Overview of “CARATS” and Recent activities related to aeronautical meteorology

Collaborative Actions for Renovation of Air Traffic Systems

Japan Civil Aviation Bureau (JCAB)
Japan Meteorological Agency (JMA)

Demand forecast of air traffic in Japan

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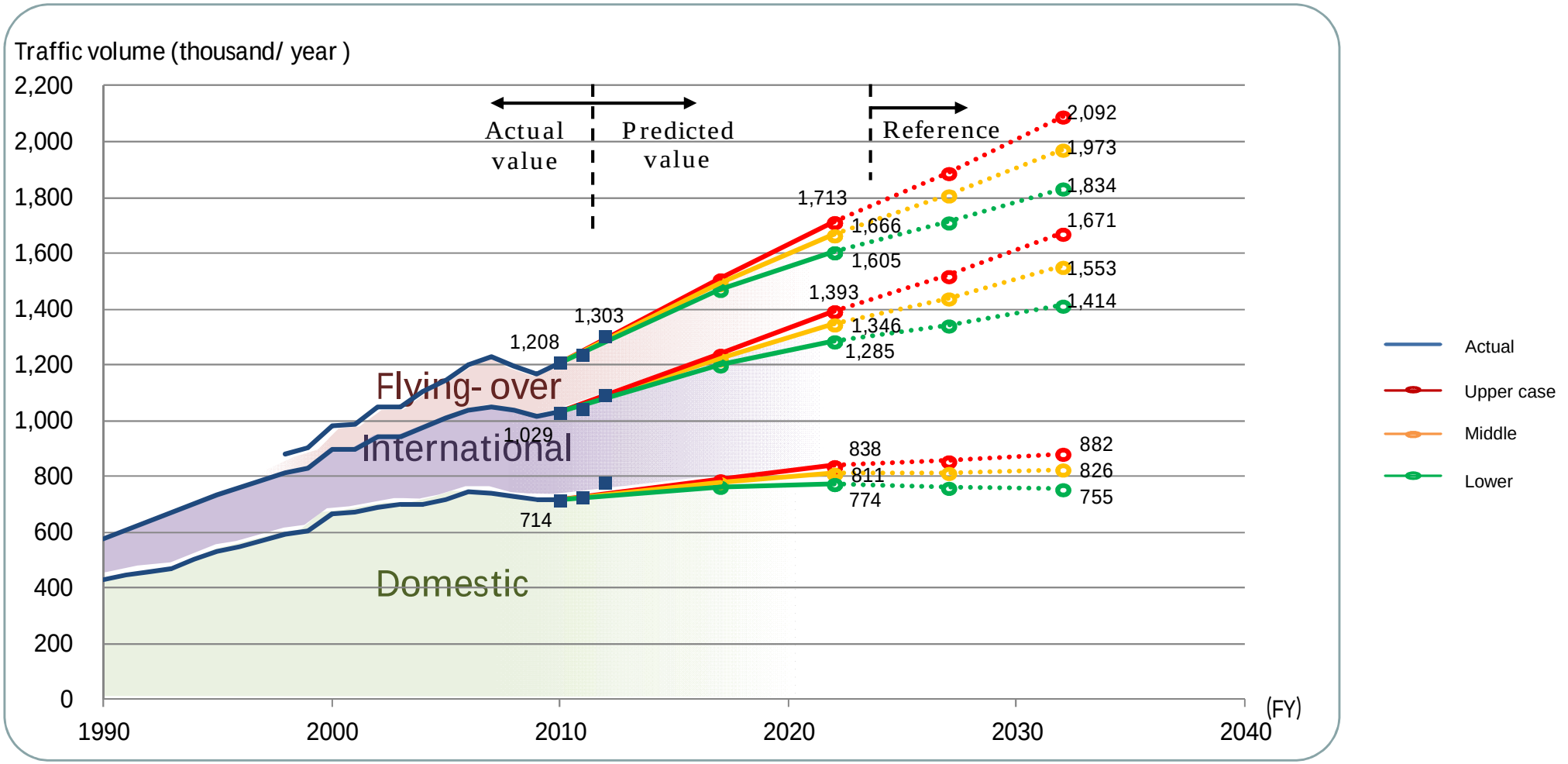
- International flight and flying-over are increased. Domestic flight is dependent on the case of GDP.
- Even if GDP is estimated low, the number of aircrafts will exceed the limit of air traffic control capacity around 2025.
- The demand may go up rather than this forecast by further promotion of inbound tourism and the growth of LCC.



* Basic case of GDP is set up based on the economic growth rate which is a target of the Japanese future strategy.
(economic growth rate is set up to 1.7% from 2010 to 2017 and 2.0% from 2017 to 2032)
* In upper case, economic growth rate is set up 1% higher than basic case.
•In lower case, economic growth rate is set up 1% lower than basic case.
•The number of IFR flights is that to add military, non-scheduled and cargo flights to those above.

Consideration of long-term vision

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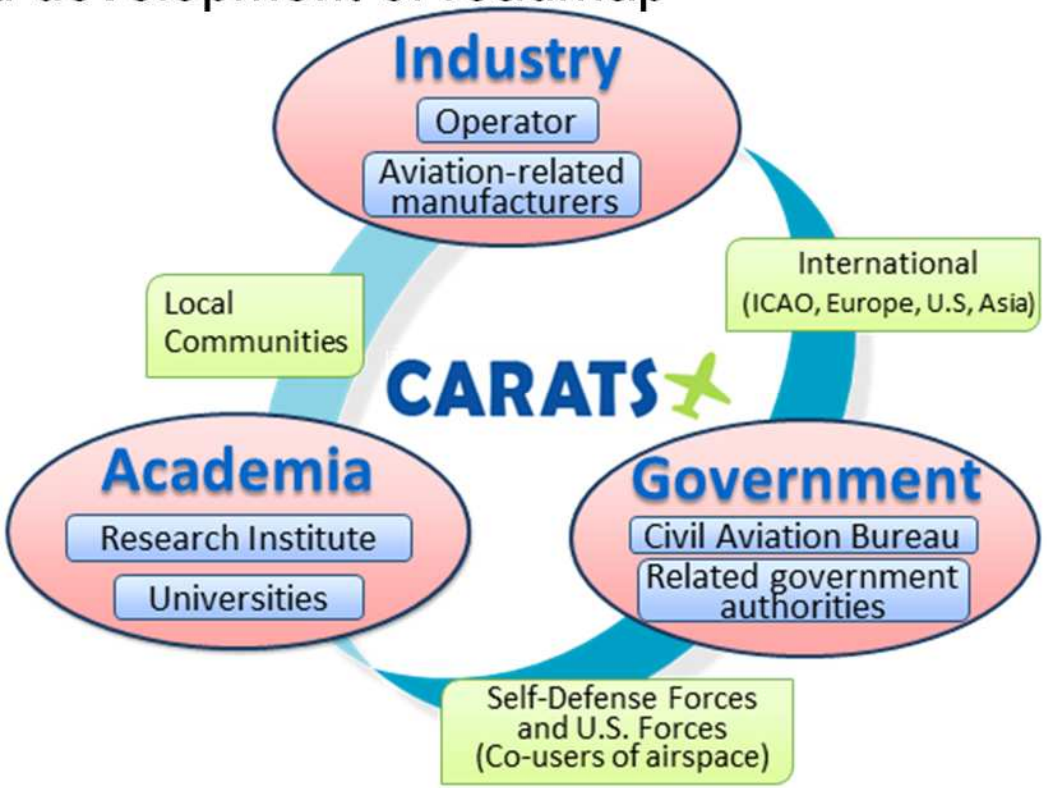
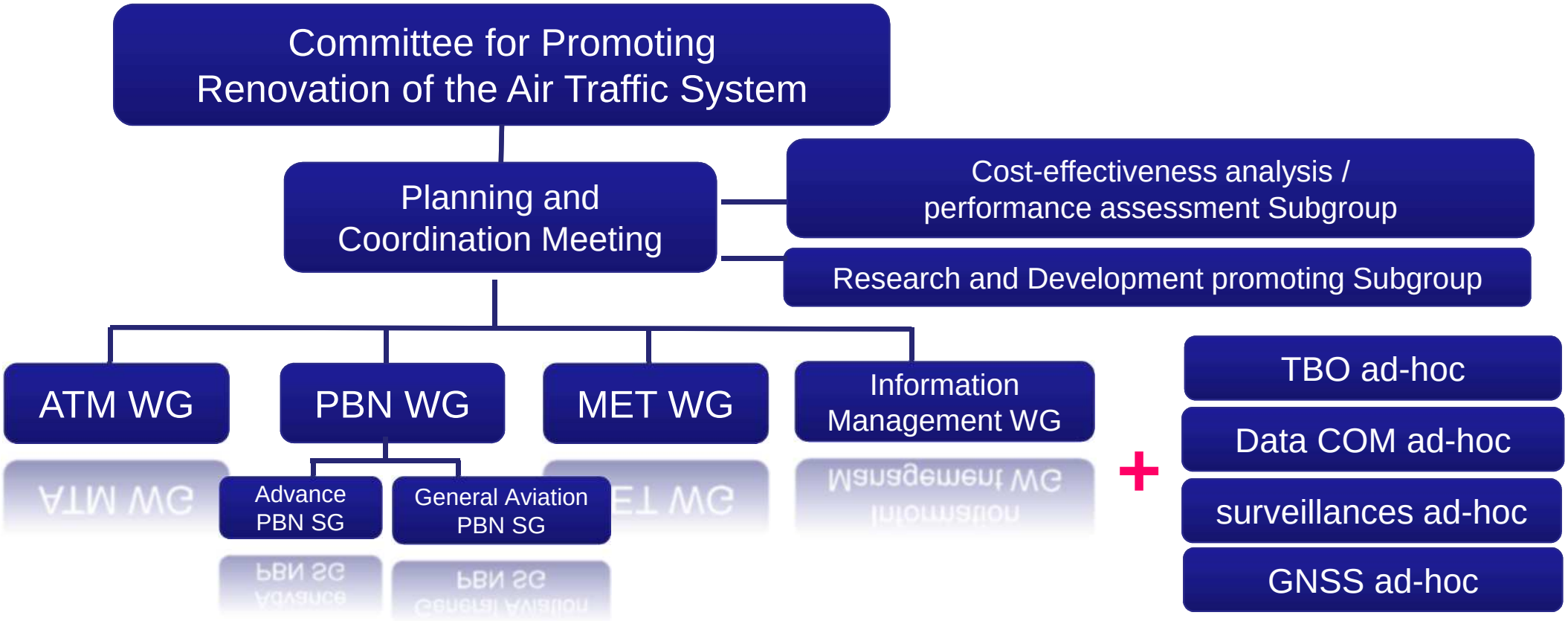
- 2009～2010　Development of long-term vision
  - Establishment of “Study group for Promoting Renovation of the Air Traffic System”
  - Development and promulgation of “Collaborative Actions for Renovation of Air Traffic Systems”（CARATS）

- 2010～2011　Development of roadmap for each measures
  - Establishment of “Committee for Promoting Renovation of the Air Traffic System”
  - Consideration of concrete measures and development of roadmap

- 2011～　Implementation Phase



Working Framework



***ATM: Air Traffic Management, PBN: Performance Based Navigation, RNAV: aRea NAVigation**

- There are four working groups (ATM, PBN,MET and IM) and relevant ad-hoc groups and sub groups.
- All of the groups carry out collaborative activities between airlines, research institutes, manufactures, JCAB, JMA and other government organizations.
- Assessments with cost-benefit analysis are required before implementation of each measure.

Objectives of CARATS and Development of performance indicators

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Development of indicators for checking the status of implementation of the CARATS measures
Progressing CARATS measures steadily and monitoring and analyzing them continuously

Objective and Numerical target	Outline of indicator
1 Enhancing safety (Increase safety level by 5 times)	The number of aircraft accident and important incident resulting from ATC (the average number for the past five years)
2 Responding to the increase in air traffic volume (Double the air traffic control capacity in congested airspace)	(Under consideration)
3 Improving user conveniences (Improve services level by 10%)	Punctuality : The rate of the arrival delay flights exceeding 15 minutes
	Actual operation rate : The flight cancellation rate by the influence of the whether (the average rate for the past three years)
	Rapidness: Flight time of Gate-to-Gate of main routes.
4 Improving operational efficiency (Reduce fuel consumption per flight by 10%)	The amount of the fuel consumption per flight in main routes
5 Improving productivity of air traffics services (Improve productivity of air traffic services by 50% or more)	The flight plan operation number of each air traffic controller
	The flight plan operation number to the maintenance expense (the average number for the past three years)
6 Responding to environmental issues (Reduce CO2 emissions per flight by 10%)	The amount of the CO2 emissions per flight in main routes
7 Enhancing the international presence of Japan in the aviation field	(Qualitative objective)

Direction of renovation in CARATS

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4. Realizing Satellite-based Navigation for All Flight Phases

Aircraft can determine position and time accurately in all FIR of Japan by Satellite-based navigation

3. Promoting Performance-based Operation (PBO)

1. Realizing Trajectory-based Operation (TBO)

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

Accurate time-based management

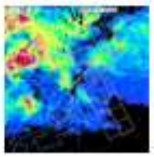
5. Enhancing Situational Awareness on the Ground and in the Air

Cooperation between ground and air, Information sharing

Integrated ATC processing system

8. Realizing High-density Operation in Congested Airports and Airspace

6 Making Maximum Use of the Capability of Human Beings and Machines



2. Improving Predictability

The calculation of air traffic control capacity, Estimation of traffic flow, Improving of predictability of meteorological phenomena

7. Complete information-sharing and Collaborative Decision-Making

Measures of aviation weather in CARATS

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CARATS RoadMap

operational improvements：OI
(improve operation)

enablers：EN
(technology for enabling OI)

Measures of aviation weather

ALL Measures of aviation weather are enablers (EN)

Improved weather observation capabilities

- Provision of weather observation information to aircraft via data uplink system
- Integration of observation data around aerodrome and air spaces

Improved weather forecast capabilities

- Development of NWP model with high frequency and resolution
- Expansion of forecast elements

Quantification of the impact of severe weather on capacity and other aircraft operations

- Estimation of impact on ATM using MET information
- Translation from MET data to airport/airspace capacity

MET information sharing infrastructure

- Sharing of weather information with standardized format on SWIM environment
- Development of Common Meteorological Database which includes weather observation and forecast information

Examples of the recent activities on MET in CARATS

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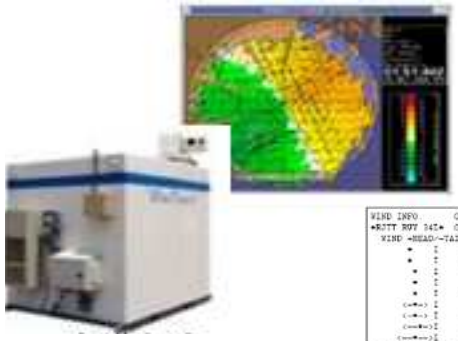
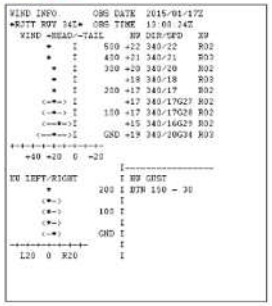
Improved weather observation capabilities

Doppler RADAR



Doppler LIDAR

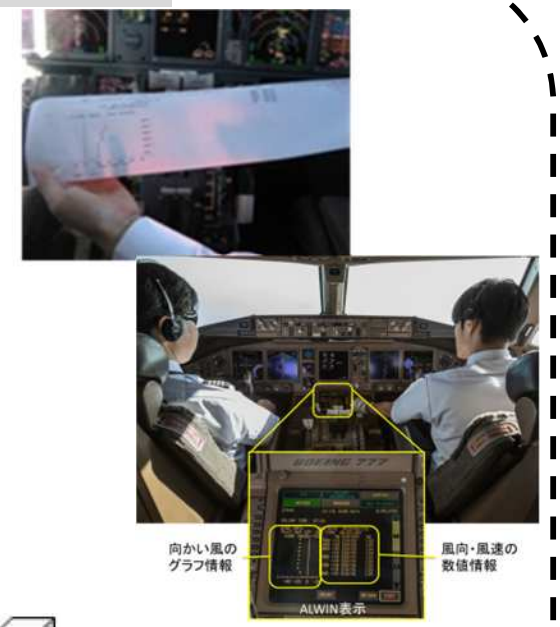


Text-based information for aircraft

Airlines

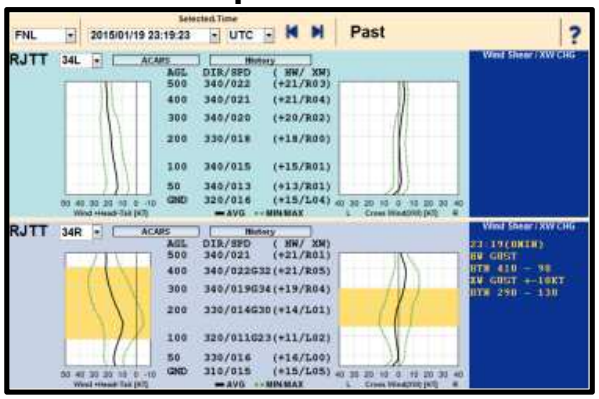
Aircraft

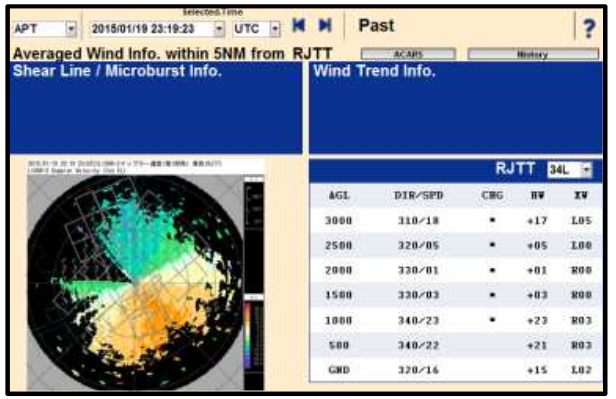
ACARS system



Operation system

Graphical information for operators





Examples of the recent activities on MET in CARATS

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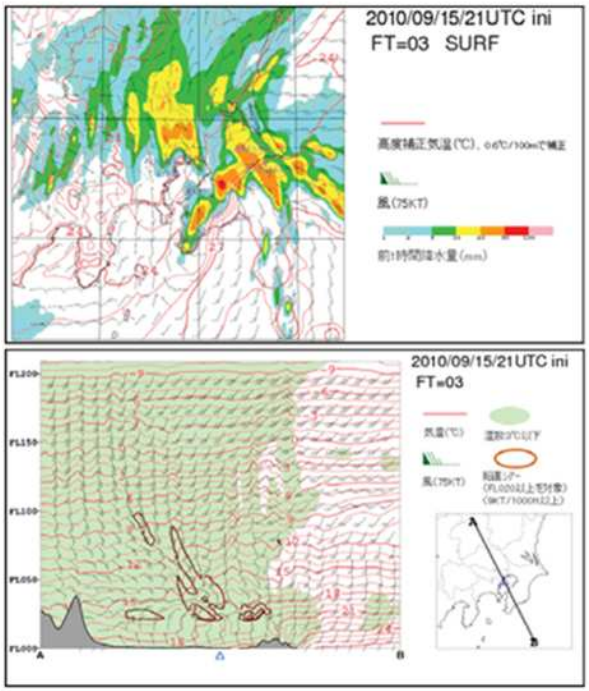
Improved weather forecast capabilities

Development of high resolution NWP model



Aerodrome sequential forecast (Graphical TAF)

RJTT AERODROME SEQUENTIAL FORECAST Part1

ISSUED TIME 2312UTC 24 SEP 2014
TOKYO AVIATION WEATHER SERVICE CENTER

	UTC	~01	~02	~03	~04	~05	~06	~07	~08	~09	~10	~11	~12
Wind	Cross	18	18	21	21	21	18	18	15	9	1	1	1
	DIR/Speed(kt)	200/24	200/24	200/28	200/28	200/28	200/24	200/24	200/20	220/10	340/08	340/10	340/10
	Gust(kt)	34	34	38	38	38	34	34	30				
	Tempo												
	Cross	26	26	26	26	26							
	DIR/Speed(kt)	200/34	200/34	200/34	200/34	200/34							
	Gust(kt)	44	44	44	44	44							
Visibility(m)		8000	8000	9999	9999	9999	9999	9999	9999	8000	8000	8000	9999
	Tempo	4000	4000							4000	4000	4000	
Ceiling(ft)		2000	2000	2000	3000	3000	3000	3000	3000	2500	2500	2500	3000
	Tempo												
Weather										-SHRA	-SHRA	-SHRA	
	Tempo	SHRA	SHRA	-SHRA						SHRA	SHRA	SHRA	-SHRA
Temperature(℃)		23	23	24	25	25	26	26	26	25	24	23	23
Pressure(hPa)		1006	1004	1003	1002	1002	1002	1002	1002	1003	1004	1005	1006
TS probability			D			D			B			B	

TILE	Wind(kt)	Vis.(m)	Ceil.(ft)	WX	TS Prob.
	34~	~900	~100	TS	A
	25~33	1000~3100	200~900		B
	~24	3200~	1000~		C,D

Summary

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- In the CARATS project of Japan, renovation of Air Traffic System has been discussed among various stakeholders, such as government organizations, research institutes, manufacturers and airlines.

- The measures relating aeronautical meteorology will be effective to address increase of air traffic, to improve safety and efficiency on aircraft operations, and to realize Trajectory-based Operation (TBO) which is one of the main directions of renovation in CARATS.