Federal Aviation Administration

PBCS and Communication Service Providers

NAT PBCS Workshop/3

20-21 February 2018

Paris, France

Overview

- **Background**
- **PBCS requirements for CSP**
- **PBCS Global Charter**
- **CSP notification and availability: challenges and efforts to improve**

ICAO Doc 9869, PBCS Manual
Historical Background

- **2007**
  - ICAO North Atlantic (NAT) and Asia-Pacific (APAC) Regions began collaborating on the global issue of increased use and dependency of commercial communication services in the provision of air traffic services.
  - The companies providing these services decided to eliminate certain components of the system for economic reasons that conflicted with the needs for aviation safety.
  - The NAT and APAC Regions recognized that the issue should be examined at the global level, but due to urgency, also at the regional level, since communication is an integral part of regional implementation plans.
  - Both regions held special meetings to address the issue.

ICAO Doc 9869, PBCS Manual
Historical Background

- **2008**
  - NAT Systems Planning Group (SPG) concluded to develop an RCP Implementation Plan proposing to mandate RCP in the NAT Region by 2015
  - NAT and APAC Regions agreed to develop common guidance material, which became known as: the *Global Operational Data Link (GOLD) Manual* (Doc 10037)
  - ANC approved a work programme to reconvene the OPLINKP, and tasked the panel to update the *Manual on Required Communication Performance (RCP)* (Doc 9869)
    - Taking into account significant advances by ICAO Member States and regions, in the areas of qualification and monitoring, commercial service contracts/agreements and operational approvals, **thereby also avoiding the imposition of regional or State-specific criteria on aircraft operators and aircraft/avionics manufacturers.**
- **2010**
  - OPLINKP reconvened and agreed to develop an amendment to Doc 9869
    - Renaming *Performance-based Communication and Surveillance (PBCS) Manual*
    - Expanding scope by incorporating parts of the GOLD and SVGM, and other material that was developed by the regions since 2007

ICAO Doc 9869, PBCS Manual
Scope and Purpose

The guidance supports the following activities:

a) States' roles and responsibilities in relation to the following:

   1) safety oversight of air navigation services;

   2) operational approval (e.g. flight crew training and qualifications); and

   3) design approval of aircraft data link systems;

b) development of agreements and/or contractual arrangements between ANSPs and aircraft operators and their respective CSPs;

c) development of operational procedures; and

d) operational monitoring, analysis, and exchange of operational data among appropriate entities, such as regional monitoring entities, States, ANSPs, and CSPs.

ICAO Doc 9869, PBCS Manual
4.3.2 Communication services provision

4.3.2.1 The CSP should provide services that meet the RCP/RSP allocations provided in the specifications. **These allocations are used to establish contractual arrangements, which support safety oversight and approval of both ANSP and aircraft operator for provision and use of the services** respectively.

4.3.2.2 The CSP should ensure that the services it provides adhere to the contractual arrangements, which include:

a) **RCP/RSP allocations**, as contained in appropriate RCP/RSP specifications;

b) **notification to ATS units**, aircraft operators and others, as appropriate, of any failure condition that may impact PBCS operations.

CSP Compliance
CSP Perspective

- CSPs stated that they would be unable to enter into binding contracts/agreements
  1) The nature of the communication system is such that it is impossible for them to guarantee a certain performance to individual ANSPs and Aircraft Operators with their being many contributors affecting performance outside of the CSP domain
  2) It would take significant cost/effort to re-negotiate individual contracts currently in place between CSP and each operator as well as with each ANSP

CSP Compliance
PBCS Charter

- **PBCS charter concept proposed as an alternative means to ensure that each data link stakeholder meets its allocated responsibilities according to the RCP/RSP specifications**
  - PBCS Charter was developed by ICAO PBCS project team
  - Available as an “alternate means of compliance” for CSP “contract/agreement” needed for operator approval if State of Operator/State of Registry accepts
    - **A change of charter membership status affects operational authorization**
  - Hosted on the DLMA/CRA website where stakeholders can go to sign and obtain proof of respective CSP signature, as required by approval process

Benefits of Charter beyond CSP requirements

- Provides concise summary of specific roles and responsibilities for each type of stakeholder without reading entire PBCS manual
- **Contact information required to be provided and maintained for all data link users – enhances communication capability**
- **Co-located with performance data and problem reporting for single point access on FANS-CRA.com website**
- All users required to coordinate planned changes in operational use of data link that can impact global or regional network performance sufficiently in advance to help CSP/SSP determine if changes to increase capacity are needed

CSP Compliance
Charter vs. contract

- **Ensuring the compliance of CSP allocations through the ANSP and operator is particularly important because no direct State safety oversight requirements under existing Annex provisions**
  - ATS provision and aircraft operation are subject to the certification and/or SMS requirements under Annexes 6, 11 and 19
- **All stakeholders are expected to adhere to the stated "terms" of the PBCS concept**
- **Some stakeholders prefer an enforceable "contract/agreement" to specify performance and safety requirements for the CSPs and are working toward updating contracts accordingly**

CSP Outage Notification

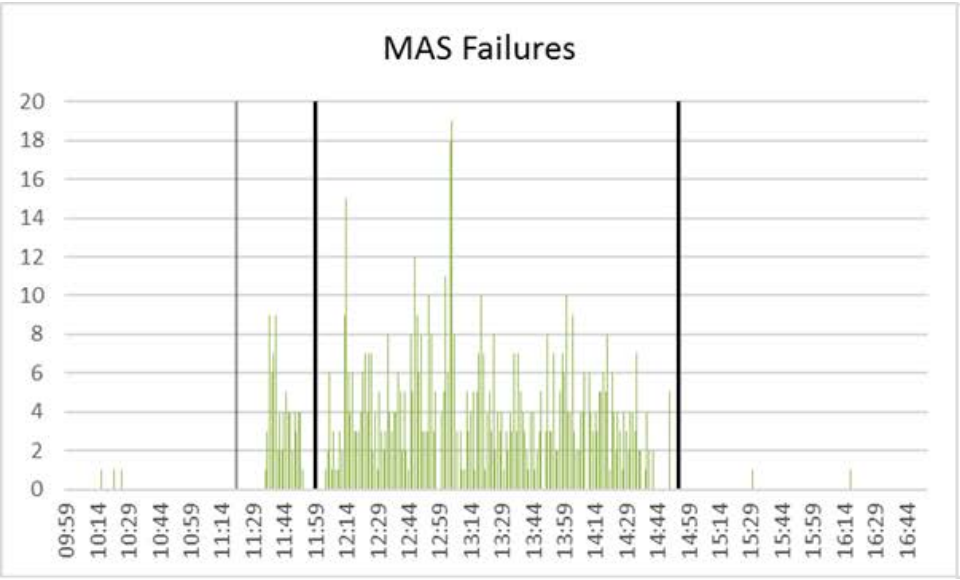
- CSPs provide reports of planned and unexpected outages/degradations
- Reports are essential operationally by ATC and Operators
  - **Ongoing challenges to get timely reports with information that can be used by ATC personnel for decision-making, and to get post-incident reports with cause/resolutions/mitigations**
- Reports are also used to estimate network availability for PBCS monitoring to assess against requirements for RCP240/RSP180

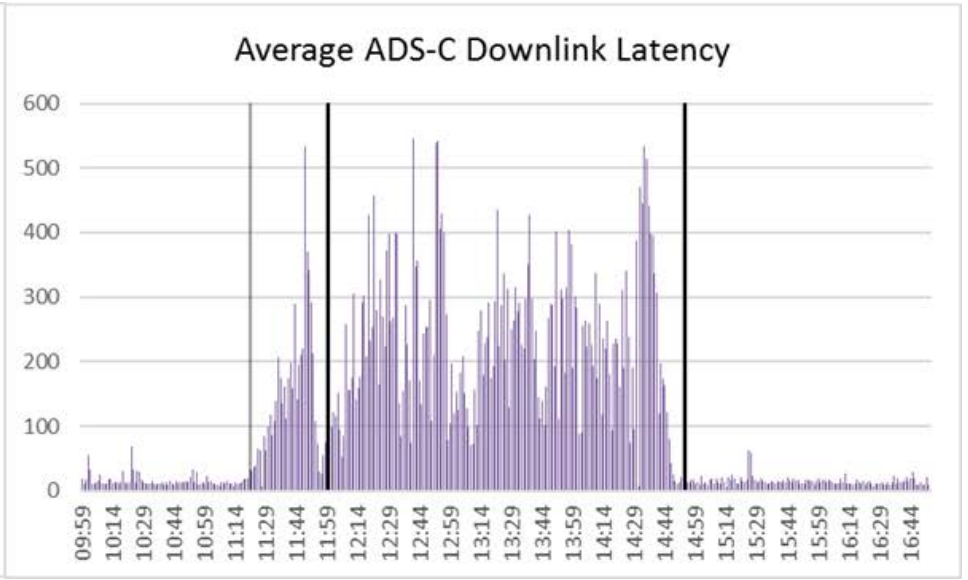
START DATE	START TIME (UTC)	DURATION (min)	SERVICE IMPACTED	SATELLITE REGION IMPACTED	NOTIFICATION SOURCE	NOTES
25-Jan-17	11:59	175.00			ARINC,SITA	The SITA-ARINC traffic is now flowing normally via the redundant link via Singapore while the Annapolis link is under investigation
8-Feb-17	18:04	30.00	SITA Iridium	Global	SITA	Issue with the Iridium Datalink ACARS Service
8-Feb-17	18:06	126.00	ARINC Iridium	Global	ARINC	Issue with the Iridium Datalink ACARS Service
9-Feb-17	17:12	68.00	SITA Iridium	Global	SITA	AOC advised IRIDIUM we were not seeing traffic from their LAN on the AISSR3TMP / AISSR4TMP routers
9-Feb-17	17:15	0.77	ARINC Iridium	Global	ARINC	AOC advised IRIDIUM we were not seeing traffic from their LAN on the AISSR3TMP / AISSR4TMP routers
16-Feb-17	03:06	34.00	Inmarsat I-3	IOR	ARINC,SITA	Inmarsat unscheduled loss of Network service in I-3 Indian Ocean Region for Classic Aero over I3
16-Feb-17	12:41	38.00	Inmarsat I-3	IOR	SITA	Inmarsat degradation for Classic Aero over I3
16-Feb-17	13:01	19.00	Inmarsat I-3	IOR	ARINC	Inmarsat degradation for Classic Aero over I3
16-Feb-17	15:11	49.00	Inmarsat I-4	APAC/AMER	SITA	Paumalu earth station had a power outage, backup power did not come up as expected.
16-Feb-17	15:13	115.00	Inmarsat I-4	APAC/AMER	ARINC	Paumalu earth station had a power outage, backup power did not come up as expected. This created a stale session on our router which had to be cleared.
22-Feb-17	08:05	647.00	Iridium	Global	SITA	Intermittent Iridium Datalink ACARS Service delays
1-Mar-17	16:02	35.00	Inmarsat I-3	POR	SITA	
3-Mar-17	13:05	15.00	Inmarsat I-3	IOR	SITA	
3-Mar-17	13:11	9.00	Inmarsat I-3	IOR	ARINC	
23-Mar-17	09:49	41.00	ARINC Iridium	Global	ARINC	
25-Apr-17	08:36	46.00	SITA Iridium	Global	SITA	Satellite Aircom Iridium Datalink ACARS service is not not available due problem at Iridium
1-May-17	03:14	127.00	Inmarsat I-4	Global	ARINC	
1-May-17	03:15	125.00	Inmarsat I-3, I-4	AOR, APAC, AMER	SITA	Inmarsat I3 and I4 services are unavailable over Atlantic, Asia Pacific and the Americas regions. EUA1,IOR2 and POR1 regions are not affected.
3-May-17	12:30	95.00	SITA	Global	SITA	SITA-ARINC Internetworking to Annapolis. The cause was identified as a looping message issued by ARINC and later removed by ARINC from their queue to resolve the issue.
3-May-17	12:30	137.00	ARINC	Global	ARINC	Numerous agencies are reporting delay in delivery of CDPLC and ATC messages, including FAA, IAA, ATC Gander, and UKNATS. No issues within our network have been found, and our Support Teams are investigating with our partners. A filter was put in place to trap the message, and delays have cleared.
18-May-17	23:34	22.00	Inmarsat I-4	EMEA	ARINC	BGAN/FB/SB/ Classic Aero over I4
8-Jun-17	01:10	30.00	Inmarsat I-3	POR	SITA	Inmarsat I3 data services over Pacific Ocean region is not available
11-Jun-17	12:51	50.00	Inmarsat I-4	EMEA, APAC	SITA	Inmarsat network service degradation in I4 EMEA and Asia-Pacific regions has now been restored
22-Jun-17	22:32	43.00	Inmarsat I-4	EMEA	ARINC	
30-Jun-17	08:40	???	Inmarsat ??	???	ARINC	???

START DATE	START TIME (UTC)	DURATION (min)	SERVICE IMPACTED	SATELLITE REGION IMPACTED	NOTIFICATION SOURCE	NOTES
30-Jul-17	00:20	15.00	Satellite Data Service	MTSAT	SITA	Degraded due to commnications line issue at MTSAT
23-Aug-17	09:12	26.00	Inmarsat I-3	POR	SITA	network problem at Perth GES station
19-Sep-17	10:42	146.00	Inmarsat I-4	AMER, APAC	ARINC	degraded services
19-Sep-17	08:51	115.00	Inmarsat I-4	AMER, APAC	SITA	degraded services
26-Sep-17	10:19	37.00	Inmarsat I-4	MEAS	SITA	degraded services
26-Sep-17	10:19	?	Inmarsat I-4	MEAS	ARINC	degraded services
26-Sep-17	10:25	?	Inmarsat I-4	EMEA	ARINC	degraded services
27-Sep-17	22:38	7.00	Iridium	Global	SITA	ACARS service was not available
1-Nov-17	03:41	98.00	Inmarsat SBB	AMER, APAC	ARINC	Connections to ground stations XXS and XXU are down
3-Nov-17	23:30	210.00	Inmarsat SBB	??	ARINC	ARINC experienced an outage on its primary and backup circuit from the Inmarsat meet me point located in Amsterdam. We are working with our circuit providers to establish the cause of this but initial investigations point to a problem with a planned migration that should not have affected our services. ACARS, SB-S and GTA voice calls were not affected by this outage.
5-Nov-17	17:17	38.00	Inmarsat I-4	AMER, APAC	ARINC	ARINC experienced an Inmarsat outage on GlobaLink / Satcom service
5-Nov-17	17:14	59.00	Inmarsat I-4	AMER, APAC	SITA	Inmarsat had network issues affecting their I4 satellites over APK and AME
17-Nov-17	16:06	34.00	Inmarsat SBB	EMEA	ARINC	Escalated to Inmarsat. IMMARSAT switched to backup server to restore service.
24-Nov-17	09:30	559.00	Inmarsat SBB	??	ARINC	outage on its primary and backup circuit from the Inmarsat meet me point located in Amsterdam. ACARS, SB-S, GtA and AtG voice calls are not affected by this outage.
24-Nov-17	22:09	677.00	Inmarsat SBB	??	ARINC	outage on its primary and backup circuit from the Inmarsat meet me point located in Amsterdam. ACARS, SB-S, GtA and AtG voice calls are not affected by this outage. During maintenance works at the Inmarsat Meet me Point in Amsterdam, Telco/Inmarsat engineers decommissioning legacy equipment and fibers inadvertently disconnected 17 customer circuits including ARINC's primary and backup circuits resulting in a loss of services for SBB, Classic Aero Data 3 including Seat back Messaging and Cabin Voice. After connectivity was restored, on the same evening, a separate maintenance work activity resulted in our fiber circuits being cut altogether. Engineers worked as fast as possible to repair our fibers and restore services, but the repair effort took longer than anticipated.
29-Nov-17	04:02	23.00	Inmarsat I-4	EMEA	SITA	Post incident report only of network service degradation issue on I-4 EMEA
13-Dec-17	22:12	120.00	Inmarsat I-3	POR	ARINC	Inmarsat network service degradation
13-Dec-17	21:55	128.00	Inmarsat I-3	POR	SITA	Inmarsat advised that an equipment at the ground earth station had failed. Inmarsat replaced the faulty equipment and service was restored.
14-Dec-17	05:36	74.00	Inmarsat I-4	APAC	SITA	degradation issue has been resolved by Inmarsat Team
20-Dec-17	18:20	105.00	Iridium	Global	SITA	degradation in Iridium Datalink ACARS Service - issue was resolved by Iridium Engineers
20-Dec-17	18:45	150.00	Iridium	Global	ARINC	Iridium network anomaly caused messages not to be delivered
25-Dec-17	00:20	45.00	Inmarsat I-3	IOR	SITA	Post incident report only of network service degradation issue on I-3 IOR
25-Dec-17	00:40	50.00	Inmarsat I-3	IOR	ARINC	Unscheduled loss of Network service in I-3 Indian Ocean Region has restored with no specific restoral action provided

Jan 25 – SITA/ARINC networking problem

Reported time vs. Impact time





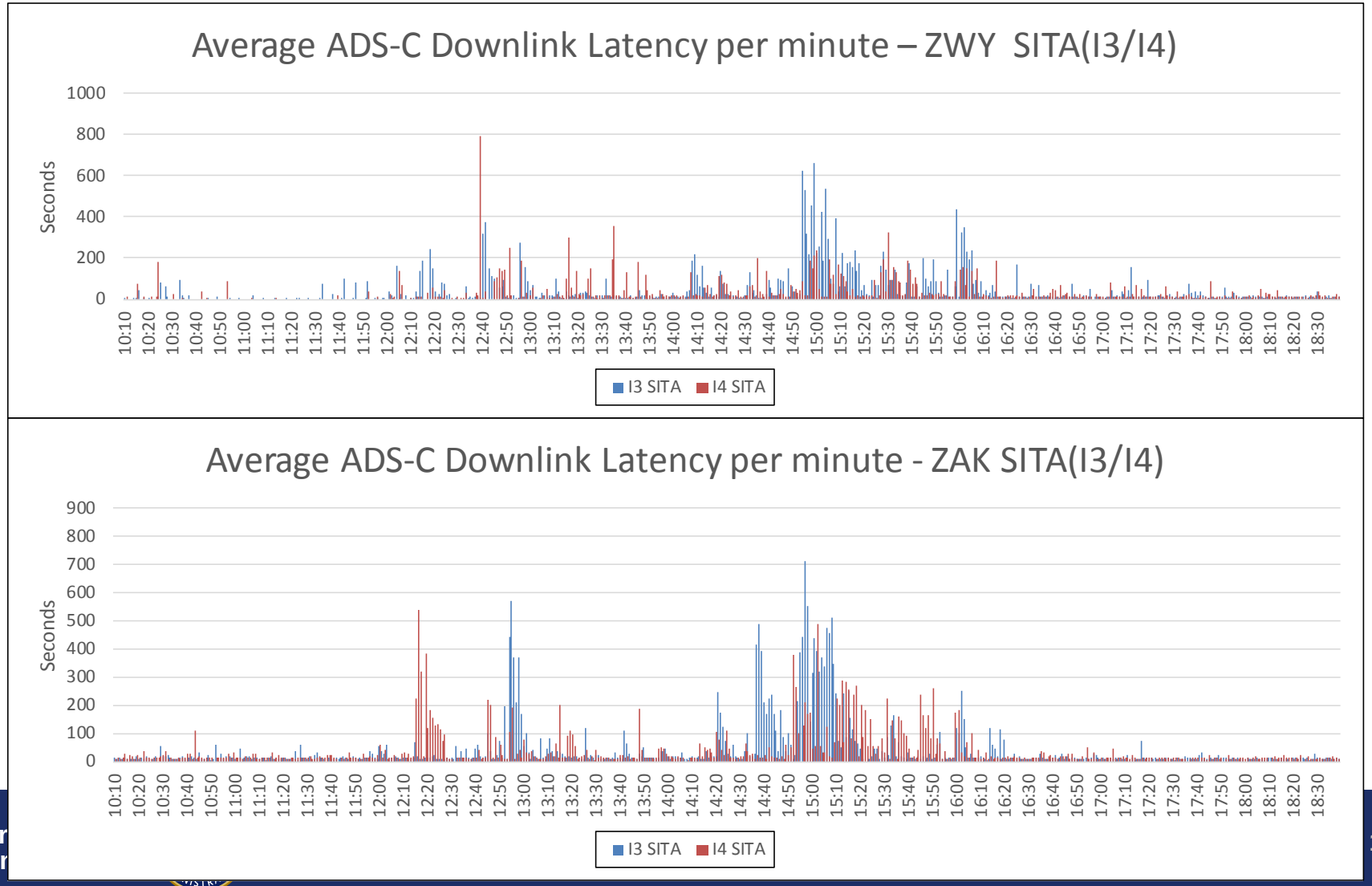
START DATE	CSP Reported START TIME (UTC)	CSP Reported DURATION (min)	New York Impact START TIME (UTC)	New York Impact DURATION (min)	Oakland Impact START TIME (UTC)	Oakland Impact DURATION (min)
25-Jan-17	11:59	175.00	11:26	208.00	11:21	213.00

Reported Outages
Operational Impact Summary

Reported Start Time	Reported Duration(Min)	FIR	Impact Start Time	Impact Duration (Mi)	Services Impacted	Impacted Flights	Delayed ADS-C Reports	Delayed ADS-C Reports by GES	Delayed Uplinks/Downlinks	MAS Failures
2017-01-25 11:59	175.0	ZAK	2017-01-25 11:21	213.0	all	all	1180			762
2017-08-23 09:12	26.0	ZAK	2017-08-23 09:13	20.0	I3	13	21	XXP(9),POR1(7),XXW(4),IOR1(1)	0/1	18/39
2017-11-05 17:14	59.0	ZAK	2017-11-05 17:14	59.0	I4	22	23	XXP(7),POR1(6),MTS1(5),H02(4),AOW2(3),H05(1),XXW(1)	3/3	4/6
2017-11-05 17:14	59.0	ZAN	2017-11-05 17:14	59.0	I4	3	7	POR1(5),HFDL(1),XXP(1)	1/0	0/2
2017-11-05 17:14	59.0	ZWY	2017-11-05 17:14	59.0	I4	25	36	AOW2(14),EUA1(10),AOE2(5),XXF(3),XXN(2),AME1(1),XXH(1)	6/3	3/4
2017-12-13 21:55	128.0	ZAK	2017-12-13 21:55	130.0	I3	7/20	10/27	H02(72),POR1(5),XXP(5)	3/4	232
2017-12-20 18:20	150.0	ZAK	2017-12-20 18:20	175.0	Iridium	10/20	21/47	H02(40),IG1(16),IGW1(5)	23/9	55/108

- **Evaluating the operational impact begins with determining the number of impacted flights**
  - **A flight is considered impacted if at least one ADS-C position report is delayed by more than 180 seconds during the outage time span.**
- **Delayed Uplinks/Downlinks and MAS Failures are also taken into consideration**

Unreported Outages
SITA(I3,I4) July 1st, 2017 1210z – 1640z



Impact Start Time	Duration(Minutes)	FIR	Services Impacted	Impacted Flights	Delayed ADS-C Reports
2017-01-02 12:05	86.0	ZAK	I3	25/110	113/1122
2017-02-28 07:16	20.0	ZAK	ARINC(I3,I4)	13	15
2017-04-11 01:26	13.0	ZAK	I3	20	23
2017-04-21 12:29	60.0	ZAK	I4	7/52	35/352
2017-05-02 08:02	10.0	ZAK	SITA(I3,I4)	14	19
2017-05-15 14:43	25.0	ZAK	SITA,MTSAT	72/78	102/295
2017-06-24 17:05	25.0	ZAK	SITA(I3,I4)	28/48	55/172
2017-07-01 03:14	24.0	ZAK	Iridium	11	22
2017-07-01 12:10	270.0	ZAK	SITA(I3,I4)	83/106	353/2488
2017-07-01 12:10	270.0	ZAN	SITA(I3,I4)	11	53
2017-07-01 12:10	270.0	ZWY	SITA(I3,I4)	78	283
2017-08-24 22:06	25.0	ZAK	Iridium	17/19	28/44
2017-08-24 22:06	25.0	ZAN	Iridium	2	4
2017-08-24 22:06	25.0	ZWY	Iridium	6	15
2017-09-19 02:34	86.0	ZAK	I3,I4,MTSAT	31/96	70/874
2017-09-19 02:34	86.0	ZAN	I3,I4,MTSAT	15	32
2017-09-20 13:07	32.0	ZAK	ARINC(I3)	29/40	52/122
2017-10-02 23:30	30.0	ZAK	Iridium	10	23
2017-10-02 23:30	30.0	ZAN	Iridium	4	15
2017-10-02 23:30	30.0	ZWY	Iridium	1	6
2017-10-26 14:44	10.0	ZAK	I3,I4	15	20
2017-10-26 14:44	10.0	ZAN	I4	2	5
2017-10-26 14:44	10.0	ZWY	I3,I4	10	11
2017-11-09 00:30	27.0	ZAK	SITA(I3,I4)	10	16
2017-11-21 00:17	13.0	ZAK	Iridium	9/21	18/58
2017-11-27 04:42	60.0	ZAK	Iridium	16/27	18/191
2017-11-28 04:08	8.0	ZAK	Iridium	10/19	12/26
2017-12-01 04:09	120.0	ZAK	Iridium	17	27
2017-12-03 04:41	11.0	ZAK	Iridium	13	16
2017-12-04 04:10	11.0	ZAK	Iridium	11	16
2017-12-08 16:29	35.0	ZAK	Iridium	10/15	28/42
2017-12-08 16:29	35.0	ZWY	Iridium	7	42
2017-12-08 16:29	35.0	ZAN	Iridium	2	3

PR 2490-MM

- **Disparity between CSP Reports of SSP outage and significant delay in notification versus outage start**
  - Sep 19, 2017 Inmarsat experienced difficulties on part of its I4 network
  - Alert received from ARINC at 10:53Z, reporting outage had started at 10:42Z
  - Later in the day (at 13:45Z) ARINC reported that full service had been restored at 13:08Z
  - SITA alert was received at 11:12Z and reported that the outage had commenced at 08:51Z
  - At 15:49Z a message from SITA announced that services had been restored at 10:46Z (BEFORE the outage was ever reported)

PR 2514-SH

- **PR was opened up for apparent outage identified at Oakland on September 20th, 2017 starting at 1307z. The investigation is still ongoing with Rockwell Collins and Inmarsat.**
  - Delays of 3 minutes or more were observed for 47 ADS-C reports(from 26 flights) sent via XXP from 1308z - 1339z
  - During this time period, 107 MAS Failures were received for uplinks sent to 37 aircraft that had previously sent messages via XXP
  - Controllers resorted to HFRO for communications for many of these flights
  - Latency issues and MAS Failures occurred intermittently through 1411z, but the majority of issues were observed between 1308z and 1339z

PR 2562-MM

- **PR was opened up for apparent Iridium outage identified at Oakland on January 18th, 2018 starting at 1307z. Not yet assigned.**
  - From 22:20 - 22:50 and from 23:59 - 00:29, 53 delayed ADS-C position reports(>180 seconds) were received from 23 aircraft

Next steps

- **Plan to propose project team at next NAT TIG meeting with CSPs/SSPs/ANSPs**
- **Objectives:**
  1. Discuss how to improve current process for detecting and notifying of outages between SSP/CSP and CSP/ANSP
  2. Develop standard content for notifications
     - Description of cause
     - Expected duration
     - Follow up after outage resolved
  3. More transparency on CSPs/SSPs to improve availability and performance