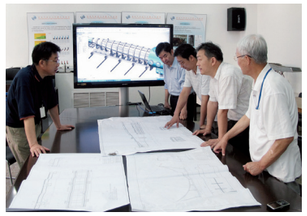
## Research Group of the Shock Tunnel of Duplicating Hypersonic Flight Conditions Institute of Mechanics, Chinese Academy of Sciences



方案设计讨论现场
At the discussion site of JF12 program design

The research group has proposed a systematic theory of detonation-driven shock tunnels, and established a technical system for developing shock tunnels of duplicating hypersonic flight conditions. A large shock tunnel (JF12) has been successfully developed. It can duplicate the flight conditions within a range from flight height 25 to 50 km, and flight Mach number 5 to 9. This is a milestone for aerodynamic ground testing from simulation to duplication. The invention of the high-power detonation-driving technology has changed the internationally applied driving mode with mechanical compression. The proposed long-test-duration method has extended the test time by an order of magnitude. The developed measurement technology of high-precision has greatly improved the measurement accuracy in extreme conditions. The shock-tunnel technology has advanced the state of the art in large-scale hypersonic test facilities, and won the Ground Testing Award 2016 of AIAA (the American Institute of Aeronautics and Astronautics). The invented shock tunnel plays an irreplaceable role in benchmarking key techniques for national science research and engineering development, and the study of high temperature gas dynamics frontier.

### Outstanding contributors of this research group

#### Jiang Zonglin

Proposed the detonation-driven theory for shock tunnels with long test-time duration, established the technical system of developing shock tunnels of duplicating hypersonic flight conditions, and has led the research group to break through a number of technical limitations for the national key scientific and engineering projects.

#### Zhao Wei

Finished the verification of critical technologies by setting up a model tunnel,and overcome a number of difficulties in achieving the design targets of duplication shock-tunnel, and completed the experimental study of some real-world hypersonic vehicles and national engineering projects.

#### Yu Hongru

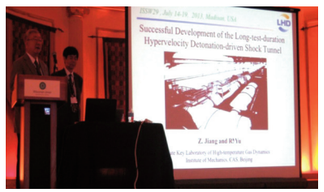
Proposed the backward detonation driving method and the operating mode of small-driving-big section, and blueprint the top level goal of simultaneous realization for total temperature, total pressure, pure air, flow-field size and test duration.

白春礼院长在全国科技活动周上和姜宗林讨论JF12风洞
Bai Chunli, CAS president is discussing with Prof. Jiang Zonglin about the JF12 Shock Tunnel in National Sci & Tec Expo

### Other members

Liu Yunfeng
Wang Chun
Lin Jianmin
Gu Jiahua
Wu Song
Li Jinping
Luo Changtong
Sun Yingying
Chen Hong
Han Guilai
Yuan Chaokai
Wang Yunpeng
Hu Zongmin
Teng Honghui

俞鸿儒和姜宗林在JF12激波风洞关键技术研讨会上
Prof. Yu and Jiangin the critical technique workshop on the JF12 Shock Tunnel




姜宗林在29届国际激波会议大会报告 (2013) 介绍JF12
Prof. Jiang is reporting the research progress of JF12 at the 29th International Symposium on Shock Waves


2016年6月，美国航空航天学会授予姜宗林2016年度地面试验奖
In June 2016, the American Institute of Aeronautics and Astronautics awarded Prof. Z. Jiang a prize of AIAA Ground Testing Award


姜宗林在中国力学大会报告 (2013) 介绍JF12介绍JF12研究进展
Prof. Jiang is reporting the research progress of JF12 at the China Conference on Mechanics





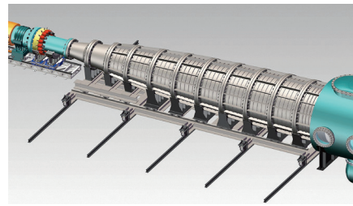
JF12激波风洞团队
Research group of the JF12 Shock Tunnel

## 复现高超声速飞行条件激波风洞研究集体

推荐单位：中国科学院力学研究所

### 研究集体主要科技贡献：

该研究集体提出了系统的爆轰驱动激波风洞理论，建立了完整的高超声速复现风洞技术体系，研制成功的世界首座复现高超声速飞行条件的超大型激波风洞实现了马赫数 5–9、高度 25–50km 范围地面试验由“模拟”到“复现”的跨越。发明的大功率爆轰驱动技术变革了国际主流机械压缩模式，提出的长实验时间方法将试验时间提升一个量级，发展的复现风洞高精度测量技术大幅度提升了极端条件下测量精准度。该风洞技术创建了先进高超声速地面试验技术的国际新高度，获得了美国航空航天学会 2016 年度地面试验奖，并在国家重大任务实施和高温气体动力学前沿问题探索中发挥着不可替代的作用。



风洞设计局部图（高超声速喷管，直径2.5m，长15m，全部设计由研究团队独自完成，甚至包括特种法兰、螺钉）
A local view of JF12 design (The hypersonic nozzle, 2.5m in diameter, 15m in length, all designed by the team members themselves)

姜宗林 Jiang Zonglin

### 研究集体突出贡献者

**姜宗林** 中国科学院力学研究所
主要科技贡献：提出爆轰驱动长实验时间激波风洞理论，构建复现风洞技术体系，领导风洞集体突破国家重大项目和型号任务关键技术。

赵伟 Zhao Wei

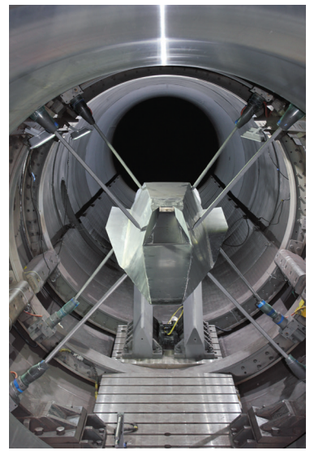
**赵　伟** 中国科学院力学研究所
主要科技贡献：建立模型风洞验证关键技术，突破多项技术难题实现复现风洞设计指标，完成某型号、某重大专项项目相关研究。

俞鸿儒 Yu Hongru

**俞鸿儒** 中国科学院力学研究所
主要科技贡献：提出反向爆轰驱动组合“小驱大”运行模式及 “同时实现总温总压、纯净空气、流场尺度和试验时间”的顶层目标。

### 研究集体主要完成者

刘云峰　王　春　林建民　谷笳华　吴　松　李进平　罗长童　孙英英　陈　宏
韩桂来　苑朝凯　汪运鹏　胡宗民　滕宏辉



JF12试验模型-吸气式高超声速飞行器内外/流一体化性能试验
A test model of JF12 –A hypersonic air-breathing vehicle for the integration performance study on inner/outer flow interaction

JF12鸟瞰图
An aerial view of JF12