

Activities of Individual Companies : Aerospace Company

FHI can trace its beginnings back to Nakajima Aircraft Co., Ltd., founded in 1917. In the intervening years, we have been able to take the lead in the Japanese aerospace industry by using aircraft production technologies and a spirit of innovation taken from the past, and to continually be involved in the development and production of a wide range of aircraft.

The Aerospace Company actively challenges itself in new fields of technology to grow further and become an internationally-outstanding company. Toward this end, we utilize the creative, cutting-edge technologies we have been cultivating, including development technology for aircraft structures such as the application of composite material to the main wings, as well as advanced system integration technology, in which the IT technology used for one of our main products, unmanned aircraft, and flight control technology are integrated.

Profile of Aerospace Company



Aerospace company



Location	1-1-11, Yonan, Utsunomiya, Tochigi (Main plant)
Products manufactured	Aircraft, unmanned aircraft, space-related equipment
Number of employees	Aerospace Company: 2,229

The History of Aircraft is the History of Structural Weight Reduction

It may be no exaggeration to say that the history of aircraft equals the history of weight reduction in aircraft structures. Since the beginning of aircraft history in 1903, when we flew up in the sky for the first time using

powered aircraft, the materials used for aircraft structures have continued to evolve, becoming even lighter and stronger, changing from wood to aluminum and eventually to composite material. Further weight reduction

in aircraft is necessary due to recent rises in oil prices and in response to increasing environmental concerns such as energy-conservation. As a result, aircraft utilizing a large amount of composite material have begun to emerge.

The Need to Develop a Health Diagnostic System of Aircraft Structures

While composite material contributes to the reduction of the weight of the aircraft, it is extremely difficult to find out to what extent and in what manner the structural

parts of aircraft are damaged or have deteriorated due to material fatigue or structural overload. There has been a strong need to develop a technology by which

invisible scratches, one of the disadvantages of composite material, can be located easily. Such technology is called a System to Diagnose the Health of Aircraft Structure*.

Finding a Clue in the Human Body

We drew great inspiration from the mechanisms of the human body in developing this system. In the human body, physical disorders are detected by the neural network which runs all over the body, and a person is alerted to a disorder by symptoms such as pain or fever (Figure 1). We have been researching whether the same mechanisms could be applied to aircraft, by which any damage could be diagnosed and the need for repair communicated using sensors installed across the entire structure of an aircraft in a manner equivalent to the human neural network. The Aerospace Company was one of the first companies to undertake research and development for this system*, and worked to put the system into practical use, taking the view that such technology will become widespread among civil aviation aircraft in the near future.

Effects of System Introduction

Weight Reduction in Aircraft Structures

If this system is applied to a section of the aircraft such as the tail assembly, for which composite material is used and the design tolerance is severe, the health of the tail structure can be diagnosed and confirmed more easily (Figure 2). Excessive strength can thus be eliminated in the early stage of aircraft design, and the weight of the structure can also be reduced (Figure 3).

Effective Maintenance

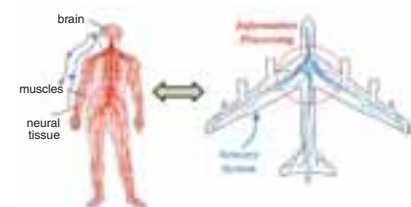
Maintenance of aircraft, such as replacement of parts, which is usually conducted according to the number of accumulated flight hours, can be done more effectively, as this system makes it possible to pinpoint the exact locations in need of repair or replacement.

Enhanced Safety

Aircraft safety is expected to increase further, as the health of the aircraft can be diagnosed in real time during flight.

Thus, the Aerospace Company actively takes on the challenge of developing a system which will contribute significantly to the reduction of aircraft weight and the creation of structures that consume less energy in the future.

■ Outline of the sensor system (Figure 1)



■ Image of the sensor system applied to the wing structure (Figure 2)



■ An ideal image of weight reduction in aircraft structure (Figure 3)



* : This research is conducted under the Development of Damage Monitoring System for Wing Box Structure of Aircraft, a 5-year program from 2003 to 2007, which was adopted and funded by the Ministry of Economy, Trade and Industry (METI), under the initiative of FHI in cooperation with the R&D Institute of Metals and Composites for Future Industries (RIMCOF).

The Industrial Products Company produces about 1 million general-purpose engines per year. These engines are loaded in machines that support our life such as construction and agricultural machinery to establish infrastructures, leisure-related equipment to fulfill our life, snow removal equipment, and engine-equipped generators for harsh environments, which have enjoyed good reputations from our customers. Product development is implemented by repeating demanding tests so that these engines and machines will always work stably under the worst conditions imaginable on the earth, such as severe heat, extreme arctic cold, blistering desert heat, and rough marine applications.

Profile of Industrial Products Company



Industrial Products Company

Main Location 4-410, Asahi, Kitamoto, Saitama
 Products manufactured Multi-purpose engines (Robin engines), engine generators, engine pumps
 Number of employees 589



EH50-Type Engines

The EH50PL is a liquid-cooled, 4-cycle single-cylinder SOHC gasoline engine with displacement of 498 (mL) and sold mainly in the North American region as an engine mounted on ATVs*1 such as the Sportsman manufactured by Polaris Industries, Inc. Since the start of production in 1995, the EH50PL has gained popularity in the market, and is still being produced today. The fuel delivery system has been changed recently from the currently-applied carburetor system to the Electronic Fuel Multi-point Injection System (MPI system), which takes into account the exhaust emission regulations of the EPA (Environmental Protection Agency) in the U.S., which came into force in 2006 Model Year and are scheduled for 2009 Model Year.



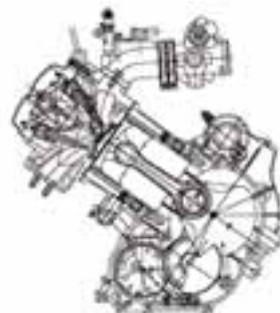
ATV "Sportsman"

Features of EH50-Type Engines

1. Environmentally friendly

The air-fuel ratio has been optimized for all driving conditions through the application of the MPI system. It complies with the current exhaust emission regulations of the EPA and CARB in the U.S. and balances high-level driving comfort with improved fuel consumption. We are also making efforts to reduce substances with environmental impact in these engines, such as hexavalent chromium and lead.

■ EH50PL MPI System Engine



2. People Friendly

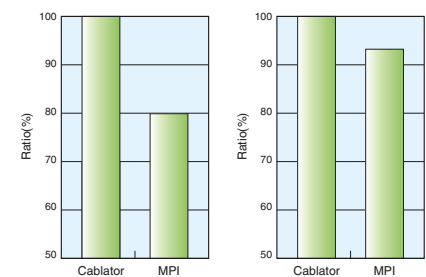
• Noise Reduction

A noise from the gears inside the engine has been eliminated by optimizing the gear specifications, reducing the noise during idling and improving the acoustics.

• Improved Starting Performance

We have worked on improving the starting performance of vehicles and the operability at cold temperatures, while also working on improving the mechanical decompressor (decompression mechanism activated upon starting-up the engine) and eliminating choking through the use of the MPI system.

■ Emission Gas Level(CO) ■ Fuel Economy Level



Column

Products of Industrial Products Company*2 Used in Disaster-Stricken Areas

FHI makes active efforts to provide disaster relief to areas stricken by natural disasters and the like, both in Japan and abroad. One outstanding example is the power generators manufactured by the Industrial Products Company, which are contributing to recovery efforts in areas where electrical lifelines were disconnected. A large number of our power generators are still being used in many areas worldwide.

FHI has donated its power generators and water pumps to several disaster-stricken areas, including the area hit by the Niigata Chuetsu earthquake in 2004, and to those stricken by the Sumatra Earthquake and Tsunami in the Indian Ocean in 2004.



ROBIN power generator playing an active role in a disaster-stricken area

*1 : ATV stands for all-terrain vehicles, and refers mainly to 4x4 buggy vehicles.

*2 : For the ROBIN products on which engines produced by the Industrial Products Company are mounted, please refer to FHI's homepage at <http://www.fhi.co.jp/robin/index.htm>.

Eco Technologies Company

Eco Technologies Company deals with a variety of products that contribute to creating comfortable living environments and a resource recycling society with an Environmentally-Sound Material Cycle and the recent refuse disposal system for skyscrapers, as well as various vehicles and equipment for waste collection, transport, and recycling. Handling the wind turbine systems to produce clean energy, Eco Technologies Company contributes to conservation of the global environment with its ecological products.

Profile of Eco Technologies Company



Eco Technologies Company

Location 1-1-11, Yonan, Utsunomiya, Tochigi

Products manufactured Environmental vehicles (Refuse collection vehicles, transporters, detachable container trucks, organic resource separation and collection vehicles), and environmental equipment, such as Wind Turbine System and a Refuse conveyance system for skyscrapers

179 (As of March 31, 2006)



Waste Collection and Transportation Vehicles

New model refuse collection vehicles, Fuji Mighty LP871

The Fuji Mighty LP871 is a model which has become available for the first time on the open market. It was developed under collaboration between FHI and Shin Maywa Industries, Ltd., the two major manufacturers of refuse collection vehicles, and was launched in May 2005. A loading system developed using some of the two companies' most highly evaluated patents is mounted on this model, and its appearance is more sophisticated than ever. For safety, we have established our own voluntary standards, SAFETY 21, which are even stricter than the relevant legal standards. The rear-view eye camera for rearward confirmation and the high mount stop lamp for enhancing the visibility of the vehicle from the rear side are mounted as standard for increased safety. We have been making series of products for 2-ton and 3.5-ton chassis bases since April 2006.

Specifications of the LP871

Body	4-ton chassis class of each domestic chassis manufacturer
Cargo box capacity	8.6m ³
Hopper capacity	1.1m ³
Cargo box dimension	3,155mm x 2,035mm x 1,660mm
Loading method/cycle	Press method loading/approx. 13 sec.
Discharging method/time	Forced discharging/approx. 18 sec.
Design renewal	The body and tailgate come in one piece



New model refuse collection vehicles "Fuji Mighty LP871"



New detachable container truck, Power Loader FPL-4A

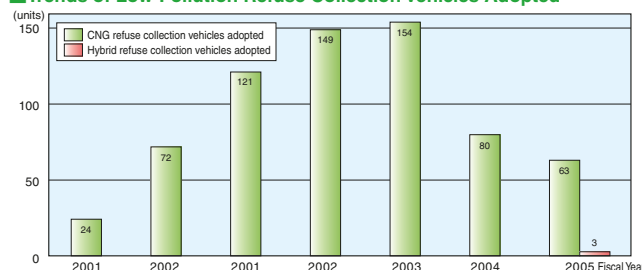
New detachable container truck, Power Loader FPL-4A

We launched a detachable container truck (product name, Power Loader), a new model in the 4-ton chassis class in March 2006. The waste container can be attached and removed as shown in the picture, and it is possible to dump the container in order to discharge the waste. Our detachable container trucks have been used at construction sites and waste treatment facilities, and the market has been expanding recently. Containers stationed at several locations can be transported using just one Power Loader, thereby improving transportation efficiency. The Power Loader is a vehicle in compliance with the compatibility requirements of the manufacturing standards issued by the Japan Auto-body Industries Association Inc.

Low-Pollution Refuse Collection Vehicles Adopted

63 of our CNG (compressed natural gas) refuse collection vehicles were adopted in fiscal 2005, as well as three hybrid vehicles.

Trends of Low-Pollution Refuse Collection Vehicles Adopted



Technological Licensing of Refuse Collection Vehicle Fuji Mighty to Overseas Companies

The Eco Technologies Company started the technological licensing of its refuse collection vehicle Fuji Mighty to Jiangsu Yueda Special-Purpose Vehicle Co., Ltd. (Jiangsu Province) in China in 2004. In the summer of 2005, local production of the first prototype vehicle was completed. Because China is presently facing growing environmental problems due to its rapid economic progress, improved waste collection and cleaner and more effective transportation is required. Expectations of the technology of Fuji Mighty are growing stronger, as demand for refuse collection vehicles grows across China, especially with large-scale international events such as the Beijing Olympics and Shanghai World Expo to be held in the near future. The Eco Technologies Company will continue to

develop and sell refuse collection vehicles capable of coping with environmentally-harmful waste not only within Japan but also in Asia, including China.



FHI's technologies being utilized in refuse collection vehicles playing an active role overseas.

Products Contributing to Recycling Society

Fuswtan, a Refuse Conveyance System for Skyscrapers

In high-rise office buildings that require further recovery of resources, efficient vertical conveyance of refuse has been demanded in recent years, rather than conventional manual conveyance by elevator. Fuswtan is a refuse

conveyance and sorting system, where refuse input from each floor is left to fall without damage by controlling the speed of the fall with pressure control, and recyclable waste is sorted according to types for efficient resource recovery.

Railroad Memorial Museum

The Railroad Memorial Museum was established to preserve the history of our railroad cars production after withdrawal from that business. The storage hall stores and exhibits representative cars FHI produced, including the rail bus for the Tarumi Railway manufactured in 1984. The material hall stores the history of wagons in materials by exhibiting photo panels of representative cars and their production processes together with commemorative products, as well as accumulated photos and materials from a line of cars. The Museum, which is open regularly, is utilized as a spot for communication among local residents and retired employees, along with a square having a green in front of the museum as a relaxation space for employees.



Overview of the Railroad Memorial Museum



Inside of the Railroad Memorial Museum

Clean Enterprise*1

FHI's Clean Enterprise has been working on developing various mobile robot products since 1991. We manufacture and sell cutting-edge elevator-interfaced cleaning robots for energy and labor conservation in building cleaning, outdoor cleaning robots which played

an active role in the Aichi World Expo, as well as an ozone deodorizing and purifying device and waste weighing system for building.

We will continue to provide highly-practical products in the field of service robots, where demand is set to continue growing.



Elevator-interfaced cleaning robots



Articulated container transportation robot for pharmaceutical companies



Outdoor cleaning robot which played an active role in the Aichi World Expo



Landmine detection robots and our staff who conducted their verification testing in Croatia

* 1 : The Clean Enterprise changed to the Clean Robot Department, Strategy Development Division of the Head Office as of July 1, 2006 following organizational changes.

Activities of Offices



Location : Shinjuku-ku, Tokyo, and Kita-ku, Saitama City, Saitama Prefecture
Business profile : Planning, marketing and sales of Subaru products, and corporate operations
Employees : 564 persons (Shinjuku and Omiya)



Location : 3-9-6, Osawa, Mitaka, Tokyo
Main business : Research and Development, Experiment of automotive engine and transmission, Research and Development of Subaru products
Number of employees : 982



Head Office (Shinjuku Business Site, Omiya Business Site)

We have been promoting the Eco Office Activities*1 in the Head Office area, involving all employees in environmental conservation activities, utilizing relevant information disseminated over the intranet, educating employees and periodically implementing EMS self-diagnosis. In fiscal 2005, we achieved our goals in respect of energy consumption in the offices (a reduction of 7.0% compared with the previous year) and paper consumption (a reduction of 14.3% compared with the previous year).

In addition, we reviewed the disposal and ordering methods of sales promotion items, which had previously been landfilled once they became unnecessary, and achieved complete recycling in fiscal 2004.

From fiscal 2006, all employees, including those at the Omiya Business Site, have been promoting EMS activities, focusing on our core business operations that relate to customers and employees.

Tokyo Office

The Tokyo Office promotes environmental activities under the theme of its environmental policy, "Provide Clean Power Units", considering how essential operations at each division affect the environment. We achieved zero emissions in September 2003 and have maintained that level ever since. We also conduct emergency drills and fire drills periodically to prepare ourselves for environmental incidents, as oils and chemicals are used for experiments and research at our properties.

As part of activities contributing to local communities, we have been assisting neighboring elementary schools in conducting their social studies classes since fiscal 2004, offering them opportunities for office tours combined with preparatory lectures. In fiscal 2005, we invited 6 elementary schools (about 500 students) to study automobile history and car manufacturing at Subaru, and provided them with opportunities to experience an environmental test room where the air temperature is set at -30°C and an anechoic chamber where sounds do not rebound, as well as design studio tours. The children who participated in these activities were all amazed and gained a deep interest in automobile development, something they would not have experienced in their daily lives. We will continue this assistance.

Achievements under the Fiscal 2005 plan

Item	Fiscal 2005 achievement
Electricity	1.0624 million kwh (7.0% reduction compared to the previous year)
Paper	23.8ton (14.3% reduction compared to the previous year)

Achievements under the Fiscal 2005 plan

Item	Fiscal 2005 achievement
Electricity	25.5982 million kwh (3.5% reduction compared to the previous year)
Paper	5.01 million sheets (10.4% reduction compared to the previous year)

Topics of Fiscal 2005 activities



The Operations Improvement Case Study Presentation is held every year to disseminate outstanding cases as examples to other divisions



Education is implemented over our intranet, and 760 persons, including temporary and part-time employees, received e-learning training in fiscal 2005

Topics of Fiscal 2005 activities



Social studies tour of fifth-grade elementary school students, watching a car being tested



Social studies tour of fifth-grade elementary school students, intrigued by the clay models



A bulletin board for separation and disposal at Subaru Parts & Accessories Division in Omiya



We participate in social contribution activities as well, donating collected stamps, telephone cards and pull-tabs



A fire drill assuming a large-scale natural disaster



An emergency drill using fire extinguishers

* 1 : Eco Office Activities are activities such as the organization and arrangement of office-related items, the turning-off of lights during lunchtime, the proper temperature control of air conditioners and the reduction of office paper consumption, in which all employees participate in order to promote environmentally-friendly office operations.