor

Dynamics of high speed turbomachinery

Cooled small turbine

Advanced transmission

### **Our Pathners:**

- První brněnská strojírna Velká Bíteš, a.s., PBS, *Czech Republic*
- Centre de Recherche en Aéronautique, ASBL, CENAERO, *Belgium*
- Technische Universität München, Institute of Energy Systems, IES, *Germany*
- Swedish Defence Research Agency, FOI, *Sweden*
- Université de Liège, ULg, *Belgium*

# SE IVCHENKO-PROGRESS PROPOSALS



# DEVELOPMENT OF ADVANCED GTEs FAMILY CONCEPT TO POWER LIGHT AIRPLANES



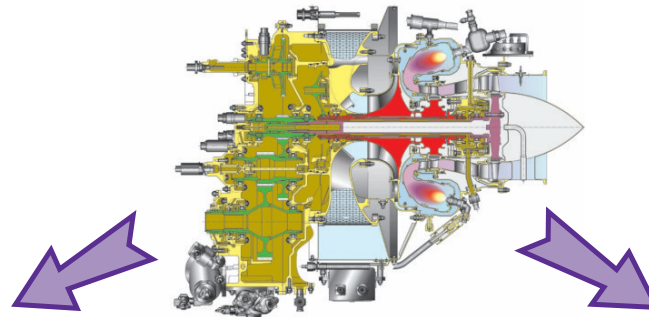
**Generation of GTE family appearance. Advanced engine core as a family baseline**

**Advanced engine for aircraft with haul - range up to 1000 km (Turboprop engine)**

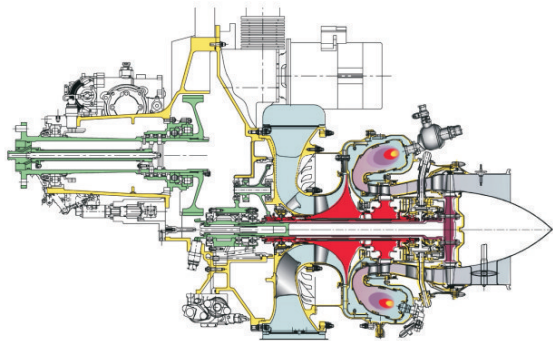
**Advanced engine for aircraft with haul - range over 1000 km (Turbofan engine)**

**Turboprop, turboshaft engine featuring latest design of variable thermodynamical cycle with counter-rotating turbine**

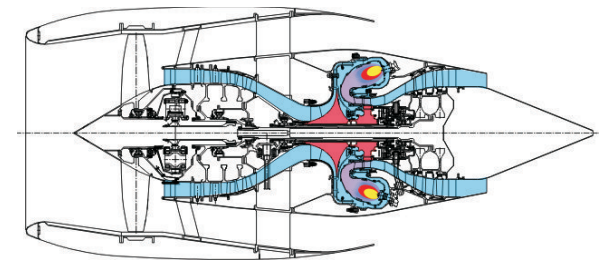
## ADVANCED CORE



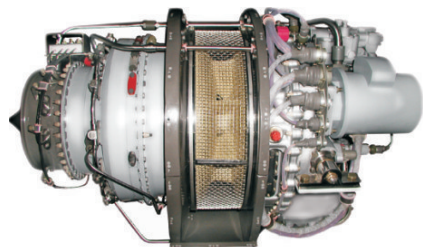
### TURBOPROP ENGINE



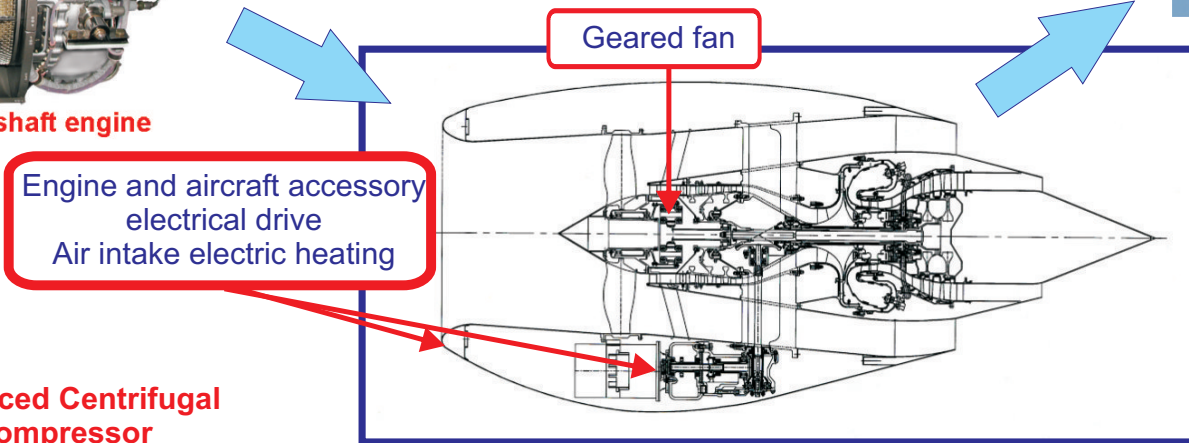
### TURBOFAN ENGINE



# THE FIRST IN EUROPE GEARED ENGINE WITH BPR > 10 FOR LIGHT EXECUTIVE AIRCRAFT

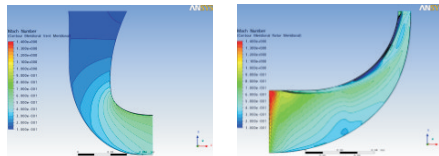
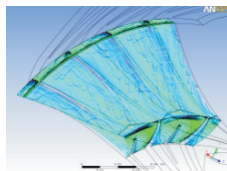


AI-450 turboshaft engine

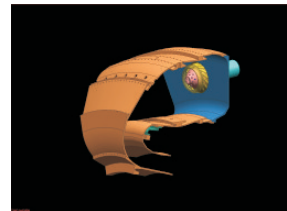
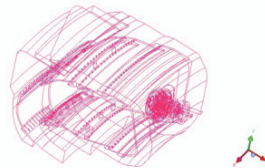


Advanced Centrifugal Compressor

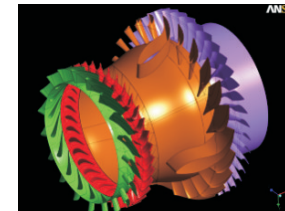
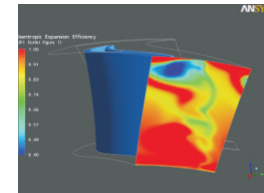
Pressure Ratio 9...10  
Efficiency 0.80...0.81



Combustion Chamber



Cooled Turbine



# TURBOPROP ENGINE FOR LIGHT EXECUTIVE AIRCRAFT

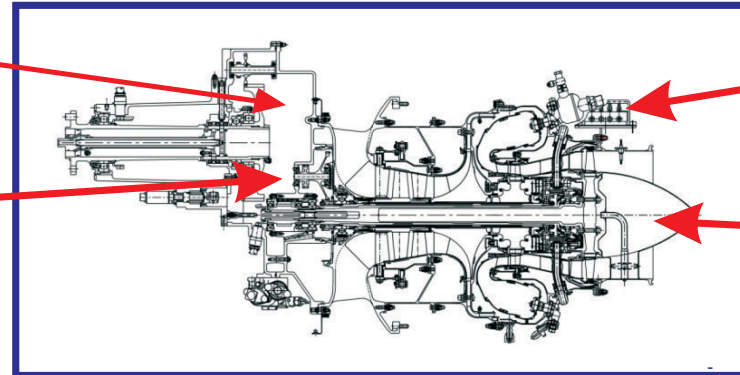


Engine and aircraft accessory electrical drive

Uniform system of automatic control for the engine and the propeller

Advanced reduction gear

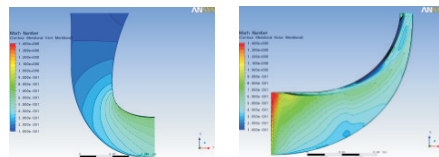
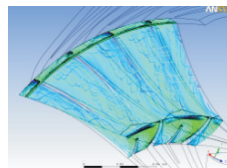
Engine weight reduction



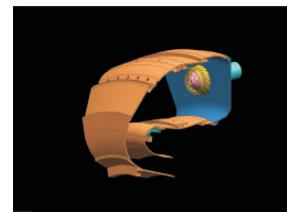
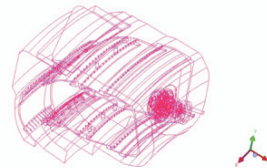
Advanced Centrifugal Compressor



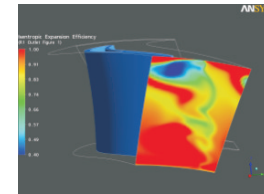
Pressure Ratio 9...10  
Efficiency 0.80...0.81



Advanced Combustion Chamber



Cooled Turbine



**TURBOPROP, TURBOSHAFT ENGINE FEATURING LATEST  
DESIGN OF VARIABLE THERMODYNAMICAL CYCLE WITH  
COUNTER-ROTATING TURBINE. .  
VARIABLE N.G.Vs ARE NOT INTEGRATED IN THE ENGINE.  
MODIFICATION OF ENGINE CYCLE IS ACHIEVED BY CHANGED  
POWER TURBINE SPEED**

- CO<sub>2</sub> and NO<sub>x</sub> emissions reduced by 10% -15% and 25%, correspondingly;
- noise reduced by 5 dB;
- SFC reduced by 10% - 15%;
- engine development cost and time saved by 40%;
- cost of engine life cycle decreased by 25%;
- engine reliability improved by 50%.

*Engine design is adapted to heat exchanger applied for reduction of fuel consumption.*

**Designing of the universal test rig for gears**

**Manufacturing of the universal test rig for gears**

**Performing of gears optimization by means of calculating of teeth  
profile modification**

**Verification of calculation accuracy of program for gears optimization on  
the universal test rig for gears**

