

先进轻型航空发动机关键技术 技术创新及应用

Innovation and Application of Key Technologies for Advanced Light-duty Aeroengines

成果简介:

团队针对我国无人机和通用飞机等平台对动力装置的迫切需求,提出了高空低雷诺数下航空发动机流动稳定性和燃烧稳定性理论,发明了分时分区蒸发管燃烧技术,解决了发动机高空熄火和稳定范围窄的难题;发明了受限空间下高稳定压缩和尾迹与负荷融合低压涡轮技术,解决了高空低雷诺数下发动机失稳、部件性能衰减和耗油率增加的难题;提出了轻型航空发动机总体布局方法,解决了发动机系统复杂、成本高等问题。研制了系列轻型涡轮发动机,批量应用于新一代无人机和巡飞系统,实现了从基础研究、关键技术突破、工程应用到产业化的全链条创新。

Introduction:

In response to the urgent need for power plants such as UAVs and general-purpose aircrafts, this achievement puts forward the theory of flow and combustion stabilities in aeroengine at high altitude low Reynolds number, and invents the time-sharing and partitioned evaporation tube combustion technology, which solves the flameout and narrow range of stability at high-altitude. This achievement proposes the high-stability compression in confined spaces and wake coupling low-pressure turbine technology, which solves the engine instability, component performance degradation and fuel consumption increase at high altitude low Reynolds number; the overall layout of light-duty aeroengines is proposed, which solves the problem of complex engine system and high cost. After 16 years of independent innovation, a series of key core technologies were broken through and a series of light-duty turbine engines was developed, which are applied in batches to new generation UAV and cruise system, forming basic research, key technologies, and engineering applications. The innovation of the whole chain to industrialization has promoted the transfer and transformation of achievements and large-scale industrialization.



中国科学院 STS 双创项目成果路演“第一名”和“最具投资价值奖”

“First Place” and “Most Investment Value Award” in the Roadshow of the CAS STS Double Innovation Project



中国先进技术转化应用大赛银奖

Silver Award in China Advanced Technology Transformation and Application Competition



轻型动力综合试验平台

Light-duty gas turbine engine integrative experimental bench



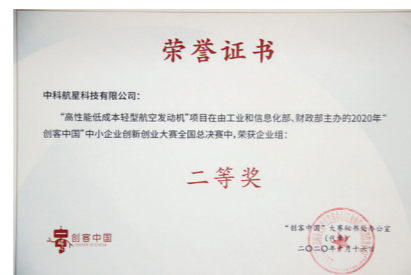
轻型航空动力成果产业化

Industrialization of light-duty gas turbine engine achievements



青岛航空技术产业基地

Industrialization of light-duty gas turbine engine achievements



创客中国全创新创业大赛全国赛二等奖

Maker China Innovation and Entrepreneurship Competition National Competition Second Prize

推荐单位 / Recommended Unit

中国科学院工程热物理研究所
Institute of Engineering Thermophysics, Chinese
Academy of Sciences

完成单位 / Accomplished Unit

中国科学院工程热物理研究所
Institute of Engineering Thermophysics, Chinese
Academy of Sciences

合作单位 / The Main Cooperation Unit

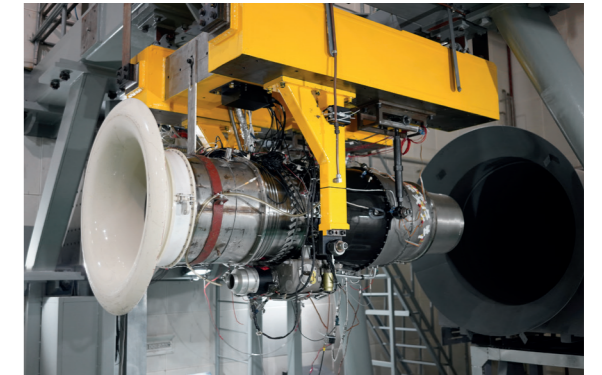
中科航星科技有限公司
CAS Aerostar Technology Co., Ltd.

社会效益和经济效益:

在军民融合发展战略框架下,团队采用混合所有制,成立了产业化公司-中科航星科技有限公司,技术转让1.32亿元,技术作价入股1.35亿元。截至2021年6月,累计交付495台轻型航空发动机,在国内轻型动力领域占据绝对主导地位。近三年新增销售额3.87亿元,新增利润5000万元,新增税收3500万元。先后荣获中国先进技术转化应用大赛银奖和中国科学院STS双创项目成果路演“最具投资价值奖”。引领和推动了我国轻型航空发动机产业的创新和发展,打造了配套健全的轻型航空发动机产业园,支撑了国家首个军民融合创新示范区建设,为国家、区域和行业经济发展做出了重要贡献。

Social and Economic Benefits:

Under the framework of the military-civilian integration development strategy, the research team adopted a mixed ownership system and established an industrialized company-CAS Aerostar Technology Co., Ltd., with a technology transfer contract of 132 million yuan, a technology investment of 135 million yuan, and a cumulative delivery of 495 light-duty aero engines. It occupies an absolute dominant position in the domestic light-duty power industry. In the past three years, it has added sales of 387 million yuan, new profits of 50 million yuan, and new taxes of 35 million yuan. It has successively won the China Advanced Technology Transformation and Application Silver Award and the "Most Investment Value Award" in the Roadshow of the Chinese Academy of Sciences STS Double Innovation Project. This leads to promote the development of light-duty aeroengine industry research and chain in China, to build a complete supporting light-duty aeroengine industrial park, and to support the country's first military-civilian integration innovation demonstration zone, all of which makes significant contributions to the economic development of industry, region and country.



高升限低油耗轻型涡扇发动机

Low fuel consumption light-duty turbfan engine



高性能低成本轻型涡喷发动机

Self-developed high-performance low-cost light-duty turbojet engine



国内首套轻型航空发动机高空台

The first domestic set of light-duty aeroengine high altitude test bench

团队成员 / Team Members:



朱俊强
Zhu Junqiang

中国科学院工程热物理研究所
主要贡献：团队负责人，组织发明关键技术，构建研发体系，组织技术研发与产业化。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Team leader, organizing the invention of key technologies, research and development system, and industrialization.



赵胜丰
Zhao Shengfeng

中国科学院工程热物理研究所
主要贡献：涡扇发动机系统集成，工程开发及产业化应用推广。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Turbofan engine system integration, engineering development and industrial application promotion.



杜强
Du Qiang

中国科学院工程热物理研究所
主要贡献：涡喷发动机系统集成，工程开发及产业化应用推广。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Turbojet system integration, engineering development and industrial application promotion.



冯引利
Feng Yinli

中国科学院工程热物理研究所
主要贡献：轻型涡喷发动机总体构型技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Development of the overall configuration technology for light-duty turbojet engine.



黄恩亮
Huang Enliang

中国科学院工程热物理研究所
主要贡献：轻型涡扇发动机多电构型技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Development of the multi-electric configuration technology for light-duty turbofan engine.



阳诚武
Yang Chengwu

中国科学院工程热物理研究所
主要贡献：斜流离心组合压气机技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Technological development of the mixed-flow centrifugal compressor.



王沛
Wang Pei

中国科学院工程热物理研究所
主要贡献：尾迹与边界层耦合的低压涡轮设计开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Development of the wake-boundary layer coupling technology in low-pressure turbine.



雷志军
Lei Zhijun

中国科学院工程热物理研究所
主要贡献：前置串列转子风扇技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Technical development of the front tandem blade fan rotor.



柳光
Liu Guang

中国科学院工程热物理研究所
主要贡献：发动机空气系统技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Engine secondary air system technology development.



刘军
Liu Jun

中国科学院工程热物理研究所
主要贡献：分时分级高稳定性蒸发管燃烧技术开发。

Institute of Engineering Thermophysics, Chinese Academy of Sciences
Main contributions: Time-sharing classification and high-stability evaporation tube combustion technology development.