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AERONAUTICAL SURVEILLANCE PANEL (ASP)

10TH MEETING OF WG-B

Montreal, 8th to 12th May 2006

Agenda Item 5. 2. 3 : Surveillance system Implementation monitoring

Analytical Results of Unauthorized Aircraft Address Measured by Aircraft Address Monitoring System

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SUMMARY

This paper describes the analytical result to detect the unauthorized aircraft address by Aircraft Address Monitoring System installed at Narita international and Kansai international airports.

1. Introduction

The Aircraft Address Monitoring System (AAMS), which is the detection system for unauthorized aircraft addresses, has been operating since July 17th, 1996 at Narita International Airport and since June 1st, 1997 at Kansai International Airport. It was already introduced by several WPs at WG1 (SICASP), WGB (SCRSP) and SCRSP/1. And the latest Information Paper is SCRSP/WGB-9 IP-21 at Paris in October 2005.

This paper updates the list of the unauthorized address aircraft, considering the recent analytical results.

2. Analytical Result and Conclusion

The analytical results measured by the AAMS are listed in Table-1 from 2000, and the transition of unauthorized address aircraft from 1997 is shown in Fig-1. Most of unauthorized address aircraft are estimated by the differences between the nationality of their registration numbers and the nationality of their aircraft addresses. Some unauthorized address aircraft are estimated by their aircraft addresses having only their nationality codes. The number of unauthorized address aircraft has been decreasing since AAMS started to operate in the second half of 1997, and as the result of this analysis, we can see the tendency to decrease the number of unauthorized address aircraft.

The series of reports of analysis results of unauthorized address aircraft by the current AAMS end with this IP. The IPs had been presented about only the unauthorized address aircraft detected twice or more tacks by current AAMS. However some aircraft were detected only one track as unauthorized address aircraft, which wasn't reported at the Panels and the WG meetings. Table-2 lists the candidates of unauthorized address aircraft that were detected only one track in 2005 by AAMS.
The following are possible reasons why these aircraft have been detected only once by the current AAMS:

- Temporary failure of the transponder responding authorized address
- Limitation of the coverage of the current AAMS (almost 50NM radial)

JCAB will continuously monitor the unauthorized address aircraft containing aircraft detected only once by the new AAMS as described in Chapter 4.

3. Analysis of Individual Case

The 2 aircraft observed in 2005 were analyzed for individual cases listed in below.

(1) Country (Operation Company): Singapore (Singapore Airlines LTD.)
Detection site place: Narita

Detected Mode-S Address		Registration Number		Number of Detection
66CDB9	No assigned	9VSMY	Singapore	2

		Hexadecimal code	Binary code
Detected Mode-S Address		66CDB9	0110 0110 1100 1101 1011 1001
Registration Country	Singapore	768***	0111 0110 1*** **** **** ****

Conclusion: The airplane submitted SSR mode-S code of mistaken 4th bit on for Singapore country code at these flights.

(2) Country (Operation Company): Vietnam (Vietnam Airlines)
Detection site place: Narita and Kansai

Detected Mode-S Address		Registration Number		Number of Detection
A10620	USA	VNA147	Australia	3

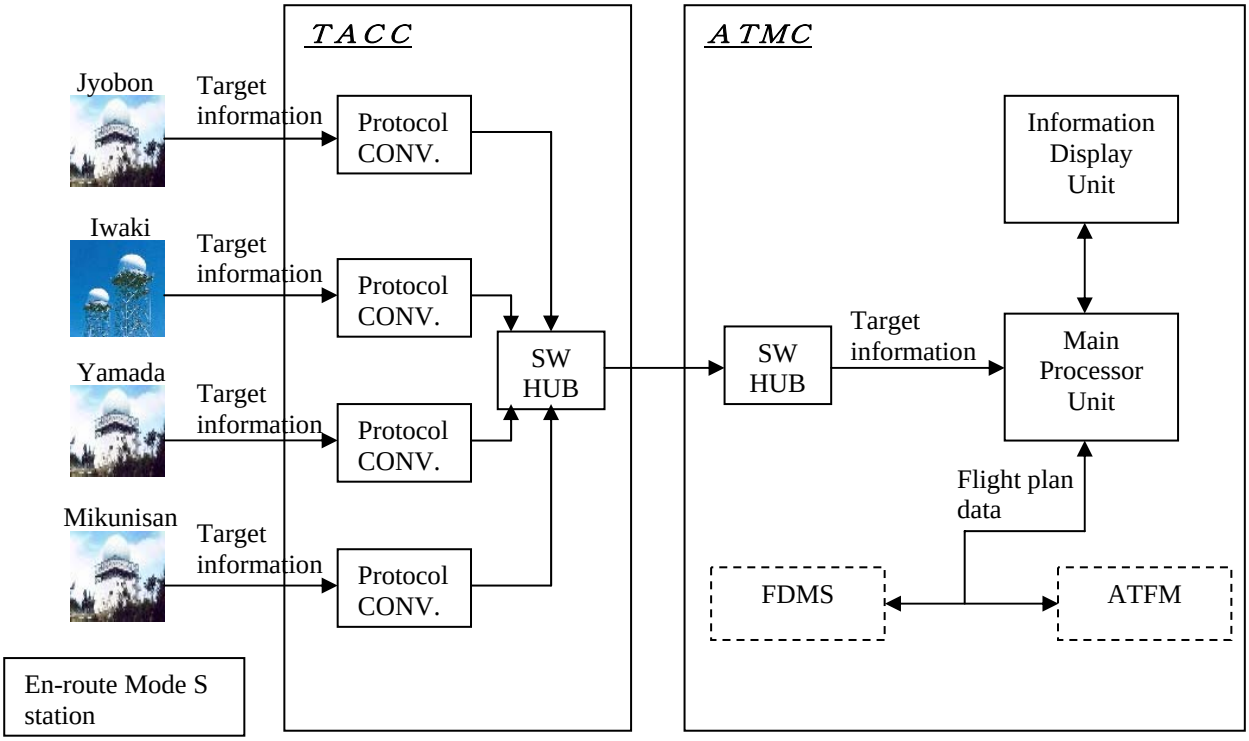
		Hexadecimal code	Binary code
Detected Mode-S Address		A10620	1010 0001 0000 0110 0010 0000
Registration Country	Australia	7C****	0111 11** **** **** **** ****

Conclusion: When the nationality of registration was changed, for example, because of transfer of aircraft, a correct Mode S address might not have been set or an incorrect Mode S address might have been used intentionally.

4. Introduction of new Aircraft Address Monitoring System (AAMS)

JCAB has installed a new AAMS at the Air Traffic Management Center (ATMC) in Fukuoka in March 2006 and started to operate this system from April 2006. A simplified block diagram of the new AAMS is shown in Fig-2. The new AAMS uses the target information detected by the operating en-route Mode S stations, so the detecting coverage area is equal to combined Mode S coverage areas. (Shown in Fig-3)

As shown in Fig-3, the new AAMS can monitor a far wider area than that of the current AAMS, and cover most of the land of Japan. JCAB will plan to increase the number of en-route Mode S stations connected and further broaden the area to be monitored. So we expect that the new AAMS will be able to detect more aircraft using unauthorized address in the future.



FDMS: Flight Data Management System
ATFM: Air Traffic Flow Management System

Fig-2: Block diagram of the new AAMS

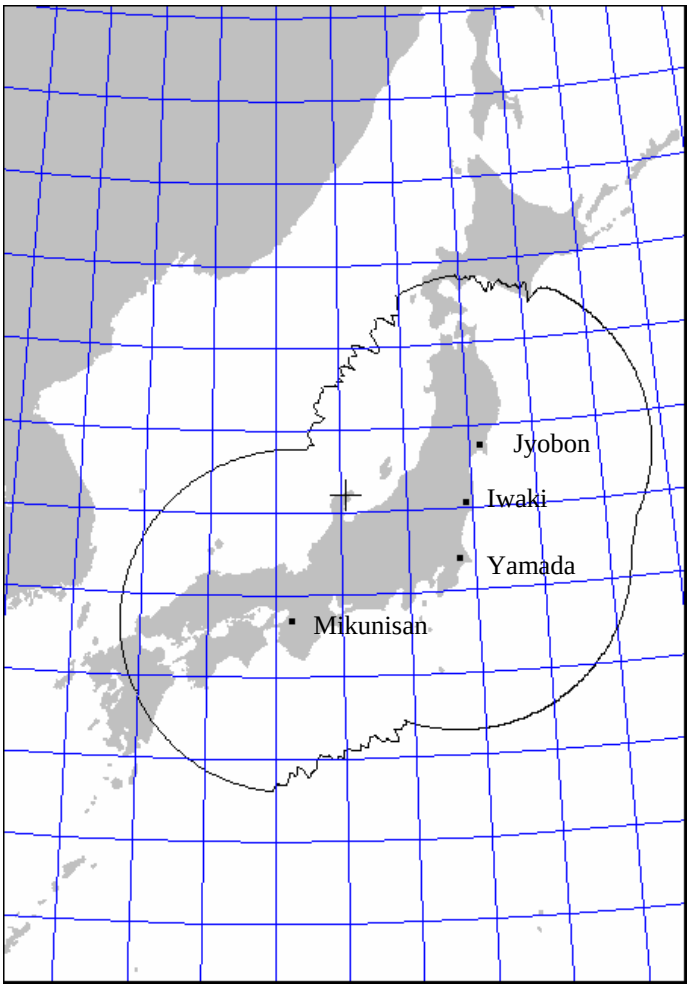


Fig-3: the detecting coverage area of the new AAMS, as of April 2006

Table-1 List of Unauthorized Mode S Aircraft

Registration Country	Registration Number	Operation Airline	Operation Airline Country	Mode S Address	Mode S Address Assign Country	code*	2000 1st Half	2000 2nd Half	2001 1st Half	2001 2nd Half	2002 1st Half	2002 2nd Half	2003 1st Half	2003 2nd Half	2004 1st Half	2004 2nd Half	2005 1st Half	2005 2nd Half	Total
Aruba?	P4GJC	OPR/PV	-	48412E	Netherlands	1					2	2							4
Australia	VNA764	Vietnam Airlines	Vietnam	000000	No assignment	3			12										12
China	BHXA	Cathay Pacific Airways LTD.	China	70015B	Afghanistan	1	3												3
China	B16103	EVA Airlines Corporation	China	81908B	India	1			1										1
China	BHLC	Cathay Pacific Airways LTD.	China	F80126	No assignment	1								7	7				14
Germany	DABVT	Deutsche Lufthansa, A.G.	Germany	BC4AD4	No assignment	1			6	5		6							17
Italy	IDEIC	Alitalia-Linee Aeree Italiane, S.P.A.	Italy	340089	Spain	1				2									2
Japan	JA8498	Japan Air System CO.LTD.	Japan	02DDCA	Tunisia	1					2								2
Japan	JA8930	Japan Transocean Air	Japan	3C618D	Germany	1	1	25											26
Japan	JA190A	Orange Cargo	Japan	A0D020	USA	1								29					29
Korea	HL7465	Korean Air Lines CO. LTD.	Korea	38DC65	France	1					4	14	13	9	14	3			57

Registration Country	Registration Number	Operation Airline	Operation Airline Country	Mode S Address	Mode S Address Assign Country	code*	2000 1st Half	2000 2nd Half	2001 1st Half	2001 2nd Half	2002 1st Half	2002 2nd Half	2003 1st Half	2003 2nd Half	2004 1st Half	2004 2nd Half	2005 1st Half	2005 2nd Half	Total
Korea	HL7281	Korean Air Lines CO. LTD.	Korea	713A81	Saudi Arabia	1		1											1
Malaysia	9MMHL	Malaysian Airlines System	Malaysia	750000	Malaysia	2	6	10	2	7									25
Malaysia	9MMPI	Malaysian Airlines System	Malaysia	7D0034	Australia	1				4	2	1							7
Malaysia	9MMPM	Malaysian Airlines System	Malaysia	F7007A	No assignment	1	5	9	6	1									21
Malaysia	9MMRM	Malaysian Airlines System	Malaysia	7D008E	Australia	1										7			7
Philippine (Russian Federation)	RPC3223	Philippine Air Lines Inc.(PAL)	Philippine	77801D	Syria	1						5	5	1	2				13
Thailand	HSTAP	Thai Airways International	Thailand	800007	India							2		2	1				5
UK	MM62173	Private?	-	33FFF8	Italy	1					2								2
USA	N201YT	Private?	-	E1A484	Argentina	1				2									2
USA	N527MC	China Airlines	Taiwan	000005	No assignment	1	1	4											5
USA	N213MT	Private?	-	E19242	Argentina	1				2									2
USA	N307FV	Private?	-	000000	No assignment	3				2									2
USA	N496AN	Private	-	04C034	Kenya	1						2							2

Registration Country	Registration Number	Operation Airline	Operation Airline Country	Mode S Address	Mode S Address Assign Country	code*	2000 1st Half	2000 2nd Half	2001 1st Half	2001 2nd Half	2002 1st Half	2002 2nd Half	2003 1st Half	2003 2nd Half	2004 1st Half	2004 2nd Half	2005 1st Half	2005 2nd Half	Total
USA	N526MD	World Airlines	USA	44B24D	Belgium	1						4							4
USA	N666US	Northwest Orient Airlines INC.	USA	88CC56	Japan	1	21	16											37
USA	N142SW	Northwest Orient Airlines INC.	USA	780009	China	1	2												2
USA	N660US	Northwest Orient Airlines INC.	USA	E83F8F	No assignment	1							3						3
USA	N641NW	Northwest Orient Airlines INC.	USA	886A33	Thailand	1						1	1						2
USA	N881Q	Private?	-	C7DC05	No assignment	1					2								2
USA	N473AS	Air Hong Kong	China	400000	UK	1, 2									20	45			65
No assignment	70400	OPR/DOD	-	AE010D	USA	1						2							2
Singapore	9VSMY	Singapore Airlines LTD.	Singapore	66CDB9	No assignment	1											1	1	2
Australia	VNA147	Vietnam Airlines	Vietnam	A10620	USA	1												3	3
					TOTAL NUMBER		39	65	27	25	14	39	22	48	44	55	1	4	383
					No. of Unauthorized aircraft		7	6	5	8	6	10	4	5	5	3	1	2	62

*code 1 : The nationality of the registration number differs from that of Mode-S address.

*code 2 : The bits for individual assignments are all zeroes.

*code 3 : All bits are zeroes.

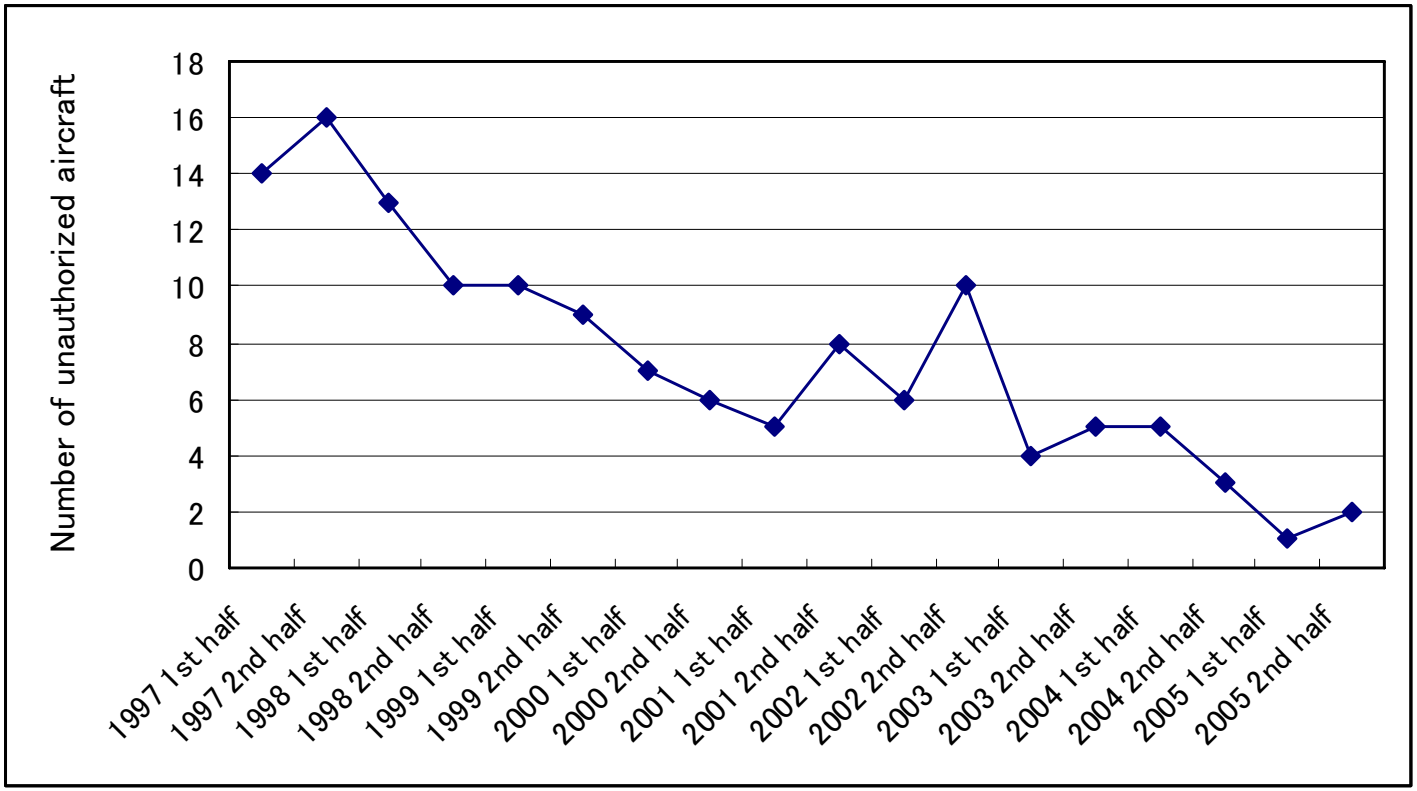


Fig-1: Transition of number of unauthorized address aircraft

Table-2 List of Unauthorized Mode S Aircraft detected only one time

Registration Country	Registration Number	Operation Airline	Operation Airline Country	Mode S Address	Mode S Address Assign Country	code*	2005 1st Half	2005 2nd Half
Unknown	OK1	Botswana GOV.	Botswana	030008	Botswana	4	1	
Unknown	828000	US A.F	USA	ADFDF8	USA	4		1
Unknown	929000	US A.F	USA	ADFDF9	USA	4		1
Unknown	010041	US A.F	USA	AE11F7	USA	4	1	
Unknown	020042	US A.F	USA	AE11F8	USA	4	1	
Aruba	P4PHS	Private	-	4000DD	UK	6		1
New Zealand	ZKNCN	Air New Zealand LTD.	New Zealand	789001	China	6		1
Japan	JA8190	Nippon Cargo Airlines CO,LTD.	Japan	79C013	China	6		1
Aruba	P4EPI	Private	-	833484	India	6		1
USA	N612FE	Federal Express	USA	8674E8	Japan	6	1	
China	B3990	DEER JET CO,LTD.	China	A32D14	USA	6	1	
Nepal	9NACA	Royal Nepal Airlines	Nepal	A8B9C3	USA	6		1
USA	N853NW	Northwest Orient Airlines INC.	USA	C0054A	Canada	6		1
USA	N485LS	Federal Express	USA	E4403F	Brazil	6	1	
China	B2580	Air China	China	F80090	No assignment	7	1	

*code 4 : A correct registration number is not found in the fight plan.
*code 5 : The bits for individual assignments are all zeroes or all bits are zeroes.
*code 6 : The nationality of the registration number differs from that of Mode-S address.
*code 7 : Mode S address not assigned by ICAO is used.