



*International Civil Aviation Organization*

**NINETEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION  
AND SURVEILLANCE SUB-GROUP (CNS SG/19) OF APANPIRG**

Bangkok, Thailand, 20 – 24 July 2015

**Agenda Item 5: Navigation**

**5.5) Other radio navigation issues**

**THE EFFECTIVENESS FOR PREPARATION OF SPARE EQUIPMENT**

(Presented by Japan)

**SUMMARY**

It is important to prepare alternative equipment to secure a certain ATC function of an airport when an equipment of the airport is destroyed by catastrophe.

This IP reports the importance of risk management by showing the example, which is early recovery from catastrophic damage of ILS by using the spare equipment.

**1. INTRODUCTION**

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

**2. DISCUSSION**

2.1 Currently 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 upgrade. Those equipment are packed in shelters and store at Tomobe transmitter site. (Figure 2.1, 2.2) The shelter contained transmitter is controlled by a certain environment and air conditioning to prevent the deterioration of electronic components.

2.2 On the other side JCAB has owned three sets of the Emergency VFR system for ATC (EVA) and Transportable Radar Control System (TRCS) each as part of the crisis management. Taking into the consideration of the disaster at the storage location, we store them in 3 airports in Japan.

2.3 These equipment were used and enabled early resumption at the Sendai airport, which was seriously damaged by Tsunami caused by the Great East Japan Earthquake on 11



Figure 2.1 [Location of transmitter site]



Figure 2.2 [Storage situation at Tomobe]

March 2011. And the resumption of infrastructure of the airport made a significant contribution for recovery in the region from the catastrophe.

#### 2.4 Temporary VOR/DME system

Temporary VOR/DME system consists of 7 sets of shelter and can be transported by a medium size truck. (Figure 2.4) It is possible to adjust the height of counter-poise reflector by three stages from 3.8m to 9.6m. Currently there are 10 sets and regularly used as alternative VOR/DME system when the original aged VOR/DME needs to upgrade.



Figure 2.4 [Temporary VOR/DME]

#### 2.5 Temporary LOC /DME system

Temporary Localizer (LOC)/DME system consists of 4 sets of shelter and can be transported by a medium size truck. (Figure 2.5) It is possible to adjust the height of antenna by three stages from 2.5m to 3.5m. Currently there are 5 sets and regularly used as alternative LOC when the original aged ILS needs to upgrade.



Figure 2.5 [Temporary LOC/DME]

#### 2.6 Example of the early recovery from mechanical damage

##### 2.6.1 Recovery process

On April 14 in 2015, at the Hiroshima airport, which is 700km west from Tokyo, ILS LOC antenna was damaged by aircraft accident. (Figure 2.6.1) The ILS is capable for Category (CAT)-IIIb operation. The airport is located in the mountain area and there are many foggy days. So ILS is indispensable and ILS CAT-IIIb is operated.

After the accident the LOC antenna was catastrophic damage and JCAB confirmed it took over 8 months to repair. And JCAB decides to make a plan to restart the ILS CAT-I operation by using temporary LOC, which is originally used as alternative LOC during upgrade work period when an aged ILS needs to upgrade.

ILS CAT-III system requires the LOC antenna specialized designed for CAT-III and JCAB does not stock the spare antenna. And temporarily LOC equipment is designed as CAT-I and cannot integrate with CAT-III equipment. With these background JCAB decides to install temporary LOC equipment as whole.



[Before the accident]



[After the accident]

Figure 2.6.1 [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 and adjustment work had completed on May 1. After the radio wave inspection and flight inspection, ILS CAT-I operation by temporary LOC has started

the operation since May 5. (Figure 2.6.2, 2.6.3)



Figure 2.6.2 [Installation of equipment]



Figure 2.6.3 [Situation at Flight inspection]

### 2.6.2 Impact for early recovery

Table 2.6.4 shows the approach procedure and operational situation after the airport reopen. During the first 7 days operation under VMC condition by effect of obstruction of the accident aircraft, many flights were cancelled when the visibility was low. After the removal of the accident aircraft, VOR approach was implemented for 9 days. Several flights were cancelled when the weather was bad. After the operation starts by using temporary LOC, there was only one cancelled flight for evaluated period during 23 days. This installation improves safety and reduces the cancelled flight.

Table 2.6.4 [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 May 27	23	Temporal ILS operation starts	CAT-I approach	RVR 550m DH 200ft	1 (May.12)

### 2.6.3 Future work

There are the actual record that CAT-III operation enables to land further about 60 flights in a year compared to CAT-I operation in the airport. JCAB will make an effort to recover original ILS CAT-IIIb operation as soon as possible. The LOC antenna for CAT-III operation has already been manufacturing. After that JCAB will start the installation work, flight check, and operational evaluation. It will start the CAT-III operation until this year.

### 2.7 Conclusion

This is our first experience to use the temporary LOC to mechanical damage by an accident. The temporary equipment enables quickly recover only for 3 weeks. This contributes safety operation and reduces the flight cancel.

After the accident JCAB quickly started the procurement of LOC antenna for CAT-III. It will take 8 months to start operation. If there was not a temporary equipment, VOR approach would have to be continued for 8 months and flight cancel would increase.

Generally JCAB stocks spare parts for failure of unit. Furthermore stock of equipment or system was effect for early recovery from catastrophic damage. This is the effective solution for disaster and JCAB shares the information as object lesson.

**3. ACTION BY THE MEETING**

- 3.1 The meeting is invited to:
- a) note the information contained in this paper;
  - b) share the practices for crisis management; and
  - c) discuss any relevant matters as appropriate

-----