

# Aerospace Systems Business Operation

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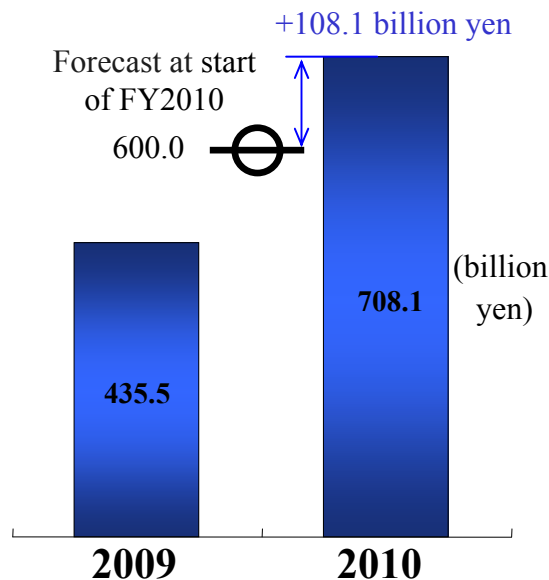
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# 1. FY2010 Overview

## Orders

Increase of 272.6 billion yen from previous fiscal year by the increase of MRJ and defense related products.  
(+108.1 billion yen compared to plans at start of the period)

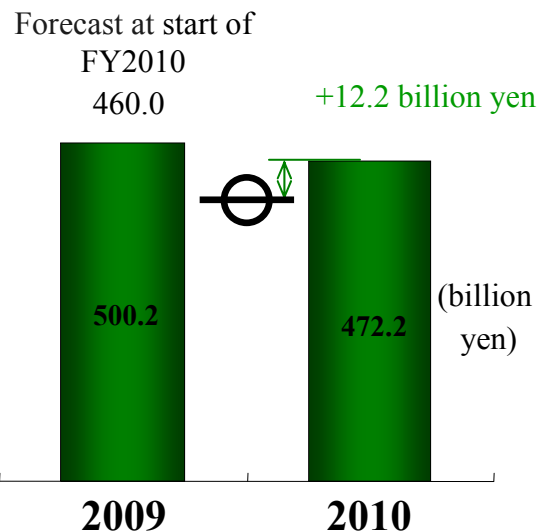


## Sales

Decrease of 28.0 billion yen from previous fiscal year  
(+12.2 billion yen compared to plans at start of the period)

### - Aircraft deliveries

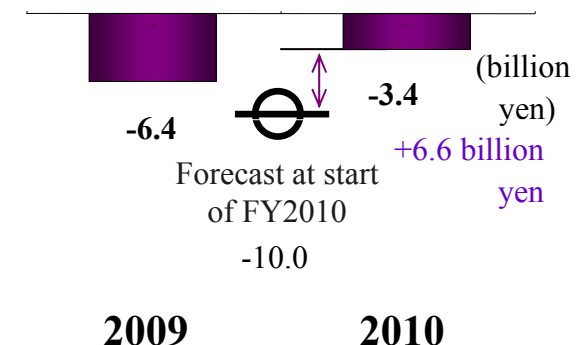
**B777 63 airplanes**  
(-19 planes YOY)  
**B787 17 airplanes**  
(+2 planes YOY)



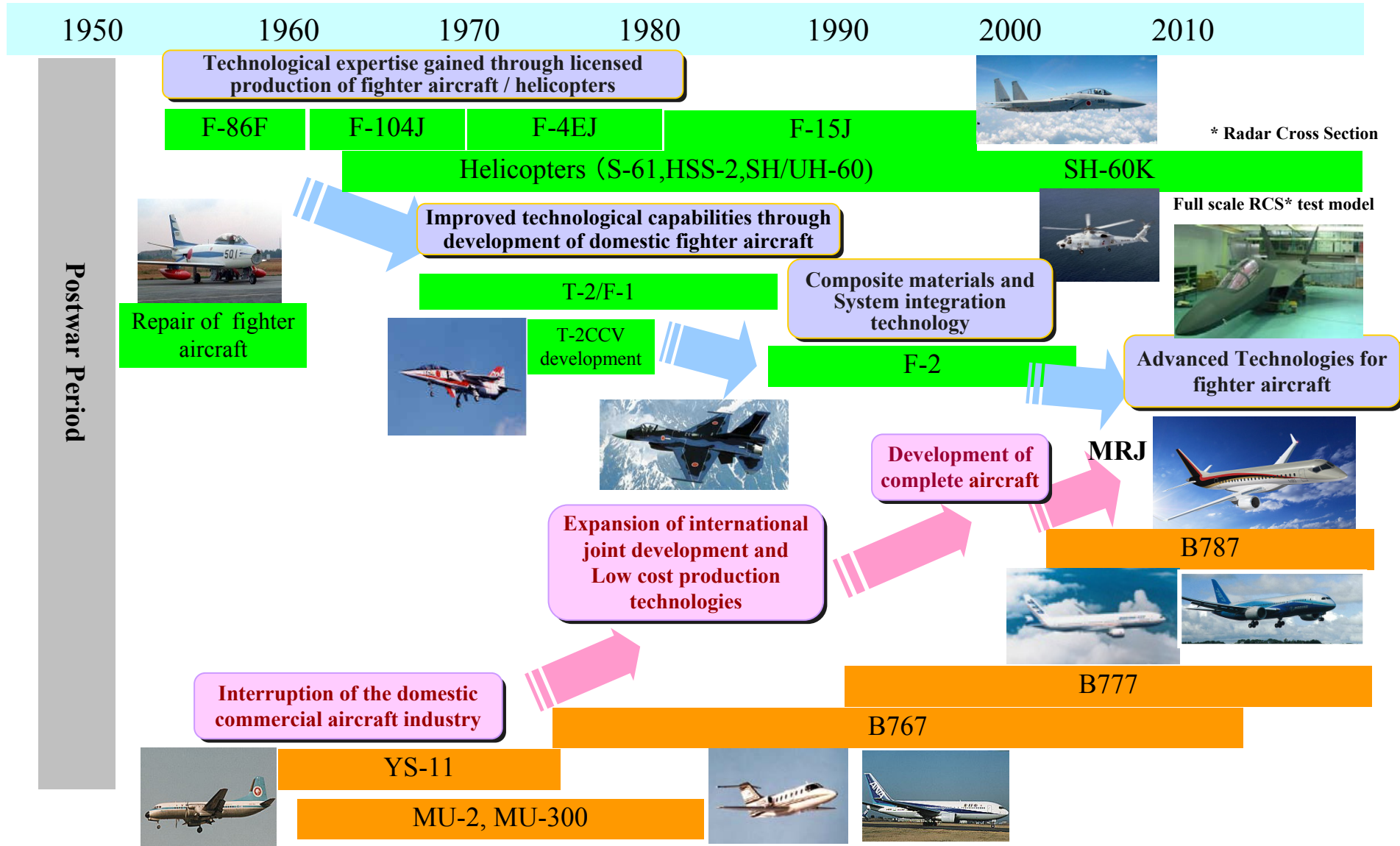
## Operating income

Deficit reduction by 3 billion yen from previous fiscal year  
(+6.6 billion yen compared to plans at start of the period)

Despite the impact of the high yen trend on foreign exchange rate, the deficit was reduced from the previous year by improving profitability of commercial aircraft.



## 2. Changes in the Business Environment and Target of the 2010 Business Plan (1) Overview of the Aircraft Business

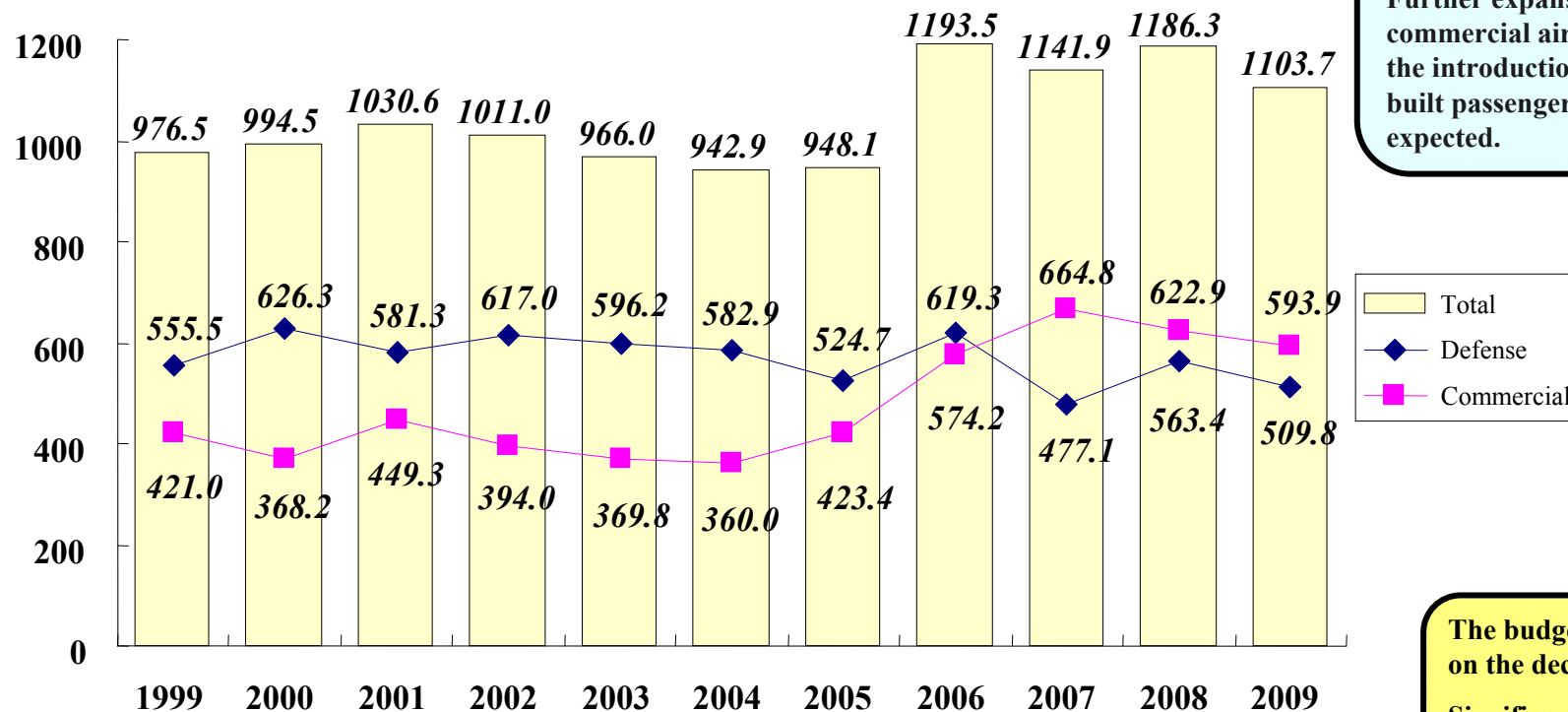


## (2) Changes in the Business Environment

### Production in the Japanese aircraft industry

In 2007, commercial aircraft production exceeded defense.

(billion yen)



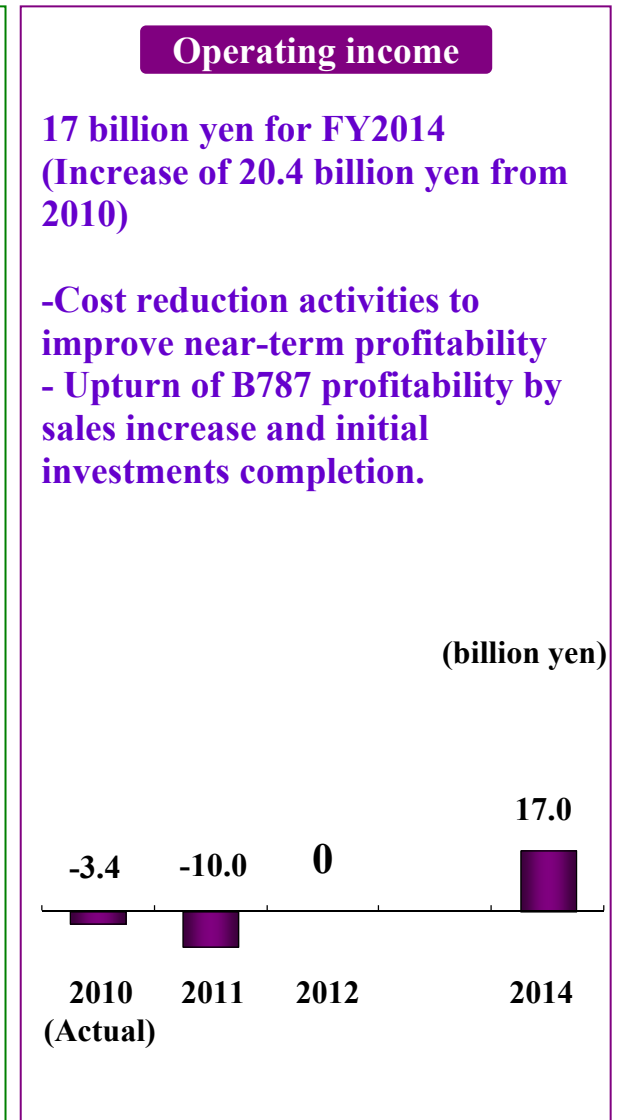
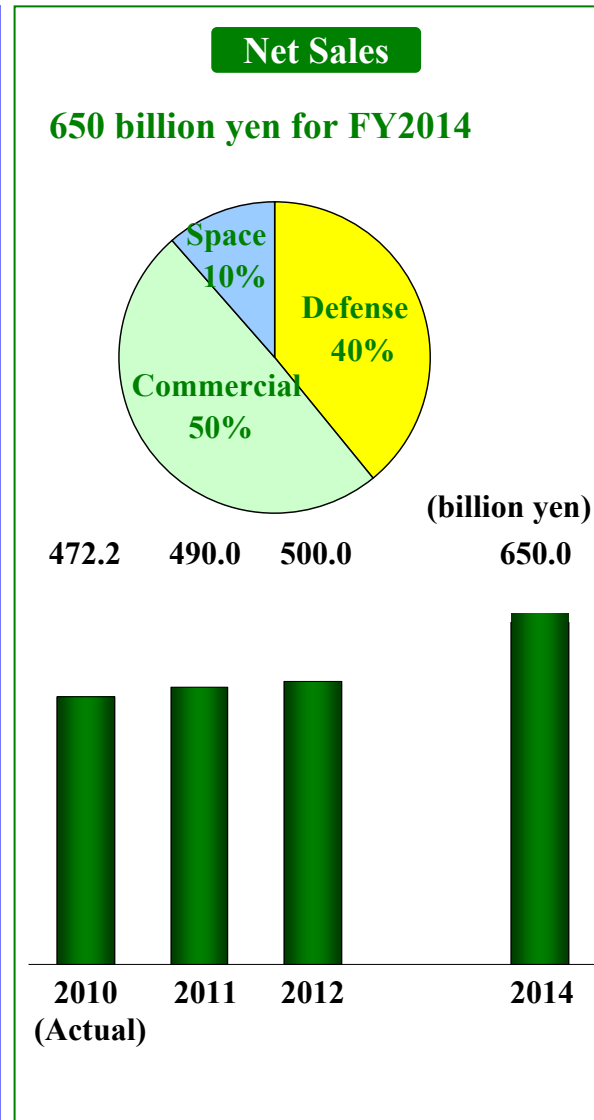
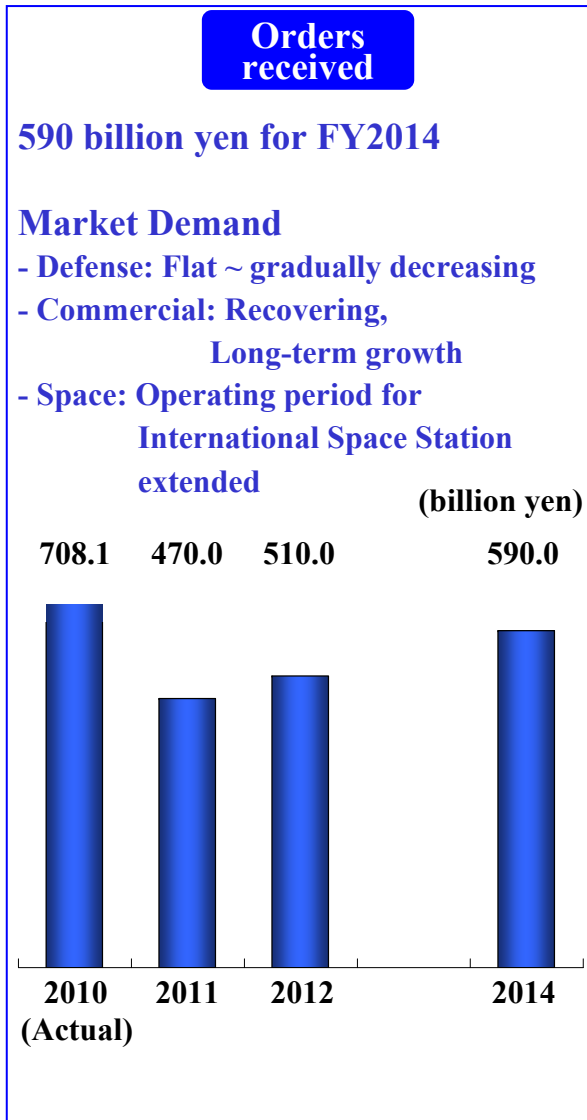
In the next 20 years, demand for passenger aircraft will grow 2.5 times in the world. Further expansion of commercial aircraft market by the introduction of Japanese-built passenger airplanes is expected.

The budget for defense is on the decline.

Significant demand growth could not be expected in the future.

Based on the results of a survey by The Society of Japanese Aerospace Companies

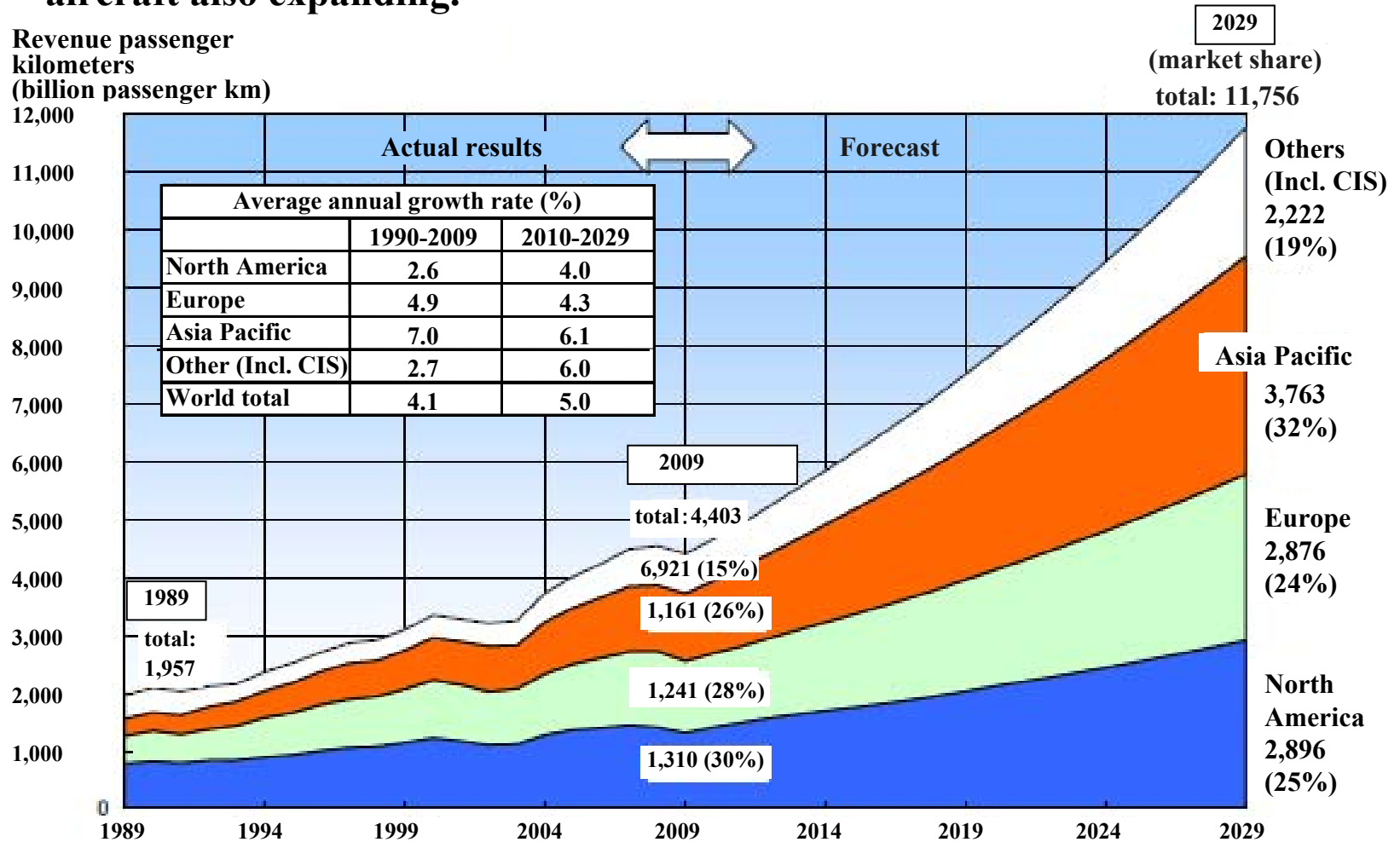
## (3) Target of the 2010 Business Plan



### 3. FY2011 Business Operation Policy

#### (1) Commercial Aircraft (i) Demand for Aircraft Passengers

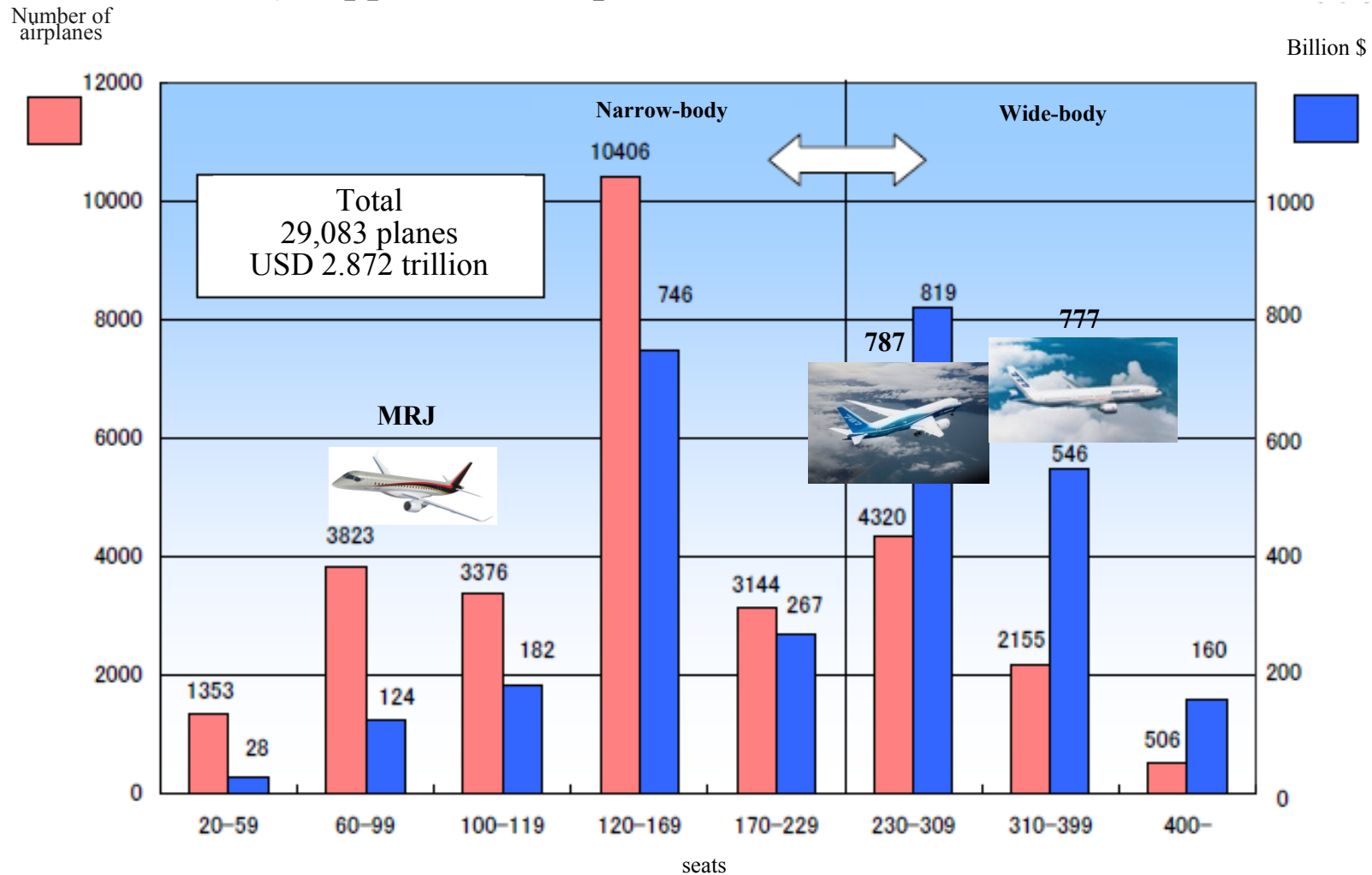
**Demand for international aircraft passengers: High growth expected in the long term (more than 2.5 times in 20 years). Demand for commercial aircraft also expanding.**



Source: Japan Aircraft Development Corporation

## (ii) Market Trend by Airplane Size (Number of Seats)

**Demand forecast for new airplanes over 20 years (2010-2029): Approx. 29,000 planes**



Source: Japan Aircraft Development Corporation



## (iii) Commercial Aircraft: Business Strategy

### Market

Demand for aircraft is right on track for recovery by airline companies' recovering business vitality, and continued growth in emerging nations. Long-term expansion can be expected.

### Business Strategy

Increase earnings by optimizing the portfolio of complete aircraft (MRJ), Joint development under the international cooperation (787 etc.), and Aeroengines (Trent1000 etc.)

#### (1) Complete aircraft and Joint development

-At present, secure profits with a focus on the 777 and other joint developments under the international cooperation with Boeing.

-Establish dual earnings sources by adding the MRJ in the future

-To counter the strong yen, promote measures to reduce foreign exchange rate fluctuations.

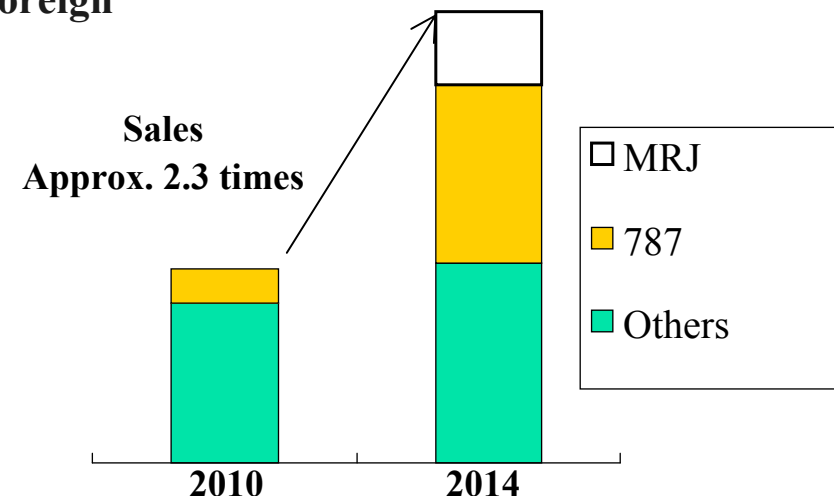
-Implement further cost-reduction.

#### (2) Aeroengines

-Create profit with aeroengines in production

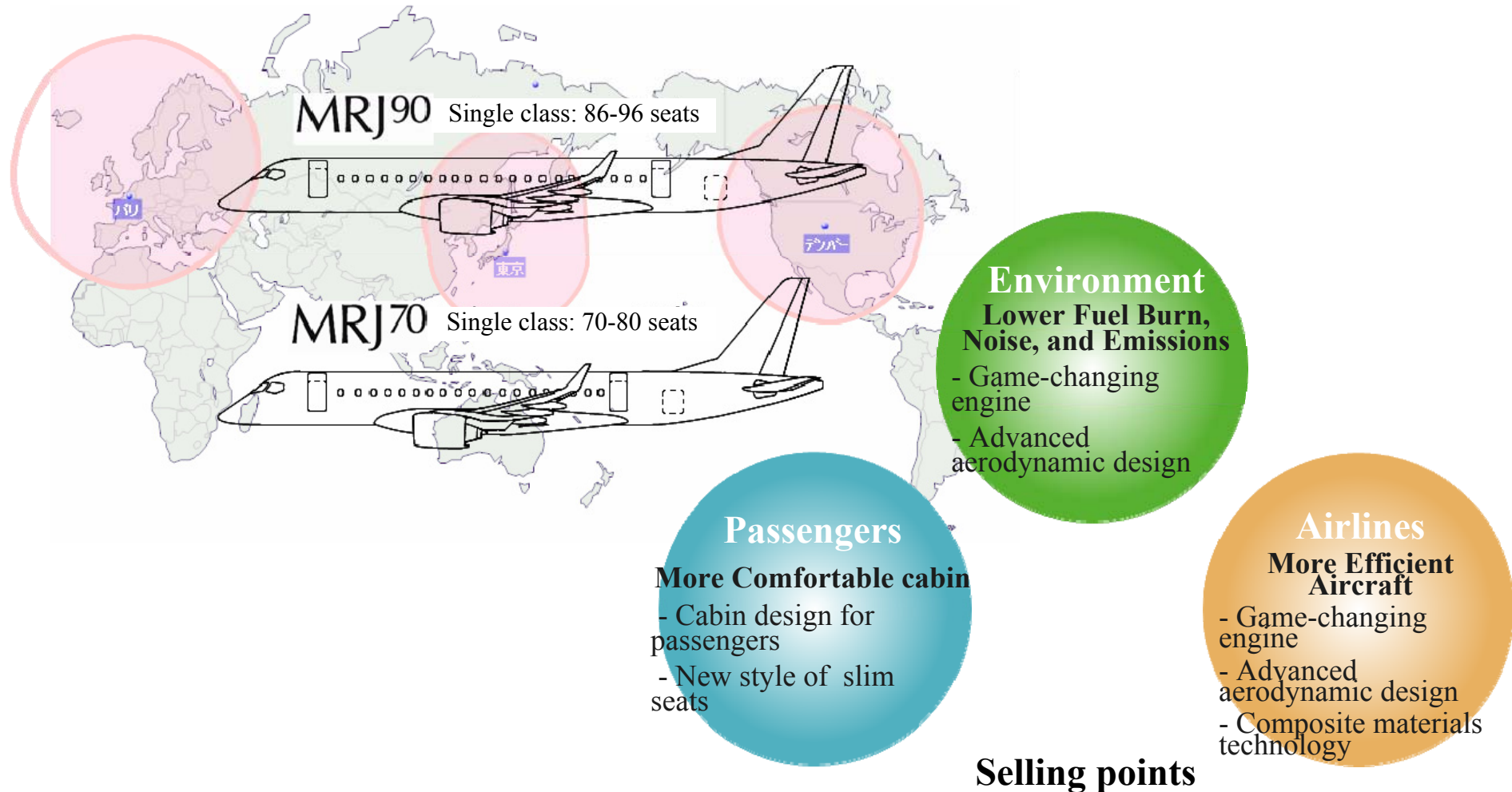
(PW4000, V2500 etc.)

-Development and smooth preparation for production for new aeroengines (Trent1000 etc.)

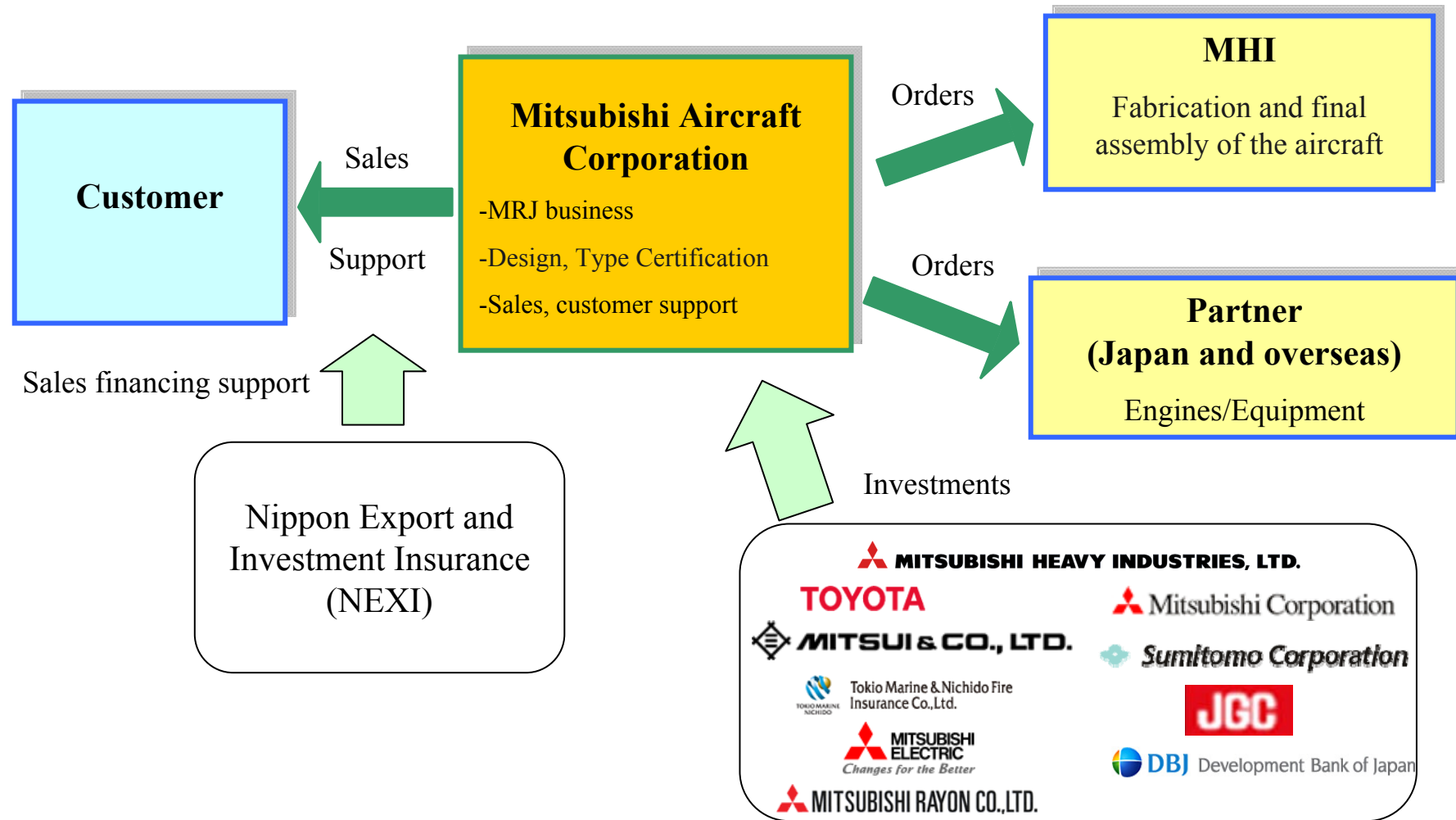


## (iv) MRJ: Product Concept

### Mitsubishi Regional Jet



# (iv) MRJ: Business Structure



## (iv) MRJ: Schedule

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### Development is in progress successfully

- ✓ 2007.10 Authorization to Offer (ATO)
- ✓ 2008.3 Launch (Concluded LOI with ANA for 25 airplanes (including 10 options))  
⇒ 2010.6 Definitive purchase agreement
- ✓ 2008.4 Started business as Mitsubishi Aircraft Corporation
- ✓ 2008.10 Established sales office in the United States
- ✓ 2009.9 Finalized the MRJ configuration (expansion of cabin space, integration of cargo space, main wing materials change)
- ✓ 2009.10 Announcement of the signing of LOI with Trans States Holdings, Inc. for 100 airplanes (including 50 options)  
⇒ 2010.12 Definitive purchase agreement
- ✓ 2010.9 From detailed designing phase to the production phase
- ✓ 2011.4 Start assembly work
- 2012 First flight (scheduled)
- 2013 Type Certification (scheduled)
- 2014 First aircraft delivery (scheduled)

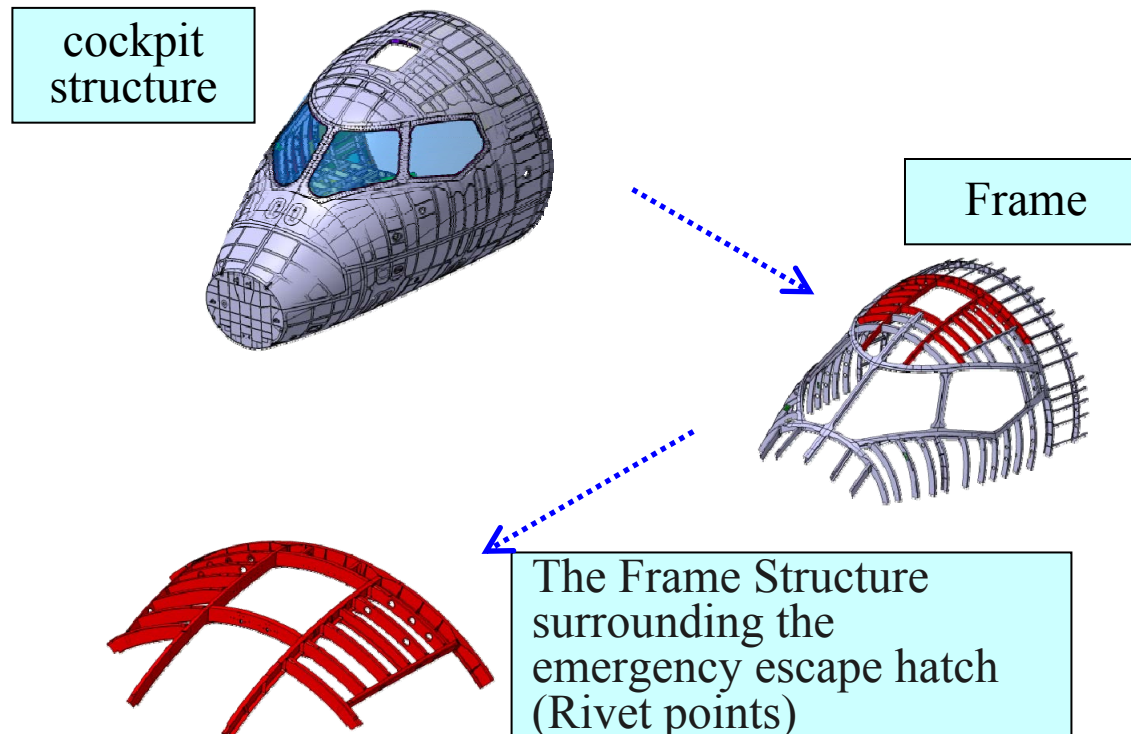


## (iv) MRJ: Start of Assembly Work

Started assembly work from April this year

Ceremonial rivet driving celebration was held at Nagoya Aerospace Systems Works on April 5, 2011.

Started the assembly of the frame structure in the cockpit roof of the aircraft for bird strike tests



## (v) Boeing 787: Schedule

Boeing is delivering the first aircraft to ANA in third quarter of this year (scheduled).

Sales/profit increase by production rate up to 10 shipsets per month.

- ✓ 2009.12 Successful first flight
- ✓ 2011.03 Firm orders for more than 830 airplanes
- ✓ 2011.04 MHI wings for 40 airplanes delivered
- 2011.3Q Type Certifications and delivery of first airplane (scheduled)
- End 2012 10 shipsets per month delivery (scheduled)



**First flight in December 2009**



**The wing loaded into Boeing Dreamlifter at Central Japan International Airport for air transportation**

## (v) Boeing 787: Productivity Improvement

**Improve production efficiency and implement automation to support production rate of 10 shipsets per month**

Expand facilities and introduce automated equipment to support production rate increase



Stringer end trimmer (Introduced)



Automatic laminator for stringers (Introduced)



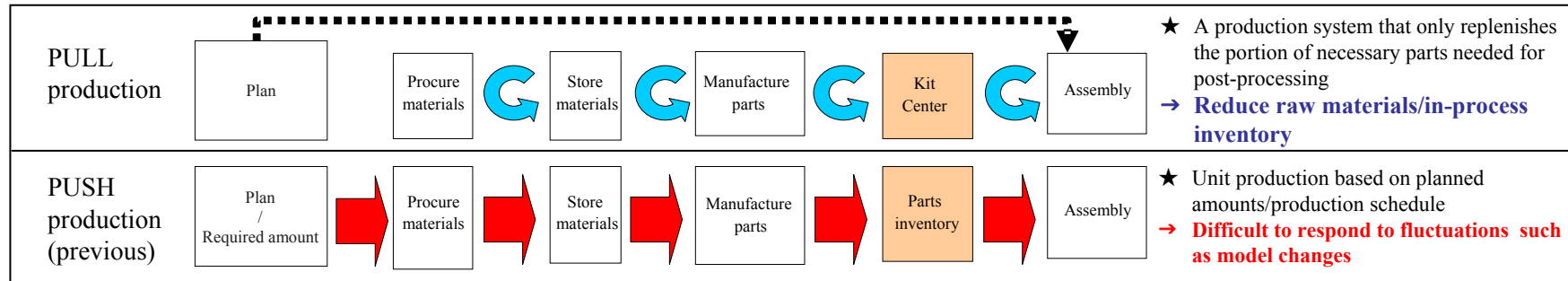
Water-jet cutting machine for skin (Expanded)



Composite material layup equipment (Expanded)

## (vi) Improvement of Commercial Aircraft Production Efficiency

### Improvements by means of PULL production process

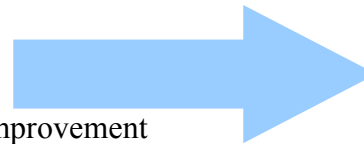


### Improvement by developing “moving line”



B737 flap assembly line

Before improvement  
Fixed style  
(work progress not visible)



After improvement

- Reduce production costs
- Improve quality

### Improvement by parts kit

Supply medium and small parts from Kit Center as necessary for immediate use on the assembly line

Example of B777 parts kit



Reduce lead-time



## (vii) Globalization of Commercial Aircraft Production

Promote overseas production as a measure to reduce fluctuations risk of foreign exchange rate (“dollar conversion of yen based costs”)

### Challenger 300 assembly work in Canada (MHICA)



**MHI Aerospace Canada, Inc.**  
**Mississauga on the outskirts of Toronto**



### B737 flap assembly in Vietnam (MHIVA)

**MHI Aerospace Vietnam Co., LTD.**  
**Thang Long Industrial Park, Hanoi**



## (viii) Improvement of Commercial Aircraft Profitability

### Profitability structure of commercial aircraft / Aeroengines

Because significant investment is necessary in development stage, initial burden of depreciation costs is high. Thereafter, profit/loss will be improved through production learning effect, efforts to keep costs reduction activities at the production stage, and full depreciation of initial investment

### Examples of cost reduction activities

#### (1) Materials cost

Buying in quantity, overseas procurement, blanket order

#### (2) Manufacturing cost

Improve production process (e.g. moving line, supply parts kits)

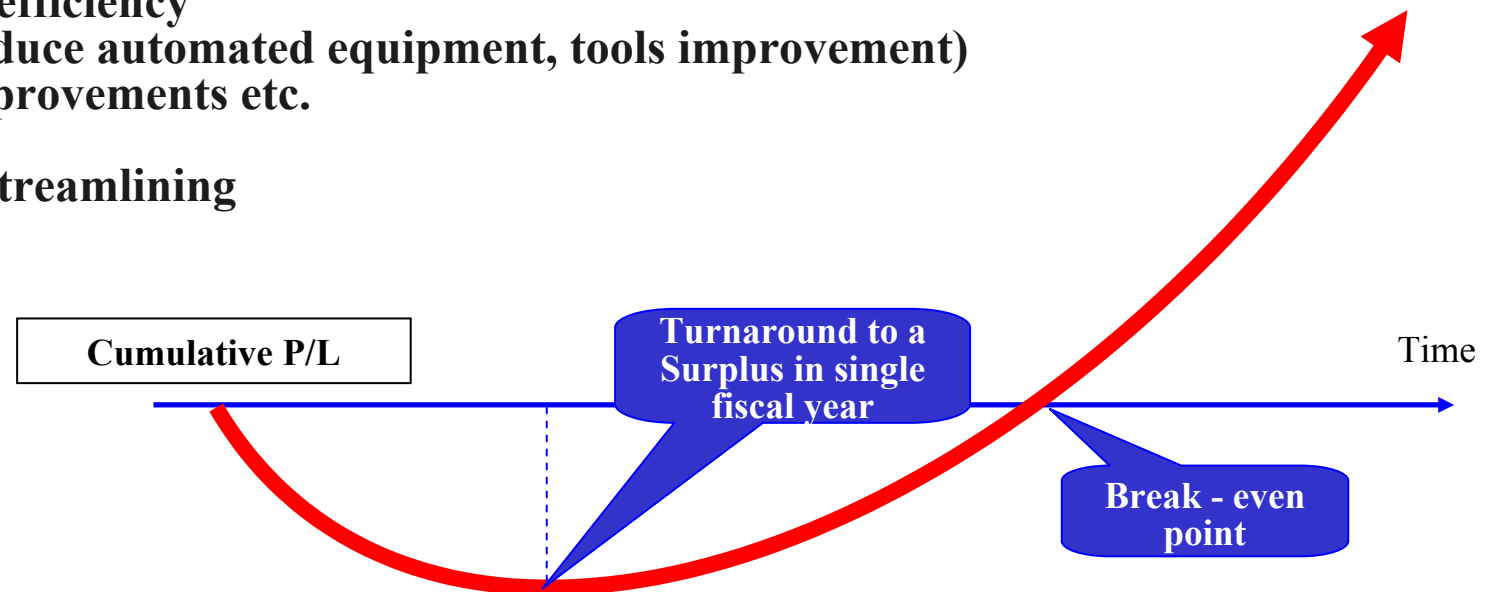
Invest for efficiency

(e.g. Introduce automated equipment, tools improvement)

Design improvements etc.

#### (3) Other

Logistics streamlining

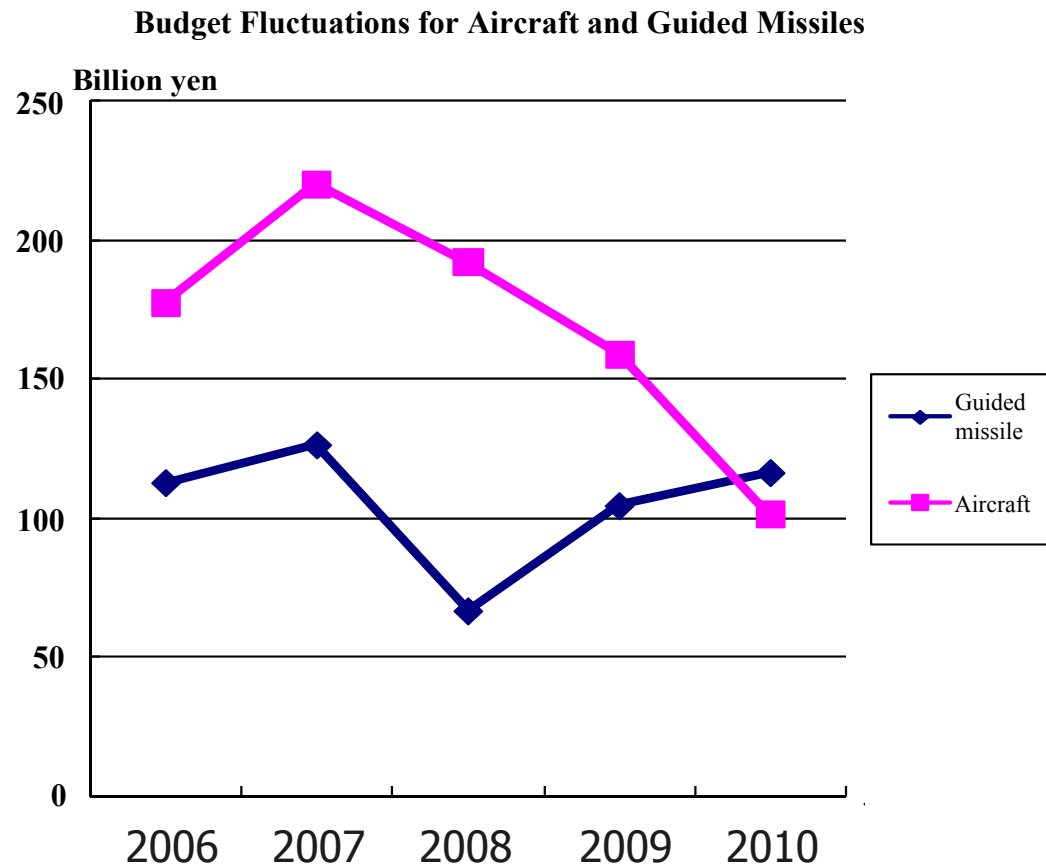


### 3. FY2011 Business Operation Policy

#### (2) Defense (i) Budget Trends

- Amid a trend for cutbacks in budget for defense equipment, budget for aircraft have been decreasing in recent years while budget for the missiles have been increasing.

→ Sustain business scale with BMD and other missiles



PATRIOT PAC-3 missile test launch in the United States

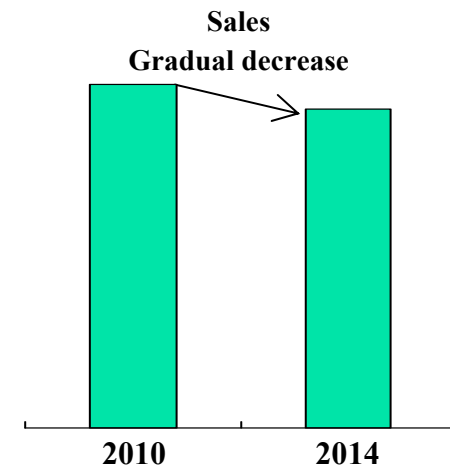
## (ii) Business Strategy

**Market** New projects in the National Defense Program Guideline for FY2011 and beyond, and Mid-Term Defense Program (FY2011-FY2015) are initiated.

- (i) The National Defense Program Guideline, Mid-Term Defense Program were approved by the cabinet in December last year
  - Aim to raise the readiness of the Self-Defense Force and to strengthen joint operations, on the other hand Cold War-style equipment/ organization to be reduced.
  - Clarify medium and long-term strategy in order to develop and maintain defense production and technological base.
  - Study for changes in the international environment regarding defense equipment (international joint development is the mainstream among developed countries)
- (ii) In January this year, the Ministry of Defense organized the IPT (Integrated Project Team) and started evaluation work to select a successor to the F-4 fighter aircraft (F-X).

**Business Strategy** sustain and develop by responding to nation's needs

- (i) Sustain fighter aircraft production and technological bases.
  - From platform manufacturer to weapon systems integrator for fighter aircraft.
- (ii) Improved SM-3 interceptor missile under joint development by US and Japan ; Secure work share for Japan by joint production by US and Japan
- (iii) Respond to decrease in budget by securing base load through acquiring orders for repairs and spare parts
- (iv) Steady promotion of new programs (Advanced Technology Demonstrator, New air-to-ship missile, Type 88 surface-to-ship missile (improved), Next rescue helicopter for Air Self Defense Force)



### 3. FY2011 Business Operation Policy

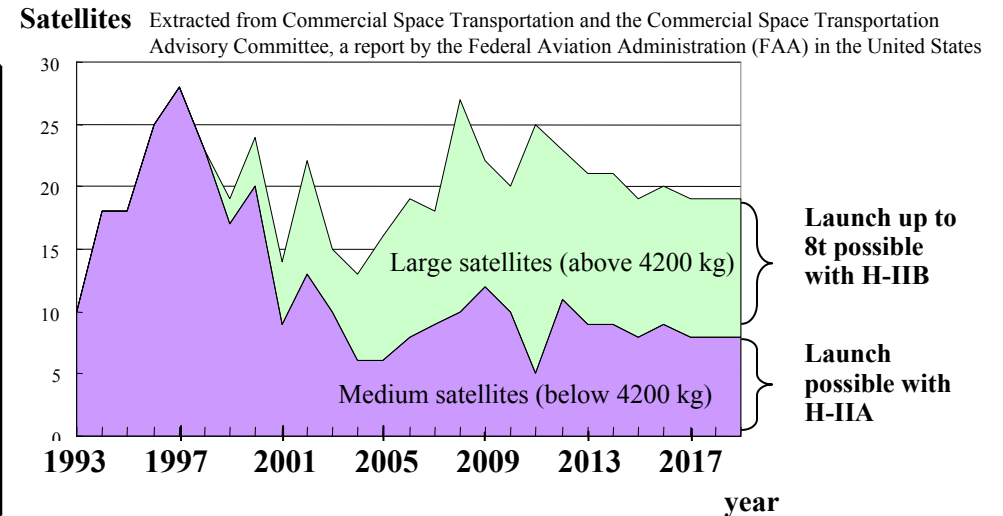
#### (3) Space (i) Market Trends

- **Government demand:** At present, large-scale increase in national space-related budget cannot be expected
- **Operating period for International Space Station (ISS) extended (2015→2020)**
- **“On the Promotion of Current Space Policy”, Strategic Headquarters for Space Development (August 2010)**
  - (1) **Promote use of satellite data from Earth Observing Satellites**
  - (2) **Quasi-Zenith Satellite: First satellite (for verification), study business plans including 2<sup>nd</sup> satellite and thereafter**
  - (3) **Improve manned technology platform**
  - (4) **Overseas expansion by means of space system package proposals**  
(Set up government taskforce team aiming to export to emerging countries etc.)

#### Official demand: Satellite launches

Rocket	Customer	Satellites	Schedule
H-IIA	JAXA	Global Change Observation Mission – Water (GCOM-W)	FY2011
		Advanced Land Observing Satellite (ALOS-2)	FY2013
		Global Precipitation Monitoring System (GPM)	FY2013
		X-ray Astronomy Satellite (ASTRO-H)	FY2013
		Quasi-Zenith Satellite	From FY2013
H-IIB	JAXA	HTV Kounotori Cargo transporter to the Space Station	FY2011, FY2012, FY2013

#### Forecast of demand for commercial satellites

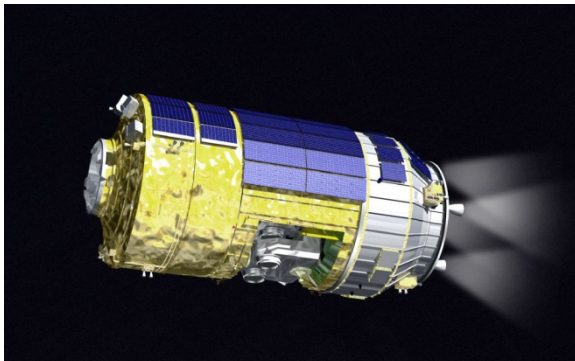


## (ii) Business Strategy

### Business Strategy:

- Improve reliability and secure base load with continuous successes of launch.
- Aiming to strengthen international competitiveness for launch services, start development of H-IIA upgrade/next-generation primary launch system
- Promote HTV-R ( HTV improved model with recovery functions). Develop for future human space activities.

Cargo transporter to the Space Station,  
**HTV KOUNOTORI**



**January 22, 2011**  
**Successful launch of H-IIB**  
**Launch Vehicle No.2 with the**  
**KOUNOTORI**

( 14<sup>th</sup> successful launch with )  
( H-IIA/H-IIB )



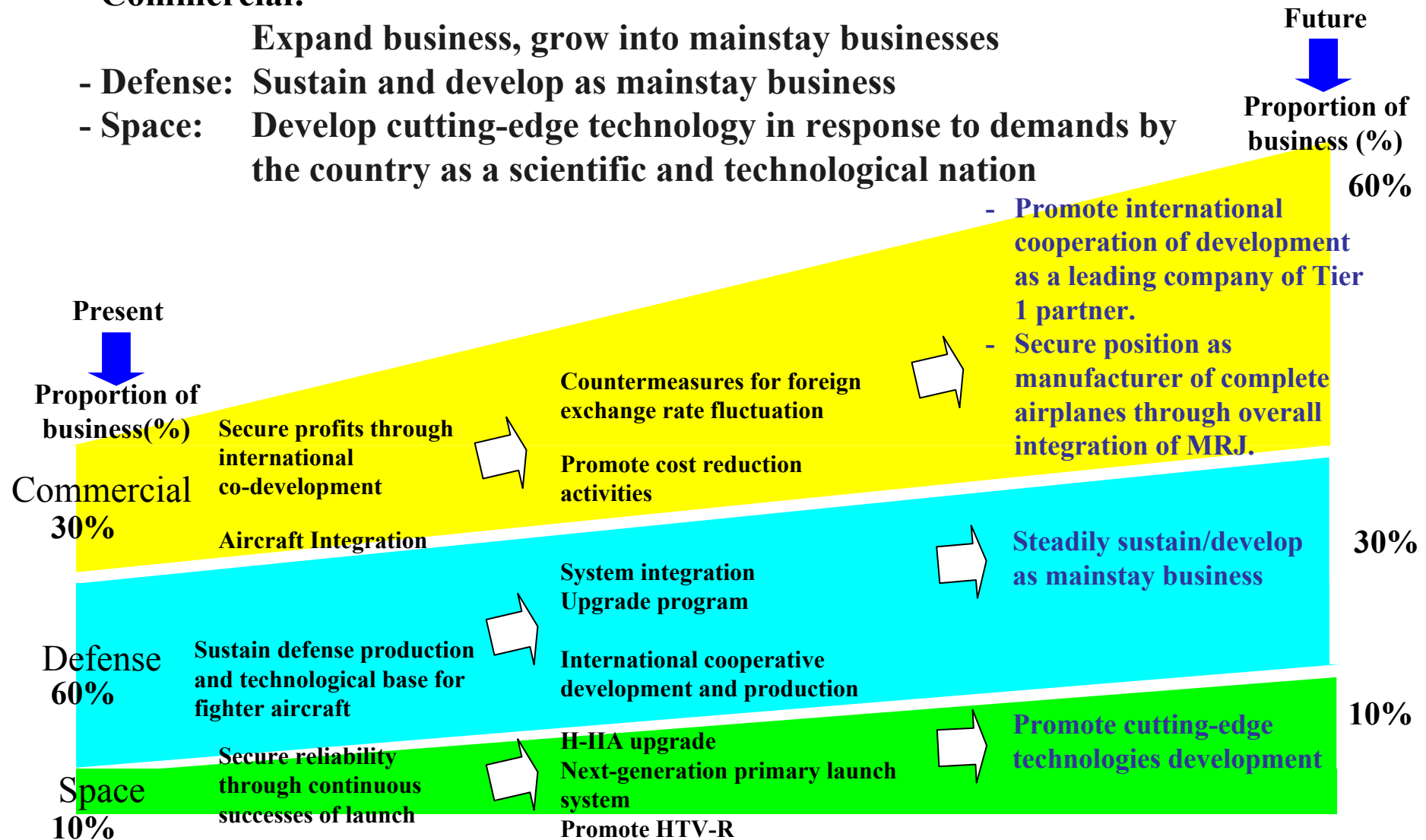
# 4. Summary

**- Commercial:**

Expand business, grow into mainstay businesses

**- Defense:** Sustain and develop as mainstay business

**- Space:** Develop cutting-edge technology in response to demands by the country as a scientific and technological nation





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