Feature

MRJ: Driving a Leap Forward to the Next Generation

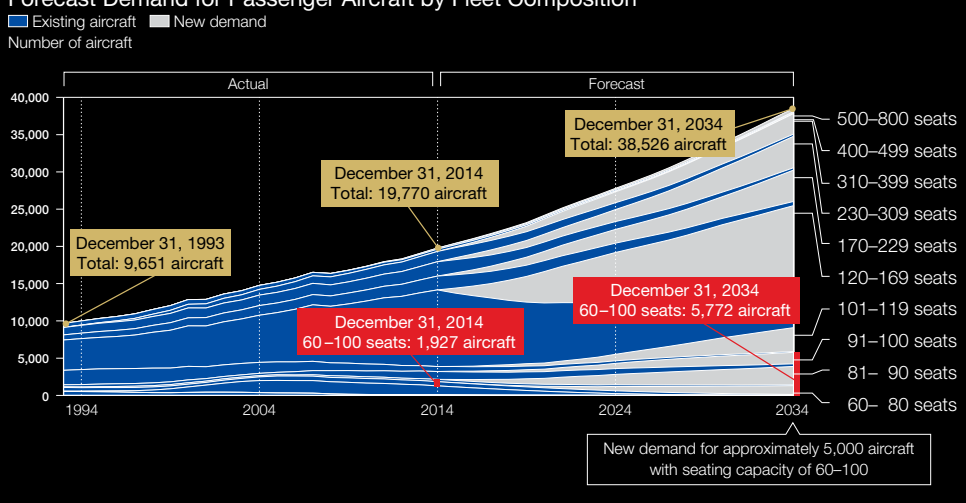
"Mitsubishi Aircraft will fulfill a long-cherished wish of the Japanese aircraft industry, leveraging technological expertise that MHI has built up through its aerospace business." These words are from a March 28, 2008, press release announcing MHI's decision to officially launch the Mitsubishi Regional Jet (MRJ) program. Seven years have elapsed since then and more development time has been required than we initially anticipated, but a schedule for the first delivery of the new aircraft has now been set. In this Special Feature, we introduce the MRJ project, a core element of MHI's growth strategies for the future and a bold undertaking to create a business model that goes beyond the scope of conventional manufacturing.

The Expanding Regional Jet Market

As the name "Mitsubishi Regional Jet" suggests, the MRJ program is focused on developing a regional jet, which is a passenger aircraft that can carry between 60 and 100 passengers and is aimed at flights between regional cities. As of December 31, 2014, 1,927 regional jets were in operation worldwide, mainly in the U.S. and European markets. In line with ongoing economic development, further routes are expected to open up within Asia and Latin America. As a result, during the next 20 years new global demand is forecast to total around 5,000 aircraft, approximately tripling the number of regional jets in operation. Against this backdrop, efforts are under way to reduce per-passenger costs by increasing the size of regional aircraft, which are currently concentrated on the 50-seat class. At the same time, some major airlines are looking to transfer the operation of certain low-demand routes to subsidiaries, which is likely to prompt demand toward smaller aircraft than those that carry 100 or more passengers. Given these trends, market demand for aircraft in the 70–90-seat class, to which the MRJ belongs, is expected to reach 3,500 units. In addition to the MRJ, the regional jet market currently includes aircraft from two leading manufacturers and two that have recently entered the business. One of the leaders is expected to introduce a next-generation aircraft in the 90-seat class in 2020, becoming an effective competitor to the MRJ.

Achieving profitability in the aircraft business is typically a lengthy process, as the business requires large-scale initial investment. Also, production quantities are limited, so realizing economies of scale is more difficult than in the automotive business. Furthermore, difficulties exist in addition to those encountered in development and manufacturing, as all development processes up to customer support must be certified for safety. The barriers to market entry are thus extremely high, but on the other hand, this business is said to generate stable returns once established.

Forecast Demand for Passenger Aircraft by Fleet Composition



MHI's Cultivation of Aircraft Technology

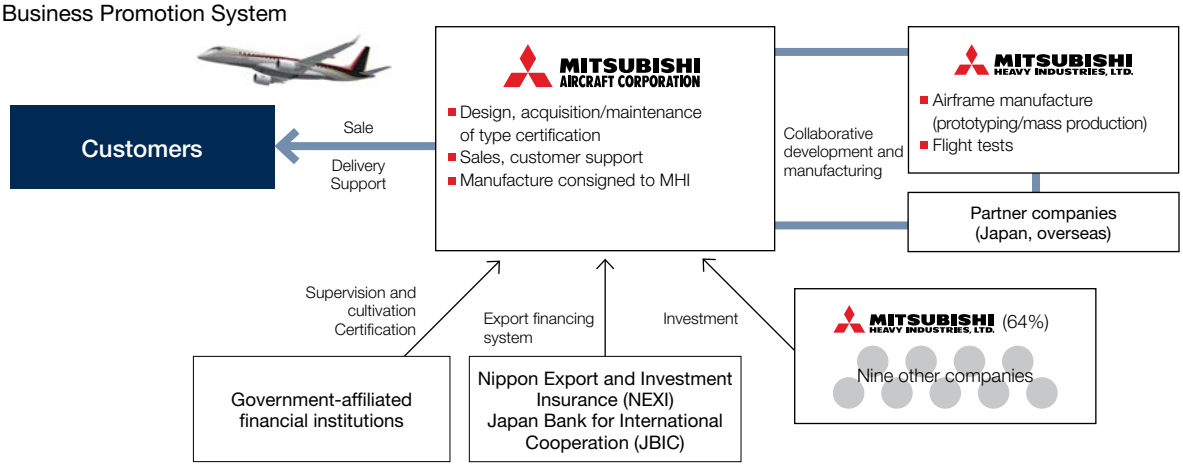
MHI began manufacturing aircraft in 1919, and with the Zero Carrier Fighter it was Japan's leading manufacturer of fighter aircraft. Before World War II, the Company was a leading aircraft developer as well. Following the war, however, in 1945 the General Headquarters (GHQ), or Supreme Commander for the Allied Powers, enacted a ban on the Japanese aircraft business that lasted seven years, putting a stop to the country's advancement in development technologies.

Thereafter, in the 1960s MHI participated in a joint development project led by the national government to produce the YS-11 passenger aircraft. We played a central role in manufacturing and customer support. However, manufacturing under this project ceased in 1972 due to worsening profitability, and no passenger aircraft were developed in Japan in the following decades. Even during this fallow period, MHI continued to nurture its aircraft technologies by manufacturing structural components for Boeing and developing defense-related aircraft and compact business jets.

In the 2000s, we launched a compact aircraft development project with the aim of fostering broad-based invigoration of the aircraft industry, and in 2003 we began considering development and launching this initiative as a business. From that point, MHI continued to solicit input from the airlines—future customers—and carefully studied competitors' operations and specification details. These efforts culminated with the formal decision to launch a business in 2008, boosted by an order from All Nippon Airways Co., Ltd.

MHI established Mitsubishi Aircraft Corporation with a 64% stake. This company operates as the main development entity, conducting overall design, development, and manufacture, as well as overseeing the suppliers that develop and manufacture aircraft components. Today, a total of 2,300 MHI and Mitsubishi Aircraft employees are moving the MRJ development project forward.

MRJ Business Promotion System



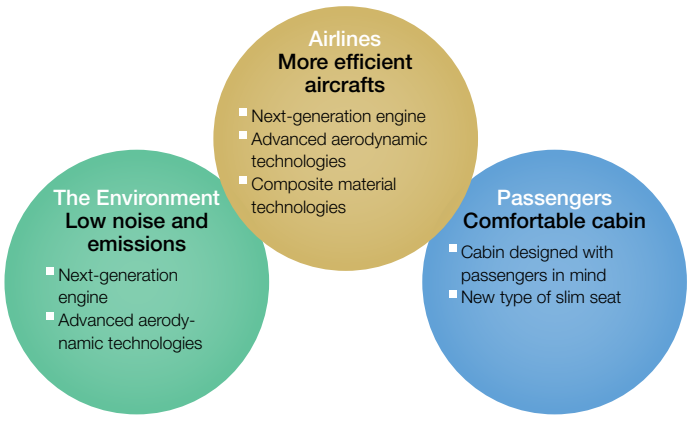
A Next-Generation Regional Jet Offering Unprecedented Value

Employing cutting-edge technology, the MRJ is a next-generation regional jet that offers top-class operational economy and cabin comfort. Superior operational economy is this jet's most outstanding characteristic. In addition to advanced aerodynamic design and composite material technologies, the MRJ uses the newest Pratt & Whitney engine with optimized fan and low-pressure turbine speed. As a result, the MRJ is expected to achieve 20% better fuel economy than conventional jets in the same class. As fuel consumption typically accounts for around 40% of aircraft operating costs, this savings should contribute substantially to airline profitability. Furthermore, a structural design featuring higher levels of strength and durability is expected to greatly reduce inspection frequency, dramatically reducing maintenance costs.

Thanks to its state-of-the-art engine, the MRJ will deliver reduced emissions, including of CO_2 and nitrogen oxides (NO_x), as well as substantially lower noise. Through its environmentally harmonious features, the jet will contribute to the competitiveness and social acceptability of its recipient airlines.

As well as airlines and the global environment, the MRJ will provide value to passengers by offering a level of comfort not found on conventional regional jets. The slim seat design gives the MRJ one of the widest seats in its class, and ample overhead space is provided for the storage of medium-sized roller bags. The MRJ also earns high marks from airlines on this front, as comfortable cabin space is a differentiating factor for them.

Providing New Value for Airlines, the Environment, and Passengers



Growing Pains as a Complete Aircraft Manufacturer

In carrying out the MRJ project, MHI and Mitsubishi Aircraft Corporation have had to draft and design the overall passenger aircraft concept, conduct project management that involves supervising scheduling among suppliers of various parts around the world, and create a value chain spanning such post-manufacturing aspects as sales, financing, and customer support. These activities require a different skill set than we have cultivated in our conventional manufacturing business to date, so we had to devise a new business model.

As passenger aircraft have a huge number of structural components, process management is difficult. Furthermore, because authorization (type certification) from national aviation authorities is required, developing a complete aircraft according to plan is not an easy task even for highly experienced leading manufacturers in Europe and the United States. Even a small passenger aircraft such as the MRJ has approximately one million parts—around 30 times the number in a typical automobile. The complete manufacture of our first passenger jetliner was a trial of project management for us, and we had to revise the production schedule three times.

The first schedule change was due mainly to additional design work. This revision included a switch from carbon-fiber composite materials to metals in the main wing. Also, based on hearings with airline customers, we increased the amount of cabin space and consolidated the cargo hold. Owing to ripple effects from the first revision, the second and third schedule revisions were necessary to ensure safety in anticipation of type certification.

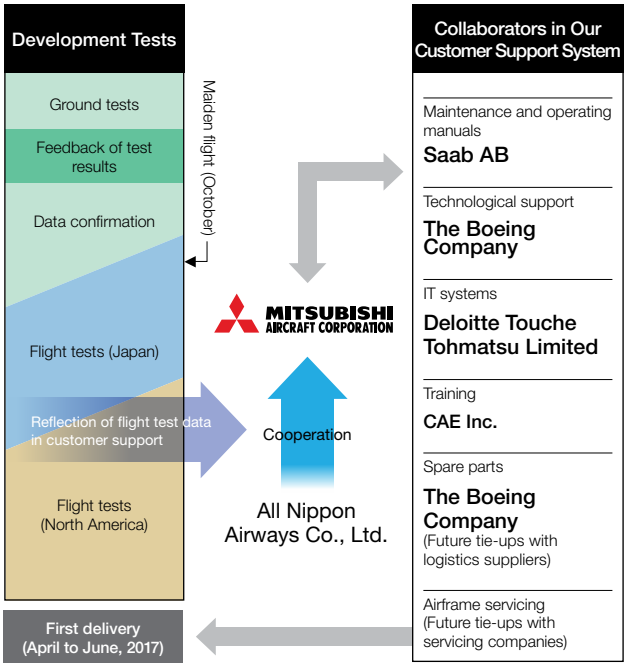
Overcoming Unavoidable Obstacles

Type certification is a government review process to ensure that a commercial aircraft's design satisfies standards for safety and environmental compatibility. Without this certification, an aircraft is not allowed to operate. Obtaining type certification is said to be more difficult than getting an airplane off the ground. For a newcomer such as us, this process presented the highest hurdle. One objective of the upcoming flight and strength tests we are scheduled to undertake in Japan and the United States on seven aircraft is to acquire results to be reflected in the MRJ's design. The biggest reason, however, is to accumulate the massive quantity of data required for type certification.

We also face a number of issues in addition to type certification. One of these issues is the configuration of a customer support system. Whereas our competitors already in the aircraft business have an infrastructure in place, we have to create the infrastructure elements that will be required post-delivery, such as maintenance and operating manuals, the provision of spare parts, aircraft maintenance and repairs, and crew training. Through alliances with Boeing and the All Nippon Airways Group, our launch customer, at the time of our first delivery we expect to have a 400-strong customer support system in place.

Creating a structure for mass production is also important. We are moving steadily forward in this regard by maximizing the use of our own bases and those of Mitsubishi Aircraft. We expect to begin ramping up operations at our mass production plant in early 2016, allowing us to produce up to 10 aircraft per month.

Overview of Schedule Leading up to Initial Delivery



Steps to Achieving Profitability

Our efforts to secure orders for the MRJ are proceeding steadily. We received our first order in 2008, from All Nippon Airways, and as of September 30, 2015, we have received orders for 407 aircraft, including purchase rights and options. We believe these results reflect positive evaluations of the MRJ's strengths, such as superior fuel and environmental performance and passenger cabin comfort, as well as recognition of "made-in-Japan" reliability.

The next-generation aircraft in the 90-seat class that a competitor plans to introduce in 2020 will employ the same state-of-the-art engine as the MRJ, but otherwise the aircraft will be based on that company's existing aircraft. In comparison, the MRJ airframe has been designed to take full advantage of this engine's performance by minimizing air resistance, so our competitor is unlikely to surpass our fuel performance.

We expect accumulated losses from the MRJ development project to peak in fiscal 2017, coinciding with our initial delivery, and we anticipate loss levels will improve following the introduction of our next Medium-Term Business Plan. The current period of our 2015 Medium-Term Business Plan will be one of up-front investments, but these capital investments and losses have already been factored into our earnings performance targets.

MRJ Orders (As of September 30, 2015)

ANA	25
Trans States Holdings	100
SkyWest, Inc.	200
Eastern Air Lines	40
Air Mandalay	10
JAL	32
Total	**407**

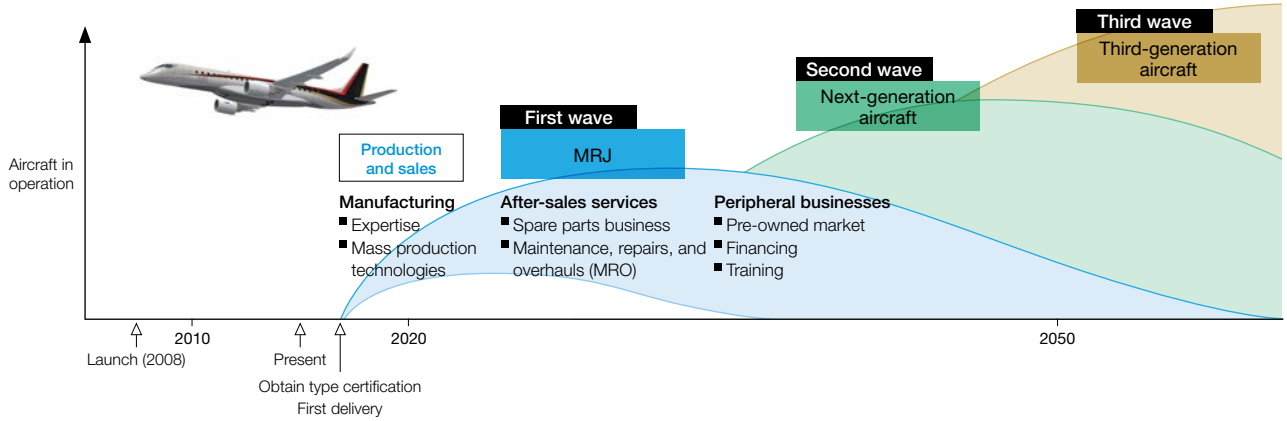
Note: Includes aircraft other than confirmed orders (purchase rights, options)

A Future Catalyst for Domestic Industry

The aircraft industry requires a huge number of parts and generates demand for after-sales services and other peripheral businesses. For these reasons, we believe that continuing as a complete aircraft manufacturer even beyond the MRJ will provide a new pillar of growth for the domestic industry. On a shipment value basis, the scale of Japan's aircraft industry is currently around ¥1.3 trillion, one-fortieth of the size of its automotive industry. By comparison, the U.S. aircraft industry is 12 times as large, and the United Kingdom and France have aircraft industries three times the size of that of Japan. As a country that excels in manufacturing, it should not be inconceivable for Japan to develop an aircraft industry on a par with those countries.

The MRJ program is also beginning to contribute to the invigoration of Japanese industry at the regional level. At our Matsusaka Plant in Mie Prefecture, for example, we plan to develop a cluster for wholly integrated manufacturing and supply of aircraft parts by companies that specialize in processing such parts. The business is beginning to invigorate regional industries as well. We expect the market for aircraft other than regional jets to grow steadily, prompted by development in emerging countries. For these reasons, with the MRJ we hope to contribute not only to our own performance but also to the medium-to-long-term expansion of Japanese industry.

Expansion of Japan's Aircraft Industry by Continuing Our Business as a Complete Aircraft Manufacturer



VOICE

We are hoping the MRJ will become part of the fleet that allows ANA to realize its management vision.

This autumn the MRJ will be making its maiden flight. Many people around the world are looking forward with anticipation to the first flight of a domestically manufactured commercial aircraft in 53 years, since the YS-11. We have been working as a collaboration partner on the MRJ since ANA became the launch customer in 2008. We have made hundreds of requests aimed at increasing the MRJ's comfort and making the aircraft more attractive for airlines in terms of ease of operation and maintenance. The maiden flight will be the moment when the aircraft embodying all these changes will take off into the skies. Following that first flight, we are scheduled to receive our first aircraft in 2017. As ANA's management vision states, "It is our goal to be the world's leading airline group in customer satisfaction and value creation." We are hoping the MRJ will become part of the fleet of aircraft essential for achieving that vision.

Hiroshi Kobayashi
General Manager
Nagoya Engineering Office
Engineering & Maintenance Center
All Nippon Airways Co., Ltd.