Ministry of Land, Infrastructure, Transport and Tourism
CIVIL AVIATION BUREAU, JAPAN

CARATS

Collaborative Action for Renovation of Air Transport Systems

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Overview

➤ What is CARATS?

➤ Background

➤ Worldwide activities

➤ Objectives

➤ Direction of Renovation

➤ Actions for Realizing the Vision

What is CARATS?

➢ CARATS is a Long-term Vision for the Future Air Traffic Systems.

➢ We need Changes to Intelligent Air Traffic Systems.

➢ It requires the collaborative works with various aviation stakeholders to reform Japan's air traffic system decisively and strategically for the future.

Background

- The environment surrounding the country's international economic and social activities is changing dramatically and becoming more complex:neighboring Asian states are enjoying rapid economic growth, and globalization is progressing.

- On the other hand, measures to counter global warming are attracting worldwide attention, and Japan is determined to positively address this issue.

- Japan needs to draw up and carry out a growth strategy, capitalizing on its strengths in order to sustain its economic growth and enhance its international position.

- Air service is a fundamental economic and social infrastructure that allows more people and goods to move more freely and efficiently than ever, and supports Japan's growth strategy for economic and social progress and for enhancing the national living standard. It is becoming increasingly important to increase the quantity of domestic and international air service while improving its convenience and environmental friendliness.

Background (continued)

→ In the current ATM system, which is based on Air Traffic Control of sectorized airspace and predetermined routes in principle, routes and sectors are operated flexibly corresponding to air traffic flow through airspace management (ASM), albeit with restrictions. Where the air traffic volume is likely to exceed the air traffic control capacity, ATM operation has coped by managing the flow of air traffic such as instructing ground delays or alternative routes.
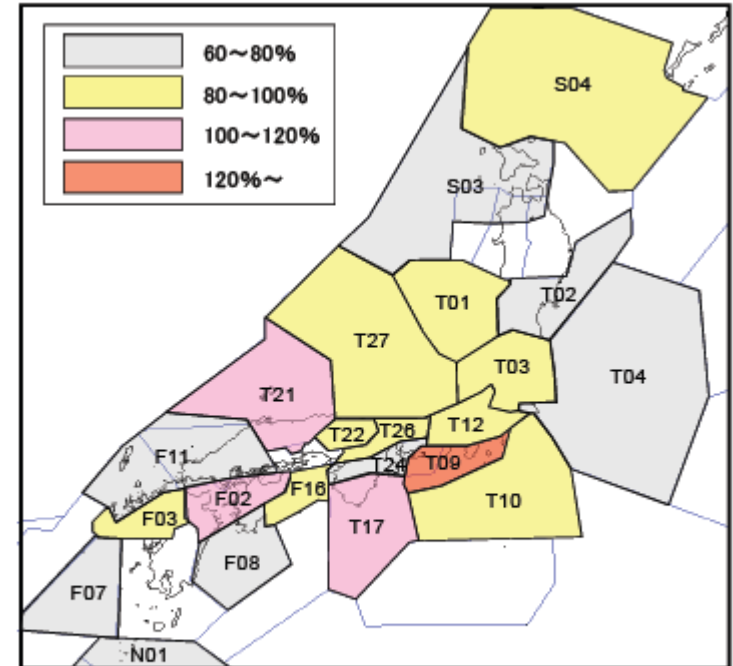

Workload per sector when traffic volume increased by 1.5 times

→ However, these procedures have limitations and are becoming increasingly difficult to maintain an efficient and orderly flow, due to the unavoidable concentration of traffic in specific airspaces and routes and continuous delays.

Background (continued)

→ With Air Traffic Control conducted for each sectors by short-term route prediction based on information of present positions of aircraft, it is becoming difficult to fully optimize flight routes and flying times over the entire flight from departure to arrival. As the air traffic volume has increased, the number of flow control procedures and delays have risen year by year, making it difficult to ensure convenience for passengers and efficient operation of flight with the current method.

Air Self-Defense Force (JASDF) high-altitude training/testing airspace
Restricted airspace for Air Self-Defense Force (JASDF)
Restricted airspace for Armed Forces of the United States (USFJ)

*High altitude training/testing airspace, restricted airspace*

→ Another issue is that meteorological information is not fully used for predicting air traffic volume and airspace capacity. Further, with flexible use of airspaces and flight routes being limited to specific sectors and/or airspaces, airspace cannot be fully used, which makes it hard to increase the air traffic control capacity.
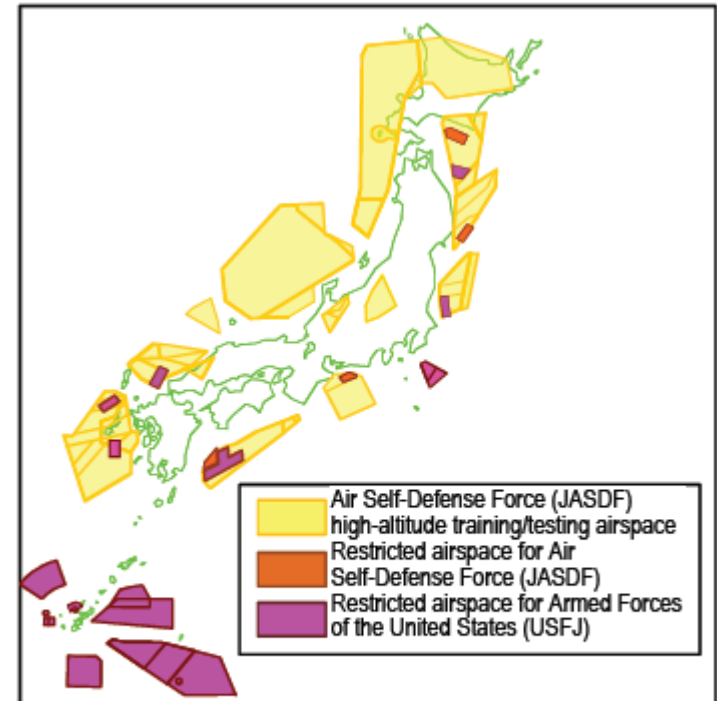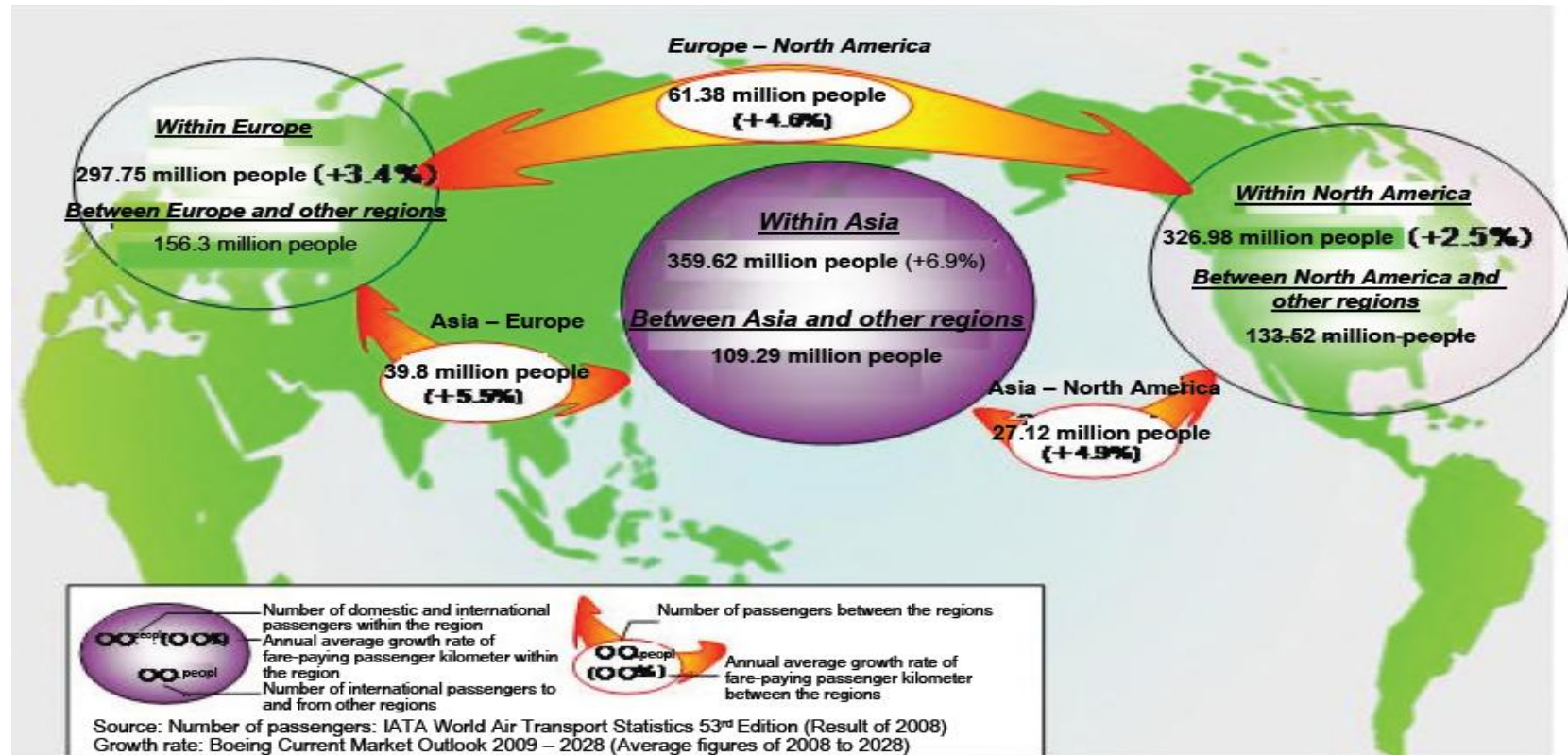
Characteristics of air traffic of Japan

✈ The number of flights, including overflights, are predicted to increase by 50% by 2027.
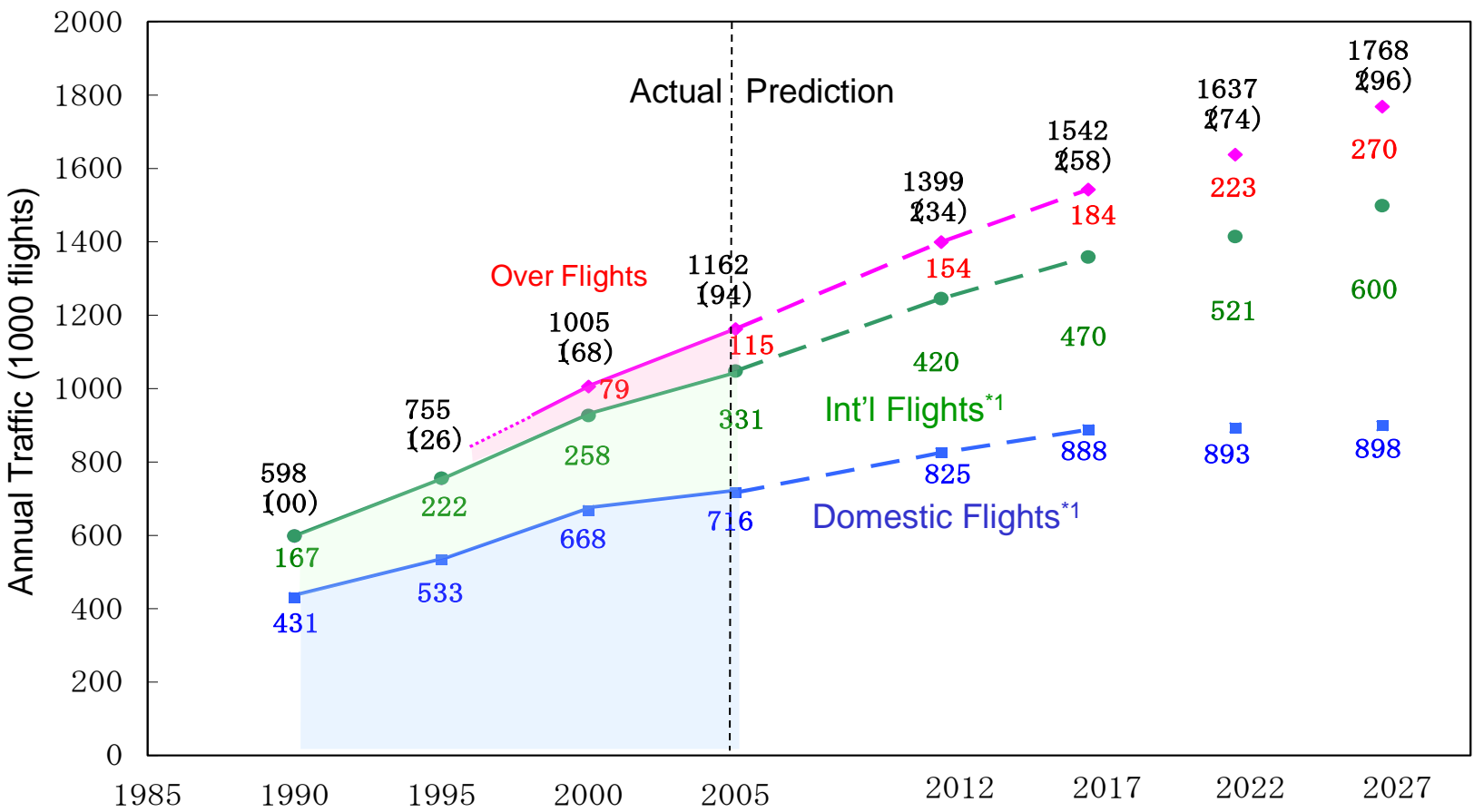
Air Traffic Growth in the world

→ Amid an anticipated global increase in air traffic demand, especially in the Asia-Pacific region with economic progress of neighboring states.


Europe – North America
61.38 million people
(+4.6%)

Within Europe
297.75 million people (+3.4%)
Between Europe and other regions
156.3 million people

Within Asia
359.62 million people (+6.9%)
Between Asia and other regions
109.29 million people

Within North America
326.98 million people (+2.5%)
Between North America and other regions
133.52 million people

Asia – Europe
39.8 million people
(+5.5%)

Asia – North America
27.12 million people
(+4.9%)

Number of domestic and international passengers within the region
Annual average growth rate of fare-paying passenger kilometer within the region
Number of international passengers to and from other regions

Number of passengers between the regions
Annual average growth rate of fare-paying passenger kilometer between the regions

Source: Number of passengers: IATA World Air Transport Statistics 53rd Edition (Result of 2008)
Growth rate: Boeing Current Market Outlook 2009 – 2028 (Average figures of 2008 to 2028)

Predicted Demand of International Air Traffic Volume

(The growth rate within Asia is higher than within North America and within Europe, and the growth rate between Asia and North America and between Asia and Europe is higher than that between North America and Europe.)

International long-term plans

→ In the U.S. and Europe, long-term visions to meet local needs have been formulated based upon the ICAO Global ATM Operational Concept (NextGen in the U.S., SESAR in Europe). To realize seamless air traffic in the Asia-Pacific region where demand is expected to increase rapidly, it is necessary to establish a future air traffic system in collaboration with the U.S., Europe and other states, while securing international interoperability.

Map is created by AIS/MAP - Copyright ICAO.

0   7,995 Kilometers
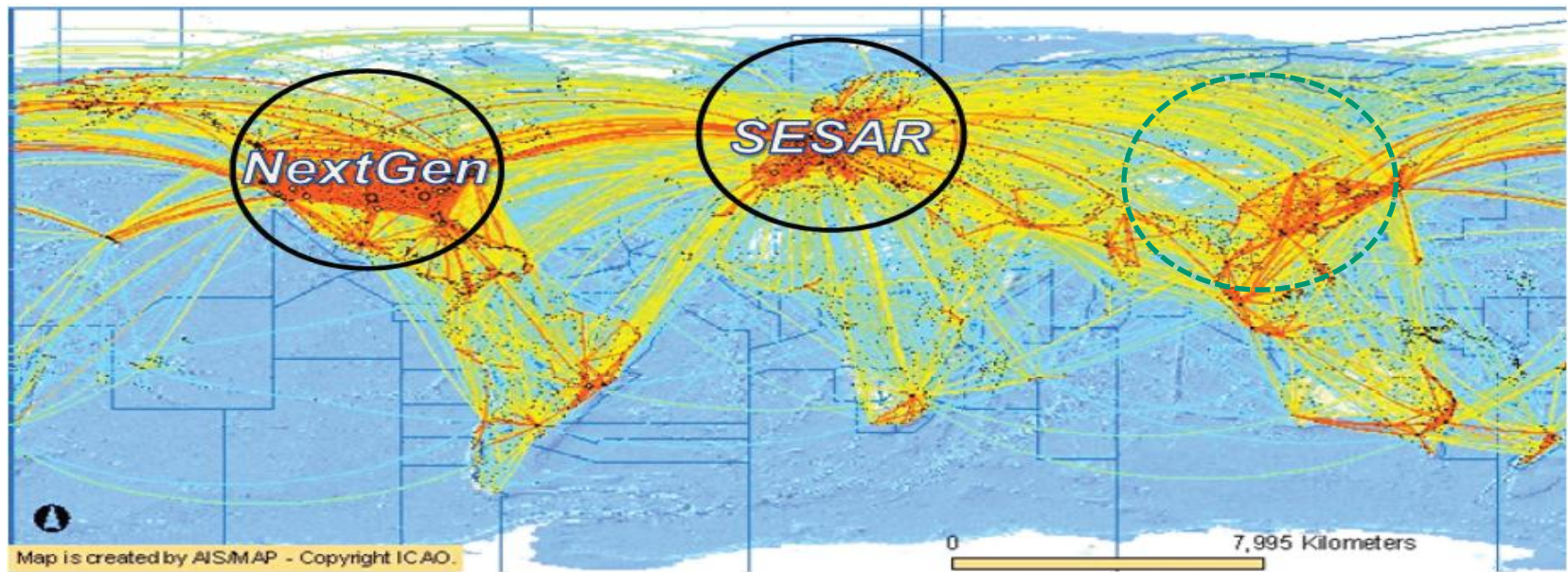
International trends of long-term plans for air traffic systems
(A long-term plan has not been formulated in the Asia-Pacific region.)

Objectives of the Future Air Traffic System

- (1) Increasing Safety
- (2) Responding to the Increase in Air Traffic Volume
- (3) Improving User Convenience
- (4) Increasing Operational Efficiency
- (5) Improving Productivity of Air Traffic Services
- (6) Responding to environmental issues
- (7) Enhancing the International Presence of Japan in the Aviation Field

Detailed objectives

Item	Numerical target
Enhancing safety	Increase safety level by 5 times
Responding to the increase in air traffic volume	Double the air traffic control capacity in congested airspace
Improving user convenience	Improve service level (punctuality and reduction of flight time) by 10%
Increasing operational efficiency	Reduce fuel consumption per flight by 10%
Improving productivity of air traffic services	Improve productivity of air traffic services by 50% or more
Responding to environmental issues	Reduce CO_2 emissions per flight by 10%
Enhancing the international presence of Japan in the aviation field	(Qualitative target. The number of international conferences in Japan, international cooperation projects, etc may be the index.)

Direction of Renovation

- ✈ **(1) Realizing Trajectory-based Operation (TBO)**
- ✈ **(2) Improving Predictability**
- ✈ **(3) Promoting Performance-based Operation (PBO)**
- ✈ **(4) Realizing Satellite-based Navigation for All Flight Phases**
- ✈ **(5) Enhancing Situational Awareness on the Ground and in the Air**
- ✈ **(6) Making Maximum Use of the Capability of Human Beings and Machines**
- ✈ **(7) Full information-sharing and Collaborative Decision-Making**
- ✈ **(8) Realizing High-density Operation in Congested Airports and Airspace**

Trajectory-based Operation (TBO)

→ We will shift from the current ATM operation, which focuses on ATC based on airspace sectors and air traffic flow management by adjusting departure time, to ATM operation along 4-DT (4-Dimensional Trajectory), which considers the whole of our FIR as one airspace, manages the entire flight trajectory from departure to arrival of all aircraft concerned in an integrated manner, and introduces time-based management in all phase of flight.

→ This operation allows the flexible flights desired by operators, while addressing policy issues such as increased air traffic capacity at congested airports, crowded airspace, and reduction of CO_2 emissions by adjusting trajectories strategically and cooperatively prior to departure.
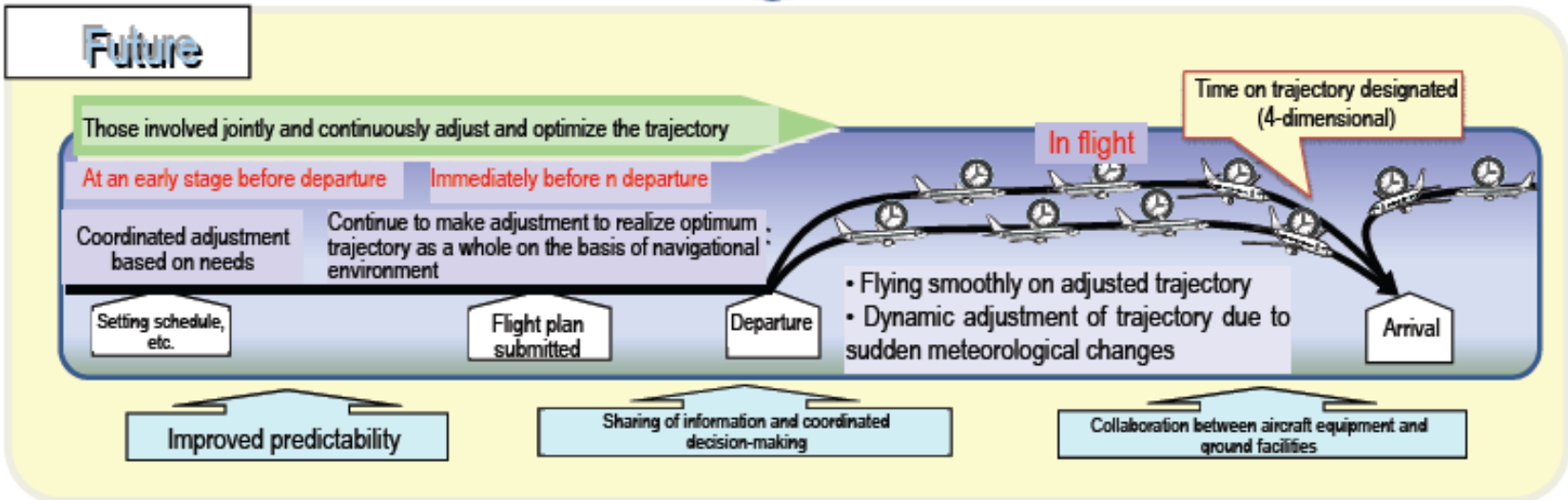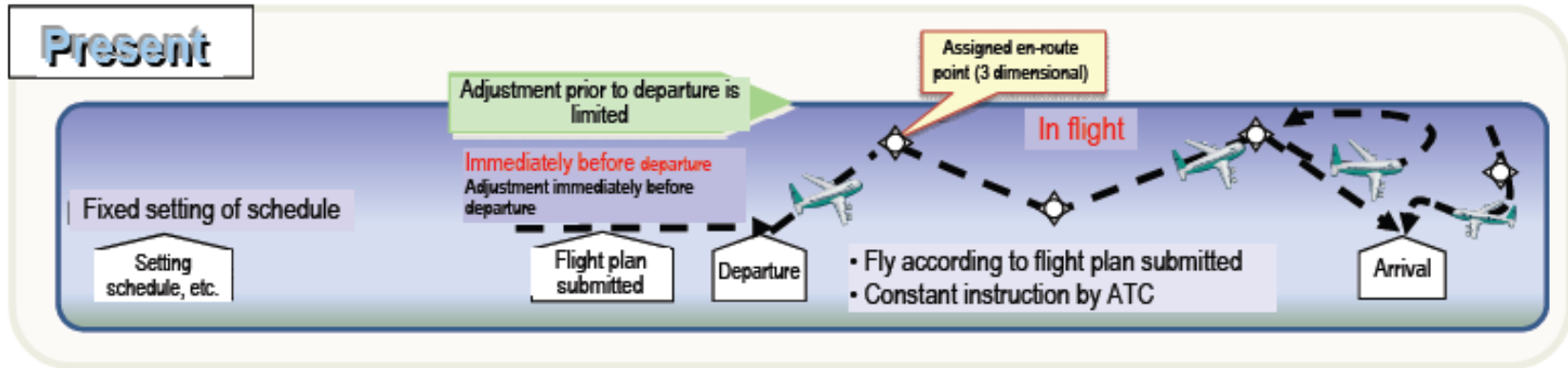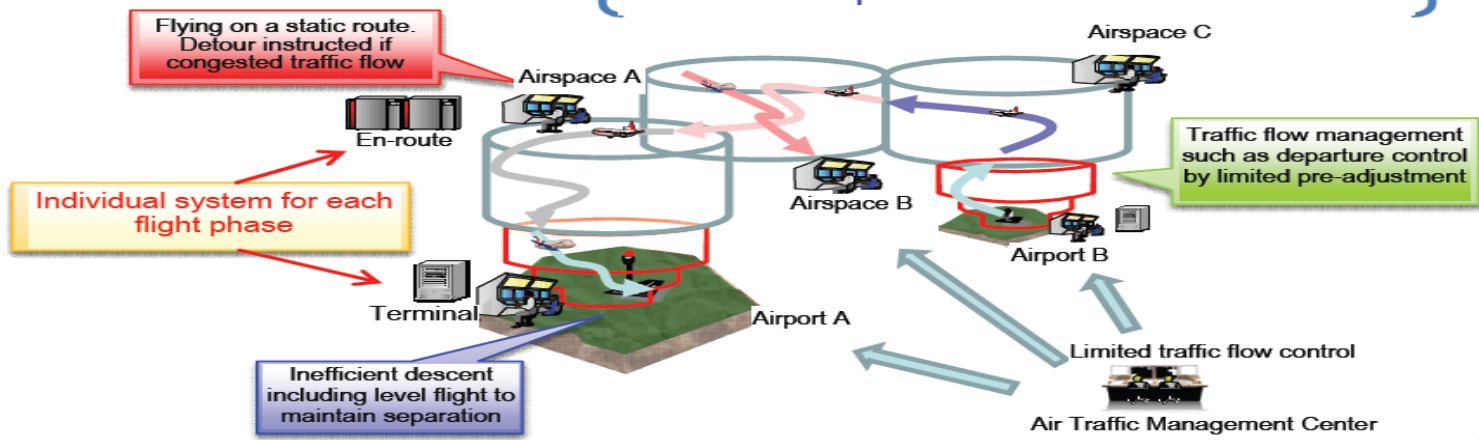
Operational change

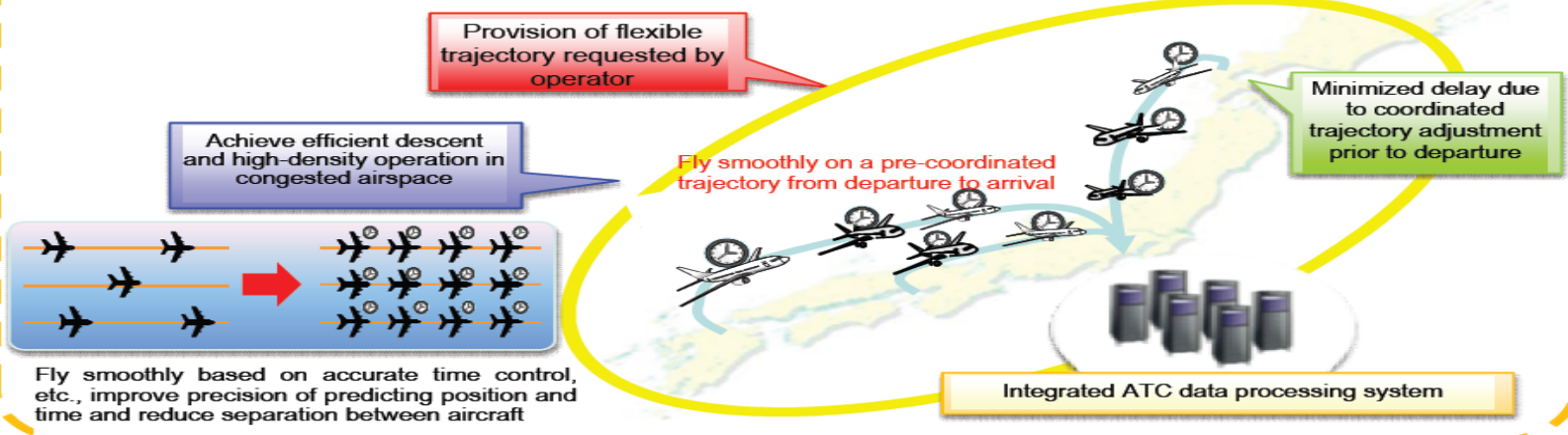*Image of coordinated and staged adjustment*

Airspace-based ATM Operation

Operation based on segmented airspace and predetermined routes

Flying on a static route. Detour instructed if congested traffic flow

Airspace A

Airspace C

En-route

Individual system for each flight phase

Traffic flow management such as departure control by limited pre-adjustment

Airspace B

Airport B

Terminal

Airport A

Inefficient descent including level flight to maintain separation

Limited traffic flow control

Air Traffic Management Center

Trajectory-based ATM Operation

Treat the whole airspace as one airspace and optimize the trajectory from departure to arrival

Provision of flexible trajectory requested by operator

Minimized delay due to coordinated trajectory adjustment prior to departure

Achieve efficient descent and high-density operation in congested airspace

Fly smoothly on a pre-coordinated trajectory from departure to arrival

Fly smoothly based on accurate time control, etc., improve precision of predicting position and time and reduce separation between aircraft

Integrated ATC data processing system

From airspace-based ATM operation to trajectory-based ATM operation

9 December 2010

14

Actions for Realizing the Vision

- ➤ **1. Establishing a Road Map**
- ➤ **2. Role-sharing and Collaboration among Parties**
- ➤ **3. Promoting an Effective and Stable Project**

Establishing a Road Map

→ In order to systematically establish the future air traffic system based on a long-term vision, we must first draw up a detailed road map with the cooperation of the parties concerned. The short-term measures should be carried out step by step, then research and development systematically carried out on the long-term measures. The road map will be revised as necessary to flexibly cope with changes in circumstances. A system for materializing the long-term vision smoothly and effectively will be drawn up with the cooperation of industry, academia, and the government.
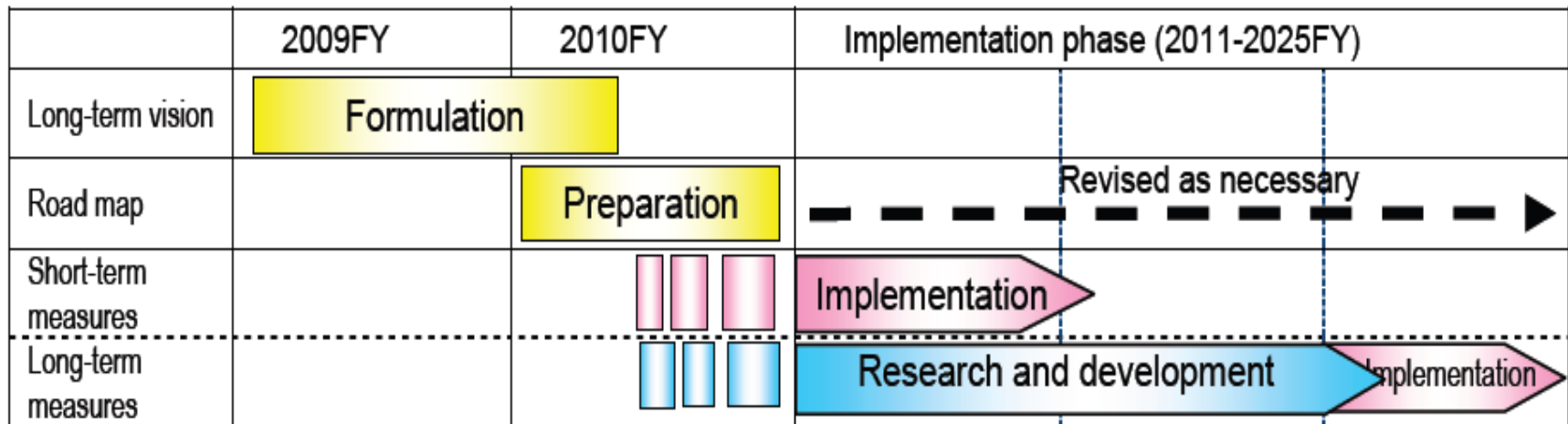
	2009FY	2010FY	Implementation phase (2011-2025FY)
Long-term vision	Formulation		
Road map		Preparation	Revised as necessary ▶
Short-term measures			Implementation
Long-term measures			Research and development · Implementation

Image of establishing the air traffic system in the future

Promoting an Effective and Stable Project

→ Research and development of the air traffic system will take a long time and must be implemented systematically, and it is also necessary to consider how to secure stable funding. To improve system efficiency within limited resources, it is important to analyze cost-effectiveness before implementing measures, taking into consideration the effectiveness of the system to be introduced and the possible scaling down of existing systems. It is also necessary to cope flexibly with changes in circumstances that may arise.
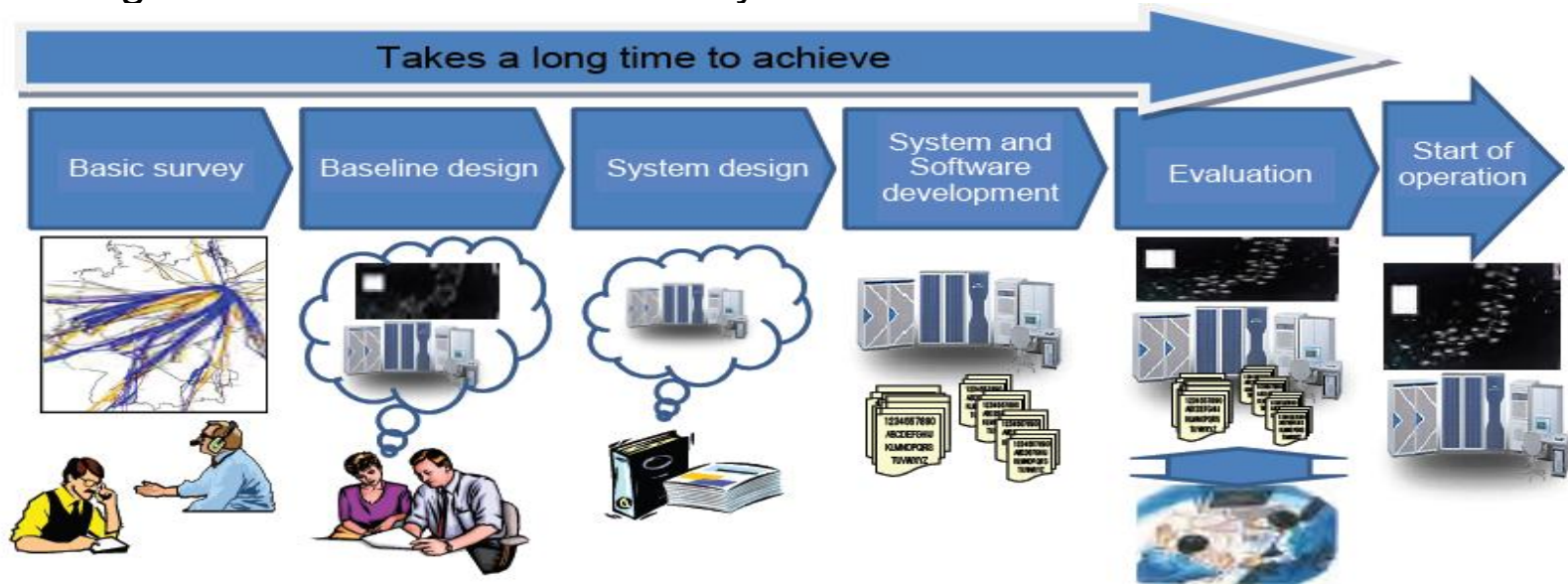
General Flow of development of Facilities related to the Air Traffic System

Further Information

➢ The full document of CARATS is available in the following website;
http://www.mlit.go.jp/koku/koku_CARATS.html

➢ Thank you for your attention.