

## Research and Development

# Honing Our Technologies and Promoting R&D with a Free and Open Spirit

Since its establishment, Honda has undertaken research on humans and focused on “being useful to people through technologies.” Outside Japan, Honda is called Honda Motor while in Japan, our birthplace, our corporate name is Honda Giken Kogyo. The word “giken” stands for “technology research” and encapsulates our desire to hone our technologies and contribute to enriching and raising the quality of people’s lives.

In 1960, Honda spun off the research and development division as a separate entity with the founding of Honda R&D Co., Ltd. By doing so, an independent R&D structure that further invigorates creativity through an open environment was established, enabling Honda to create original technologies and products, and contributes to the further development of the Company.

Honda R&D operates highly efficient development structured into the motorcycle, automobile and power products businesses—as separate R&D centers—in accordance with the products and market characteristics of each business. Honda R&D promotes wide-ranging in-house development that encompasses products as well as technologies for raw materials and elements. This has enabled Honda to gain a deep understanding of these technologies and allowed for the creation of proprietary technologies and products using unique concepts. The research centers share and research results with one another for effective usage. Moreover, Honda R&D undertakes R&D globally and works to develop products matched to local markets and gathers information on leading-edge technologies and markets in each region.

Honda established the Fundamental Technology Research Center in 1986. The center has carried out a diversity of forward-looking research in such areas as fuel cells, robotics, and aircraft and aircraft engines. The center is promoting development in these fields toward practical use and some products have already been commercialized.

Aircraft research and development made a transition from the Fundamental Technology Research Center to a volume production development organization. These efforts bore fruit at the end of 2015 with the certification of the HondaJet. This aircraft realizes high performance and comfort using the non-conventional concept of mounting the engines above the wings.

Honda’s unrestrained creative powers that are not bound to the status quo are continuously utilized in the research and development of all Honda products.

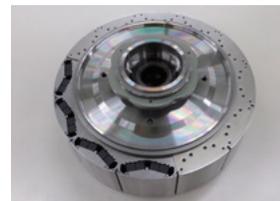
### T O P I C S

#### Reducing Resource and Supply Chain Risk Using a Magnet Completely Free of Heavy Rare Earth Elements

Honda and Daido Steel Co., Ltd. became the world’s first companies to achieve practical application of a neodymium magnet containing no heavy rare earth and that can be used in the driving motor of a hybrid vehicle. This neodymium magnet was applied to the all-new Freed minivan. Neodymium magnets, which have the highest magnetic force among all magnets in the world, are being used for the drive motors of electric vehicles. Heavy rare earth is added to the neodymium magnets as a conventional method for securing high heat resistance. However, major deposits of heavy rare earth elements are unevenly distributed around the world and are also categorized as rare metals. For these reasons, reducing the usage of heavy rare earth elements is a major issue. The use of this technology will make it possible to avoid resource-related risk, reduce costs and diversify procurement channels.



Magnet completely free of heavy rare earth elements



Rotor for i-DCD drive motor

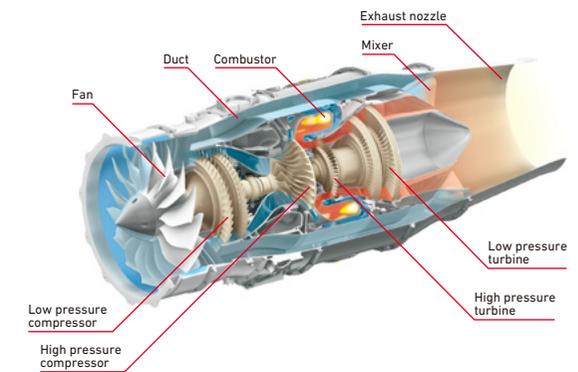
### T O P I C S

#### Leading the Way in Environmental Performance of Small Jet Engines

Honda started research on aircraft engines in 1986. These engines were mounted on the HondaJet, which was under development as a business jet, and full-scale flight testing was performed in 2003.

Jointly developed with GE, the HF120 turbofan engine obtained Type Certification in 2013 and boasts the highest thrust-to-weight ratio in its class as well as high endurance reliability. The fan, which requires a particularly high level of technology, meets the difficult challenge of attaining the highest degree of balance among ruggedness, performance and lightness giving consideration to safety as a top priority. The engine realizes low fuel consumption through the intake of larger amounts of air as well as efficient compression and combustion to obtain large thrust. At the same time, the engine assures sufficient strength for withstanding the intake of foreign objects during flight to raise safety.

In this way, the HF120 achieves top-of-class environmental performance and leads the industry.



Perspective diagram of the HF120 turbofan engine