

Contributing Organizations
to
GTSJ



Gas Turbine Society of Japan

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Corporations

Aikoku Alpha Corporation AP Division



C1

<http://www.aikoku.co.jp/en/>

We use 5-axis machining center to make structural components for the aerospace industry as well as other complex and sophisticated components. One of the first companies to introduce a 5-axis machining center in 1975, we have been steadily accumulating expertise in this technology since then. We now produce a significant portion of the world's machined impellers while confidently guaranteeing that they are of the finest quality available. We will continue to push our machining technology to new heights as we focus steadfastly on the further developing the potential of simultaneous 5-axis machining.



C2

<https://www.bub-agema.de/>

B&B-AGEMA GmbH is an independent service provider of expert design solutions for turbo machines and power plant engineering tasks. The company collected professional design experiences for 25 years since its foundation in 1995 at its site in Aachen, Germany.

In particular, it provides innovative design services for gas turbines, steam turbines, compressors and combustions systems. A special focus is laid on the progressive design of major gas turbines components including innovative solutions for advanced turbine cooling technologies, DLN 100% Hydrogen combustion and increased operational flexibility. The company experts for gas turbines and steam turbines have long-year experiences in design for gas turbines varying in power output from 3 kW to 300 MW and for steam turbines up to 1000 MW. Special steam turbine design technologies for high-flexible CSP applications are available.

The company has developed advanced software for monitoring and maintenance prediction as well as for digital twin applications for gas turbines and other energy conversion systems. Engineering design software for multi-stage axial compressor and turbine design are available. **B&B-AGEMA** is deeply involved in research projects for Hydrogen generation, storage and utilization as well as in development and testing of applicable pure Hydrogen combustion concepts.

CRE Co.,Ltd

<http://www.cre-nagoya.com/>



C3

★Product and Service Features

- Focused on gaining customer trust, CRE offers engineering support in the areas of aircraft structural design, structural analysis, electrical and electronic design, software development, device design, productivity-focused process design, and quality assurance.
- CRE prepares and edits a variety of manuals. We also perform contracted projects associated with documentation, such as electronic conversions of documents and translations of technical documents and manuals.

★ Forte

- CRE has been involved in nearly all of major development projects in the Japanese aerospace industry, while building upon the strong relationships with aircraft manufacturers.
- CRE has experience in design and development of almost all major components of aircraft.
- Our skilled engineers, with 30 years of experience in aircraft design and development, are assigned to key roles in projects in order to manage the projects and provide training and guidance to younger engineers.

DAIHATSU

DAIHATSU DIESEL MFG.CO.,LTD.

www.dhtd.co.jp



C4

Daihatsu Diesel Mfg. Co., Ltd. was established at Osaka in 1907, where is one of the most popular spot in Japan as Umeda Sky Building now.

We have been manufacturing Diesel Engines for Marine and Land over hundred years.

We started to develop Gas-Turbine Engines as "Pure Made in Japan" in 1976 and 5-years later, the first memorial Gas-Turbine engine was delivered.

Our turbines are used for back-up system to public facilities such as Pump Stations, Hospitals, Banks and Data-Center.

Daihatsu Gas-Turbines receive high evaluation by quality and performance from many clients.

2-10, Nihonbashi-Honcho 2-chome, Chuo-ku, Tokyo, 103-0023 Japan

Plant Management Division

TEL: 81-3-3279-0828 FAX: 81-3-3245-0395

Everloy Shoji Co., Ltd.

<http://www.everloy-spray-nozzles.com/>



C5

Everloy provides planning, design development, manufacturing and sales of spray nozzles. In addition to the lineup of standard productions, we have been also developing new model nozzles and improving existing products.

Spray nozzle performance is dependent on the factors such as pressure, flow rate, spray pattern, particle size, velocity, flow distribution and impact force distribution, etc. At Everloy, we offer the optimal spray nozzles with our analysis and evaluation technologies.

Searching for greater possibilities, we develop nozzles with superior quality and creativity through constant research and development.



Furuya Metal Americas, Inc.

Address 250 Commercial Street Manchester, NH 03101
TEL +1 (603) 518-7723 Email general@furuya-ma.com
Website <http://www.furuya-ma.com/>



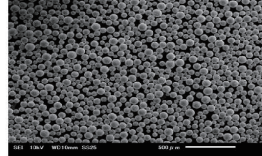
C7

**Need high heat resistant materials for your propulsion system?
Furuya Metal will have the solution for you.**

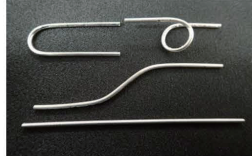
High temperature measurement of combustion gas above 1900°C



Iridium Spherical powder for Additive Manufacturing



Iridium fine tubes



Summary of Products/Services/Technologies

- Iridium-Rhodium Thermocouple - for ultra high temp measurement of combustion gas above 1900°C
- Iridium and Iridium alloy thruster for rocket engine – world number one Iridium fabrication technology
- Catalyst materials, Powders for Additive Manufacturing, etc.
- Thin Film Coating service

FE Fuji Electric

C6

Fuji Electric Co., Ltd. <http://www.fujielectric.com/>

Fuji has engaged in the thermal power plant business through the planning, design, procurement, construction, commissioning and after sales service, ever since we delivered the first steam turbine generator unit in 1959.

Fuji has promised to realize the plant design by Client requirements and high-efficiency and availability for several kind of thermal power plants of coal-fired power plant, combined power plant and co-generation power plant etc..

Fuji is a leading company in the geothermal power generation industry and has supplied geothermal power generating facilities worldwide. Geothermal energy is the renewable energy and its utilization will grow to reduce CO₂ emission.

GE Gas Power

C8



<https://www.ge.com/power/gas>

GE Gas Power is a world leader in power generation with deep domain expertise to help customers deliver electricity from a wide spectrum of fuel sources. We are transforming the electricity industry with the digital power plant, the world's largest and most efficient gas turbine, full balance of plant, upgrade and service solutions as well as our data-leveraging software. Our innovative technologies and digital offerings help make power more affordable, reliable, accessible and sustainable. Headquartered in Schenectady, N.Y

Hitachi Metals

<http://www.hitachi-metals.co.jp/e/yss/index.html>



Hitachi Metals, Ltd. (HML) was founded in 1956, true to our tradition, we strive to consistently refine our material development capabilities. Through decades of advance in material technology, quality assurance and research and development, we are able to provide highly reliable

materials and services that will serve various fields for years ahead. With our unique melting technology and manufacturing processes, we will continue to provide valuable products and innovations in the global energy industries.

In 2011, HML established "Japan Aeroforge, Ltd". Which is the joint-venture manufacturer that Hitachi Metals (40.53%) and Kobe Steel (40.53%), along with for smaller shareholders. It houses a 50,000ton hydraulic press, one of the largest forging machines in the world, to mainly produce turbine disks and blades for energy industries.

In 2018, HML merged with "Hitachi Metals MMC Superalloy, Ltd", a consolidated subsidiary of Hitachi Metals, in form of an absorption-type merger.

HML generates future innovations in the energy industries through advanced technology and a long term perspective on quality as material producer and expects to help making gas turbine more affordable, reliable, efficient and eco-friendly.



■ Large rotating part of nickel alloy

C9

Hitachi Zosen Corporation

C10

<http://www.hitachizosen.co.jp>

Hitachi Zosen Corporation was founded in 1881 originated from Shipbuilding, now being diversified to Waste to Energy system, Desalination system and other infrastructure related businesses including power plant business, with approx. 9,000 employee throughout the world. In the gas-fired power plant business, Hitachi Zosen is able to offer not only turn-key service of construction but operation and maintenance services, supported by its own IPP business for more than 15 years. Currently built and operate 2 units of 110MW GE-based GTCC plants in Ibaraki prefecture, Japan. This all inclusive service brings customer promised and stable project earnings in long term basis.

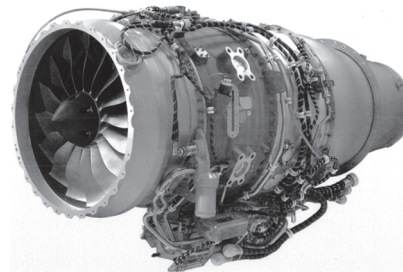
Honda R&D Co., Ltd.

C11

Innovative Research Excellence, Power unit & Energy

<https://global.honda/products/aeroengine.html>

Our research center has been striving to offer the best-in-class aircraft engine starting from compact design, light weight, premium performance, and environmental ethics gas turbine engine for business jet. From the Center foundation in 2004, HF120 Engine, jointly developed with GE Aviation, received Type Certification from U.S. Federal Aviation Administration on Dec, 2013.



GE Honda HF120 Turbo Fan Engine

The engine production has launched in our plant in Honda Aero Inc. headquarters in North Carolina, 2014. Our research center is picking up steam to offer reliable product and prime service to customer, and introduce competitive and innovative engine technology into Aviation industry.

IHI Castings Co., Ltd. (ICC)

C12

<http://www.ihico.jp/icc/>

IHI Castings Co., Ltd. (ICC) manufactures heat-resistant alloy precision castings used for aircraft jet engines, industrial gas turbines, space equipment, turbocharger for vehicles and ships, general industrial equipment and such. Since its establishment as Ishikawajima Precision Casting Co., Ltd. in 1977, we have been manufacturing and providing precision casting materials. Also, to address the growing demands, we have enhanced the production capacities of Soma and Matsumoto Plants by promoting efficiency of production lines. We will put more effort into new techniques including powder metallurgy and additive manufacturing along with precision casting, and continue to offer excellent products of near-net-shape and net-shape materials.

C13

I H I Corporation

<https://www.ihl.co.jp>

Aero Engine, Space and Defense Business Area

IHI participates in international collaborative engine programs for regional, medium, large and super large sized commercial aircrafts, and designs, develops and manufactures modules and component parts for those engines. In addition, IHI applies the comprehensive engineering capabilities to implement engine maintenance operation and parts repairs.

IHI also participates in the research and development of engine for the genuine domestically-produced aircrafts operated by the Ministry of Defense. Besides, IHI develops and manufactures main propulsion and power generators on naval vessels by applying aero-derivative gas turbines. IHI is in charge of the maintenance and repair of these gas turbines, contributing to the stable operations of the Ministry of Defense.

C14

IHI Inspection & Instrumentation Co., Ltd.

<http://www.iic-hq.co.jp/>

IHI Inspection & Instrumentation Co., Ltd. (IIC) is a fully owned subsidiary of IHI. In 1974, the quality management and inspection functions of IHI were spun off to establish IIC. Therefore, from the outset, IIC has been employed many top-level experts in various fields such as sophisticated inspection technology, material and chemical analysis, strain and vibration measurements, stress and fatigue diagnostics and conduct of advanced tests using huge wind tunnels, vibration stands or other facilities. Moreover, we have an organization for developing and manufacturing state-of-the-art inspection instruments and equipment.

C15

IHI Jet Service Co., Ltd.(IJS)

<http://www.ihl.co.jp/ijs>

IJS provides services and maintenances of Gas Turbines Equipment developed and manufactured by IHI, supports to design and manufacture of Aero-engines and Space Equipment, and maintenances of Industrial Plants.

Based upon high-quality technology which IJS has developed and know-how which IJS has accumulated through these business, IJS also develops and manufactures Gas Turbine Generator and Aircraft Rinse System.

We continue to make an effort to create customer's delight through our assured technology and our thoughtful service, and contribute to realization of wealthy and happy society.

C16



IHI
Realize your dreams



IHI Power Systems Co., Ltd.

<https://www.ihl.co.jp/ips/>

IHI Power Systems(IPS) has been providing products using highly efficient and reliable engines and gas turbines.

In the area of power system plant business, we provide a wide variety of power generating products including gas turbines, diesel engines, and gas engines with simple-cycle, combined-cycle and co-generation application.

In addition, IPS provides remote monitoring, engine & gas turbine maintenance, and other services throughout the various product lifecycles.

In the marine power system business, IPS supplies a full range of diesel engines and Z-PELLER® Azimuth Thruster.

14-5,Sotokanda 2-Chome,Chiyoda-ku,Tokyo,101-0021 Japan
TEL: +81-3-4366-1200 FAX: +81-3-4366-1300

IHI Rotating Machinery Engineering Co., Ltd. (IRM) C17

<http://www.ihico.jp/irm/>

IHI Rotating Machinery Engineering Co., Ltd. (IRM), as a member of IHI group, provides comprehensive engineering solutions from manufacturing industrial compressors, marine turbochargers to development, design, engineering, installation and maintenance. Our experience and expertise in rotating machinery has been gained through years of manufacturing jet engines and turbochargers.

We have been manufacturing compressors since 1882 and many compressors have been delivered to date. Also, IHI compressor lineup covers from 15kW to 14200kW and can meet wide range of customer requests like oil-free option for ecological purpose.



Ipsen Co.,Ltd. C18

<http://www.ipsen.co.jp/>



Ipsen Co.,Ltd. was established in 2008 as a Japanese subsidiary of the Ipsen Group . Backed by more than 70 years of experience, Ipsen's mission is to strengthen heat treatment through expert-driven solutions.

We are committed to delivering proven technology for a range of applications that enable you to transform space exploration, improve titanium medical implants and develop more efficient cars and jet engines.

Through our global partnerships, we provide unmatched service and support for all your needs.



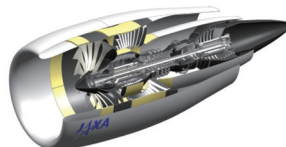
<http://www.aero.jaxa.jp/eng/> C19

Japan Aerospace Exploration Agency Aeronautical Technology Directorate

The Aeronautical Technology Directorate of Japan Aerospace Exploration Agency (JAXA) is pursuing various R&D programs on three key words, "Environment", "Safety", and "Frontier", while continuing to research the aeronautical sciences and basic technologies.

One of them is the En-Core (Environmentally Compatible Core Engine Technology Research) project. Two major targets of En-Core are "Ultra-low NOx Lean Premixed Combustor" and "High-temperature, High-efficiency Turbine". The usage of CMC (ceramic matrix composite) will be the key technology which reduces the cooling air.

For low-pressure components, the aFJR (advanced Fan Jet Research) project has been conducted with industry and universities. The outcome of the project contributes to making the technologies for these fields more competitive. As well, researches, e.g., low-carbon, combustion, high-speed propulsion, and low-noise, are conducted for future propulsion systems.



Japan Internal Combustion Engine Federation (JICEF) C20



<http://www.jicef.org/>



Japan Internal Combustion Engine Federation (JICEF) was founded in 1954, which is the Secretariat of Japanese National Member Association (NMA) for CIMAC (International Council on Combustion Engines), and also the Secretariat of JICESC, Japan Internal Combustion Engine Standard Committee for ISO, which consists of national committees for ISO/TC70 (Technical Committee on Internal Combustion Engines in ISO, International Organization for Standardization) and ISO/TC192 (Technical Committee on Gas Turbines in ISO).

JICEF is having very active and important roles for communications, coordination of opinions for common interests, promotion of mutual friendship etc. among manufacturers, users and neutral experts on reciprocating internal combustion engines and gas turbines.

Japan Patent Office



JCN 2000012090003

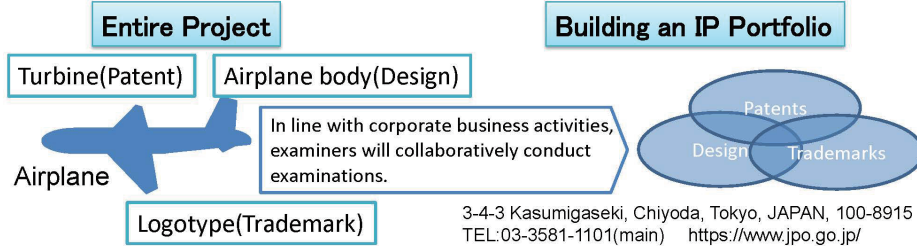
C21

We are dedicated to providing excellent services.

1. Circuit Examination through Interview
-JPO examiners will reach users to conduct interview for patent applications.



2. Collective Examination for IP portfolio supporting Business Strategy
-A team of JPO examiners will conduct cross-sectionally examinations of multiple IP applications (patent, design, trademark), which will be developed into businesses inside and outside Japan.



Japanese Aero Engines Corporation

C22

<http://www.jaec.or.jp/>

The Japanese Aero Engines Corporation was established to coordinate and manage the overall progress of multi-national collaboration programs in 1981 under the direction of the Ministry of International Trade and Industry (presently known as the Ministry of Economy, Trade and Industry) with the IHI Corporation, Kawasaki Heavy Industries, Ltd., and Mitsubishi Heavy Industries, Ltd. It is the Japanese business entity contributing to the success of international collaboration projects to develop and produce engines for civil aircraft such as V2500 and PW1100G-JM.

Kawasaki Heavy Industries, Ltd.

C23

<http://global.kawasaki.com>

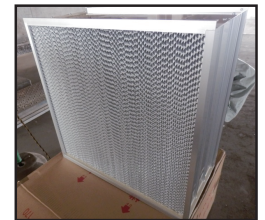
The origin of Kawasaki's gas turbine business is dating back to 1943, the success of first test flight of type "Ne-0" engine which is developed by Kawasaki. Nowadays, Kawasaki supplies helicopter engines to Japan self-defense force. Also, Kawasaki has been participated several international development programs for commercial airline engines. Furthermore, in order to utilize the technology developed through manufacturing of jet engines, Kawasaki started to manufacture the industrial gas turbine named "Kawasaki Gas Turbine". Kawasaki has wide range of line up from 150kW to 30,000kW and it has been installed all over the world.



Kondoh Industries, Ltd. Cambridge Filter JAPAN, Ltd.

C24

<https://cambridgefilter.com/e/>



- Kondoh Industries and Cambridge Filter JAPAN, which was established together with Cambridge Filter Corporation USA in 1968, have been offering the highest performance and longest life air filters for gas turbine intakes.
- We are proud to recommend our filters as a solution to customers who wish to improve and enhance quality and cost performance.
- We provide our top quality Cambridge brand to clients throughout the world.

Maruwa Electronic Inc.

C25

<http://www.maruwa-denki.co.jp/>

Maruwa Electronic Inc. (MEI) has gone forward infinite and unique development for a high speed rotation apparatus and combustion chamber. Our product and service are essential to the design and material integrity for new design, performance and reliability improvement. High frequency drive with active magnet bearing solution that is MEI's core technology surely meets the coming turbomachinery application and supports the environmental impact.



C26

Metal Technology Co. Ltd. (MTC) was founded in 1960 and has developed into a global expert in providing *metal solutions* to its customers. We provide integrated manufacturing solutions and services of metal parts through HIP treatment, Vacuum Heat treatment, Diffusion Bonding, Machining, Brazing, Welding and Additive Manufacturing to meet the rapidly changing needs of various industries including the Aerospace and Industrial Gas Turbine industries. Adding to our 7 Japanese facilities, and our subsidiary in China, our recent acquisition of MTC Powder Solutions AB in Sweden places MTC as a global provider for our customers needs.



Near Net Shape
WYE Part



The world's largest HIP
unit. (Giga-HIP)

Our website: <https://www.kinzoku.co.jp/en.html>

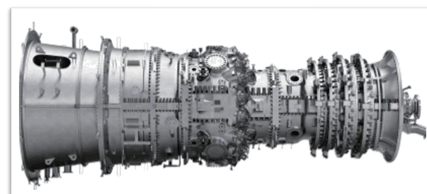
E-mail: info@kinzoku.co.jp



C27

Mitsubishi Hitachi Power Systems

<http://www.mhps.com/>



Mitsubishi Hitachi Power Systems, Ltd. (MHPS), is one of the global leading companies in the Energy and Power industry.

MHPS can provide the stable and efficient electricity to meet the demands of industries and societies with a wide range of Gas turbine and Combined cycle lineup from the 30MW to the 1280 MW class.

MHPS will contribute to the sustainable ecofriendly electric power, promote the decarbonization of energy, and support the conservation of the global environment through the cutting-edge clean power generation technologies, such as a hydrogen fueled gas turbine.

Learn more about MHPS industry leading technologies at
<http://www.mhps.com/products/gasturbines/index.html>

※Mitsubishi Hitachi Power Systems, Ltd. (MHPS) is scheduled to be changed to Mitsubishi Power, Ltd. on September 1st 2020. ⇒<http://www.mhps.com/news/20200731.html>

Mitsui E&S Machinery Co., Ltd.

C28



<http://www.mes.co.jp/>

Mitsui Engineering & Shipbuilding Co., Ltd. has shifted to a holding company, named Mitsui E&S holdings Co., Ltd. Each business is assigned to newly established three operating companies and "Mitsui E&S Machinery" succeeded gas turbine business.

Mitsui's industrial gas turbine development has started from 1950, and the first machine was delivered in 1954. We keep proposing good systems to meet customer's various requests.

-SB Series (Mitsui's gas turbines): 1MW~24MW

-MSC Series (Packaging Solar Turbines' gas turbines): 3MW~15MW

Nakakita Seisakusho Co., Ltd.

C29

<http://www.nakakita-s.co.jp/>

Since foundation in 1930, we have been engaged in research and development of fluid control system with a central focus on valves, and aspiring to be a company, which can make best proposals to customers ahead of the needs of the times.

We're producing valves for gas turbine as an overall manufacturer. Products line-up you can use at the wide process, including high/low-temperature and high-pressure line. We can supply high quality control valves (pneumatic/hydraulic/servo/electric-motor operated), butterfly, self-operated and safety valves, which has been verified by our high-accuracy inspection facilities including precise Cv measurement and are applicable to customer's various requests.

NGK SPARK PLUG CO., LTD.

C30

<https://www.ngkntk.co.jp/english/>



NGK SPARK PLUG CO., LTD., headquartered in Nagoya, Japan, is a comprehensive ceramics processing manufacturer. We hold a world leading share of spark plugs and automotive sensors for internal combustion engines and also offer a broad lineup of semiconductor packages, cutting tools, bio ceramics and industrial ceramics.

Our global network of sales and manufacturing organizations with over 15,000 employees offer value creation to the world. We are now contributing to a sustainable society by developing products related to the environment energy, next generation vehicles and the medical field.

The company's belief is to embrace the challenge of new era under the catch-phrase of "manufacturing only one and number one product".



NIPPON KAIJI KYOKAI (ClassNK)

C31

ClassNK is a ship classification society dedicated to ensuring the safety of life and property at sea and protecting the marine environment. With over 120 years of accumulated knowledge and expertise, ClassNK provides surveying services to certify both ships in construction and those already in service that comply with the technical rules developed by the Society and international conventions.



ClassNK www.classnk.com



Nippon Muki Co., Ltd.

C32

<http://www.nipponmuki.co.jp>

We make new clean value and help to control the clean environment as leading company of air filter.

Air filter protects air compressor from dust and prevents for drop of the generation efficiency. We started the sales to Gas Turbine (GT) customer from 1993. Now many GT customer in Japan are using and satisfying our products.

Air filter for GT are requested as high efficiency and long life. Because we have a lot of filter lineup, technical knowledge, and experiences, we can propose the best filter based on the customer's environment and request. Please feel free to contact us.

NTN corporation

<https://www.ntnglobal.com>

NTN has manufactured and supplied a wide range of bearings and driveshafts to meet customer needs across a variety of applications and industries since its establishment.

We design, manufacture, and provide bearings globally for main shaft of gas turbine engine. Especially, in aerospace application, we have supplier approvals from top 4 jet engine manufacturers in the world. Our firm adherence to quality has earned high reputation and reliance.

Headquartered in Osaka, Japan, we have plants specialized in aerospace bearings in Kuwana, Japan and Argonay, France.

For New Technology Network
NTN



C33

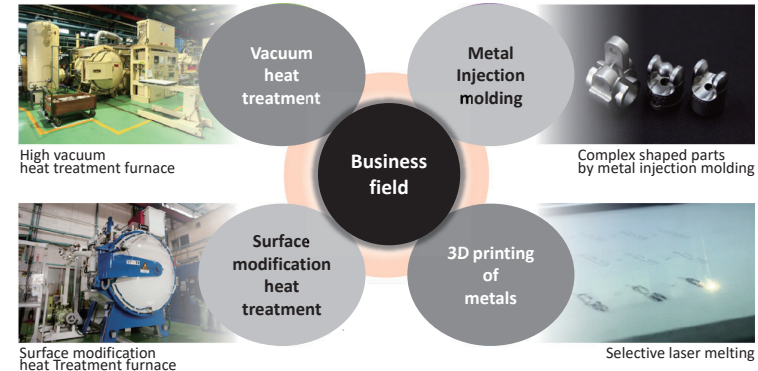
Osaka Yakin Kogyo Co., Ltd.

<http://www.osakayakin.co.jp>



C34

Based on technology cultivated for over 79 years, we offer vacuum heat treating, vacuum brazing and surface modification for heat-resisting alloys used for gas turbine. We also produce complex shaped parts by metal injection molding and 3D printing of metals.



It proposed a metal thermal processing technology to the total.

■ Head Office : 4-4-28 Zuiko Higashiyodogawa-ku Osaka 533-0005 Japan
Tel. +81-6-6328-1345

■ Miki Factory : 25 Tomoe Besshocho Miki Hyogo 673-0443 Japan
Tel. +81-794-86-1345

Mail : info@osakayakin.co.jp

Pulstec Industrial Co., Ltd.

C35

Portable X-ray Residual Stress Analyzer
NEW *micro* **μ -X360s**



Quick and easy setup
Simple non-destructive
measurements

Pulstec Industrial Co., Ltd. was established in 1969 as a test equipment company in Japan.

Our "Portable X-ray Residual Stress Analyzer (μ -X360s)" is the world's lightest and smallest analyzer. The features are "quick and easy setup" and "its fast non-destructive measurement".

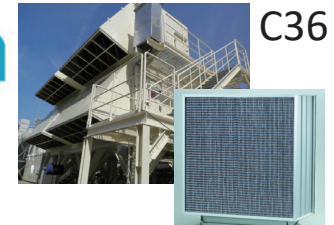
PULSTEC

<http://www.pulstec.co.jp/>

SHINWA CORPORATION

Shinwa Corporation

<http://www.shinwatec.co.jp/en/index.html>



C36

We and main factory as Japan Air Filter corporation are engineering / trading company specializing in air filtration products and related equipment so we are taking the part of traction of this industry.

We are supporting our customer to improvement GT performance such as GT out put, Heat Rate Value by good performance of our Air filter products.

Please let us know your concern issue of GT performance or intake Filter system.

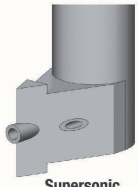
1-32-2 Honcho Nakano-ku, Tokyo, Japan
info@shinwatec.co.jp

You can order from one

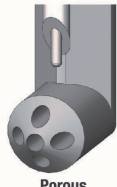
C37

1 Design **2 Processing** **3 Assembly**

LINE UP



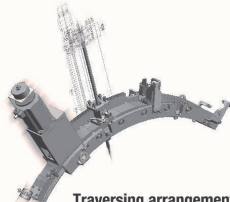
Supersonic



Porous



Total temperature tube
Total pressure tube



Traversing arrangement



Wind tunnel test part



Suzuki Seiki Industry Co., Ltd.

4-6-5, Higashiogu, Arakawa-ku, Tokyo, 116-0012, Japan
tel.03-3800-3331 <http://www.k-suzukiseiki.co.jp/>



**TOKYO GAS
ENGINEERING SOLUTIONS**

C38

<http://www.tokyogas-es.co.jp/en/>

Energy Advance Co., Ltd. and Tokyo Gas Engineering Co., Ltd. merged on April 1, 2015 and started a new chapter in their history as Tokyo Gas Engineering Solutions Corporation.

We are a provider of comprehensive energy solutions to make your facilities more energy efficient using renewable energy. Our approach include smart energy networks with concept of “local production local consumption of heat and electricity” based on cogeneration system. We also help customers meet engineering requirements of LNG receiving terminals and city gas distribution network.

Our mission is to contribute to sustainable, safe and stable society through engineering solutions.



<http://www.ethosenergygroup.com>

富永物産株式会社

C39



TOMINAGA & Co.,Ltd. was founded in 1939, and our Gas Turbine business has more than 30 years of history.

EthosEnergy, whom Tominaga has served as distributor, is a joint venture between Wood Group GTS and TurboCare of Siemens group. EthosEnergy is a leading independent service provider of rotating equipment services and solutions to the power, oil & gas and industrial markets.

Globally, their services include power plant engineering, procurement and construction; facility operations & maintenance; design, manufacture & application of engineered components, upgrades & re-rates; repair, overhaul & optimization of gas & steam turbines, generators, pumps, compressors and other high-speed rotating equipment.

Their products and service will provide the maximum cost merit for customers. It is not only brought by low initial cost but also their high-standard technologies which make turbines operation optimized truly. “Delivering 15% life cycle value improvement on your power generation and mechanical drive assets”, they state loudly.

Tominaga Co.,Ltd (<http://www.english.tomco.co.jp>)
Tel: +81-3-3639-5315 Fax: +81-3-3639-5360

TOSHIBA

Leading Innovation >>>

C40

TOSHIBA ENERGY SYSTEMS & SOLUTIONS CORPORATION

<https://www.toshiba-energy.com>

Toshiba Energy Systems & Solutions Corporation was established on October 1st, 2017 by spinning off Energy Systems & Solutions Company and Nuclear Energy Systems & Solutions Division from Toshiba Corporation.



Toshiba Eco Technologies Give Energy to the Future.

We also provides IoT solutions by combining business and managerial know-how with our accumulated know-how/data.

Toshiba Plant Systems & Services Corporation C41

<http://www.toshiba-tpsc.co.jp/>

Toshiba Plant Systems & Services is a comprehensive engineering constructor that globally carries out integrated operations ranging from planning and engineering to procurement, construction and field services. Using our solid technological capabilities as a foundation, we aim to offer technologies and quality that accurately respond to the voices of our customers. By doing so, we seek to achieve further growth and development as a company that is widely trusted and chosen by people in Japan and overseas.

Toyo Controls Co.,Ltd C42



<https://www.toyocontrols.co.jp/>
<https://www.maxmachinery.com/>

Toyo Controls & Max Machinery have been offering for over 30 years application such as hydraulic fluids and jet fuels for aviation hydraulic components/servo flow control valve test stands and gas turbine combustor test stands as well as automotive gasoline & diesel engine fuel metering test stands, marine engine, small engine test and chemical materials in MAX's liquid high temperature precision positive displacement flow measurement technology based on the highest levels of precision, craftsmanship and performance & long term durability & safety. MAX 4-Radial piston/ Helical rotor/Rotor gear types PD flowmeters for flow range (0.05mL/min to 540L/min) are know for exceptional accuracy (within $\pm 0.2\%$ of rdg, high resolution and fast time constant output), wide range (1000:1 over), Bi-Directional flow, low-high temperature operating ($-40^{\circ}\text{C} \sim 225^{\circ}\text{C}$), high pressure (3000psi/6000psi/7250psi) and ability to measure fluid of any viscosity (0.5~500,000cps). Our standards stringent the performance of our products is unpararelled.

Toyo Tanso USA, Inc. C43

URL : <http://www.ttu.com/> e-mail: sales@ttu.com



C43

Precision EDM material for Turbine Blade, Graphite : TTK-5

- Enable micromachining No bent even with ultra-fine pin such as $\Phi 0.0019$ inch
- Reducing Machining Time Compared to metal, it has good workability and speed up machining
- No Burrs Since no burrs are generated during cutting, it can be used for EDM immediately after machining
- No Deformation Graphite electrodes do not deform due to cutting resistance or heat during EDM like metal, so accurate EDM processing is feasible

For Turbine Blade Grooves and Holes, TTK-5 is suitable as an electrode material for EDM processing

Sharp Edge
No Burr & Sharp Edge

Deep Ribs
0.0039×1 inch

Square Pins
0.007X0.015X0.2 inch

Sample Size 2×2×2 inch

Photo provided by ROKU-ROKU Co.,Ltd
(Machined by HC-658)

ULTRA-FINE PIN
Ultraprecision
No bent even $\Phi 0.0019$ inch

Pin Size $\Phi 0.0019 \times 0.07$ inch 64pins

Photo provided by Makino Milling Machine Co., Ltd
(Machined by V33i-Graphite)

Toyota Motor Corporation C44

C44

TOYOTA

<http://www.toyota-global.com/>

Toyota started development of the automotive gas turbine in 1964. The idea of “the gas turbine hybridization” was succeeded to the PRIUS. The technologies developed since have been utilized for the automotive turbocharges and other products of Toyota Turbine and Systems Inc. We continue to pursue R&D for various applications of the gas turbine, including potential for use in future mobility. I would appreciate any advice members and supporting members of the Gas Turbine Society of Japan may provide.

Turbo Systems United Co., Ltd.

<http://www.turbo.co.jp/doc/eng/index.html>



Turbo Systems United Co., Ltd. (TSU) was established on October 1, 1998 as a joint venture of ABB and IHI Corporation.

TSU is committed to provide ABB and IHI turbocharger products to engine builders and end-users in Japan with best quality as well as first class services and expertise.

TSU is the sales and service organization for ABB and IHI turbocharger products in Japan applied on large diesel and gas engines for ships, power stations, gen-sets, diesel locomotives and large off-highway vehicles.

TSU works closely with engine builders from the initial design stage, providing the highest level of application engineering and support for the customer through installation as well as operating fully integrated in the ABB worldwide turbocharging network.

Since 1985, IHI has license agreement with ABB in Switzerland (formally BBC) for production of ABB turbochargers.

Woodward Japan Ltd.



<http://www.woodward.com/Application-IndustrialTurbine.aspx>

Since 1870, Woodward Inc. has been developing Aero and Industrial Control Systems for the Gas Turbine market. Woodward supplies reliable products and services to customers worldwide. Woodward's market-leading portfolio contains controllers, metering valves, geometric actuators, and fuel nozzles for application in heavy frame turbines, aero-derivative engines, as well as Small and Micro gas turbines. Visit our website to find the optimum solution for your gas turbine.

Woodward Japan Ltd.
WBG Marive West 19F, 2-6-1 Nakase,
Mihama-ku, Chiba-shi, Chiba 261-71119 Japan



Woodward Gas Fuel Valves
(Hydraulic / Electric drive)

<- Electric Geometric Actuator

Yokogawa Denshikiki Co., Ltd.

<https://www.yokogawadenshikiki.co.jp/ydk/>

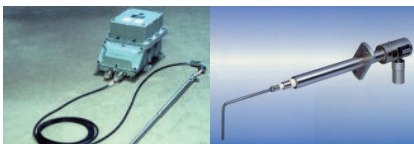
Since its founding in 1960, Yokogawa Denshikiki Co., Ltd. has been striving to serve its customers and society by providing quality equipment and services in defense, the environment, marine navigation, aviation, aerospace, and other relevant fields, in pursuit of the realization of its corporate philosophy and implementation of action guidelines.

In our aerospace business, we design, develop and manufacture various sensors for position/pressure/temperature/speed, fuel control valves equipments, ignition exciters and electrical/optical harnesses which are excellent in harsh environment and come from our many experiences and long history.

In our combustion business, we serve customers through providing equipments and services around combustion system such as gas turbines and boilers for example, high energy/explosion proof ignitions, flame detectors and MRO with special technologies and experiences.



Sensors, Ignition and Harness for aerospace



Ignition and Flame Detector for general industry

■ New company name
YDK Technologies Co., Ltd.

■ Date of change
October 1, 2020



C47

Universities

Hosei University

Fluid Engineering Laboratory

Department of Mechanical Engineering

U1

Professor Hoshio Tsujita

<http://mech.ws.hosei.ac.jp/tsujita-lab/index.html>

The research subjects in the fluid engineering laboratory at Hosei University are emphasized on the reduction of secondary flows related to passage vortex, horseshoe vortex, tip leakage vortex and so on, and on the improvement of performance characteristics of turbomachines. The recent research programs for axial turbines are the improvement of aerodynamic performance of highly loaded turbine cascade with high turning angle by the reduction of the loss due to the tip leakage flow, by using both the experimental and the numerical methods. The feasibility study for the application of transpiration cooling to the axial turbine is also conducted by the numerical method. Those for the turbocharger are devoted to the controls of the rotating stall and the surge in the centrifugal compressor and to the clarification of the influences of nozzle vane on the circumferential uniformity of flow field at the inlet of radial turbine impeller.

Iwate University

Aerospace Propulsion Research Lab.

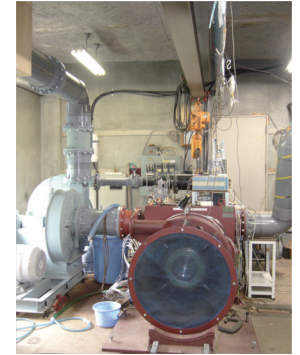
Prof. Funazaki Ken-ichi <http://turbo.mech.iwate-u.ac.jp/>



U2

The Funazaki Laboratory of Iwate University has been conducting its research activities successfully from the beginning. The laboratory has been established by Professor Ken-ichi Funazaki who is the head of it. Twenty-seven researchers, including Professor Funazaki and Assistant professor Hideo Taniguchi, are working in the laboratory.

The research areas of this laboratory are improving cruise performance of aero-engines, investigation of 3-D unsteady aerodynamics of the compressors, aerodynamics of aero-engine turbine cooling, next generation rocket engine turbo pump, in-situ Lunar orientation measurement, bioengineering, bio-fluid dynamics of various diseased arteries, and multi-objective robust design optimization. Fortunately, the laboratory has various experimental facilities such as Environmental Wind Tunnel, Film Cooling Experiment, Anechoic Chamber, and Rotating Test Ring. Moreover, it has a very high performance computer simulation facility so that the researchers can easily get numerical results from their investigations and compare them with experimental results.



Kansai University

Thermal Engineering Laboratory,

Department of Mechanical Engineering

U3

http://www.kansai-u.ac.jp//English/academics/fac_eng.html

Fundamental researches on film cooling, impingement jet cooling, endwall heat transfer, and ribbed and pin-fin channels, are being performed by Large Eddy Simulations (LES) validated by wind tunnel test. We are developing an in-house LES program with a SGS model developed in Japan, which can simulate our low-speed wind tunnel tests of complex turbulent flows and heat transfer in gas turbines. Our goals are (1) to clarify the basic mechanism of complex heat transfer in gas turbines, (2) to control flow and heat transfer to minimize entropy generation, and (3) to develop advanced cooling technologies for coolant flow reduction.

Kochi University of Technology

Aeronautical Propulsion and Supersonic Flow Laboratory

School of Systems Engineering



U4

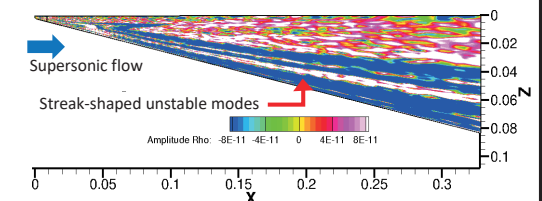
Professor: Osamu NOZAKI, Assistant Professor: Yousuke OGINO

Aeronautical Propulsion and Supersonic Flow Laboratory
School of Systems Engineering

We perform studies of aerodynamics, propulsion and thermofluids to improve the safety and energy saving of aircraft. We also study the internal flows of gas turbine engines and the drag reduction of vehicles. Further, we try contributing to the development of aerospace engineering by the numerical study on supersonic fluid dynamics.



Overview of cascade wind tunnel



A computed result of an eigen mode of density for the maximum eigenvalue around a sphere-cone model

Kyoto University

U5

Advanced Imaging Lab.

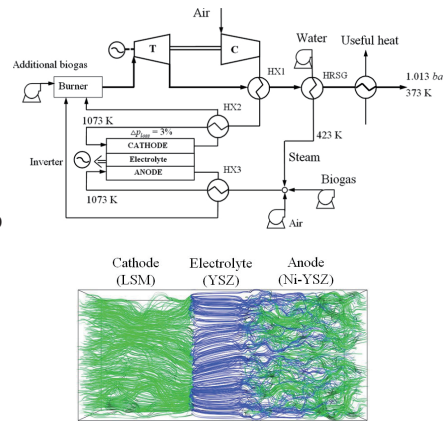
<http://www.ail.me.kyoto-u.ac.jp/>

Department of Mechanical Engineering and Science

Prof. Hiroshi IWAI Assist. Prof. Masashi KISHIMOTO



We are currently studying transport phenomena in solid oxide fuel cells (SOFCs), solid oxide electrolyzers (SOEs) and reformers. In particular, to improve the performance and durability of SOFCs and SOEs, microstructure of porous electrodes are investigated by using a focused ion beam and scanning electron microscope (FIB-SEM). Numerical simulations are also conducted for the thermofluid and electrochemical fields. In view of energy carrier, studies on ammonia are ongoing with special emphasis on decomposition/reforming reactions. Previously, we also made performance analyses for hybrid systems consisting of micro-GT and SOFC fed with biogas.



Kyoto University

U6

Thermal Science and Engineering Lab.
Department of Mechanical

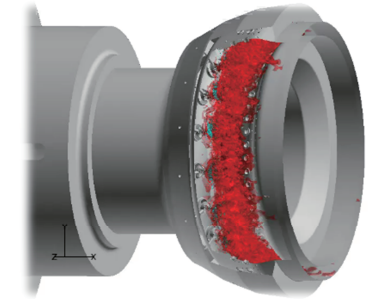
Engineering and Science

Professor Ryoichi Kurose



http://www.tse.me.kyoto-u.ac.jp/index_e.php

Thermal Science and Engineering Lab (TSEL): The principal objectives of the TSEL are to understand the physical aspects of thermodynamic, heat transport and radiative properties of fluid and solid matters on the basis of thermodynamics, thermal conductivity, fluid dynamics, spectroscopy and electrostatics, and to elucidate the complex phenomena including them, from nanoscale to macroscale. In addition, based on such basic researches, applied researches on the developments and advancements of technologies of numerical simulations and measurements to support "industrial innovations" are conducted.



Large-eddy simulation of turbulent spray combustion field of full annular combustor for aircraft engine (In Proc. of GTC2015)

Aerospace Propulsion Laboratory, Department of Aeronautics and Astronautics, Kyushu University

U7

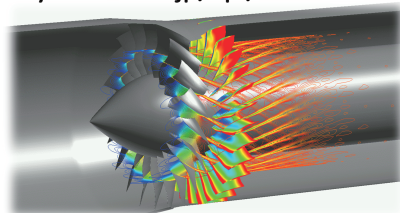
<http://www.aero.kyushu-u.ac.jp/apl/>



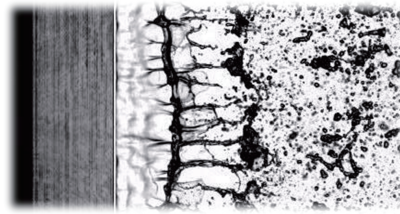
In Aerospace Propulsion Laboratory, many studies related the fluid dynamics and thermal engineering of airbreathing and rocket engines are executed.

One of main research topics is the fan noise prediction and active control. In the fan noise prediction, the hybrid method of CFD and the modal decomposition is used, and good agreement with experiment is obtained. In the active control of fan noise research, the optimal anti-sound of the target sound modes is successfully generated to reduce the fan noise.

Another topic is the prediction of liquid fuel fragmentation at air-blast atomizer. The sheet breakup and droplet spreading events are visualized, and the spray flux distribution is quantitatively measured. An identified new length scale of the spray leads to a theoretical model, predicting the spray flux distribution, which is validated by the experimental results.



Total Pressure Distribution due to Rotor/Stator Interaction for Sound Pressure Evaluation using CFD



High-speed visualization of a planer liquid sheet fragmentation by high speed gas streams

Kyushu University Department of Mechanical Engineering, Fluid Science Laboratory

U8

<http://fe.mech.kyushu-u.ac.jp/index-j.html>

The research topics in the Laboratory include: unsteady flow phenomena in turbomachines such as the rotating stall and the surge in axial and centrifugal compressors, aerodynamic noise in fans, design of wind-lens turbine, aerodynamic optimization of turbomachines, advanced turbomachinery design with an innovative approach, development of optical measurement (PSP: pressure sensitive paint) technique for low speed flow. Much of the research has been conducted as collaborative projects with industries and consortium research.

Kyushu University

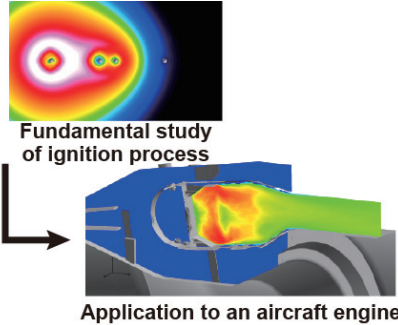
Thermal Science and Energy Laboratory
Department of Advanced
Environmental Science and Engineering



U9

Professor Hiroaki Watanabe
http://tse.kyushu-u.ac.jp/intex_e.html

In our laboratory, combustion, and heat and mass transport phenomena are the major topic based on thermodynamics, fluid dynamics, and thermochemistry to realize clean and low-carbon energy technologies. A complex physics in which the turbulence and the chemistry interact with each other is investigated to clarify the characteristics, to construct the mathematical models, and to perform the numerical simulation of such multiscale and multiphysics phenomena among gas, solid, and liquid three phases. In addition, the proposed models are applied to industrial applications to contribute to the society by means of the massively parallel large-scale computing.



Nagaoka University of Technology

Professor OKAZAKI Masakazu

U10

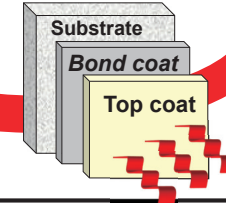
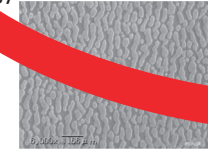
<http://mcweb.nagaokaut.ac.jp/~okazaki/iamutHP/>

Research activities

Relating to gas turbine structural components;

- * Structural and/or functional reliability of superalloys,
 - * Thermo-Mechanical, Low- and High- cycle Fatigue of Thermal Barrier and Protective Coatings,
 - * Evolution and Non-Destructive Evaluation of CMAS Damage,
 - * Friction Stir Welding,
 - * Fretting and Wear
- and,
- * Utilization Technology of Bio-Mass Resources for Gas Turbine Based Energy Systems.

*Microstructurally-
Controlled
Superalloys*



TBCs



Teikyo University

Strategic Innovation and Research Center
Laboratory of Fluid-Structural Simulation and Design
<https://www.teikyo-u.ac.jp/affiliate/laboratory/sirc/>



U11

Our laboratory's objective is to promote pioneering, cross-sectoral and comprehensive research and education in Teikyo University through strategic-innovation-oriented collaborative research programs with manufacturing companies, universities and research institutes. We are giving special emphasis to design innovations for industry.

Our scopes of research and development are

1. Energy Machinery Systems: Researches and education to increase steam turbine efficiency with the development of high-performance blade and exhaust diffuser design methodology using large-scale aerodynamic and structural interaction analysis.
2. Applied Fluid Dynamics, Applied Structural Mechanics: Evaluations of steady and unsteady blood vessel wall stresses of an artery with a cerebral aneurysm, CFD studies of nasal passages with Continuous Positive Airway Pressure (CPAP) mask for patients with sleep apnea syndrome, CFD studies of nasal and pharynx airway for oral surgeries, Development of mechanical model of lungs for respiratory surgery

If you would be interested in more detail, please contact Tadashi Tanuma (t-tanuma@med.teikyo-u.ac.jp).

Laboratory academic and research staff

Professor Tadashi Tanuma, Research Assistant Kumi Akiyama

Jet Propulsion Laboratory The University of Tokyo



U12

東京大学
THE UNIVERSITY OF TOKYO

UTJPL

<http://webpark1362.sakura.ne.jp/?lang=en>

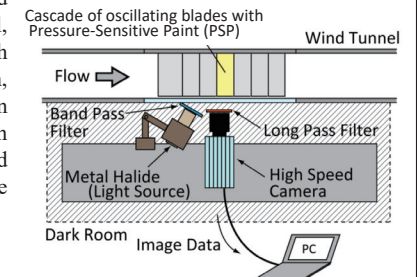


Website url

Jet Propulsion Laboratory in the University of Tokyo (UTJPL) executes fundamental researches in the area of thermo-fluid dynamics in jet engine and rocket systems through experimental, computational, and theoretical approaches. The recent research programs include flow-induced vibration of transonic fan, detailed unsteady behavior of compressor flow, humid air flow in compressor, broadband fan noise, two-phase flow phenomena in liquid rocket system, sloshing, liquid atomization, bio-fluid mechanics, and so on. The laboratory is widely opened to the global collaboration with institutes and industries.

Professor: Toshinori Watanabe

Associate Professor: Takehiro Himeno



Unsteady Pressure Measurement on Oscillating Blade using Fast-Response Pressure-Sensitive Paint

The University of Tokyo

Dept. of Aeronautics & Astronautics, Teramoto-Okamoto Lab.

U13

<http://www.thermo.t.u-tokyo.ac.jp>

Our research interest is to understand basic flow physics of variety of flowfields related to aerospace propulsion and turbomachinery. Current research topic includes high-resolution large-eddy simulation of tip clearance flow, acoustics from supersonic impinging jet, turbulence of cryogenic supercritical flows, shock wave / turbulent boundary layer interaction, cycle analysis and design study of new concept rotating machines such as wave rotor Tesla pumps. Faculty members: Associate Professor Susumu Teramoto, Associate Professor Koji Okamoto, Assistant Professor Kazuo Yamaguchi

Advanced Aeropropulsion Laboratory (AAL) U14

The University of Tokyo

<http://www.aeroeng-lab.t.u-tokyo.ac.jp/>



Website url

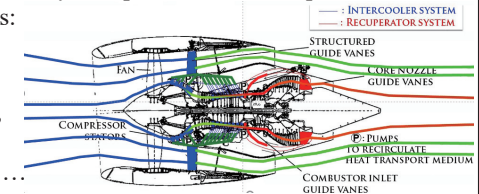
社会連携講座 東京大学 東大工学部 IHI
将来航空推進システム技術創成
Advanced Aeropropulsion Laboratory

Members: Project Professor: Toshinori Watanabe (concurrent)
Project Associate Professor: Yu Ito
Project Academic Support Staff: Ayumi Mamada

AAL is a social collaboration laboratory based on a collaborative study between IHI Corporation and the University of Tokyo, located in the University of Tokyo.

The present project is intended to create advanced and fundamental technology and to foster human resources for developing a safe, highly environmentally compatible and innovative aeropropulsion system that is inevitable for future air transport to be broadly-accepted and to accomplish sustainable growth. The research topics are as follows:

- Environmental compatibility: noise, pollutions, inlet distortions, ...
- Energy management: CO₂ reduction, electrification, heat exchangers, cycle modifications, ...
- Material and Manufacturing: CFRP, CMC, coating, ...



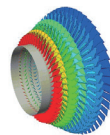
Along with these research activities, AAL is working on education and promotion of cooperation among government, industry, and academia.

An intercooled and recuperated (ICR) turbofan using component heat exchangers and heat transport medium with the same weight of the baseline turbofan

Tohoku University

U15

Professor Satoru Yamamoto
Associate Professor Takashi Furusawa
Laboratory of Mathematical Modeling and Computation
Department of Computer and Mathematical Sciences



TOHOKU UNIVERSITY

Our laboratory is studying mathematical modeling and the computation using supercomputers and PC clusters. In particular, we study multi-physics computational fluid dynamics(MCFD), developing mathematical models governing complex physics associated with flow dynamics, such as nonequilibrium condensation. As a typical in-house code based on MCFD, we are updating "Numerical Turbine" simulating unsteady wet-steam and moist-air flows in gas- and steam-turbines. Currently we have achieved the simulation of those flows in whole annulus multi-stage stator-rotor blade rows. "Supercritical-fluids Simulator(SFS)" is another in-house code resolving MCFD problems. This code can simulate flows of arbitrary substances in gas, liquid and solid states with the phase changes. Using the code, we are primarily simulating supercritical water and supercritical CO₂ flows near the critical condition, especially, supercritical CO₂ flows in a compressor and turbine which are expected as those in supercritical CO₂ power plants. This code can capture nonequilibrium condensation of CO₂ in the flows.

<http://www.caero.mech.tohoku.ac.jp/>

Tokushima Bunri University (TBU) U16

125th 2020
Tokushima BUNRI UNIVERSITY

Tokushima Bunri University (TBU)



SINCE 1895

- ◆ Thermal Science and Engineering Laboratory(TSEL)
- ◆ Fluid Engineering and Fluid Machinery Laboratory(FEFML)
: Prof. Yoshiki Niizeki

TSEL was relocated major laboratory equipment from Osaka University in 2014, and started research on gas turbine heat transfer etc in TBU by Prof. Takeishi who retired. FEFML updated in 2018, began working on both experimental and numerical analysis to improve the performance and reliability of turbomachinery.

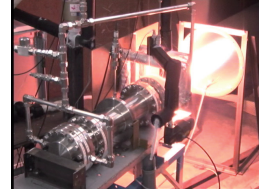
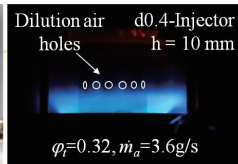
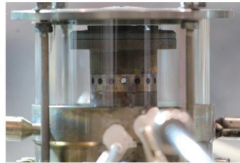
In both laboratories, we have carried out our own unique efforts, such as the application of MRI to fluid measurements. The following items are investigated now.

- * New experimental method to investigate gas turbine heat transfer and flow field of turbomachinery, such as MRI, X-ray CT, LIV, PIV etc.
- * Higher efficient film cooling configurations and the mechanism of its high efficiency
- * Improvement of heat transfer coefficient of an impingement cooling, turbulent ribs and pin fin etc.
- * Swirling flow in turbomachine diffuser
- * Wet steam flow

Tokyo Metropolitan University

Combustion and Propulsion Laboratory

<http://www.comp.sd.tmu.ac.jp/comb/index.htm>



SOFT Hybrid Rocket engine with LOX regenerative cooling nozzle

Propane-fueled miniature combustor for 500 W MGT

Our research mainly focuses on the development of micro gas turbine applications and hybrid rocket propulsion. Fundamental combustion topics related to these applications are also studied. The laboratory has a rocket and gas turbine engine test cell enabling up to 3 kN thrust and a combustion experiment lab.

Research topics:

- Combustor development for Micro Gas Turbines
- Propulsion applications of detonation and high-speed flames
- Swirling-flow Hybrid Rocket Engines
- Fundamental combustion: meso-scale combustion, Lean-premixed pre-vaporized combustion of kerosene using porous media

Member: Takashi SAKURAI (PI, Assoc.Prof.), Graduate students (Master: 8), Bachelor students: 4

Tokyo University of Agriculture and Technology

Thermal Fluids Engineering Lab.

(Prof. Akira Murata)

Department of Mechanical Systems Engineering

U19

<http://www.mmlab.mech.tuat.ac.jp/>

We carry out the researches on various heat/thermal problems as follows:

- 1) Effective cooling of gas turbine elements for higher thermal efficiency and CO₂ reduction (film cooling of airfoil trailing edge, internal cooling enhancement of turbine blades by using dimpled surface, and effusion cooling of combustor liner wall)
- 2) Cooling performance analysis of air-cooling heat sink for electric aircraft
- 3) Development of high performance heat exchanger for environment-friendly energy conservation (heat transfer enhancement by using vortex generators and dimples)
- 4) High performance heat transport device utilizing phase change applicable to heat spreader for electronic/electric device cooling (parallel tube heat transport device with spontaneously induced internal flow)

Tokyo Metropolitan University

Dept. of Mechanical Systems Engineering

Professor Koji KAKEHI



U18

TOKYO METROPOLITAN UNIVERSITY

東京都立大学

<http://www.comp.tmu.ac.jp/superalloys/>

Materials and Manufacturing Processes—

- The major research project is to evaluate the properties and reliabilities of heat-resisting alloys used for gas turbine for airplanes and power plants. The study intends the alloys actually used for present engine of airplane and alloy designated for future engine, and has a purpose to analyze the damage mechanism under various mechanical loads. The aircraft engine and the turbine rotor blade of the power generation gas turbine are received flue gases that exceed 1500° C and rotate at high speed. To improve fuel efficiency and reduce emissions from gas turbine, Turbine Entry Temperatures (TETs) of the aero engine have risen to 1700° C. But engine designers are looking for TET of 1800° C in order to increase engine efficiency. Materials developments in all turbine components, combustors, blades, and discs, are critical to achieving this. The Ni based superalloys are used for the turbine parts used under such a severe environment. The excellent Ni based superalloys in the creep property are put to practical use in the aircraft engines. We focus on understanding the fundamental mechanisms determining the mechanical properties of Ni based superalloys.
- **Metal Additive Manufacturing**, also known as metal 3D printing is the technology that produces three-dimensional parts layer by layer and offers the design freedom with the ability to manufacture parts from a wide range of materials. Additive manufacturing for the heat-resistant alloys are also being researched.

Tokyo University of Science

Department of Mechanical Engineering

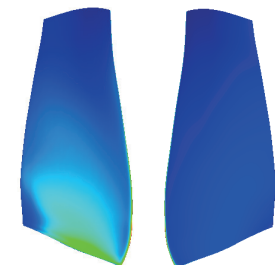
Yamamoto CFD Laboratory

<http://www.rs.kagu.tus.ac.jp/yamamoto/index.html>

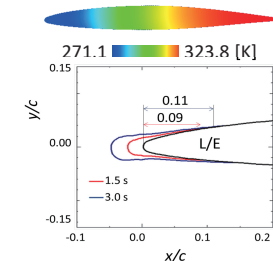


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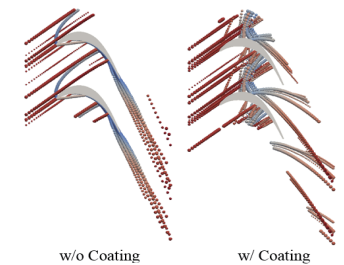
Multi-physics CFD (Computational Fluid Dynamics) simulation would be one of key technologies in research and development of various machines in near future. We are challenging to develop multi-physics CFD codes to reproduce a lot of multi-physics phenomena such as icing, sand erosion, particle deposition and so on, which can often observed in a jet engine. The developed codes have successfully be applied to fans, compressors and turbines. The numerical results provides us useful knowledge and insights that it is too difficult to obtain by experiments.



Pressure S. Suction S.
Ice Thickness of Fan Blade



Blade Temp. and Ice Shape
in Ice Crystal Icing



w/o Coating w/ Coating
Velocity [m/s]
20.0 110.0
Particle Trajectory in LPT



Aerospace Transportation Systems Lab. (Prof. Tetsuya Sato)
Department of Applied Mechanics and Aerospace Engineering

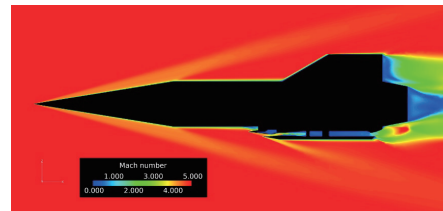
<http://www.waseda.jp/sem-sato/>



Our laboratory mainly conducts R&D of the hypersonic precooled turbojet engine to apply for hypersonic cruisers and spaceplanes in cooperation with JAXA. We are currently involved in preliminary studies on the engine system unsteady simulation, supersonic inlet buzz, cryogenic two-phase flow, frost formation on the cryogenic surface, etc. We have proposed a Mach 5 flight experiment of a small ramjet vehicle using a sounding rocket called HIMICO: High Mach Integrated Control Experiment. We also conduct researches of the effect of the boundary layer ingestion (BLI) on the fan engine.



Precooled Turbojet Engine (Courtesy of JAXA)



High Mach Integrated Control Experiment Vehicle (HIMICO)

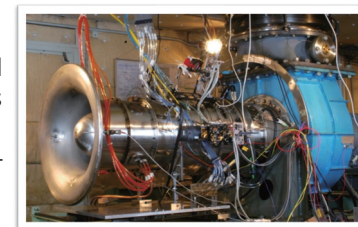


Fluid Mechanics and Turbomachinery Lab.
Department of Applied Mechanics and Aerospace Engineering

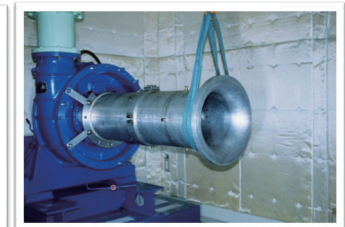
Professor Yutaka OHTA

Assistant Professor Nobumichi FUJISAWA

Unsteady flow-induced vibration and noise generated in turbomachinery systems such as rotating stall, surge, rotating instability, inlet distortion, off-designed operation and aero-acoustic noise are main targets of our research. In order to achieve high-efficient fluid machinery systems, we are conducting large-scale experiments with detailed measurements of flow field and high-precision numerical analyses of unsteady turbulent flows. Our research covers various types of rotating machinery, such as axial-flow compressors and turbines for aircraft engines, centrifugal and radial-flow compressors and turbines for turbochargers and also cross-flow and propeller type fans for ventilating or HVAC systems.



Single-Stage Axial-Flow Compressor



Centrifugal Compressor