

**52<sup>ND</sup> CONFERENCE OF  
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ASIA AND PACIFIC REGIONS**

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AGENDA ITEM 3.3: AIR NAVIGATION MATTERS

**EFFECTIVENESS FOR PREPARATION OF  
TEMPORALLY EQUIPMENT**

(Presented by Japan)

**SUMMARY**

It is important to prepare temporarily equipment to secure a certain Air Traffic Control (ATC) function of an airport when equipment of the airport is destroyed by catastrophe.

This Paper introduces the best practice of risk management, which enabled early recovery from catastrophic damage of ILS by using temporarily equipment. States are encouraged to consider to stock temporarily equipment to secure a certain ATC function from damage caused by catastrophe.

## EFFECTIVENESS FOR PREPARATION OF TEMPORALLY EQUIPMENT

### 1. INTRODUCTION

1.1 It is important to prepare temporarily equipment to secure a certain ATC function of an airport when equipment of the airport is destroyed by catastrophe such as earthquake, fire, or others, and when recovery of the damaged function is estimated to take a long time.

### 2. DISCUSSION

2.1 Currently Japan Civil Aviation Bureau (JCAB) has prepared temporarily equipment such as VOR/DME, ILS, DME, and SSR for use as alternative system when the original aged equipment needs to be upgraded. It is taken apart and those devices are packed in shelters and are stored at Tomobe transmitter site. (Figure 2.1, 2.2) The shelter contained transmitters is controlled under the appropriate air-conditioned environment to prevent deterioration of electronic components.

2.2 On the other side transportable VFR tower or transportable radar control system for emergency is commonly prepared by many States. JCAB has owned three sets of the Emergency VFR system for ATC (EVA) and Transportable Radar Control System (TRCS) each as part of crisis management. Taking into consideration of disaster at the storage location, we store them in 3 airports in Japan. These systems were used and enabled early resumption at the Sendai airport, which was seriously damaged by Tsunami caused by the Great East Japan Earthquake on March 11, 2011. And the resumption of infrastructure of the airport made a significant contribution for recovery from the catastrophe in the region.

#### 2.3 Temporary VOR/DME system

The temporary VOR/DME system is taken apart and packed in 7 shelters. It can be transported by a medium size truck. (Figure 2.3) It is possible to adjust the height of counter-poise reflector by three stages from 3.8m to 9.6m. Currently JCAB has 10 sets and normally uses them as alternative VOR/DME system when the original aged VOR/DME needs to be upgraded.



Figure 2.1 [Location of transmitter site]



Figure 2.2 [Storage situation at Tomobe]



Figure 2.3 [Temporary VOR/DME]

2.4 Temporary LOC /DME system

The temporary Localizer (LOC)/DME system is taken apart and packed in 4 shelters. It can be transported by a medium size truck. (Figure 2.4) It is possible to adjust the height of antenna by three stages from 2.5m to 3.5m. Currently JCAB has 5 sets and normally uses them as alternative LOC when the original aged LOC needs to be upgraded.



Figure 2.4 [Temporary LOC/DME]

2.5 Example of early recovery from mechanical damage

2.5.1 Recovery process

On April 14, 2015, at Hiroshima airport, which is 700km west from Tokyo, ILS LOC antenna was accidentally destroyed by a passenger aircraft. (Figure 2.5.1) The ILS is capable for Category (CAT)-IIIb operation. Because the airport is located in mountain area and there are many foggy days, so high precision ILS is indispensable for this airport.

After the accident the LOC antenna was catastrophic destroyed and JCAB confirmed it took over 8 months to repair. ILS CAT-III system requires a LOC antenna specialized designed for CAT-III, however JCAB does not stock the spare antenna. And the temporarily LOC equipment is designed as CAT-I and cannot integrate with CAT-III equipment.

With these background JCAB decided to make a plan to restart ILS as CAT-I operation by using a temporary LOC, which is originally planned to be used as alternative LOC during the upgrade work of an aged ILS at the other airport.



[Before the accident]



[After the accident]

Figure 2.5.1 [LOC antenna at Hiroshima airport]

JCAB started the work from removal of damaged LOC antenna from April 16 just after the completion of traffic accident investigation. And JCAB started the installation work of temporary LOC from April 17. After that installation work, the adjustment work had completed on May 1. After radio wave inspection and flight inspection, ILS CAT-I operation by temporary LOC has started the operation since May 5. (Figure 2.5.2, 2.5.3)



Figure 2.5.2 [Installation of equipment]




Figure 2.5.3 [Situation at Flight inspection]

2.5.2 Impact for early recovery

Table 2.5.4 shows approach procedures and operational situations after the airport reopen. During the first 7 days, operation was limited under VMC condition because of the accident aircraft existing in the airport, thus many flights were cancelled when the visibility was low. After removal of the accident aircraft, VOR approach was implemented for 9 days. Several flights were cancelled when the weather condition was bad. After operation started by using the temporary LOC, there were only 14 cancelled flights until full recover of ILS for 133 days. This installation improved safety and reduced cancelled flights.

Table 2.5.4 [Operational situation after the airport reopen]

Date	Days	Event		Approach procedure	Metrology condition	Number of cancelled arrival flight
April 14		Accident happen				
April 19 to 25	7	Airport reopen (Obstruction existing)		VMC	5,000m	29 (Apr.19) 28 (Apr.20)
April 26 to May 4	9	Obstruction clear		VOR approach	RVR 1,600m MDH 528ft	1 (May.3) 5 (May.4)
May 5 to September 14	133	Temporal ILS operation starts	CAT-III manufacture and installation work	CAT-I approach	RVR 550m DH 200ft	14 (100m<RVR <550m)
						
September 15		CAT-III operation recovery		CAT-III a	RVR 200m DH N/A	
September 19		Complete recovery		CAT-III b	RVR 100m DH N/A	

2.6 The effectiveness of preparation of temporally equipment

This was our first experience to use the temporary LOC to mechanical damage by the accident. The temporary equipment enables quickly recover only for 3 weeks. This recovery contributed safety operation and reduced a large number of cancellations of commercial flight.

If there was not temporary equipment, VOR approach would have to be continued for about 5 months and more cancellations would be expected.

Stockpiling temporally equipment was effect for early recovery from catastrophic damage. This is the effective solution for disaster and JCAB shares lesson learned from the accident.

**3. ACTION BY THE CONFERENCE**

3.1 The Conference is invited to:

- a) note the information contained in this Paper;
- b) encourage States to share their best practices for crisis management;
- c) encourage States to consider to stock temporally equipment to secure a certain ATC function from damage caused by catastrophe.