



ICAO

*International Civil Aviation Organization*  
**Twenty-Fifth Meeting of the Regional Airspace Safety  
Monitoring Advisory Group (RASMAG/25)**

Video Teleconference, 23 – 27 October 2020

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

#### JASMA CATEGORY J LHD INVESTIGATION

(Presented by JASMA)

##### SUMMARY

This paper presents the results of the investigation of the category J Large Height Deviation (LHD) in the Fukuoka Flight Information Region (FIR) by the Japan Airspace Safety Monitoring Agency (JASMA) for the period from 1 January 2019 to 31 December 2019.

#### 1. INTRODUCTION

The Japan Airspace Safety Monitoring Agency (JASMA) presented the summary information for the Large Height Deviation (LHD) reports for the period from 1 January 2019 to 31 December 2019 at the 7th Meeting of the Monitoring Agency Working Group (MAWG/7) in February 2020. The meeting pointed out the high number of TCAS RA (Category J) LHD events reported from JASMA and offered JASMA to further investigate these Category J LHDs in collaboration with the Monitoring Agency for Asia Region (MAAR).

#### 2. DISCUSSION

2.1 In Japan, all ATC facilities including terminal control centers are required to submit a safety report for the occurrence of TCAS RA regardless of the reason to the regulator of Japan Civil Aviation Bureau (JCAB). JASMA also obtains a lot of safety reports for the occurrence of TCAS RA.

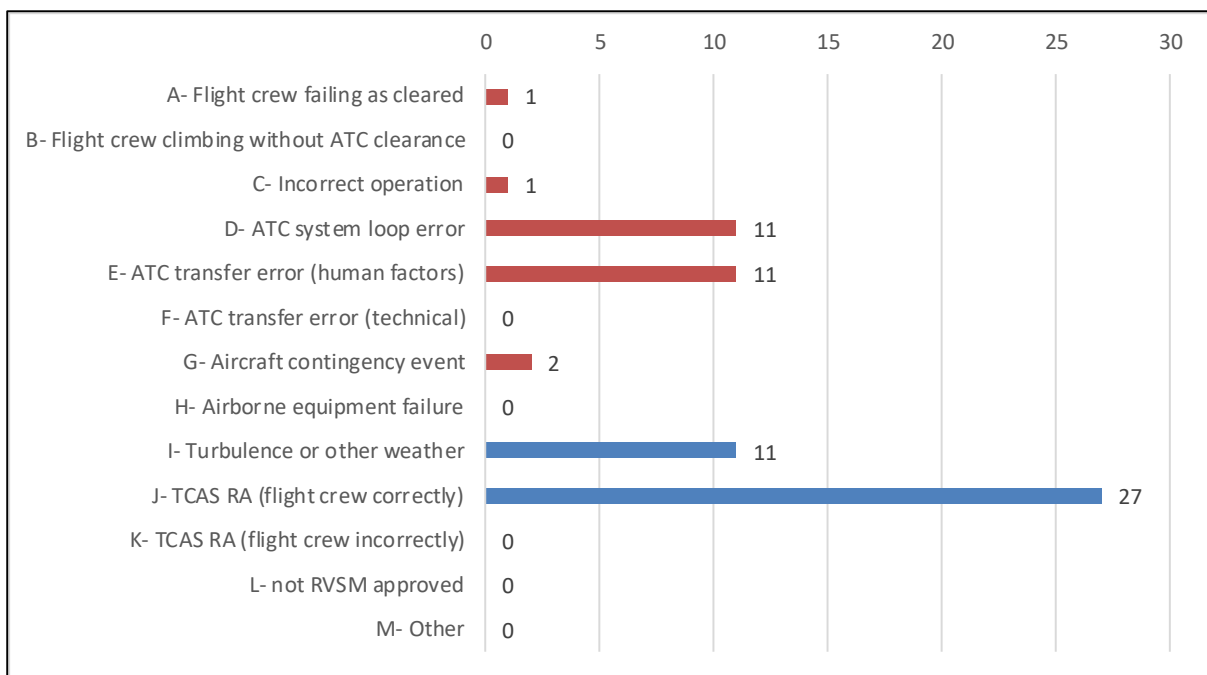
2.2 64 LHD events that occurred within the Reduced Vertical Separation Minimum (RVSM) airspace in the Fukuoka Flight Information Region (FIR) for the period from January 2019 to December 2019 were reported to JASMA.

2.3 The LHD reports are categorized based on the characteristics of each deviation event. The most frequent event was the Traffic Alert and Collision Avoidance System (TCAS) Resolution Advisory (RA). The seconds were the ATC system loop error, the ATC transfer error, and the Turbulence, Bad weather. **Table 1** presents the summary of LHD reports and **Figure 1** shows the number of operational and technical errors during the same period.

Code	Cause of Large Height Deviations	count
A	Flight crew failing to climb/descend the aircraft as cleared	1
C	Incorrect flight level provided due to incorrect operation or interpretation of airborne equipment	1
D	ATC system loop error	11
E	ATC transfer of control coordination errors due to human	11

factors		
Aircraft contingency events		
G	Aircraft contingency leading to sudden inability to maintain level	2
Deviation due to meteorological conditions		
I	Turbulence or other weather-related cause	11
Deviation due to TCAS RA		
J	TCAS resolution advisory and flight crew responds correctly	27
Other		
M	Other	0
Total		64

**Table 1:** Summary of LHD Causes in the Fukuoka FIR



**Figure 1:** Number of Operational and Technical errors

2.4 27 category J LHDs, approximately 40 percent of the total number of LHD occurred in the Fukuoka FIR for the period.

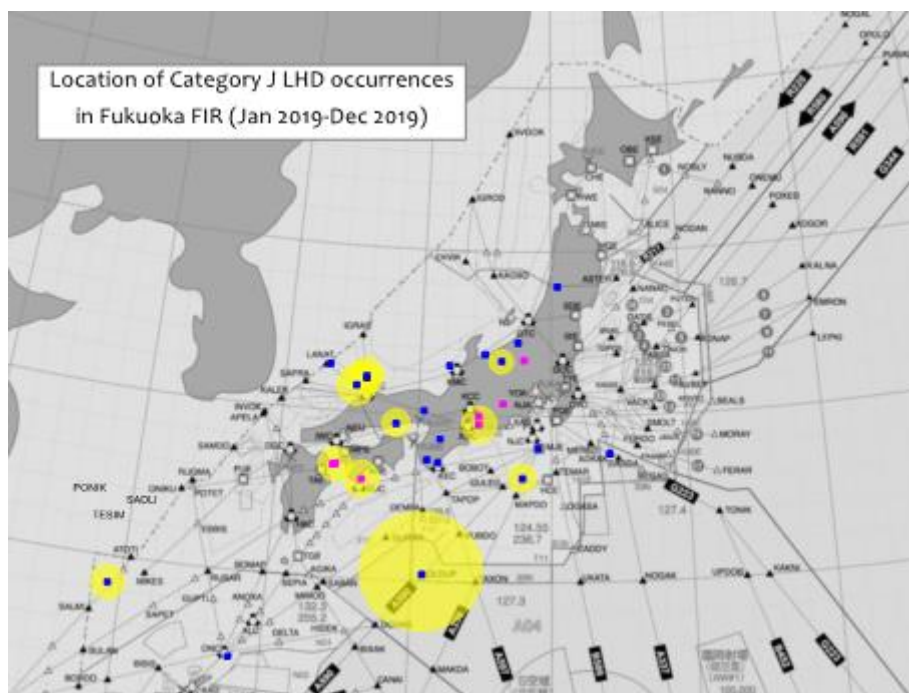
- 20 Category-J LHDs were caused by TCAS RAs that occurred despite ATC instructed enough vertical separation for aircraft and the flight crew responded correctly. These are loosely termed "nuisance TCAS RAs".
- 7 Category-J LHDs were caused by TCAS RAs that occurred when ATC did not provide 1,000 ft or more vertical separation. These are loosely termed "genuine TCAS RAs".

2.5 **Table 2** presents the summary of category J LHD reports. The category J LHD of genuine TCAS RA occurred 4 times in the airspace of Tokyo Area Control Center (ACC) and 3 times in the airspace of Fukuoka ACC for the period from January 2019 to December 2019. 16 category J LHD of nuisance TCAS RA occurred in the airspace of Tokyo ACC for the period. Seasonal bias or characteristic had not been confirmed.

ATC unit	TCAS RA	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Total	Percentage
Sapporo	Genuine													0	0.0%
	ACC Nuisance													0	0.0%
Tokyo	Genuine	1										2	1	4	14.8%
	ACC Nuisance		1		1	1	2		1	4		3	3	16	59.3%
Kobe	Genuine													0	0.0%
	ACC Nuisance						1					1		2	7.4%
Fukuoka	Genuine			1				1			1			3	11.1%
	ACC Nuisance			1										1	3.7%
ATMC	Genuine													0	0.0%
	Nuisance				1									1	3.7%
Total	Genuine	1	0	1	0	0	0	1	0	0	1	2	1	7	25.9%
	Nuisance	0	1	1	2	1	3	0	1	4	0	4	3	20	74.1%

**Table 2:** Summary of Category J LHD

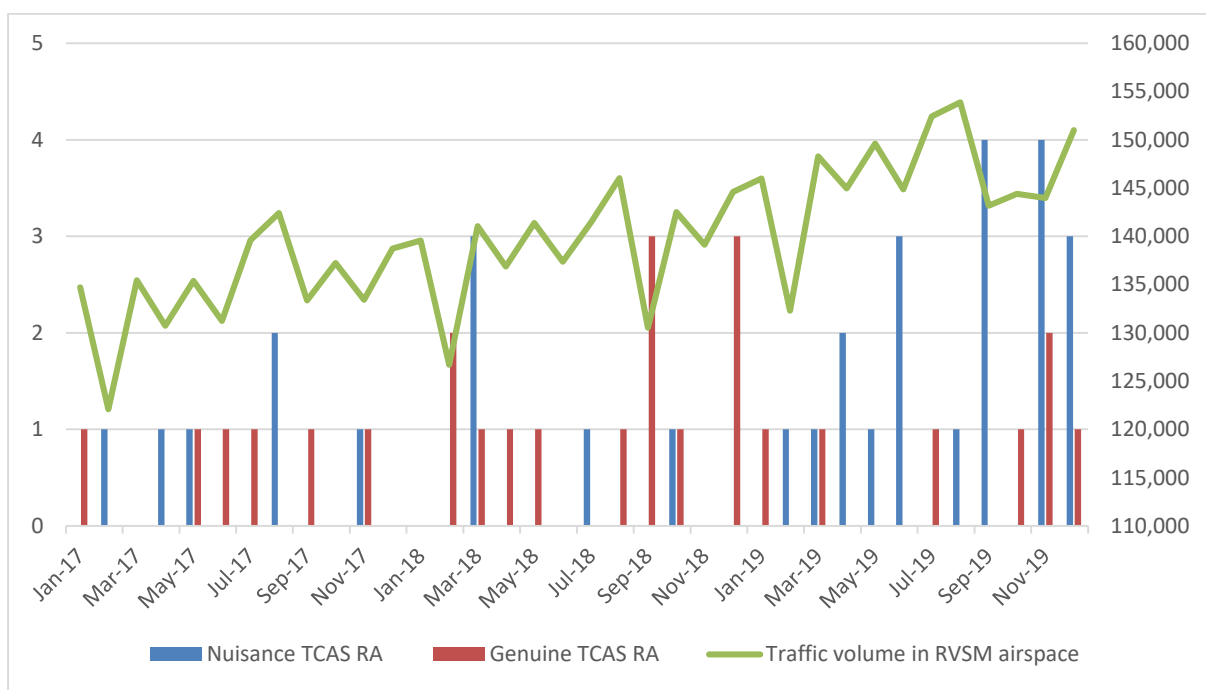
2.6 **Figure 2** provides the geographic location of category J LHD reports in the Fukuoka FIR during the assessment period. The blue square symbols represent the LHD location of nuisance TCAS RA and the pink square symbols represent the LHD location of genuine TCAS RA. The circle size means an LHD duration of 50 seconds or more.



**Figure 2:** Fukuoka FIR Airspace – Category J LHD

2.7 Most of the category J LHD events during the assessment period, whether they were caused by nuisance TCAS RAs or genuine TCAS RAs, occurred in airspace that had major Fix, Waypoint, or Navigation Aid which an aircraft and the other aircraft were crossing or face to face with vertical separation. On the other hand, the category J LHD events hardly occurred in airspace that aircraft flow was a One-way and same direction.

2.8 **Figure 3** presents the comparing category J LHD from the calendar year 2017 to 2019. The number of Category J LHD by nuisance TCAS RA seems to increase in proportion to traffic volume in the RVSM airspace of Fukuoka FIR.



**Figure 3:** Comparing Category J LHDs from 2017 to 2019

2.9 **Table 3** presents the summary of aircraft pairs of category J LHD reports for the period from January 2019 to December 2019. Of all TCAS RA aircraft pairs that produced Category-J LHDs:

- 11 pairs were between an aircraft maintaining a level altitude and the other aircraft descending.
- 4 pairs, all nuisance, were between aircraft that were both maintaining a level altitude.
- 4 pairs were between an aircraft maintaining a level altitude and the other aircraft under the Visual Flight Rules (VFR).
- 2 pairs were between an aircraft maintaining a level altitude and unknown traffic which was not observed by pilot eyesight and ATC surveillance system.

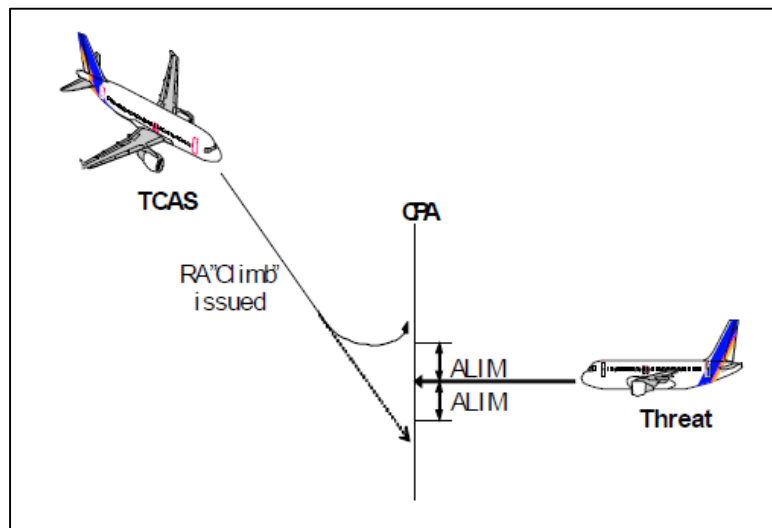
	Climb-Descent	Climb-Level	Level-Level	Level-Descent	Descent-Descent	Level-VFR	Level-Unkown	Total
Nuisance TCAS RAs	1	3	4	6		4	2	20
Genuine TCAS RAs		1		5	1			7
Total	1	4	4	11	1	4	2	27

**Table 3:** Summary of aircraft pairs of Category J LHD in 2019

2.10 **Table 4** presents the sensitivity level definition and alarm thresholds of TCAS II Version 7.1 and **Figure 4** describes the Selection of non-crossing RA sense of TCAS II Version 7.1, both are quoted from the Introduction to TCAS II Version 7.1 which is a document of the Federal Aviation Administration. The Altitude Limit (ALIM) of TCAS RA in the RVSM altitude band is +/- 600ft, so that may contribute to why TCAS sometimes still issue an RA alert even though aircraft which have 1,000ft or more vertical separation.

Own Altitude (feet)	SL	Tau (Seconds)		DMOD (nmi)		ZTHR (feet) Altitude Threshold		ALIM (feet)
		TA	RA	TA	RA	TA	RA	RA
< 1000 (AGL)	2	20	N/A	0.30	N/A	850	N/A	N/A
1000 - 2350 (AGL)	3	25	15	0.33	0.20	850	600	300
2350 – 5000	4	30	20	0.48	0.35	850	600	300
5000 – 10000	5	40	25	0.75	0.55	850	600	350
10000 – 20000	6	45	30	1.00	0.80	850	600	400
20000 – 42000	7	48	35	1.30	1.10	850	700	600
> 42000	7	48	35	1.30	1.10	1200	800	700

**Table 4:** Sensitivity Level Definition and Alarm Thresholds



**Figure 4:** Selection of Non-Crossing RA Sense

2.11 JASMA visited Tokyo ACC to interview with persons whose responsibilities are investigation and safety management on 15 September 2020. It was confirmed that all controllers were encouraged to give traffic information to aircraft pairs involved with each TCAS RAs.

2.12 If the flight crew of the aircraft given traffic information adjusts vertical speed, the category J LHD events caused by nuisance TCAS RAs may decrease.

2.13 The JASMA would like to express our appreciation for MAAR cooperating further investigation.

### 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.

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