INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY NINTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/29)

Bangkok, Thailand, 3 to 5 September 2018

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.5: **MET**

AIRPORT LOW-LEVEL WIND INFORMATION (ALWIN)

(Presented by Japan)

SUMMARY

This paper presents Airport Low-level Wind INformation, ALWIN, has started the operation at Tokyo International Airport and Narita International Airport since April 2017. The ALWIN provides detailed wind information such as direction, speed, wind shear, or turbulence, etc., on the final approach paths to pilot by ACARS.

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency****—Increase the capacity and improve the efficiency of the global aviation system*

E***: Environmental Protection*** *— minimize the adverse environment effects of civil aviation activities.*

1. INTRODUCTION

1.1 Sudden localized wind changes at low altitude such as wind shear and turbulence become major causes for occurrence of go-around event, decrease of service ratio and in the worst case, accidents. For example, at Narita International Airport, there are about 100 go-around cases occurs every year. More than 90% of them occur due to low-level wind disturbances, such as wind shear, turbulence, and strong headwinds or crosswinds. In the past 10 years, there was a go-around case which caused 20 minutes delay of arrival time and there were 2 accident cases, due to low-level wind disturbances at the time of landing.

1.2 With these backgrounds, Airport Doppler Weather Radar (DRAW) are installed at nine airports and Airport Doppler Weather Lidar (LIDAR) are installed at three airports in Japan to detect strong wind shear and microbursts, which may cause an accident. DRAW can detect wind disturbance in rainy condition and LIDAR can complement in dry and clear air condition. The detected information is provided to Air Traffic Controller (ATC) through Total Information Display Unit (TDU) and delivered to pilot by VHF radio (See Fig.1).

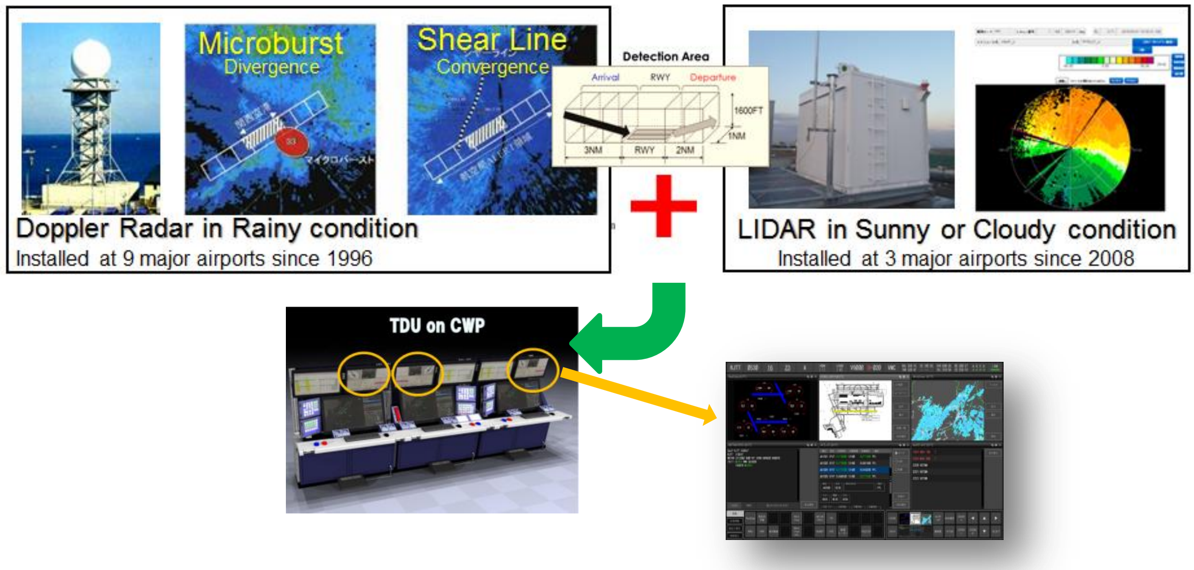

Fig.1 Existing system

2. DISCUSSION

2.1 <u>Current system for Wind Shear Alert/Microburst Alert</u>

In the existing system, low-level wind shear and microburst are detected by these two criteria as below. (See Fig 2)

Shear line: the case which increase or decrease headwind component equal or greater than 20kt
Microburst: the case which decrease headwind component equal or greater than 30kt

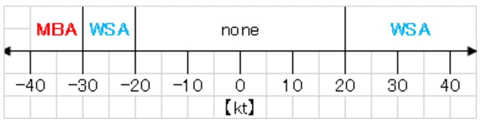

Fig.2 Alert limit

Those thresholds are defined for the provision of wind shear alert (WSA) and microburst alert (MBA), against headwind component. And the contents of the information are intentionally limited, because it is broadcasted by ATC by VHF voice immediately.

2.2 <u>Introduction of new system, ALWIN</u>

Sometimes there were go-around cases happened when any alerts were not issued. While the existing wind shear information system using DRAW/LIDAR is proven to be effective for reduction of accident, there were some views identified through user consultation regarding further improvement of wind information for the safety and efficiency of aircraft operation along final approach paths, as follows.

1. There is no information on local wind change that may changes aircraft's speed and attitude on final approach.
2. There is no information to support the pilot's decision-making on landing timing when wind condition is severe.

3. Pilot cannot use alert information to plan stable landing. Because the information is not quantitative nor visualized.

To address the above requirements from users, Japan Aerospace eXploration Agency (JAXA) and Japan Meteorological Agency (JMA) had jointly developed Airport Low-level Wind Information (ALWIN). After operational evaluations in coordination with some airline users, ALWIN started its operation at Tokyo international airport and Narita international airport in April 2017. The ALWIN calculates detailed wind information such as direction, speed, wind shear, or turbulence, etc., along with the final approach paths. ATC or flight dispatchers can use numerical and graphical wind information by dedicated web-based service (MetAir) provided by the JMA. In addition, pilot in the cockpit can acquire the detailed wind information by ACARS and can see it on alphanumeric cockpit displays and printers. (See Fig3)

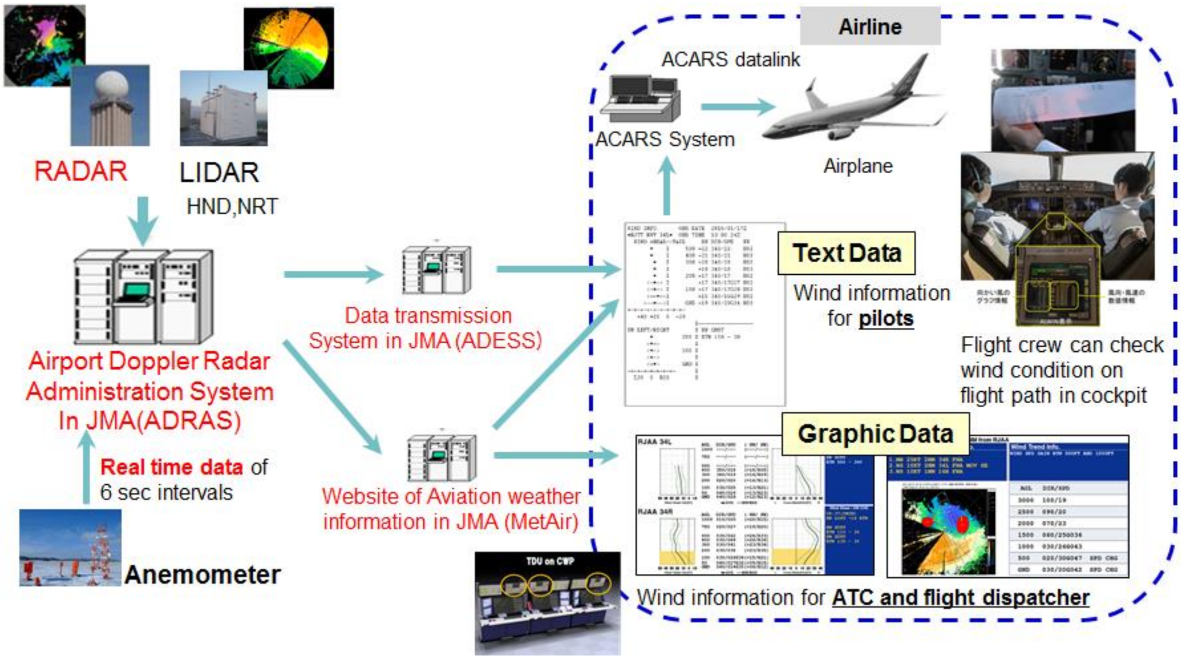

Fig.3 Outline of ALWIN system

Using ALWIN, pilots can acquire detailed information on low-level wind changes on the final approach path in timely manners. And such information enables the pilot to take more appropriate measures such as speed or thrust adjustment, and attitude control when landing. This will contribute to better safety for aircraft landings. Furthermore, it is expected to improve the efficiency of operations, by sharing the same data among pilot, flight dispatcher, and ATC.

2.3 Flow of providing wind information by ALWIN

ALWIN detects wind disturbances every 2 minutes using observation data from DRAW and LIDAR. ACARS by VHF datalink can be used as a media to send the wind information to aircraft. There are two ways of operational use of ALWIN information;

1) 'push' operation

Flight dispatchers monitor the ALWIN screens and send ALWIN information to aircraft when notable wind disturbances are detected.
This type of operation does not require any modifications to existing airline systems.

2) 'pull' operation

Pilots can obtain ALWIN information from the cockpit at any time using ACARS. To realize this type of operation, airlines have to modify their ACARS ground systems to respond automatically to pilot requests by retrieving the latest ALWIN text information from the JMA server and to uplinking it. Currently this pull type operation is made available only in two major airlines in Japan due to system restriction.

2.4 <u>Example of wind information</u>

Fig4 and Fig5 show examples of ALWIN information. Each of left side figures shows web-based information for ATC and flight dispatcher. They can see headwind, crosswind, on landing paths and location, of shear lines or microbursts around airport.

Each of right side figures shows text-based information for pilot. Pilots can get the same information formed in text format except the locations of shear lines or microbursts.

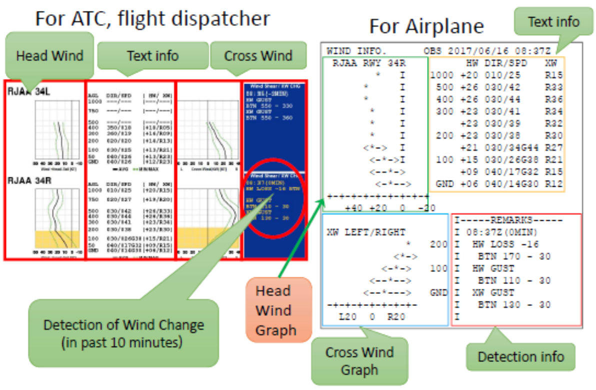

Fig.4 Flight path wind information

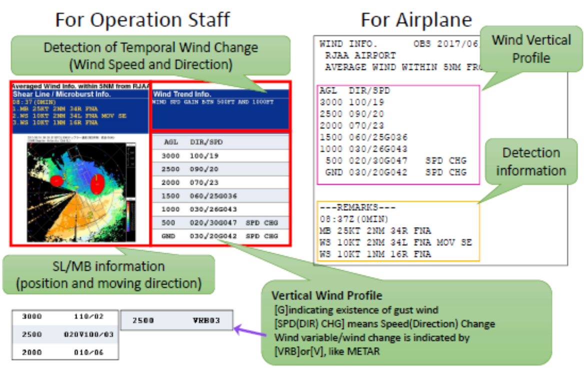

Fig.5 Airport information

2.5 <u>Conclusion</u>

Before the implementation of ALWIN, two operational evaluations by using the ALWIN prototype were conducted in 2014 and 2015 at Narita International Airport and Tokyo International Airport with the participation of two Japanese airlines. Over 80% of pilots responded the ALWIN was useful for their operation. And 90% of them hoped operational implementation of the ALWIN. In response to this evaluation result, the JMA decided to install ALWIN system in Tokyo International Airport and Narita International Airport.

The JMA will consider further improvement of the ALWIN in close consultation with users. JAXA plans to quantify the operational benefit of the ALWIN by comparing aircraft operation record before and after the ALWIN introduction.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the information contained in this paper, and

b) discuss any relevant matters on the draft guidance as appropriate.

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