CIVIL AVIATION BUREAU OF JAPAN

# Contributing to Efficient Air Traffic Operations


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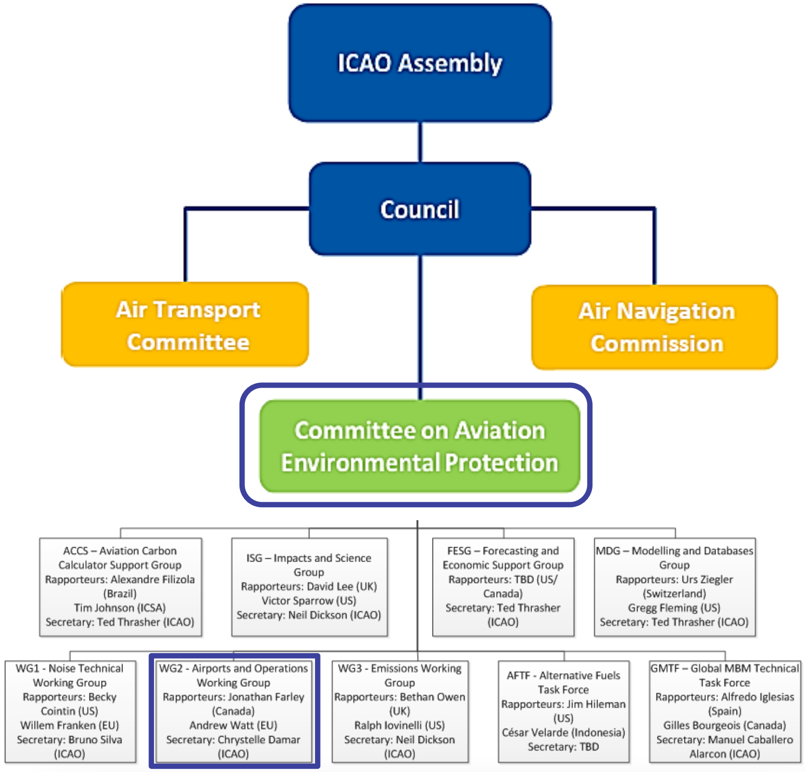
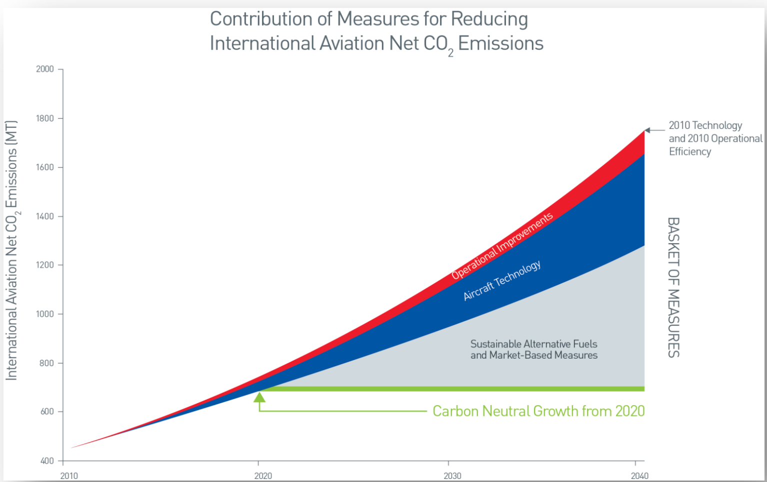
3. **GBAS** *(Ground Based Augmentation System)* **Implementation plan**

# ICAO（CAEP）activities for ENVIRONMENT

国土交通省
【機密性2】




<u>The 39th session of ICAO Assembly reached a historic ENV agreement.</u>

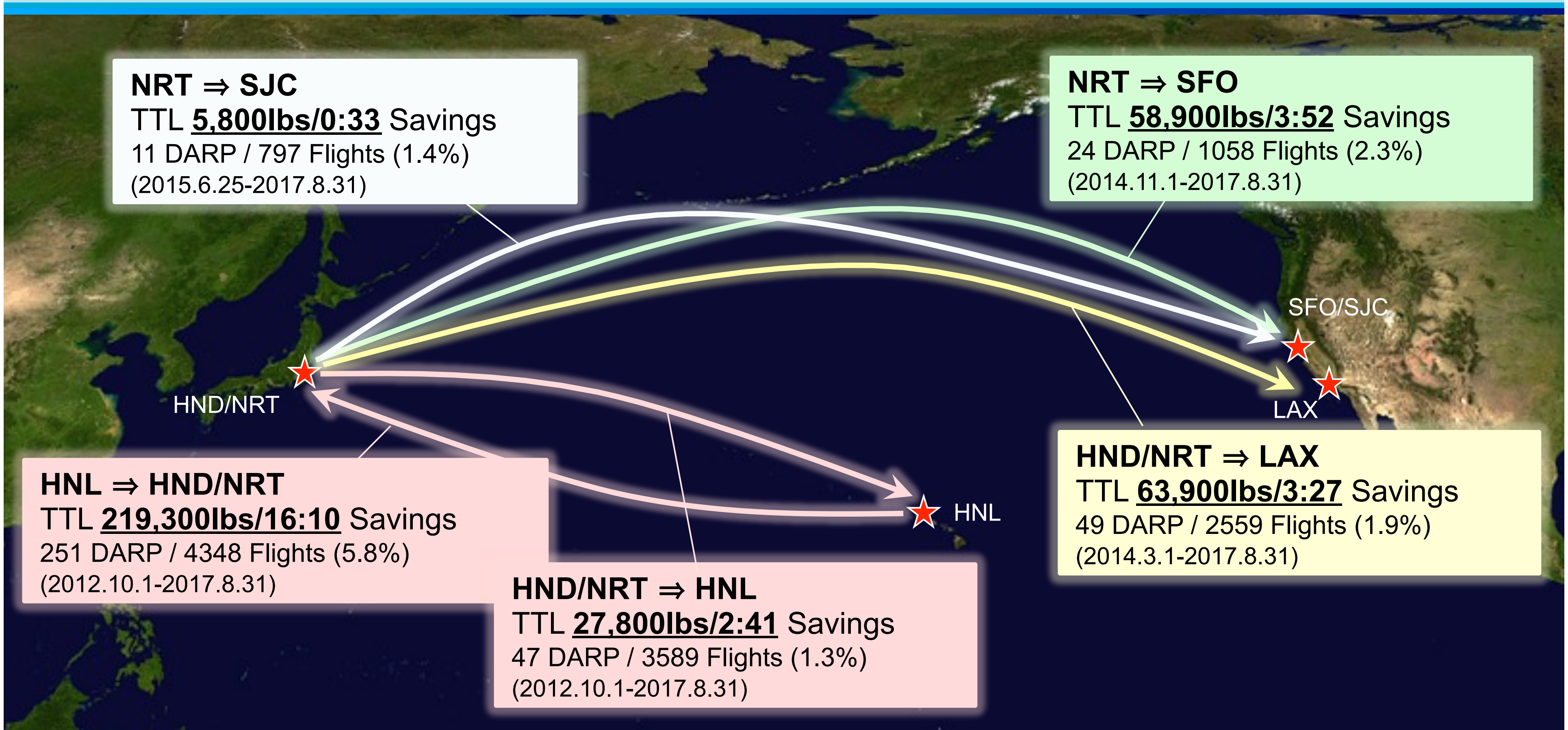
- The basket of measures (i.e. aircraft, technology and standards, operational improvement, sustainable alternative fuel, and GMBM.
- CORSIA : Carbon Offsetting and Reduction Scheme for International Aviation

<u>The Assembly Resolution adopted on ENV.</u>

Resolution A39 1-3 : Consolidated statement of continuing ICAO policies and practices related to environmental protection

- General provisions, noise and local air quality.
- Climate change.
- Global Market Based Measure scheme.

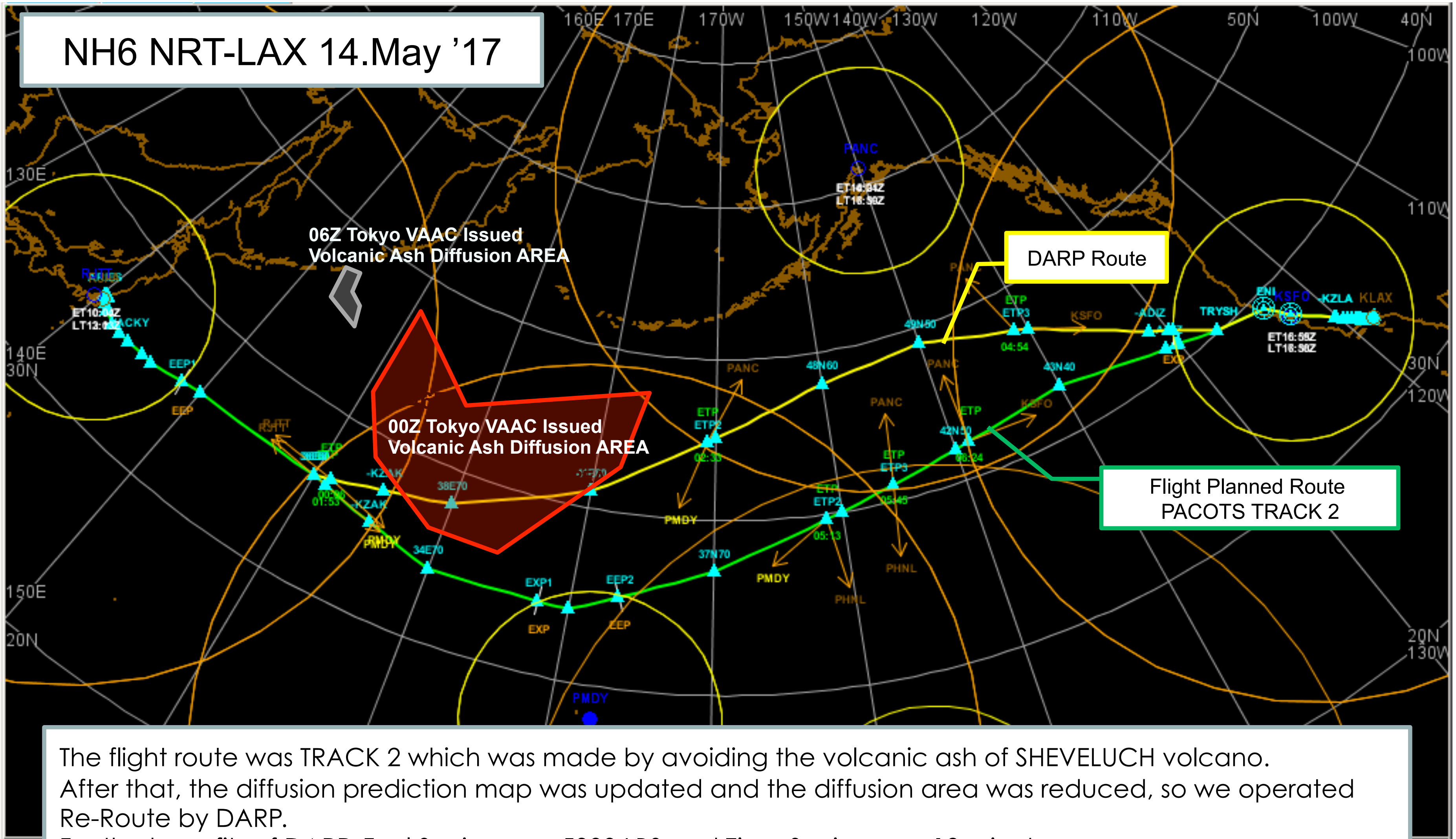
# DARP-1




| Departure Airport | Arrival Airport | Target FLT | Applied DARP FLT | Executing Rate (%) | TTL Fuel Saving (LBS) | TTL Time Saving | Fuel Saving per flight (LBS) | Time Saving per flight |
|---|---|---|---|---|---|---|---|---|
| HNL | HND/NRT | 4348 | 251 | 5.8% | 219,300 | 16:10 | 874 | 0:03 |
| HND/NRT | HNL | 3589 | 47 | 1.3% | 27,800 | 2:41 | 591 | 0:03 |
| HND/NRT | LAX | 2559 | 49 | 1.9% | 63,900 | 3:27 | 1,304 | 0:04 |
| NRT | SFO | 1058 | 24 | 2.3% | 58,900 | 3:52 | 2,454 | 0:09 |
| NRT | SJC | 797 | 11 | 1.4% | 5,800 | 0:33 | 527 | 0:03 |

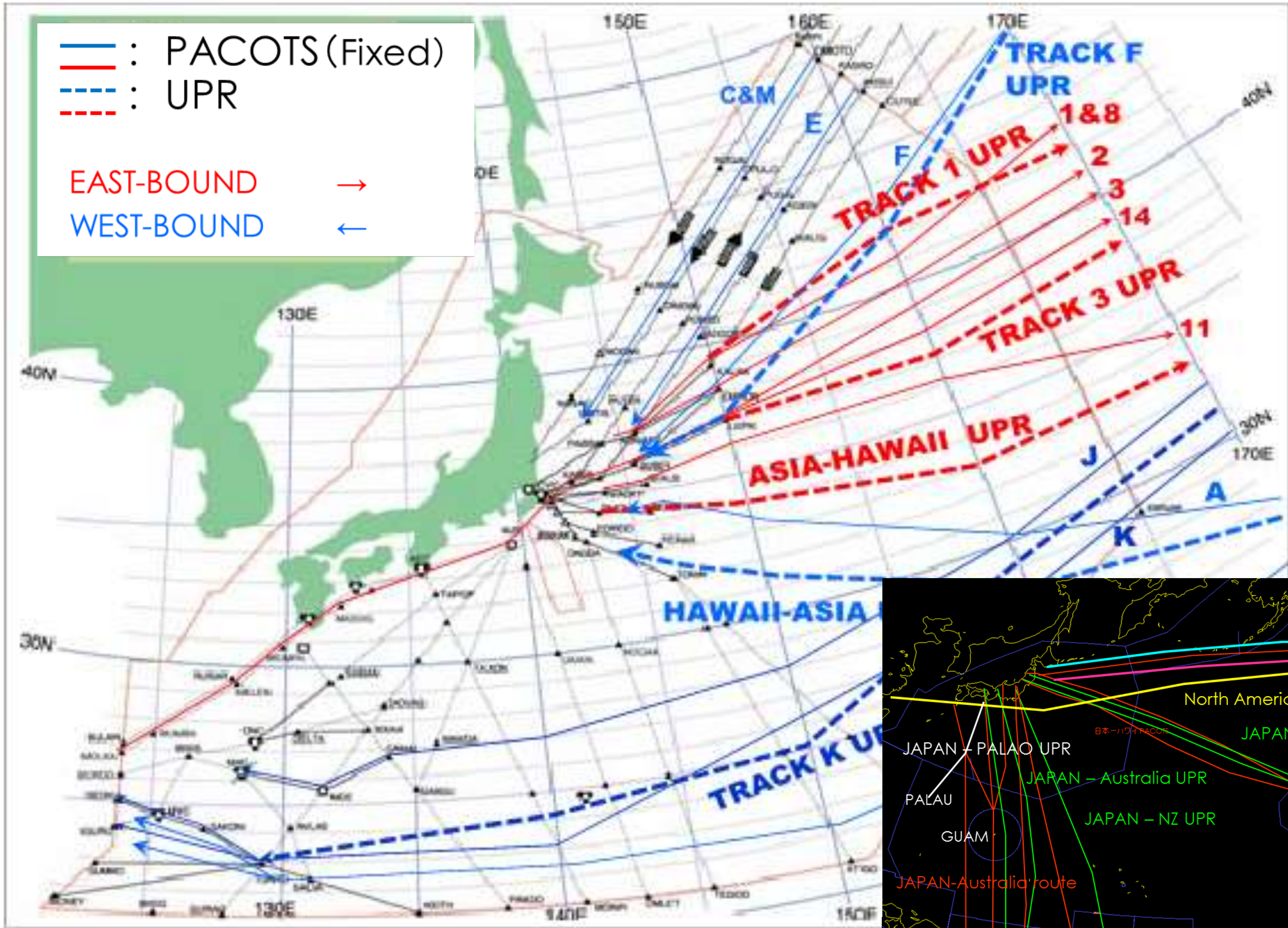
(Data: A total of 12,351 flight between 2012.10.1 and 2017.8.31)

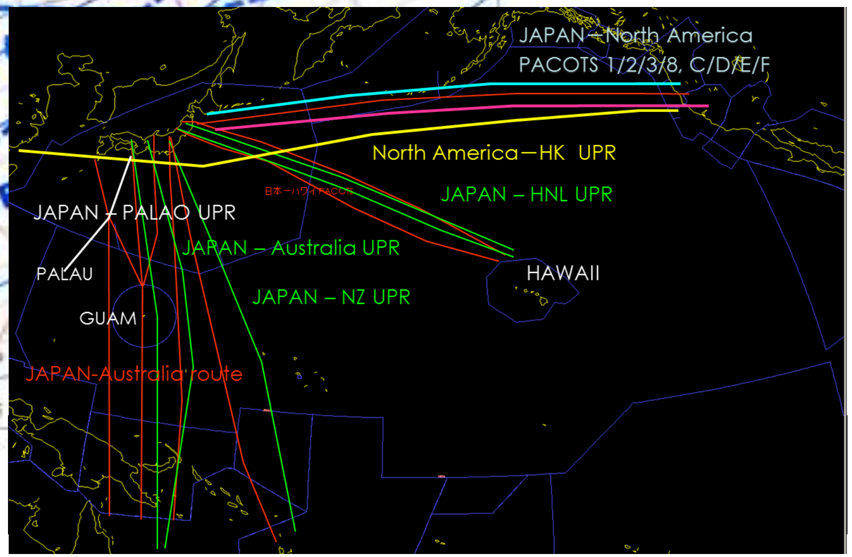
# DARP-2




The flight route was TRACK 2 which was made by avoiding the volcanic ash of SHEVELUCH volcano.
After that, the diffusion prediction map was updated and the diffusion area was reduced, so we operated Re-Route by DARP.
For the benefits of DARP, Fuel Saving was 5300 LBS and Time Saving was 18 minutes.
Even if it is difficult to predict the change like this time, it is considered that the latest data can be applied as appropriate and DARP can be used to minimize the influence on flight.

# UPR User Preferred Route



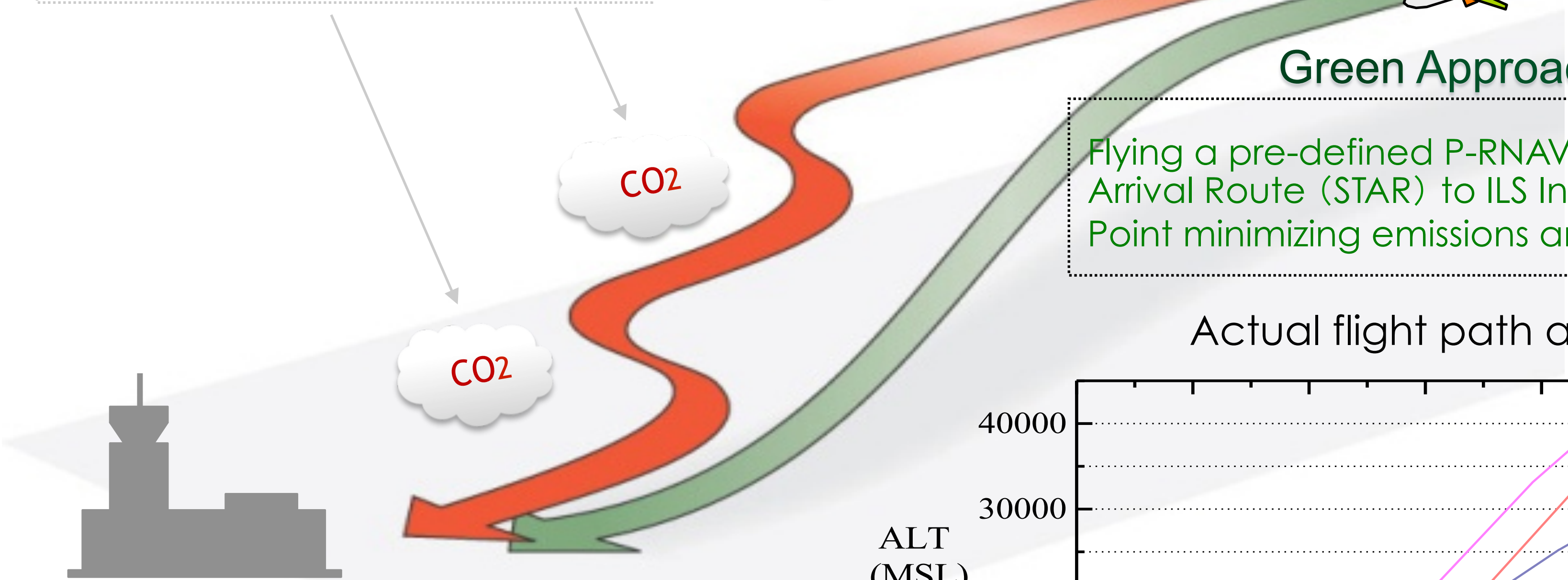
# CDA at Kansai International Airport

## Traditional Approach

Level off segment forcing the aircraft to use engines, flaps, slats etc. that creates more emissions and noise

## CDA is implemented at

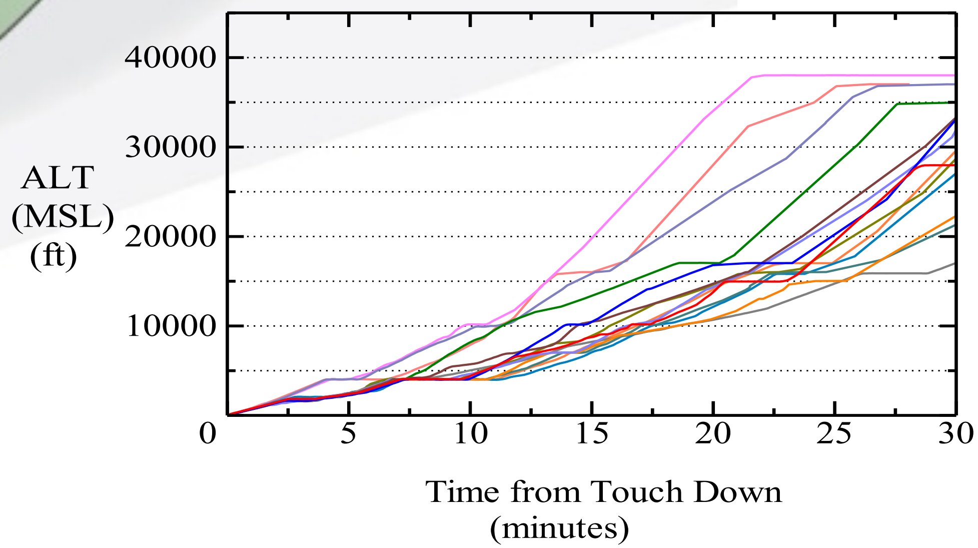
- Kansai Airport
- Naha Airport
- Kagoshima Airport




## Green Approach

Flying a pre-defined P-RNAV Standard Arrival Route (STAR) to ILS Intercept Point minimizing emissions and noise.

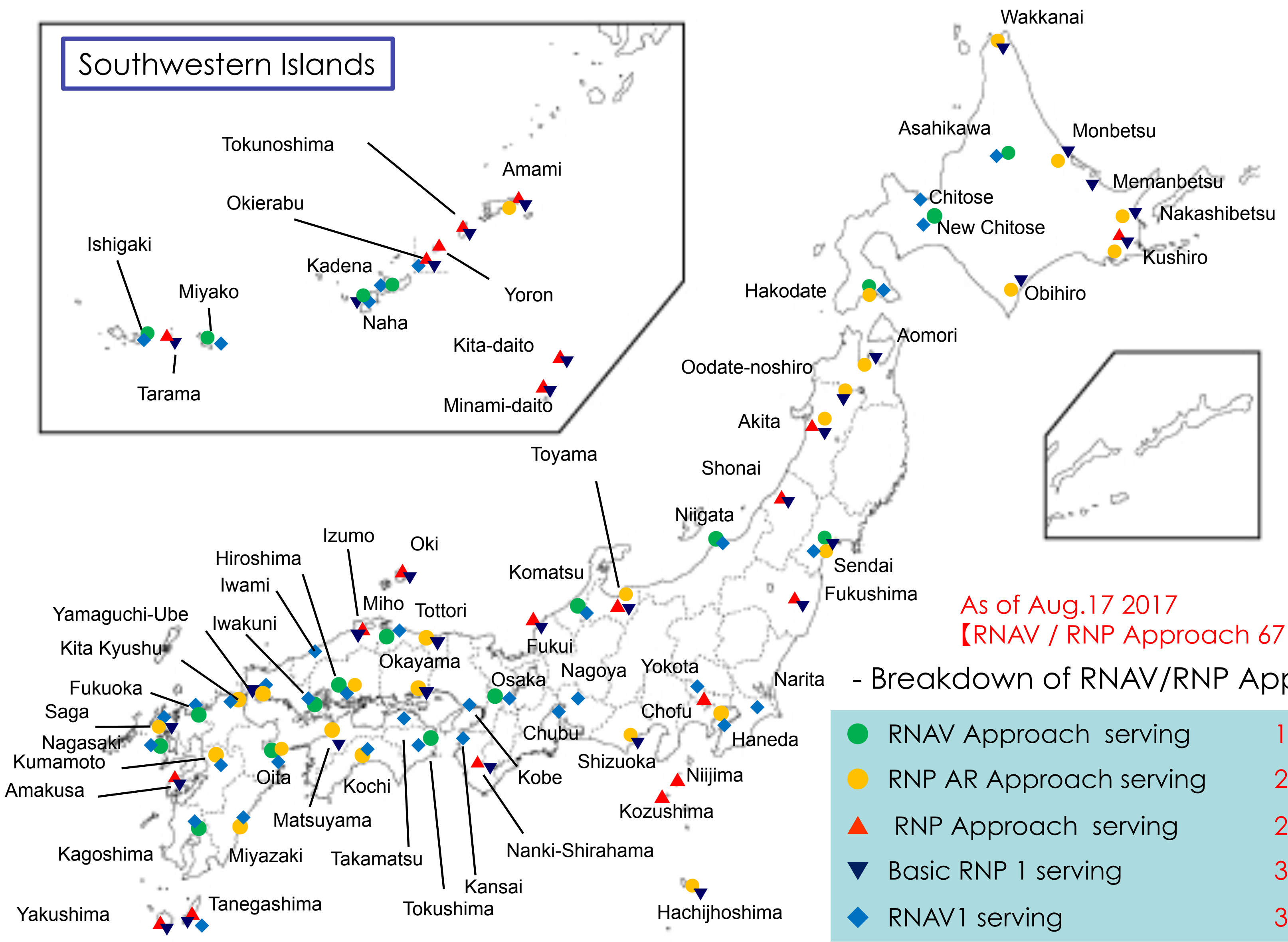
### Actual flight path at KIX




## ENV Benefit of CDA

- Noise reduced by up to 5 dB
- Fuel savings – 50-150 kg per flight
- $CO_2$ by over 300 kg per flight
- NOx also reduced

# RNAV / RNP Approach in JANS



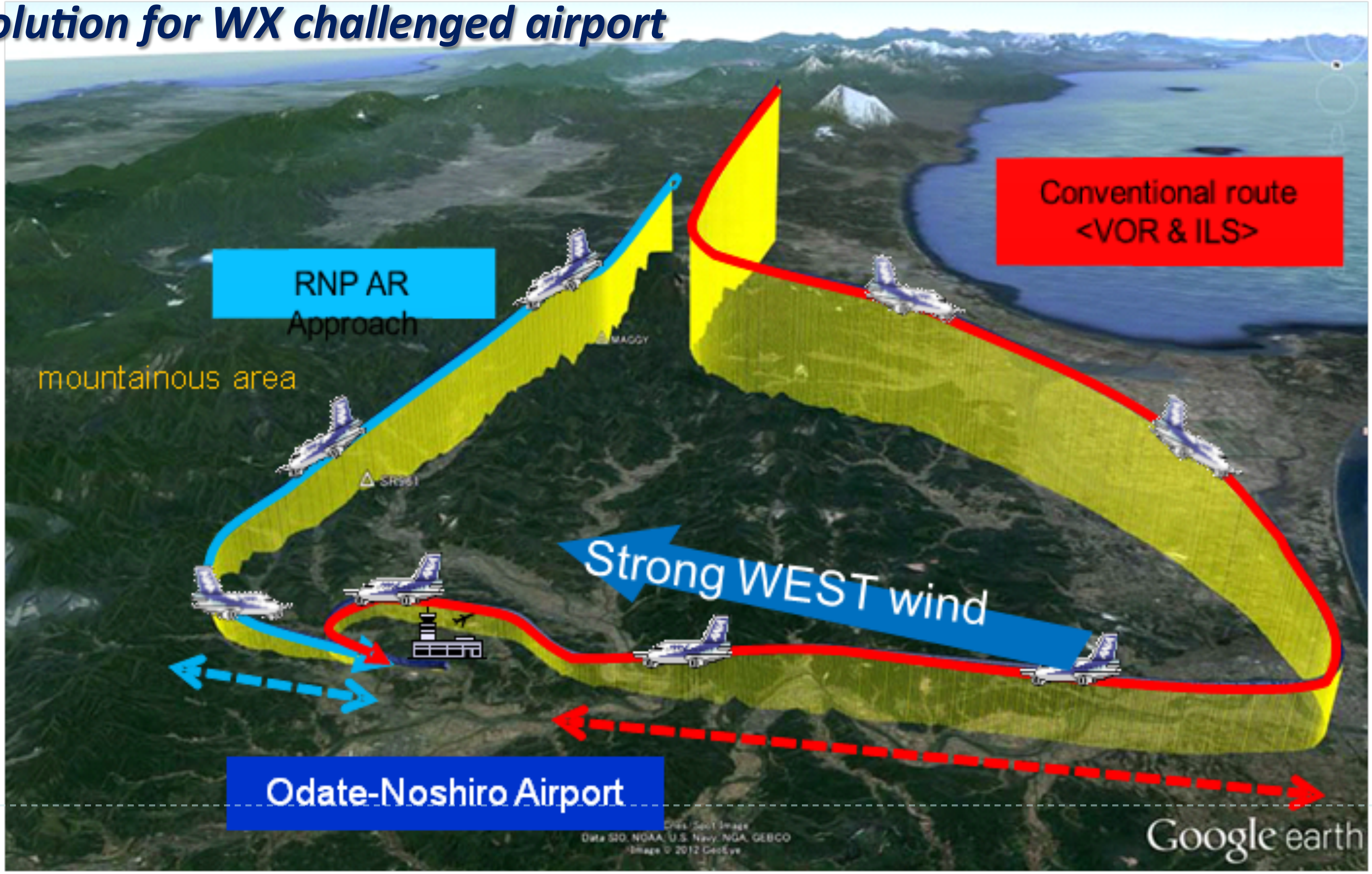

As of Aug.17 2017
【RNAV / RNP Approach 67 airports】

- Breakdown of RNAV/RNP Approach -

| | | |
|---|---|---|
| ● | RNAV Approach serving | 19 airports |
| ● | RNP AR Approach serving | 26 airports |
| ▲ | RNP Approach serving | 22 airports |
| ▼ | Basic RNP 1 serving | 34 airports |
| ◆ | RNAV1 serving | 37 airports |

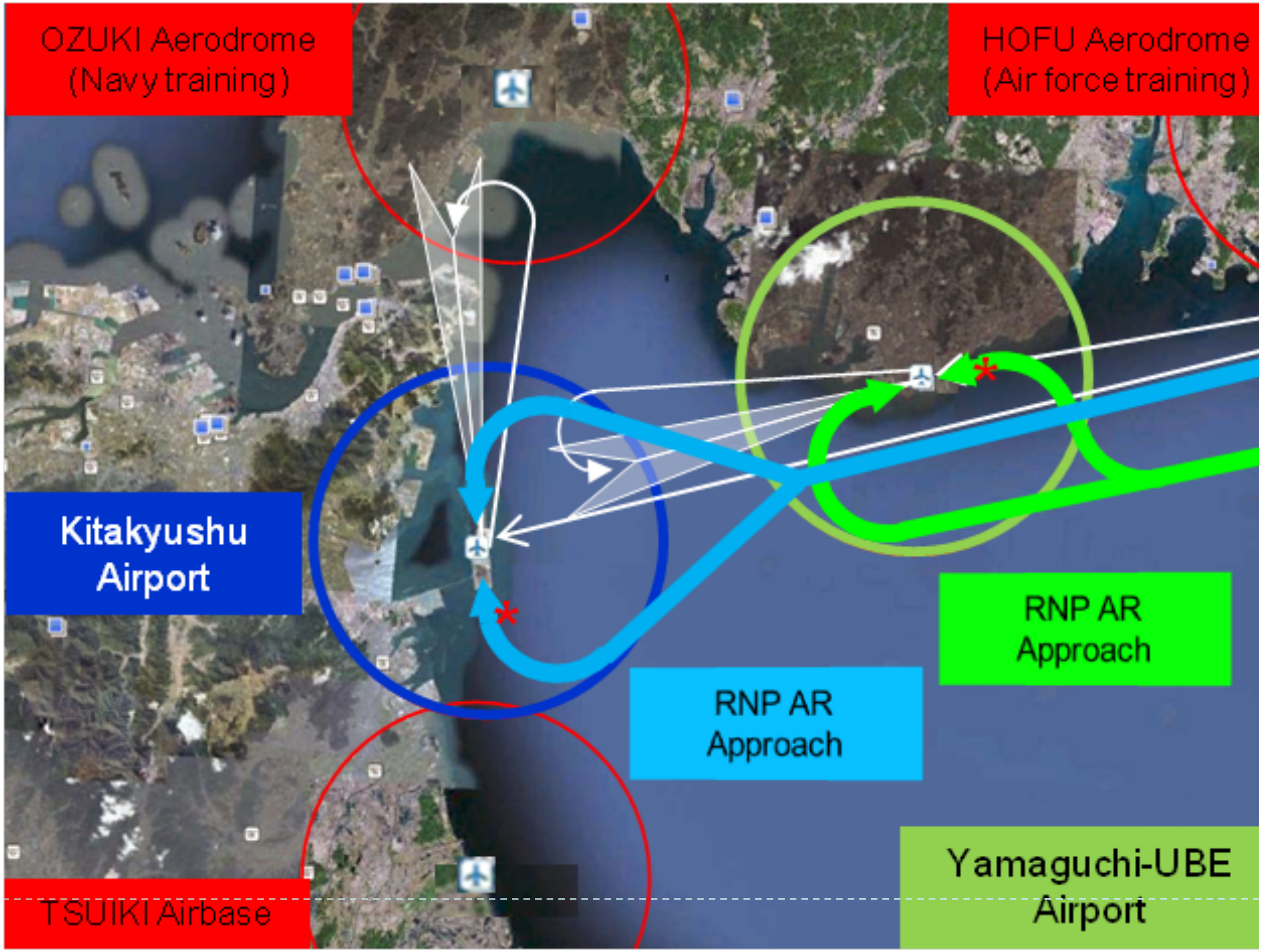
# RNP-AR example-1

## Solution for WX challenged airport



# RNP-AR example-2

## Solution for Closely located Airport



# *Civil and Military Working together toward FUA*

***FUA:Flexible Use of Airspace***

**Military Training Areas in Japan**

**Air Traffic Management Center**

# Benefits of ATFM

The ATMC provides Routing management, Approval for flight plans and Flow control as ATFM functions.

- Routing management:

  Managing route-network to form efficient and orderly traffic flow and rerouting to avoid congested airspace or severe weather area.

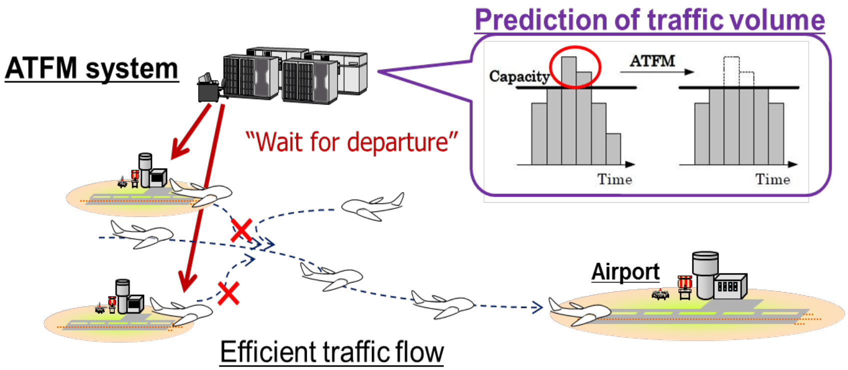
- Approval for IFR flight plans:

  The flight plans are given by ATMC with necessary instructions in accordance with overall traffic flow management.

- Flow control:

  To ensure appropriate and maximum traffic flow by instructing minimum restrictions when traffic demand exceeds airspace capacity.

  - Assignment of Expected Departure Clearance Time/EDCT.
  - Assignment of restrictions on ATC procedures to ATC facilities.




**Japan's Experience and Benefit**

- Total Delay Time : 120,000 minutes.
- Economic Effect : 32,000 kiloliters fuel reduction ( cost cut : 24,400,000$)
- Eco Friendly : 6,000 tons of $CO_2$ emission reduction.

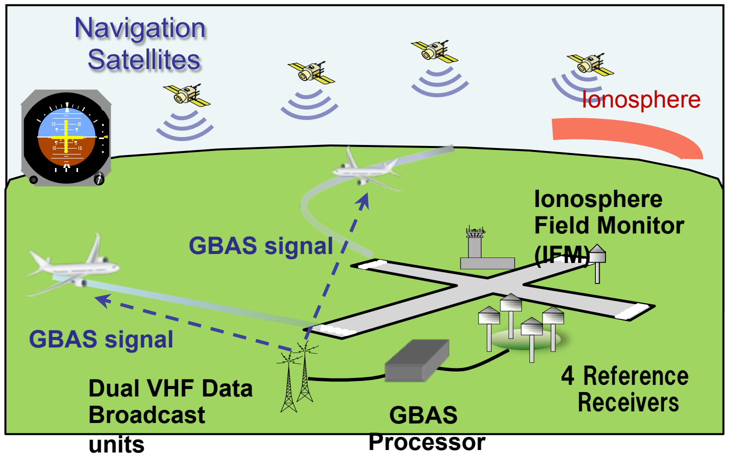
# GBAS Implementation Plan

- JCAB is now installing Japan's 1st GBAS, manufactured by NEC at Tokyo International airport scheduled to be in operation in 2022 after test and evaluation periods of 2 years.

- GBAS consists of
  - **4 Reference Receivers** for collecting navigation data from GPS
  - **Processor** for generating GBAS signal
  - **VHF Data Broadcast unit** for transmitting digital data to aircraft
  - **Ionosphere Field Monitor** (IFM) for mitigating severe ionosphere effect at low geo-magnetic location in Japan

- GBAS corrects GPS errors and provides vertical and horizontal guidance to suitably equipped aircraft for precision approach and landings, initially CAT-I and eventually to CAT-III standards.

Tokyo international Airport



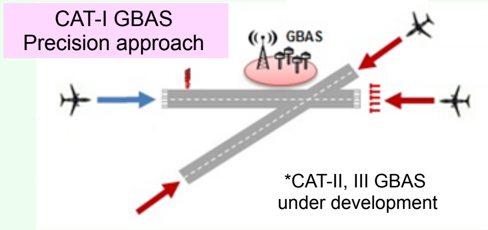

GBAS configuration

# Advantages for GBAS

GBAS provides new operational concept and solution.

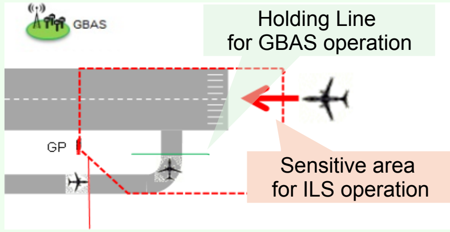
## One system covers Multi-R/W

- Precision approach procedures for multiple runway are provided by one system.
- CAT-I GBAS standard had incorporated in ICAO ANNEX-10 and the multiple runway service also already operated in several countries.



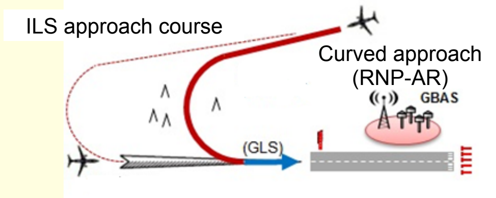

## No Critical/Sensitive area

- The aircraft landing timing by GBAS does not requires CSA, which is required by ILS technical operation, consequently enables to set holding line close to runway.



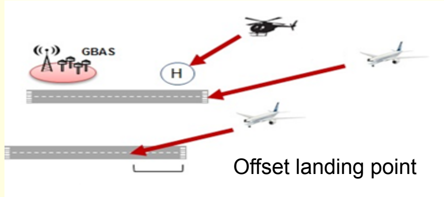

## Flexible precision approach

- In the combination of RNAV/RNP procedure, it enables to introduce CDA to R/W-end. This advantage would be expected to improve fuel consumption, noise abatement and $CO_2$ emission.




## Offset landing point

- Technically GBAS has possibility to set several landing point on the runway and it is expected to reduce noise pollution and separation minima by wake turbulence.



# Thank you for your attention！