

Aero Engine, Space & Defense Business Area Briefing



September 20, 2023

I H I Corporation

Hideo Morita
Director, Managing Executive Officer, and President
of Aero-Engine, Space & Defense Business Area

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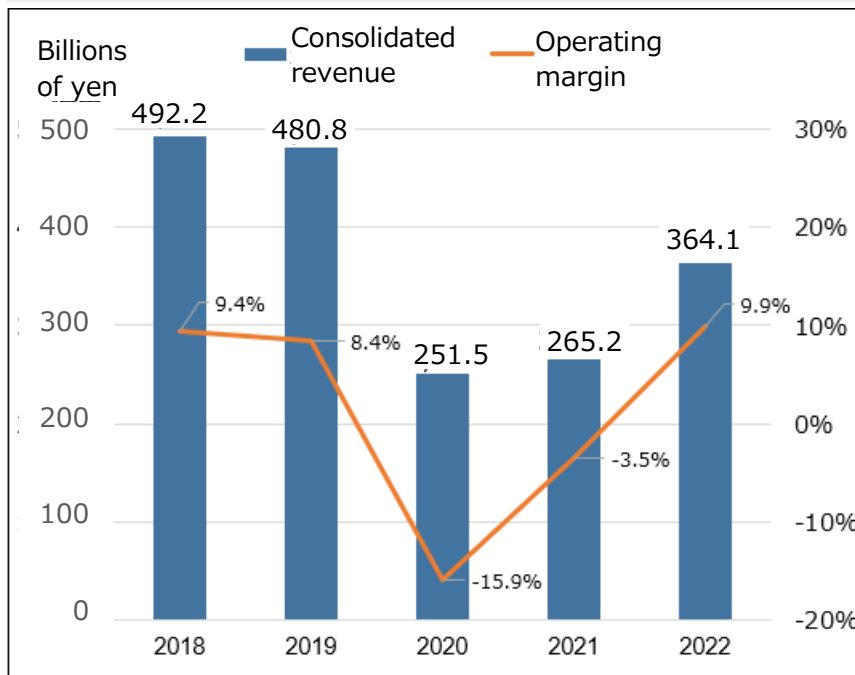
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1. Business Area Outline

Business head		Hideo Morita, Managing Executive Officer
Number of employees (as of March 31, 2023)	(Consolidated basis)	6,981
	Parent company	4,177

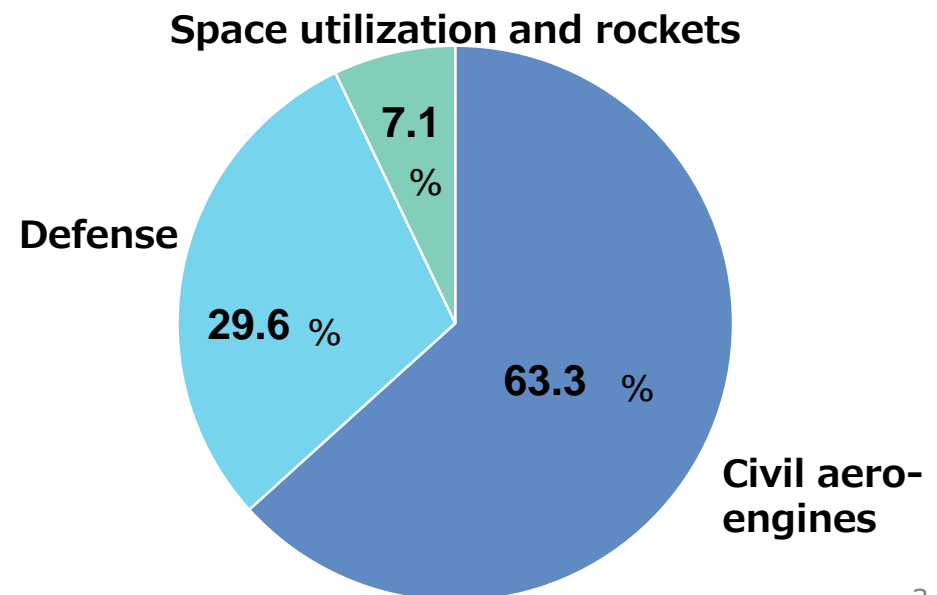
Business structure	<ul style="list-style-type: none"> • Defense Systems Division • Civil Aero-Engine Division • Rocket Development Department • Space Systems Business Preparation Office Research & Engineering Center • Production Center • Lifecycle Solutions Center • Transformation Center
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Operating Results



* Consolidation since FY2020 based on International Financial Reporting Standards

FY2022 Revenue Composition



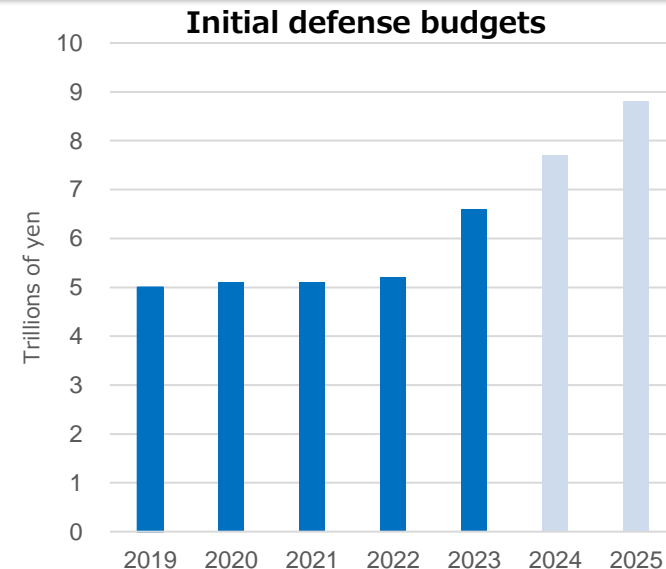
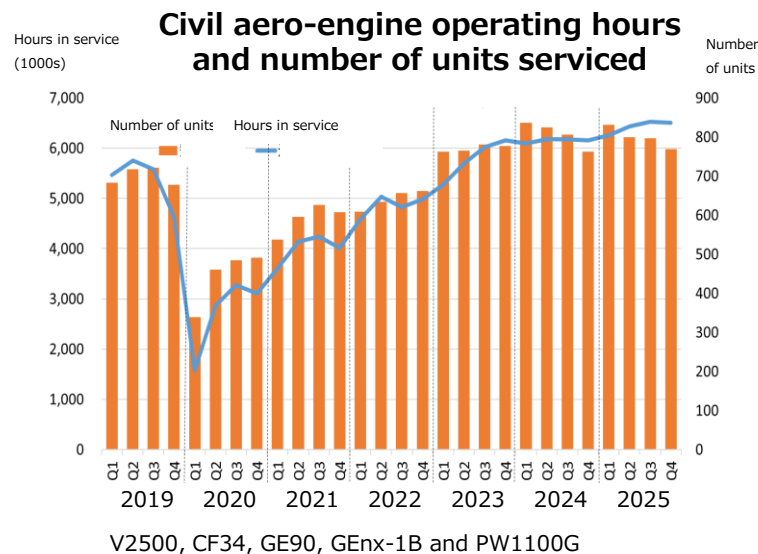
IHI

Note: See slide 16 for sources

2. Business Environment Outlook and Assumptions

Civil Aero-Engines

- ✓ Global aviation demand should largely recover by 2024
- ✓ Ongoing supply chain disruptions and price hikes → need to bolster financial strength
- ✓ Competition intensifying to develop light, electrified, and other fuel-efficient products (carbon-neutral)

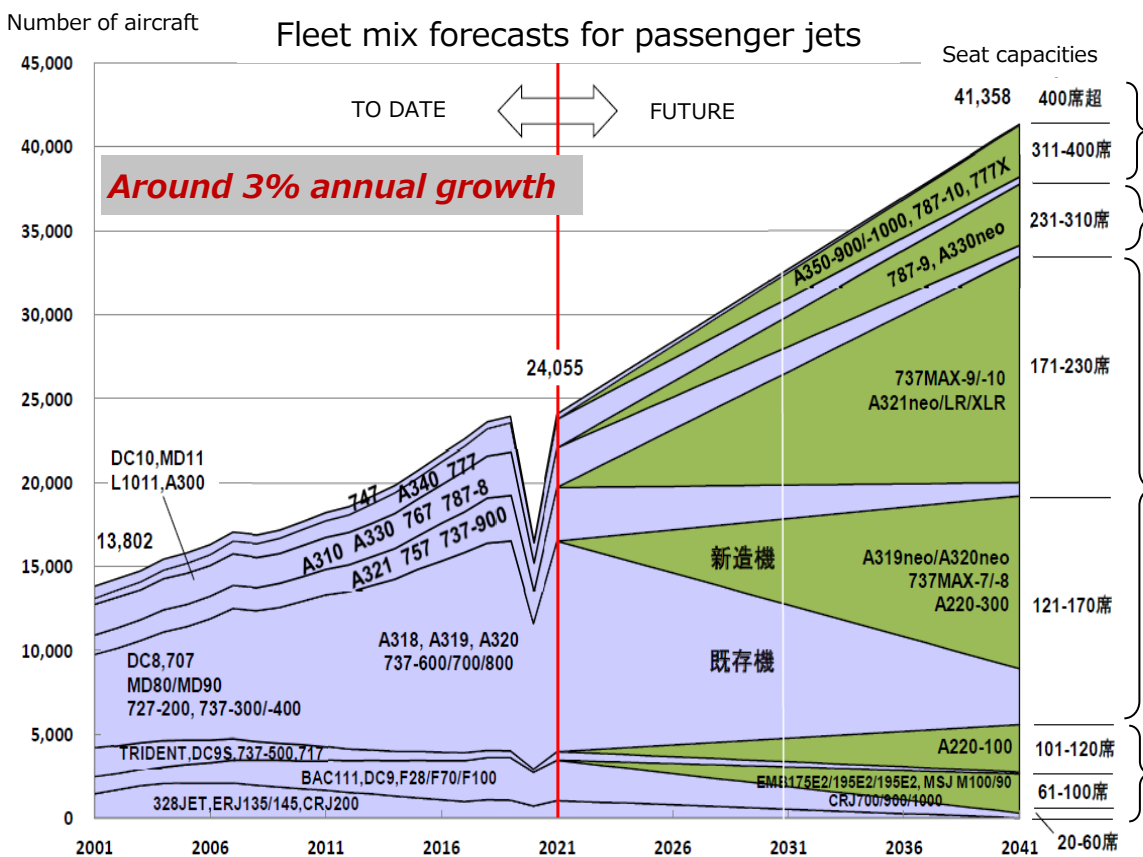


Defense and Space

- ✓ Defense: Cabinet decision on three national security documents
→ Government policy to dramatically reinforce defense capabilities and lift defense budget
- ✓ Space: Global market to expand, primarily for satellite services
→ Market to triple to more than ¥100 trillion by 2040
- ✓ Defense and Space: Satellite data-based solutions business expanding across both fields

2. Business Environment Outlook and Assumptions

- With global demand for aircraft poised to steadily expand, IHI participates in programs to develop and mass-produce best-selling engines all classes, from small through large and super-large models
- Refining proprietary technologies across domestic supply chain and tackling the world market



First generation

Second generation



Source: *1

GE90 (B777)

IHI share: 9%

- In service since 1995



Source: *2

GEnx (B787)

IHI share: 13%

- In service since 2011



Source: *3

V2500 (A320ceo)

IHI share: 14%

- In service since 1988



Source: *4

CF34

(Bombardier and Embraer RJ)

IHI share: 27%

- In service since 2001



Source: *5

GE9X (B777 successor)

IHI share: 11%

- Type recognition obtained in 2022
- In service from 2025



Source: *6

PW1100G-JM (A320neo)

IHI share: 15%

- In service since 2016



Source: *7

Passport 20

(G7500/8000)

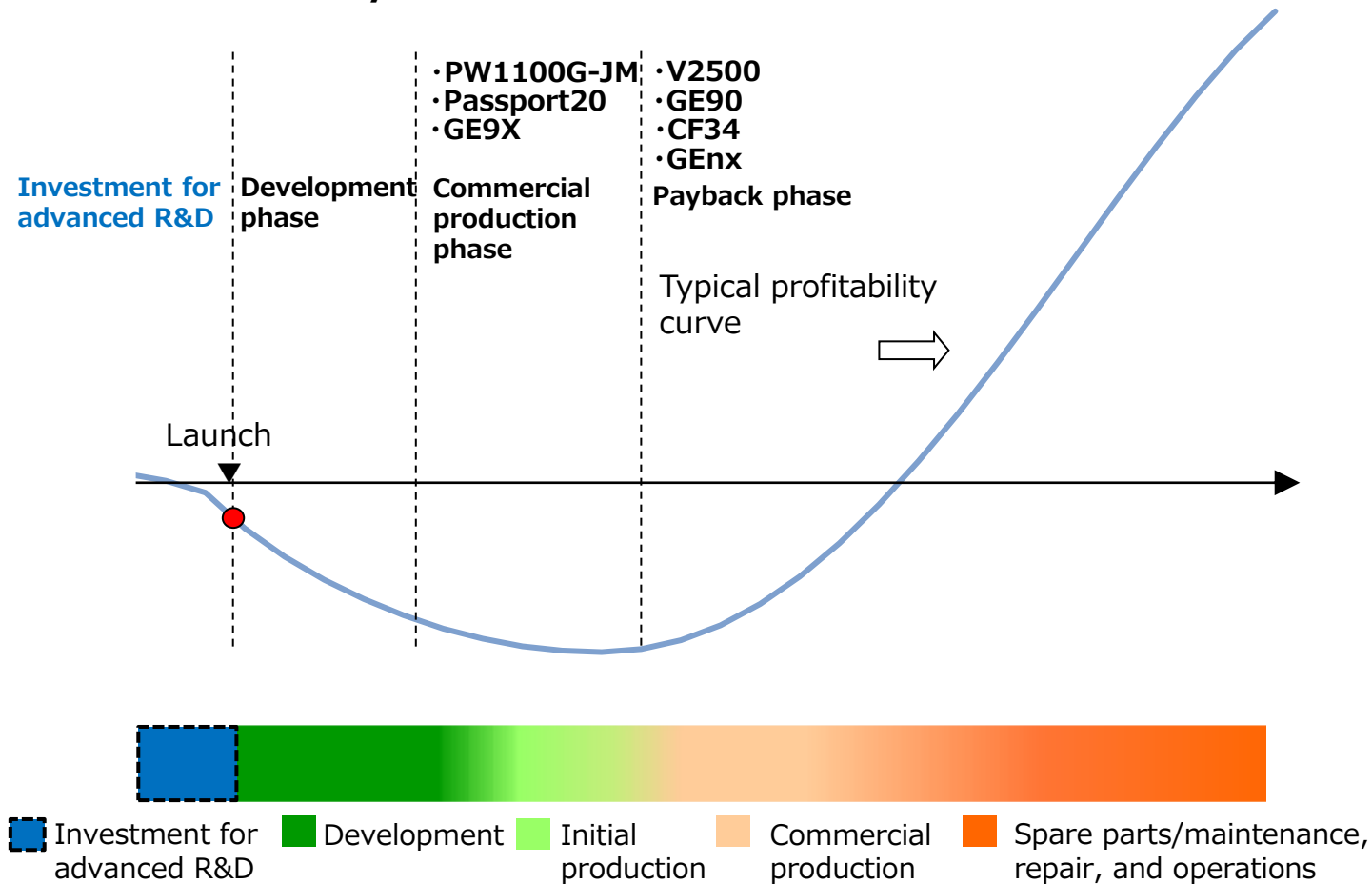
IHI share: 27%

- In service since 2018

2. Business Environment Outlook and Assumptions

Attributes of civil aero-engine business

- Advanced technology requirements
- Large initial investments
- Payback over 15 to 20 years



➤ As more programs enter payback phase, investing extensively in developing advanced technologies is also necessary to tackle challenges in those areas

3. Aero Engine, Space & Defense Business Area Initiatives

(1) Segment Strategies Based on Group Management Strategies 2023

We have positioned the aero-engines and rockets as growth businesses:

- As well as reinforcing and expanding our civil aero-engine and defense fields, we will drive growth by overhauling our businesses
- We will create new business areas from lifecycle and value chain perspectives

Expanding businesses from lifecycle and value chain perspectives

Initiatives for next-generation aircraft

- Lightweighting Technology
- Electrification technology
- Sustainable aviation fuel and synthetic fuel

Eco-friendly and economically viable carbon-neutral aircraft

Strengthen existing businesses

Reinforce aero-engine business

- Improve gas turbine performance
- Develop engines for next-generation fighter aircraft
- Apply proprietary technologies on next-generation engines
- Establish new maintenance sites
- Expand materials businesses

Operating climate: Returning to growth after pandemic downturn, with defense sector demand increasing



Boost profitability and asset efficiency dramatically by tapping digital technology to overhaul production

Fortify rocket business

- Increase production structure to meet growing defense demand
- Reinforce solid rocket competitiveness
- Establish launch service business



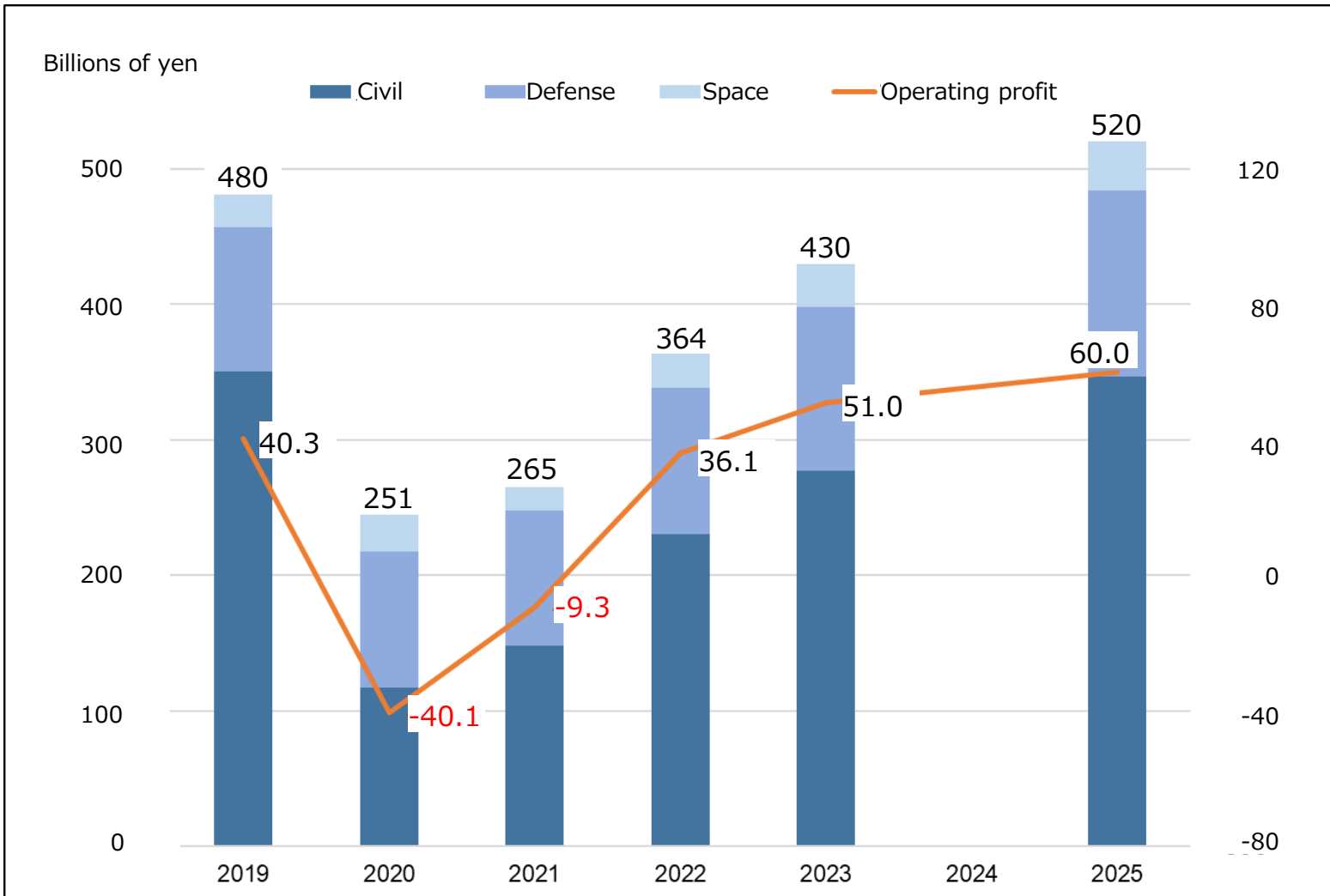
Space, terrestrial, and undersea data utilization initiatives

- Surveillance and defense systems
- Collaborate with partners in using satellites for vessel surveillance, forest management, and other purposes

3. Aero Engine, Space & Defense Business Area Initiatives

(1) Segment Strategies Based on Group Management Strategies 2023

Earnings targets

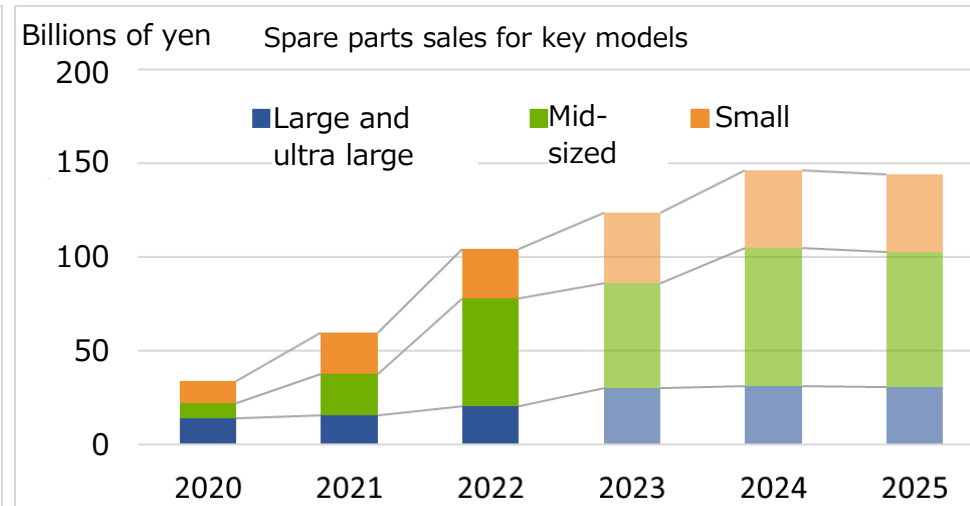
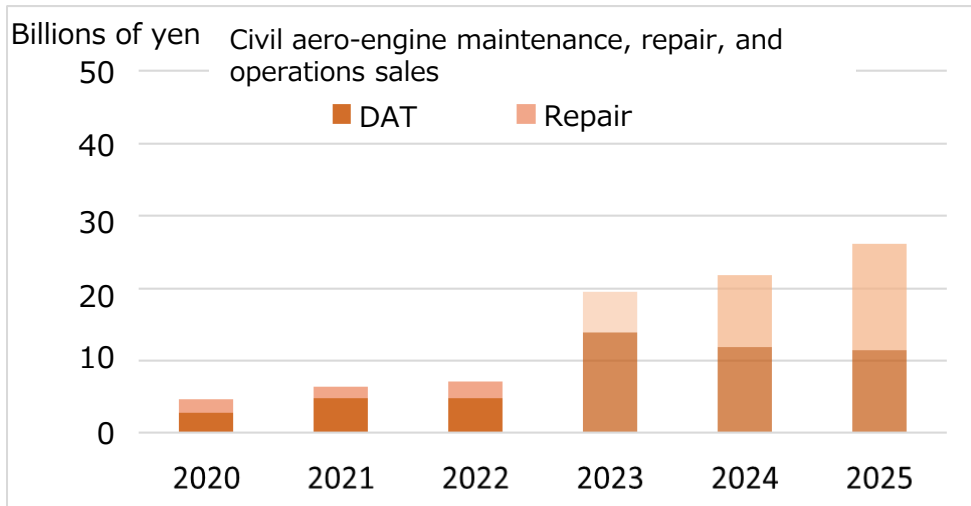
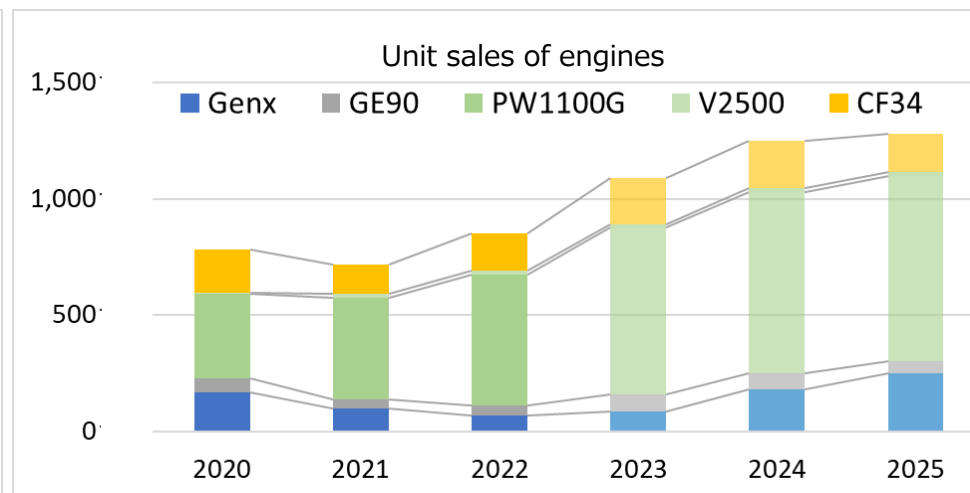
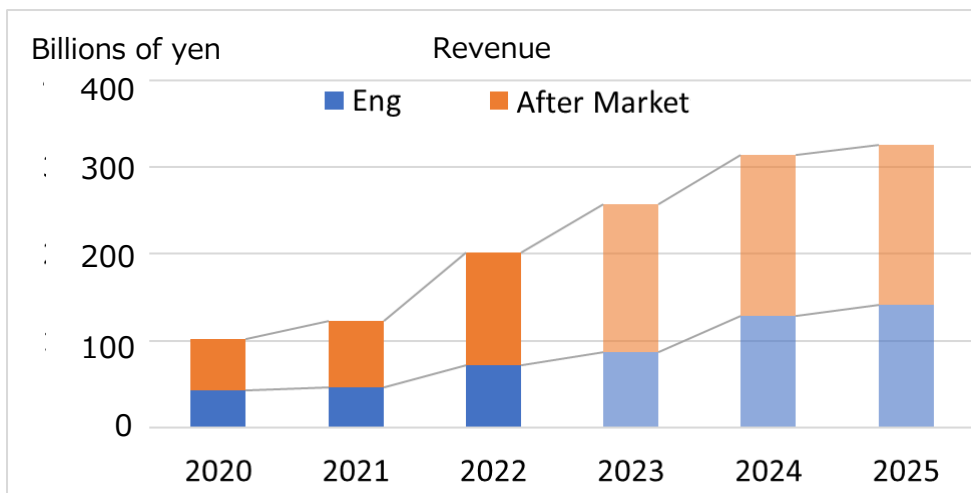


- Revenue bottomed out in FY2020, and should recover to pre-pandemic level by FY2025
- Returned to profitability in FY2022; operating margin should stabilize at 10% from FY2022

3. Aero Engine, Space & Defense Business Area Initiatives

(1) Segment Strategies Based on Group Management Strategies 2023

Civil aero-engines business revenues



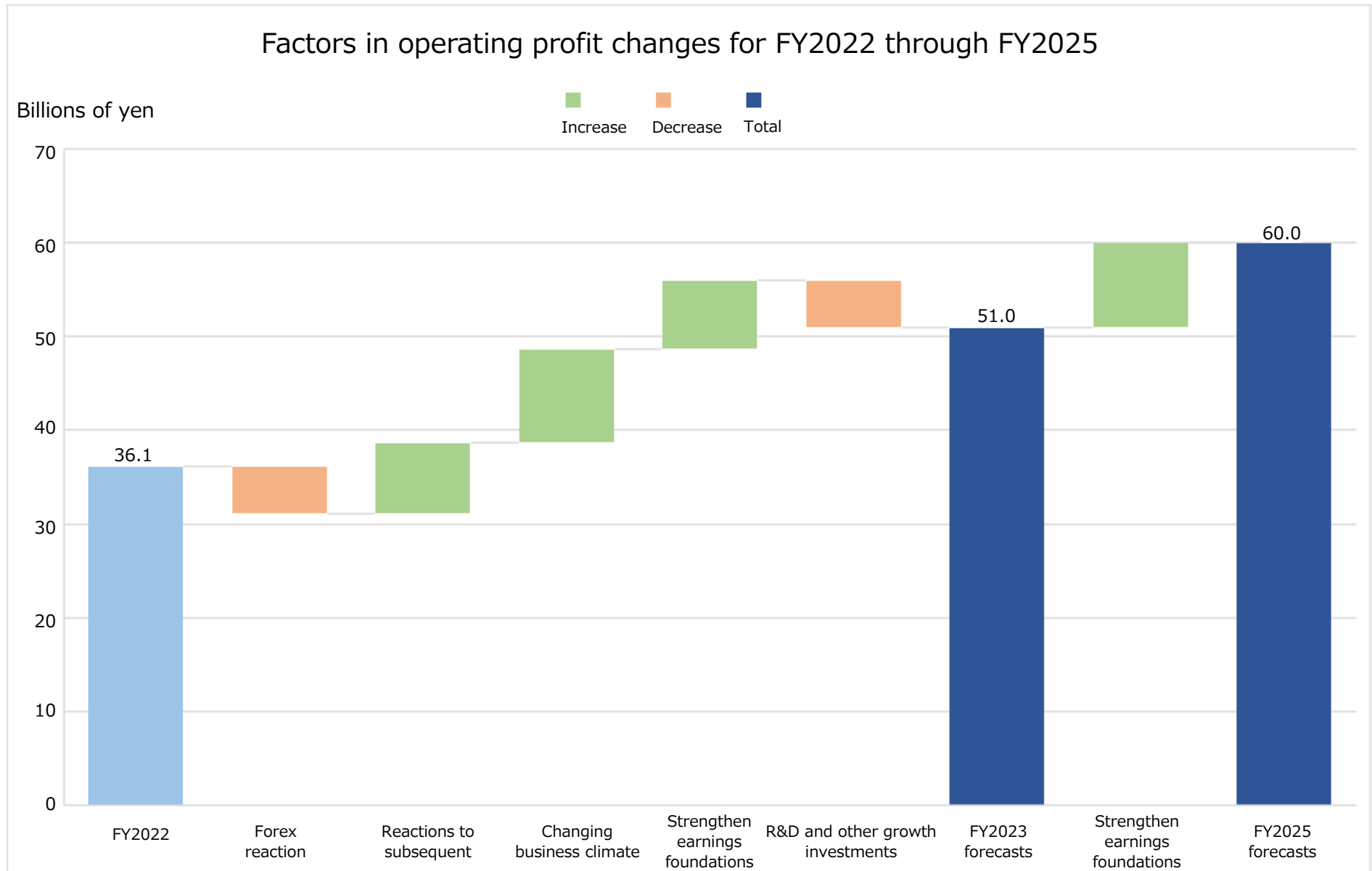
*Figures from FY2023 are projections; forex assumption for revenue is ¥130 to US\$1

- Sales up steadily for PW1100G-JM engine (on Airbus A320neo) offering excellent fuel efficiency
- Sales of spare parts, particularly for small and mid-sized aircraft turning around in line with passenger demand recovery

3. Aero Engine, Space & Defense Business Area Initiatives

(1) Segment Strategies Based on Group Management Strategies 2023

Earnings Analysis



3. Aero Engine, Space & Defense Business Area Initiatives

(2) Business Strategies to Reach Performance Targets

Civil aero-engines (pursuing carbon neutrality)

Lightweighting technologies



Composite fan blades



Ceramic matrix composite turbine blades



Fiber-reinforced thermoplastic airframe structure

Electrification and hydrogen propulsion technologies



Highly heat-resistant motors



Hydrogen tanks



Source: *1

Gas turbine engines



Source: *2

Fuel cell propulsion aircraft



Source: *3

Innovative engines



Source: *4



Source: *5

Hybrid electric propulsion aircraft



©Boeing

Source: *6



©Airbus

Source: *7

Revolutionary aircraft

Carbon neutral
(Effectively zero carbon dioxide emissions)

2020

2030

2040

2050

Driving advances with conventional aircraft

Exploring revolutionary aircraft and technologies

Aircraft propulsion systems

Improve conventional aircraft and engines

Revolutionary aircraft and engines

Fuel diversification

Sustainable aviation fuel (biofuel → synthetic fuels) Hydrogen and fuel cells, etc.

3. Aero Engine, Space & Defense Business Area Initiatives

(2) Business Strategies to Reach Performance Targets

Defense business

Cabinet decision on three national security documents leading to government policy to dramatically reinforce defense capabilities and lift defense budget

- **Priority capabilities in ramping up defense capabilities** → Major priority projects
 - Standoff defense and integrated air defense missile defense capabilities → Missiles and rocket motors
 - Unmanned asset defense capabilities → Including drones and unmanned underwater vehicles
 - Cross-domain operational capabilities and command and control and information-related functions → New engines, information-gathering satellites, and ocean surveillance
 - Durability and toughness → Expand engine auxiliary parts sales and conclude comprehensive agreements
- **Positioning defense production and technological foundations as defense capability**
 - Boost profit margins, engage in Japan-led international joint development, and transfer defense equipment overseas

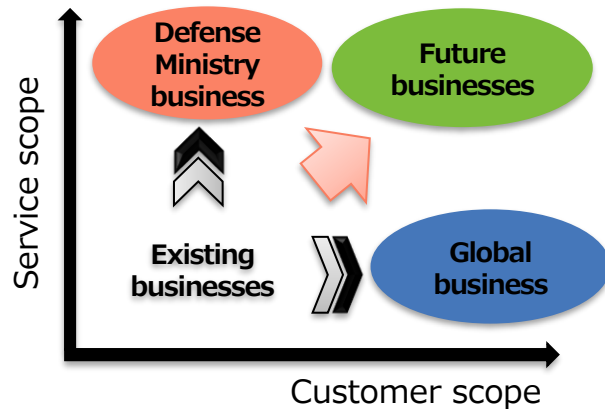


Image Source: Ministry of Defense (*1)

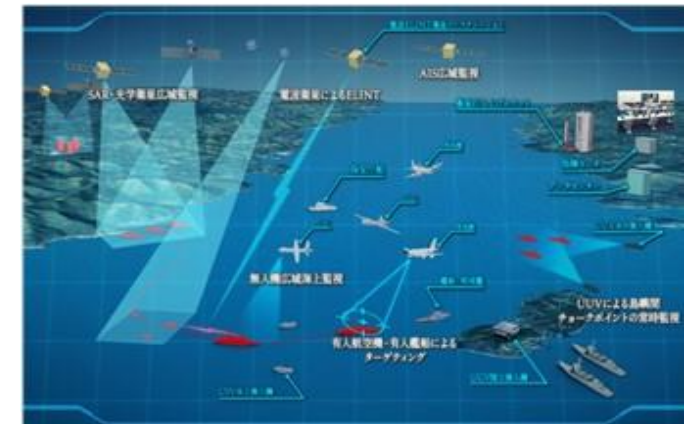
Next-generation Global Combat Air Programme fighters → International joint development



Unmanned underwater vehicles



F100 engine (for defense equipment transfer)



Marine surveillance → Multiregional surveillance

3. Aero Engine, Space & Defense Business Area Initiatives

(2) Business Strategies to Reach Performance Targets

Rocket systems and space utilization business

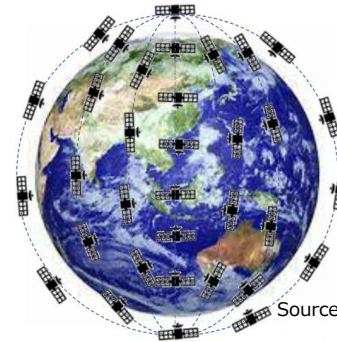
Source: *1 https://www8.cao.go.jp/cstp/anzen_anshin/20221021_meti_3.pdf

Solutions provision

As well as developing, manufacturing, and providing launch services for rockets and satellite components, we look to partner with other companies to provide solutions that help customers resolve their issues

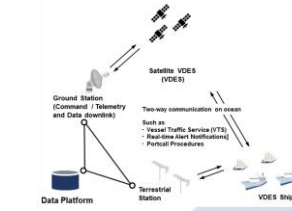
Launch services

Rocket and satellite manufacturing

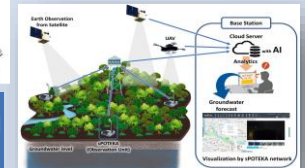


Source: *1

VDES Satellite constellation

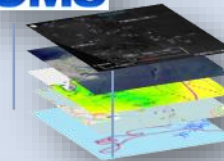


Vessel monitoring (VDES)



Forest management

iOMS



Epsilon launch services



提供: JAXA

Development, manufacturing, and parts supply



提供: JAXA

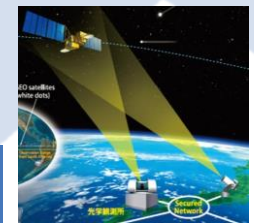


提供: JAXA



Nanosatellites

Ocean surveillance



Understanding space conditions



Small commercial rockets

iOMS : IHI Ocean Monitoring Service
AIS : Automatic Identification System
VDES: VHF Data Exchange System

3. Aero Engine, Space & Defense Business Area Initiatives

(2) Business Strategies to Reach Performance Targets

Overhaul production efficiency and business structure through new Transformation Center

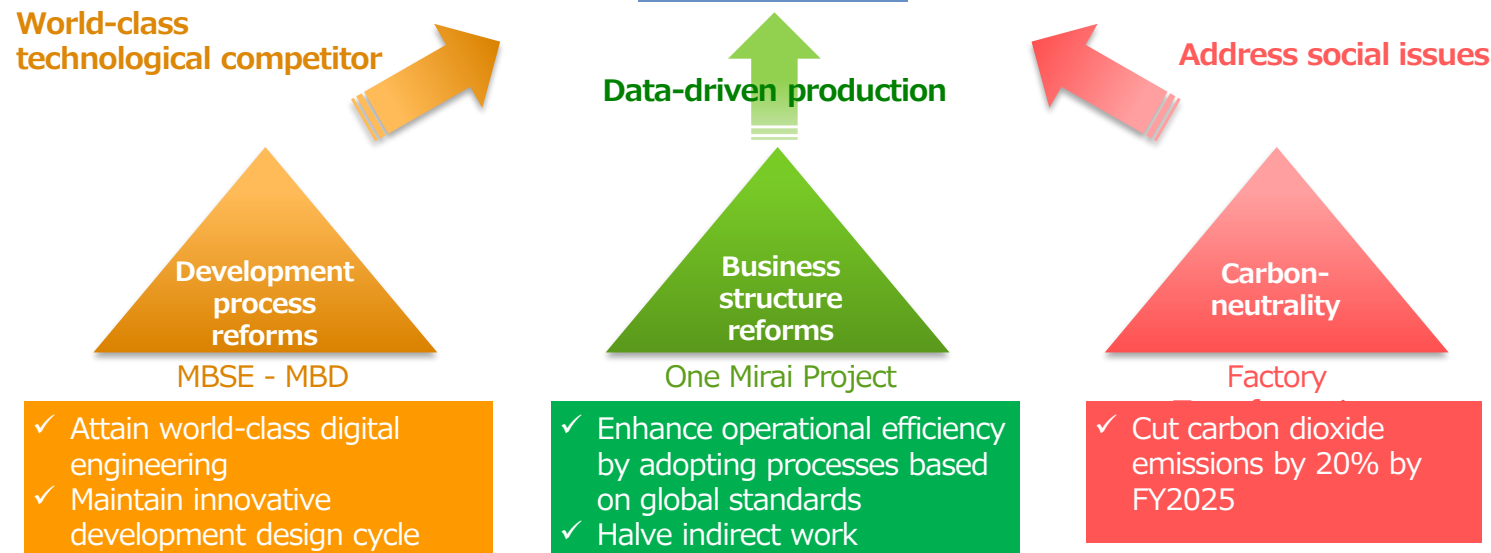
Leverage robust digital infrastructure to deliver world-class production efficiency and profit margins equal to exceeding those of original equipment manufacturers

Operate as specialized reform organization that integrates design and manufacturing and **unites with all business units and the Production and Research and Engineering centers** to **create and embed reform-centric culture** that always takes on new challenges without fear of failure

Attain world-class production efficiency

Deploying zero defect initiatives as first step in streamlining production

In line with our endorsement of the GX League*, we formulated plans to cut electricity consumption at each works, and are pursuing carbon neutrality for works and our products



* The GX (for green transformation) League is a forum for companies to discuss ways to achieve economic growth and reform social systems through initiatives to achieve carbon neutrality by 2050.

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- *1 <https://www.geaviation.com/commercial/engines/ge9x-commercial-aircraft-engine>
- *2 <https://www.geaviation.com/commercial/engines/ge90-engine>
- *3 <https://www.geaviation.com/commercial/engines/genx-engine>
- *4 <https://www.mtu.de/engines/commercial-aircraft-engines/narrowbody-and-regional-jets/v2500/>
- *5 <https://www.geaerospace.com/propulsion/commercial/cf34>
- *6 https://www.ihl.co.jp/all_news/2016/aeroengine_space_defense/1190378_1652.html
- *7 <https://www.prattwhitney.com/en/products/military-engines/f135>
- *8 <https://www.space-one.co.jp/gallery/>

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- *1 <https://www.geaviation.com/commercial/engines/ge90-engine>
- *2 <https://www.geaviation.com/commercial/engines/genx-engine>
- *3 <https://www.mtu.de/engines/commercial-aircraft-engines/narrowbody-and-regional-jets/v2500/>
- *4 <https://www.geaerospace.com/propulsion/commercial/cf34>
- *5 <https://www.geaviation.com/commercial/engines/ge9x-commercial-aircraft-engine>
- *6 <https://www.mtu.de/maintenance/commercial-aircraft-engine-services/engine-portfolio-mro/narrowbody-and-regional-jets/pw1100g-jm/>
- *7 https://www.ihl.co.jp/all_news/2016/aeroengine_space_defense/1190378_1652.html

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- *1 <https://www.prattwhitney.com/en/newsroom/news/2022/10/04/pw-gtf-advantage-tm-flight-testing-starts-on-airbus-a320neo-aircraft>
- *2 <https://hydrogen.aero/press-releases/universal-hydrogen-successfully-completes-first-flight-of-hydrogen-regional-airliner/>
- *3 https://www.cfmaeroengines.com/wp-content/uploads/2021/07/CFM_RISE_Whitepaper_Media.pdf
- *4 <https://blog.geaerospace.com/product/the-future-of-flight-engine-maker-unveils-new-technology-development-program-to-cut-co2-emissions-by-20/>
- *5 <https://www.mtu.de/newsroom/press/press-archive/press-archive-detail/clean-aviation-switch-project-to-advance-hybrid-electric-and-water-enhanced-turbofan-technologies/>
- *6 <https://www.boeing.jp/%E3%83%9B%E3%83%BC%E3%82%A4%E3%83%B3%E3%82%AF%E7%A4%BE%E7%B4%B9%E4%BB%8B/%E3%82%B5%E3%82%B9%E3%83%86%E3%83%8A%E3%83%93%E3%83%AA%E3%83%86%E3%82%A3.page.page>
- *7 <https://www.airbus.com/sites/g/files/jlccta136/files/2021-06/Full%20Report-Airbus-SE-Annual-Report-2020.pdf>



Forward-looking figures shown in this material with respect to IHI's performance outlooks and other matters are based on management's assumptions and beliefs in light of the information currently available to it, and therefore contain risks and uncertainties. Consequently, you should not place undue reliance on these performance outlooks in making judgments. IHI cautions you that actual results could differ materially from those discussed in these performance outlooks due to a number of important factors. These important factors include political environments in areas in which IHI operates, general economic conditions, and the yen exchange rate including its rate against the US dollar.