International Civil Aviation Organization

Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27)

Video Teleconference, 22 – 25 August 2022

Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs

THE TRIAL OF HOT SPOT IDENTIFICATION IN CHINESE AIRSPACE

(Presented by China RMA)

SUMMARY

In support of the RASMAG/MAWG/9 meeting's conclusion, China RMA trialed the method proposed in MAWG/9 WP07 to identify the Hot Spot in Chinese airspace. This paper presents the analysis based on the LHD events in 2015, 2017 and 2021, providing the verification to the Hot Spots in Chinese airspace.

1. INTRODUCTION

1.1 As is required by RASMAG/MAWG/9 Action 9/6, all the RMA should try to identify Hot Spots using the method proposed in MAWG/9 WP07 in RASMAG/27 meeting. So, China RMA conducted the trial to identify the Hot Spots in Chinese airspace based on the proposed method.

1.2 In 2015, several Hot Spots were identified in Chinese airspace. After actions taken, all Hot Spots were removed in 2020. In order to verify the effectiveness of this method, China RMA applied the proposed method to historical Hot Spots in Trial 1. China RMA also conducted the trial based on the LHD events in 2021 in Trial 2, which showed that there was no Hot Spot in Chinese airspace in 2021.

2. DISCUSSION

Trial 1: assessing the method using historic event

2.1 The area of Hong Kong FIR interface with Guangzhou/Sanya FIR, Lahore FIR interface with Urumqi FIR, Guangzhou FIR interface with Wuhan FIR had been identified as Hot Spot C, Hot Spot E and Hot Spot H in 2015. After that, China RMA had explored the solutions actively, so the LHD events in Hot Spot C and Hot Spot E had decreased, but the LHD events in Hot Spot H had reached a peak in 2017. With the efforts by all the stakeholders, the LHD events in these Hot Spots have been less than five for two years (2018 and 2019), so these Hot Spots had been removed in 2020.

2.2 In order to validate the effectiveness of the Hot Spot identification method, China RMA conducted the trial by applying the proposed steps and criteria to these Hot Spots based on the actual LHD events in 2015 and 2017.

2.3 These Hot Spots have been identified as LHD clusters as depicted in red ovals in Figure1 and Figure2.

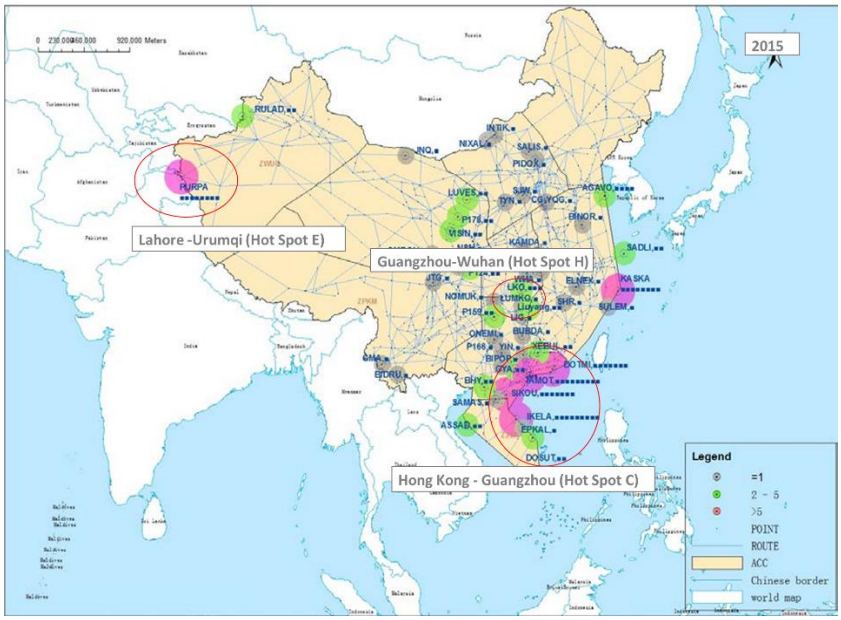

Figure 1: Chinese LHD cluster in 2015

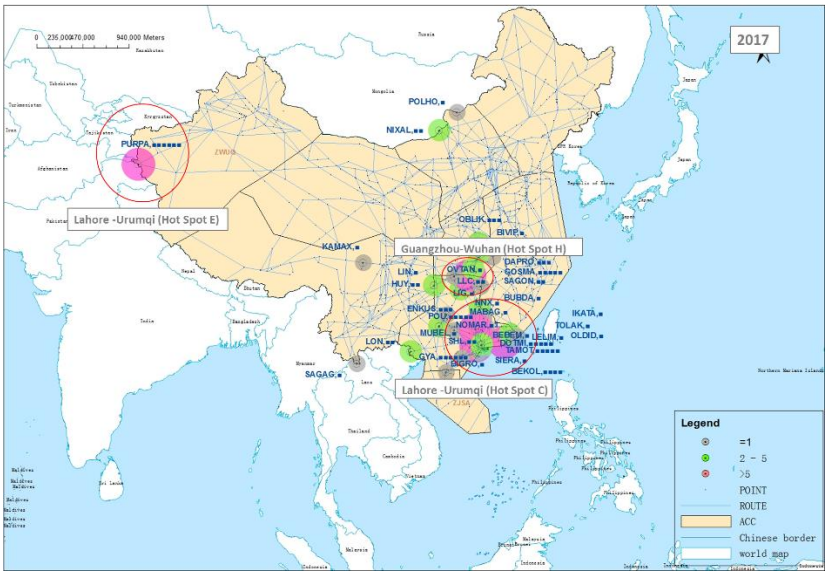

Figure 2: Chinese LHD cluster in 2017

2.4 According to the method in MAWG/9 WP07, there are 3 criteria to check if the identified clusters can be considered as Hot Spots. The first criteria is the number of operational events of a cluster, the second criteria is the risk estimate of a cluster, and the third criteria is if the risk in the cluster exceeds the overall TLS of 5×10^{-9} FAPFH.

2.5 **Table1** shows the Hot Spot criteria in 2015 and 2017.

	2015	2017
Number of Operational LHD Events	103	101
Operational Risk ($x10^{-9}$)	3.16	27.95
Number of Clusters	3	3
Criteria: Number	25.75	25.25
Criteria: Risk	0.79	6.98

Table 1: The Hot Spot criteria in 2015 and 2017

2.6 **Table 2** to **Table 4** show the number of LHDs, the risk of the identified Hot Spots and the results of comparing with the criteria.

Hong Kong FIR interface with Guangzhou/Sanya FIR (Hot Spot C)	2015	2017
Number of Operational LHDs	41	10
Cluster Risk	0	0
Check Criteria: Number	Positive	Negative
Check Criteria: Risk	Negative	Negative
Check Criteria: TLS	Negative	Negative

Table 2: Hot Spot C identification and the criteria

Urumqi FIR interface with Pakistan Lahore FIR (Hot Spot E)	2015	2017
Number of Operational LHDs	10	6
Cluster Risk	0.17	0.102
Check Criteria: Number	Negative	Negative
Check Criteria: Risk	Negative	Negative
Check Criteria: TLS	Negative	Negative

Table 3: Hot Spot E identification and the criteria

Guangzhou FIR interface with Wuhan FIR (Hot Spot H)	2015	2017
Number of Operational LHDs	2	43
Cluster Risk	0.069	26.5
Check Criteria: Number	Negative	Positive
Check Criteria: Risk	Negative	Positive
Check Criteria: TLS	Negative	Positive

Table 4: Hot Spot H identification and the criteria

2.7 It can be observed that Hot Spot C in 2015 and Hot Spot H in 2017 complied with the criteria and could be identified as Hot Spot. But Hot Spot E is not complied with the criteria. Maybe in this trial, only Hot Spot are considered for the cluster, the number and the shape of clusters is open for other possibilities.

Trial 2: 2021 LHD map trial analysis with the method

2.8 China RMA also conducted another trial based on 2021 LHD events.

2.9 The LHD clusters are depicted in red ovals in Figure 3 and Figure 4. The cluster1 is between Shenyang FIR and Shanghai FIR, and the cluster 2 is at the junction of Wuhan FIR, Shanghai FIR and Guangzhou FIR. Table 5 shows the Hot Spot criteria and Table 6 shows the result against the criteria.

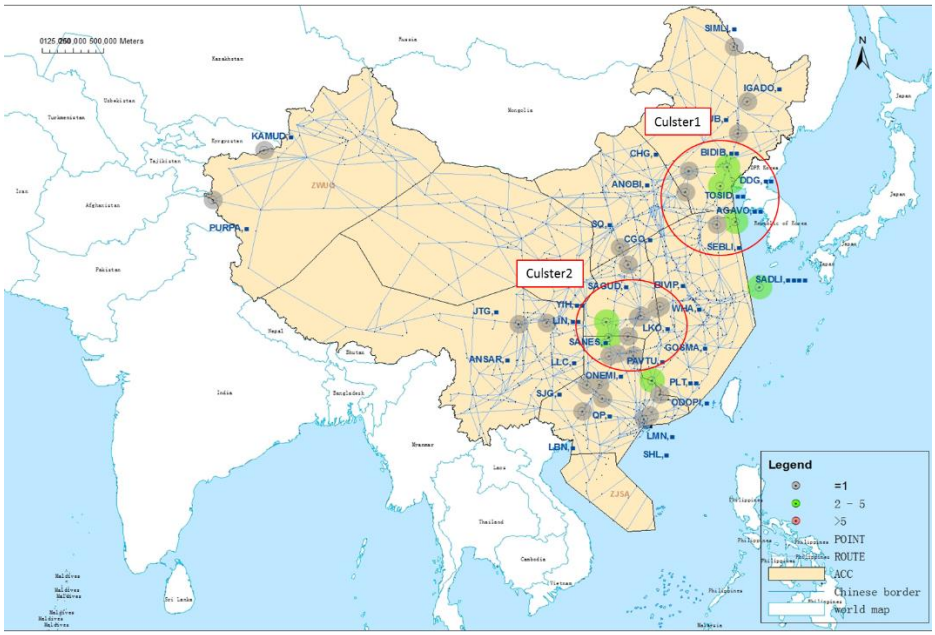

Figure 3: LHD clusters in 2021

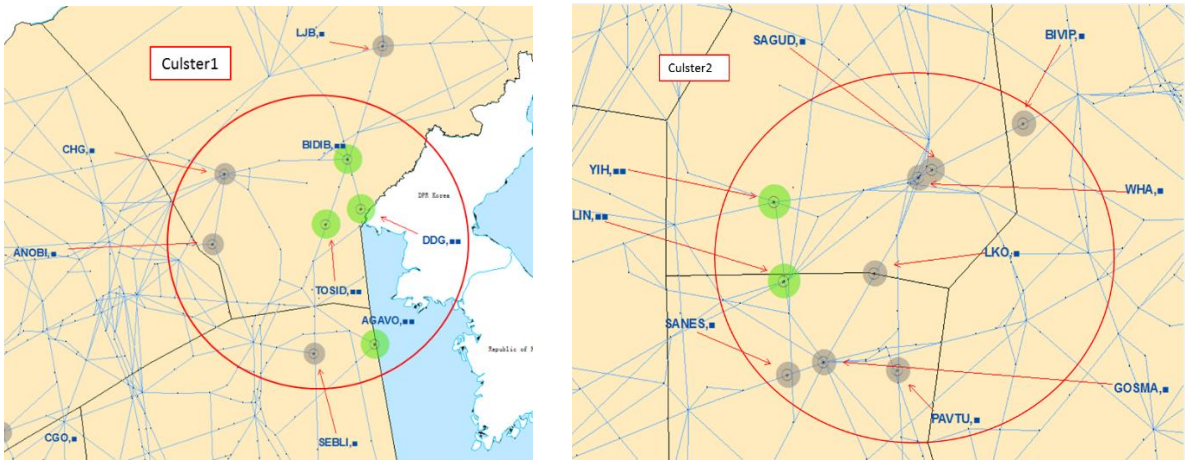

Figure 4: Cluster area zoomed in

	2021
Number of Clusters	2
Number of Operational LHD Events	48
Operational Risk (x10-9)	1.96
Criteria: Number	16
Criteria: Risk	0.65

Table 5: The Hot Spot criteria in 2021

	Cluster 1	Cluster 2
Number of Operational LHDs	11	11
Check Criteria: Number	Negative	Negative
Risk	0.0494	0.0494
Check Criteria: Risk	Negative	Negative
Check Criteria: TLS	Negative	Negative

Table 6: The results of checking again the criteria

2.10 According to the result of Trial 2, there was no Hot Spot in Chinese airspace in 2021. The total risk of 2021 is 2.17 x 10^{-9}, which is below TLS, and there was also no high risk event occurred in this year. In our opinion, the Hot Spot identification result is complied with the safety risk result of this year.

2.11 The results of the two trials demonstrates some of the successful cases. In Trial 1, the Hot Spot E is not identified as Hot Spot by the criteria because the event count and the risk in the area are below the criteria, even when there were operation issues and the Hot Spot E is reasonable. So, the trial shows potential to detect this existing operation challenge.

2.12 Beside, another issue we can study is found in Trial 2, which the clusters sometimes could be too big and sometimes too small, which is somewhat more dependent on the RMA's observation. This may impact the consistency of the method, because the result of the analysis is much determined by the number and the size of the cluster, which can vary from different observers.

2.13 In our opinion, the identification of clusters is the key to locate the Hot Spots. Setting a very specific standard for pinpointing the cluster is also a challenge.

2.14 The RMAs, however, are capable of operational problem identification utilizing the method, and may improve it as experience accumulates.

2.15 Based on the method from RASMAG/MAWG/9 WP/07, a potential Hot Spot may be formalized with close coordination among the stakeholders.

2.16 Reviewing its now existing pros and cons, China RMA recognizes the prospect of the method, and will continue with the trial and report the operational problem in our responsible area to RASMAG meeting timely.

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 as appropriate.

…….