



Report

Normal Aircraft Tracking Implementation Initiative (NATII)

Produced by:

NATII Steering
Committee

Version 1.0

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1. Background

1.1 On 8 March 2014, Malaysia Airlines flight MH370 from Kuala Lumpur, Malaysia to Beijing, China was reported missing and at the time of the publication of this report the B-777 was yet to be found. Before this occurrence, Air France flight AF447 from Rio de Janeiro, Brazil to Paris, France went missing on 1 June 2009. While the wreckage was found shortly after the incident, it took almost two years to find and recover the flight data recorders.

1.2 Following the disappearance of Malaysia Airlines flight MH370, a special Multidisciplinary Meeting on Global Flight Tracking (MMGFT) was held at ICAO Headquarters from 12 to 13 May 2014 to make recommendations and propose future actions by ICAO. The MMGFT concluded that global tracking of airline flights should be pursued as a matter of priority.

1.3 As a result of that meeting the Global Aeronautical Distress and Safety System (GADSS) concept of operations was developed. The GADSS presented a high-level system with a description of users and usages of flight tracking information during all phases of flight, both normal and abnormal flight conditions including timely and accurate positioning of an aircraft in distress.

1.4 The MMGFT concluded that an industry-led initiative under the ICAO framework would be the most expeditious means to promote flight tracking implementation in the short-term. In this regard, the Aircraft Tracking Task Force (ATTF), led by the International Air Transport Association (IATA), was established to identify potential solutions for normal flight tracking using existing technologies. The ATTF report described the characteristics of a normal aircraft tracking process taking into consideration existing aircraft capabilities. It described aircraft tracking in terms of existing coverage, practices and technologies. The report also outlined useful performance criteria that were established based on a review of existing technologies and best practices.

1.5 In February 2015 and at the Second High-Level Safety Conference (HLSC) in Montreal, delegates discussed the issue of aircraft tracking at length. The Conference endorsed and encouraged the prompt implementation of the GADSS concepts of operations, including normal tracking every fifteen minutes and distress tracking every minute. The Conference also urged States and aviation safety partners to maintain the confidence of the public in the safe air transportation system by improving flight tracking, especially over oceanic and remote areas.

1.6 The HLSC 2015 called upon ICAO to finalize the GADSS concept for global tracking and to lead the conduct of a Normal Aircraft Tracking Implementation Initiative (NATII) using existing technologies. A NATII Steering Committee, with global participation, was formed and selected the Asia Pacific Region as a representative area of operations for the initiative.

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2. Definitions

For the purpose of the Normal Aircraft Tracking Implementation Initiative (NATII) the following definitions were adopted by the Steering Committee and are used in this report and any supporting documents:

Aircraft Tracking – A ground-based process that maintains and updates at standardized intervals a record of the four dimensional position of individual aircraft in flight.

4D/15 Service - In the provision of air traffic services an ATS unit receives four dimensional (latitude, longitude, altitude, time) position information at 15 minute intervals or less from suitably equipped aircraft.

4D/15 Tracking - The operator obtains four dimensional (latitude, longitude, altitude, time) aircraft position information at 15 minute intervals or less.

Oceanic Area- Airspace which overlies waters beyond the outer limit of the territorial sea.

Note 1 - The territorial sea is up to 12 nautical miles as measured from baselines in accordance with the U.N. Convention on the Law of the Sea.

Note 2 – Airspace that is not covered by the definition of Oceanic Area is referred to as non-Oceanic Area.

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3. Structure of the NATII

3.1 The NATII was established to provide input for the development of guidance material to support the implementation of aircraft tracking provisions. The initiative identified existing practices used by some operators to determine the location of their aircraft when operating in Oceanic Areas, as well as challenges facing the practical implementation of Normal Aircraft Tracking.

3.2 To lead the NATII, a Steering Committee was created comprised of States and international organizations. The group represented a multi-disciplinary team with expertise in the following areas:

- a) the proposed ICAO SARPs and guidance material development processes and implementation initiatives;
- b) the GADSS;
- c) operators' capabilities to track aircraft;
- d) the capabilities of Air Traffic Service (ATS) providers to determine aircraft position; and
- e) technical solutions related to aircraft tracking.

3.3 Membership of the Steering Committee included Australia, China, Indonesia, Japan, Malaysia, Singapore and the United States as well as the international organizations CANSO, EASA, EUROCONTROL and IATA. The group met every two weeks via teleconference commencing 19 February 2015. A list of the NATII Steering Committee members is included in Appendix B and a copy of the terms of reference are included in Appendix C.

3.4 Having identified the major areas of work, the Steering Committee initially created two sub-groups: Airspace and Scenario. For the purpose of the initiative, the Airspace sub-group's task was to identify routes in Oceanic Areas, including dynamic routing (i.e. User Preferred Routes, Flex Tracks, Dynamic Oceanic Track System Plus), that reasonably reflected the nature of operations and technologies in the Asia/Pacific Region where ATS units received aircraft position information at greater than 15 minutes intervals and, for each route, identified the:

- o ATS unit(s) reporting rate in minutes;
- o operators that use those routes; and
- o SAR alerting procedures.

3.5 The Scenario sub-group's task was to contact operators identified by the Airspace sub-group for a given route and invite them to participate in the initiative in a number of areas. These areas included:

- o describing operator tracking methods in use, or methods that would be required to meet 4D/15 tracking requirements as well as the pros and cons of technologies used;
- o establishing a timeframe to be able to track aircraft on particular routes, demonstrating the ability to manage the tracking information generated in normal operations; and

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- participating in a table top exercise.

3.6 Due to the overlapping nature of the work, these two sub-groups eventually merged to form the NATII Working Group. The Working Group was made up of the following States and international organizations: Australia, Japan, Malaysia, Singapore, United States, CANSO, IATA and IFALPA. The Working Group met initially every two weeks and subsequently met at weekly intervals as workload increased with a total of sixteen teleconferences. A list of the Working Group members is included in Appendix B and a copy of the terms of reference are included in Appendix C.

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4 Activities

The two principal activities conducted to support the development of guidance material and implementation of global aircraft tracking included a Communications and Aircraft Tracking Service Providers' Workshop and a table top exercise of aircraft tracking scenarios. A summary of each of these activities and the results of the associated discussions is included in this section. In addition, the NATII monitored the Australian Enhanced Flight Tracking Evaluation Trial.

4.1 Communications and Aircraft Tracking Service Providers' Workshop

4.1.1 A Communications and Aircraft Tracking Service Providers' workshop was held in Montreal on 30 April and 1 May 2015. The purpose of this workshop was to consult with industry in order to better understand aircraft tracking technical solutions, and to identify any operator(s) using the various aircraft tracking system(s) who would be willing to share their experience with the Implementation Initiative including:

- dedicated aircraft tracking systems as well as other technologies and data that can be repurposed to facilitate aircraft tracking;
- identifying and learning from challenges to the implementation of aircraft tracking systems ; and
- identifying operators using aircraft tracking technology who would be able to assist with the NATII trial.

4.1.2 The workshop invitees included the members of the NATII Steering Committee and the Working Group as well as industry representatives. The industry representatives provided presentations with information based on a series of questions developed for the workshop by the NATII Steering Committee. These questions represented the areas identified by the Steering Committee as most useful to the development of the Implementation Initiative.

4.1.3 The questions and the summary of the discussions in response to the questions are included below:

4.1.3.1 Who is using the system now, would they be interested in participating in trial?

4.1.3.1.1 The workshop participants expressed a willingness to assist the Implementation Initiative by providing details of operators using their systems on aircraft with take-off mass of 27,000 kg or more, particularly where the systems were being used within the Asia/Pacific region. This information was later used when establishing the table top exercise scenarios.

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4.1.3.2 What issues have there been in getting the system set up?

4.1.3.2.1 Few issues were reported in the setting up of tracking systems. One potential issue concerned the operators' ability to gain regulatory approval to use satellite links within certain States, potentially affecting the Global coverage of the proposed tracking solution.

4.1.3.2.2 The Workshop noted a concern regarding operations over and around the North and South poles, since many operators were equipped with systems that rely on the use of geo-stationary satellites. Such systems did not provide coverage over and around the North and South poles, although there were other options available for tracking within those areas.

4.1.3.2.3 Several vendors noted that operators in general appear to have a perception that the cost of tracking is high. They presented some system solutions that were relatively inexpensive. That disconnect between the perceived cost and the actual cost meant that many operators were not considering all of the available tracking system options.

4.1.3.3 Describe the aircraft equipment. What Supplemental Type Certificates (STCs) are available?

4.1.3.3.1 The workshop noted that some solutions were based on existing aircraft equipment using certified avionics (e.g. repurposed existing technologies already on the aircraft such as ADS-C, ADS-B, engine monitoring, IFE, etc.).

4.1.3.3.2 Other dedicated aircraft tracking systems were designed to be permanently installed in aircraft, with some STCs already existing for transport category aircraft types. The vendors advised that STCs could be obtained for additional aircraft types. The NATII noted that this would take additional time based on the complexity of the particular system and regulatory environment(s).

4.1.3.3.3 Portable aircraft tracking systems which are not installed in the aircraft (portable tracking solutions) have made it harder for State Regulatory Authorities to approve their use as there was a lack of clarity on which standards apply to those systems. However, a number of States have approved their use. ICAO guidance on Portable Electronic Devices (PEDs) and the Electronic Flight Bag (EFB) Manual were identified as having applicable procedures that States could use to identify potential issues with PED tracking solutions.

4.1.3.4 What service standards do you operate to (availability, integrity, latency)?

4.1.3.4.1 The majority of dedicated aircraft tracking systems presented, for which no industry standards apply for aircraft tracking, claimed latency and integrity figures exceeding 95%. The workshop noted that systems used for ATS purposes meet the appropriate ICAO SARPs.

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4.1.3.5 Can an operator receive ATC messages? If yes, how?

4.1.3.5.1 The aircraft position reports addressed to ATC can also be routed by the communication service provider to multiple recipients. This was noted as a common practice.

4.1.3.6 Describe the process used to monitor 15 minute position reports (manual, automated, alarms)?

4.1.3.6.1 All systems presented at the workshop described some level of automated monitoring, with many offering alerts generated by missed reports.

4.1.3.6.2 Also discussed was the issue of how to manage communications between operators and ANSPs as there was the potential for ATC units to become swamped by calls regarding missed reports.

4.1.3.7 How much training is required by operator (pilots, dispatch) to use the system?

4.1.3.7.1 The vendors indicated that training requirements for pilots varied from none at all (integrated and fully automatic systems) to a few hours. For operations staff the requirement could be from a few hours to a day or two, depending on the complexity of the system chosen and the options taken with this system. Generally it was thought that training was not a significant issue.

4.1.3.8 What capacity constraints are there on this system?

4.1.3.8.1 The satellite and communication service providers indicated that the overall network capacity was not likely to be a limiting factor, some expressed a need to plan for the potential increased network traffic. The workshop noted that sufficient time should be given for the service providers to put extra capacity in place, if required. The applicability date of November 2016, for the proposed SARPs, was not considered to be an obstacle.

4.1.3.8.2 The issue of multiple ADS-C contracts exceeding the limitation allowed on the same aircraft was highlighted and may need to be considered (e.g. current, next, neighbouring ANSPs and operator).

4.1.3.8.3 For systems using existing equipment on the aircraft, there was concern that these may not be able to prioritize the position reporting function over less essential functions. The NATII noted that this requires further research.

4.1.3.9 What is the highest frequency of position reporting that can be achieved?

4.1.3.9.1 The dedicated aircraft tracking systems that were presented could achieve a minimum time between reports that ranged from a few seconds to one minute. All of the systems presented met the proposed standard of 15 minute reporting.

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4.1.3.10 How is data security accomplished?

4.1.3.10.1 All of the dedicated aircraft tracking systems presented use encryption at all stages of their process.

4.1.3.10.2 On a related topic, where the position data is required to be shared between parties, a common standard or format for this data sharing was thought to be beneficial. It was noted by the workshop that there was no existing industry standard.

4.1.4 The Communication and Service Providers' Workshop provided insight on the technology available for aircraft tracking. This information was then used as the basis for developing aircraft tracking scenarios that were tested in the NATII Table Top Exercise (TTX).

4.2 Table Top Exercise (TTX)

4.2.1 The Normal Aircraft Tracking Implementation Initiative (NATII) Table Top Exercise (TTX) meeting was held at the Qantas Crisis Management Centre in Sydney, Australia from 16-18 June 2015. There were twenty-three participants from four States, three international organizations, and ICAO throughout the three day exercise period. A virtual meeting link was made available for the TTX to all NATII Steering Committee, Working Group members and invited parties who could not participate in person.

4.2.2 The participants reviewed six scenarios developed for the TTX to identify existing capabilities and opportunities for improvement for global flight tracking. In addition key issues were discussed that applied to all scenarios.

4.2.3 The NATII considered the TTX outcomes and recommendations, along with other inputs, in developing the NATII Recommendations to ICAO. In reviewing the TTX activities, the NATII amended the evolution of concepts for consistency and clarity. The original intent has not been modified and a complete summary of TTX discussions is available on the NATII SharePoint website.

4.2.4 For the purposes of the TTX, assumptions and definitions of key terms were reviewed and agreed upon. As the exercise progressed the definitions were refined to those introduced in this report. The TTX agreed that using "Remote" to identify the locations where it is recommended that aircraft tracking should be undertaken by an operator was complicated because there was no universal harmonized definition for "Remote" areas. The TTX further reviewed the suggestion to use "Continental Area" for that purpose and found it problematic because there would be up to a 12 NM gap between the proposed "Oceanic Area" definition and the "Continental Area" definition. The TTX concluded that all airspace outside of the proposed "Oceanic Area" definition would be referred to as non-Oceanic Area.

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NATII Recommendation 4/1

The NATII recommended that ICAO consider using the following definition for “Oceanic Area” in the proposed SARPs:

Oceanic Area- The airspace which overlies waters beyond the outer limit of the territorial sea.

Note 1 - The territorial sea is up to 12 nautical miles as measured from baselines in accordance with the U.N. Convention on the Law of the Sea.

Note 2 – Airspace that is not covered by the definition of Oceanic Area is referred to as non-Oceanic Area.

NATII Recommendation 4/2

The NATII recommended that ICAO consider referring to non-Oceanic Areas instead of Remote Areas in proposed Provision 3.3.3.

4.2.5 Prior to considering the scenarios, the TTX discussed the proposed Annex 6 Part I amendment to ensure there was a common understanding of the intent and how it applied to the exercise. In that regard, with respect to proposed provisions 3.3.2 and 3.3.3, the TTX understood that the requirement was that an operator must determine, at the flight planning stage, the applicability of the 4D/15 Tracking requirement/recommendation for a route.

To aid in determining the applicability of the 4D/15 Tracking requirements/recommendations, the TTX developed the following guidelines for use during the exercise:

- a) The operator must determine whether the aircraft to be operated on a route has the capability to participate in an available 4D/15 Service (i.e. the aircraft is suitably equipped to allow an ATS unit to receive its 4D/15 position data);
- b) If the aircraft could not participate in an available 4D/15 Service for any portion of the route, the operator was required to determine whether the portion(s) of the route was within an Oceanic Area or not;
 - I. Within Oceanic Areas, the operator was required (shall) to conduct 4D/15 Tracking for that aircraft;
 - II. Outside Oceanic Areas (non-Oceanic Areas), it was recommended (should) that the operator conduct 4D/15 Tracking for that aircraft;
- c) If the aircraft would be participating in an available 4D/15 Service along the entire route, the operator would not be required to provide 4D/15 Tracking for that aircraft;

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d) After flight commencement, a loss of 4D/15 Tracking capability or 4D/15 Service, with respect to the tracking requirements, should not prevent continuation of the flight.

4.2.6 In reviewing the TTX guidelines for the exercise, the NATII recognised the need for operators to have, in a useable format, current information on the system(s) used by ATS units to receive aircraft position information and their associated coverage area(s). For non-surveillance system(s), it was also recognised that there was an additional requirement for the periodic reporting intervals (time).

NATII Recommendation 4/3

The NATII recommended that ICAO consider complementing the proposed Provisions with a requirement for ANSPs to publish, in the AIP, current information on all system(s) used by ATS units to receive aircraft position information (e.g. ADS-C, MLAT), their associated coverage area(s) and for non-surveillance system(s) the periodic reporting intervals (time).

Note: Annex 15 currently contains provisions addressing some of these systems.

NATII Recommendation 4/4

The NATII recommended that ICAO consider complementing the proposed Provisions with a requirement that system information described in Recommendation 4/3 be made available centrally and in a standardized format that is useable by automated systems.

4.2.7 The scenarios were designed to test the ability for operators to meet the proposed requirements using a variety of aircraft types and equipage levels, and through a series of events such as system failures and missed reports. In addition, the response to the events was reviewed by the TTX to provide recommendations. Each of the scenarios are described below along with observations and NATII recommendations identified in the scenario.

4.2.8 Scenario I – Sydney (SYD/YSSY) to Narita (NRT/RJAA).

4.2.8.1 The scenario used a Boeing 777 with ADS-C equipage. This scenario introduced an in-flight ADS-C failure. Air traffic services continued because High Frequency communication (HF) was supported by the ANSPs.

4.2.8.2 The TTX discussed the challenges of making HF voice, 4D position reports to the operator every 15 minutes in addition to the ATC reports. HF communications require fine tuning of the correct frequency prior to establishing contact. This takes time and, on occasion, it was determined would impede reporting at regular intervals. The exercise demonstrated that the additional flight deck workload required to meet 4D/15 Tracking requirements distracted the flight crew from other

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operational flight deck activities and had a negative impact on the overall safety of the operation. Additionally, manual reporting (i.e. VHF voice, HF voice, manual ACARS) introduced a level of uncertainty regarding the accuracy of the reports. In other words, the manual report could indicate that the aircraft was in one location when it actually was in a different place.

NATII Recommendation 4/5

The NATII recommended that ICAO consider amending proposed Provisions 3.3.2 and 3.3.3 so that only automated systems be used in fulfilling the Normal Aircraft Tracking requirements and recommendations.

4.2.9 Scenario II – Singapore (SIN/WSSS) to Port Moresby (POM/AYPY).

4.2.9.1 The scenario used a Boeing 777 with ADS-C equipage. The scenario introduced the discussion of monitoring missed reports, and operator and Air Navigation Service Provider (ANSP) procedures for initiating search and rescue (SAR) coordination. This theme was further developed in the ensuing scenarios.

4.2.9.2 In this scenario the normal ANSP procedures for missed reports were reviewed. Additionally, for the portions of the flight where 4D/15 Services were not available, the operator used the aircraft's ADS-C system to meet the 4D/15 Tracking requirements. This scenario highlighted the operational benefit of using automated systems to meet 4D/15 Tracking requirements. Furthermore, the scenario identified the need for verification and/or security procedures when missed 4D/15 Tracking reports were communicated by the operator to the ANSP, in particular to determine the legitimacy of the notification.

4.2.9.3 This scenario also supported the NATII Recommendation 4/5.

4.2.10 Scenario III – Sydney (SYD/YSSY) to Santiago (SCL/SCEL).

4.2.10.1 The scenario used an Airbus A340 with CPDLC equipage only. With limited equipage, this scenario discussed operator procedures to provide 4D/15 Tracking along the route. The scenario also elicited discussion on procedures along the route where the aircraft is near an FIR boundary and tracking had been lost, and how operators and ANSPs should coordinate missed reporting procedures.

4.2.10.2 The scenario had an aircraft miss a 4D/15 Tracking report shortly before the aircraft was due to cross an FIR boundary. By the time the operator had performed its established procedures (i.e. attempting to re-establish a 4D position and/or establishing communications) the aircraft had crossed the FIR boundary. Although prevalent in all scenarios, this scenario highlighted the need for operators and ANSPs to have up-to-date operational contact details.

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NATII Recommendation 4/6

The NATII recommended that ICAO consider complementing the proposed Provisions with procedures to establish a centralized location (preferably hosted by ICAO) for ANSPs to publish all relevant means of contact that operators should use to report a 4D/15 Tracking missed report(s) and to keep this information current.

NATII Recommendation 4/7

The NATII recommended that ICAO consider complementing the proposed Provisions with procedures to establish a centralized location (preferably hosted by ICAO) for aircraft operators to publish all relevant means of contact for their Operations Control Centres (OCC) for ANSPs and to keep this information current.

4.2.11 Scenario IV – Sydney (SYD/YSSY) to Christchurch (CHC/NZCH).

4.2.11.1 The scenario focused on operator and ANSP procedures when an aircraft failed to provide a 4D/15 Tracking report and procedures for contacting an aircraft following missed reports. It also considered the actions to be taken when an aircraft subsequently failed to make a required ATS position report. This led to a discussion on when the “clock starts” for Alerting purposes and/or appropriate Emergency Phase declaration.

4.2.11.2 Following the first missed 4D/15 Tracking report, the operator established communications with the aircraft, did not obtain a 4D position report and no further action was taken. Subsequently the aircraft missed a second 4D/15 tracking report, only this time the operator was unable to establish contact with the aircraft. On contacting the ATS unit the operator was advised that the aircraft had also missed an ATC position report.

4.2.11.3 The last known aircraft position is one of the most important pieces of information that an ATS unit needs to provide to SAR organizations. Failure of the operator to obtain an updated 4D position report resulted in a greater amount of time having passed since the last known position. The TTX highlighted the need for guidance to collect an updated 4D position after restabilising communications following a missed report.

4.2.11.4 The TTX also concluded that guidance needs to be developed for ANSPs on when to declare an appropriate emergency phase based on an operator’s missing 4D/15 Tracking report. The guidance should include how best to integrate operator missed reports into current procedures (i.e. Annex 11, Section 5.5 and PANS-ATM 9.2.2), that it should be based on the earliest missed aircraft report time (i.e. operator missed 4D/15 Tracking report or ATS missed aircraft report), and in due course, the Annex 11 and PANS-ATM (Doc 4444) should be reviewed.

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4.2.11.5 The TTX recommended developing a form for the purpose of communicating information related to a missed 4D/15 Tracking report to ATSS.

4.2.11.6 Following the TTX recommendations, work was undertaken to develop draft guidance material, Appendix D contains the proposed table of contents and the current draft is available on the NATII SharePoint website.

NATII Recommendation 4/8

The NATII recommended that ICAO consider developing guidance material to support operators and ANSPs in the implementation of the Normal Aircraft Tracking requirements.

4.2.12 Scenario V – San Francisco (SFO/KSFO) to Narita (NRT/RJAA).

4.2.12.1 The scenario used a Boeing 747 equipped with an ADS-C system. Prior to flight commencement, there was a system-wide failure of ADS-C. Under this scenario, it was discussed at what point a “go-no go” decision should be made and what modified procedures, if any, were required for flight crews and ANSPs.

4.2.12.2 In this scenario the flight was planned over airspace where 4D/15 Services were available using ADS-C. The ATS units along the entire route had periodic reporting intervals of 15 minutes or less. At the planning stage, 4D/15 Tracking was not required. Shortly before departure, the operator was informed that the communication service provider had an outage and ADS-C would not be available. The aircraft was able to depart because it met the ANSP requirements for operating in the airspace (e.g. HF communications). Under the proposed SARPs, 4D/15 Tracking would now be required, however the outage meant that any SATCOM based system (e.g. ACARS, CPDLC) would be unavailable to meet that requirement with an automated system. The TTX identified the need for complementary ICAO provisions to allow flights to continue where the 4D/15 Tracking capability was lost before flight commencement.

NATII Recommendation 4/9

The NATII recommended that ICAO consider complementing the proposed SARPs with provisions to address aircraft tracking to allow for risk based variations to prescriptive requirements, acceptable to the State of the operator, which would allow flights to commence lacking a 4D/15 Tracking capability.

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4.2.13 Scenario VI – Cairns (CNS/YBCS) to Port Moresby (POM/AYPY).

4.2.13.1 The scenario used a Bombardier Q400 aircraft equipped with High Frequency (HF) and a portable dedicated aircraft tracking device. This scenario evaluated operator procedures when data from the device was no longer being received, as well as ANSP procedures when operators do not have the capability to contact their aircraft. The topic of data retention was also discussed.

4.2.13.2 The route used for this scenario had a 30 minute 4D/15 Service gap over oceanic airspace. The aircraft was fitted with a geo-fenced portable dedicated aircraft tracking device to meet the 4D/15 Tracking requirements. In the middle of the 4D/15 Service gap, where a report was expected, the aircraft missed the 4D Tracking report. The operator did not have a means to communicate with the aircraft (e.g. no ACARS, no HF). By the time the operator contacted the ATS Unit, the aircraft was back in radar coverage. This scenario highlighted the need for operators to develop procedures to assess the aircraft tracking system's serviceability. Furthermore, the TTX questioned whether 4D/15 Tracking was necessary for this type of operation (i.e. short 4D/15 Service gaps). The TTX identified the need for complementary ICAO provisions to address the scenario when 4D/15 Tracking capability does not exist for short segments where 4D/15 Tracking would be required.

4.2.13.3 This scenario also supported NATII recommendation 4/9 to consider complementing the proposed Provisions with SARPs to address risk based variations.

4.2.13.4 The TTX discussed at length how long 4D/15 Tracking data should be retained. It took into consideration ATS unit recording requirements and concluded that, unless there was an accident, there was no need to retain tracking data after the aircraft had landed safely under normal tracking conditions.

NATII Recommendation 4/10

The NATII recommended that ICAO consider amending proposed Provisions 3.3.4 to clarify that aircraft tracking data retention should only be for the purpose of assisting SAR in determining the last known position of the aircraft.

4.2.14 The TTX concluded with a discussion of the value of having a real-time trial and concluded there was little value at that time. A number of operators were exploring various alternatives to meet the 4D/15 Tracking requirements and were conducting trials with various systems to determine which systems could best integrate into their current operations. A real-time trial would be beneficial when the elements and all the stakeholders' procedures are in place and relevant information available (i.e. 4D/15 Service system coverage, ATS unit contact information) but prior to any applicability date for aircraft tracking requirements.

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4.3 Australian Enhanced Flight Tracking Evaluation Trial

4.3.1 The NATII monitored the Australian Enhanced Flight Tracking Evaluation Trial. The primary goal of that evaluation was to explore how oceanic aircraft tracking capabilities could be enhanced by reducing ADS-C satellite position reporting intervals to 15 minutes. The trial time interval was further revised down to 14 minutes to allow for the additional benefit of a reduced separation standard.

4.3.2 The evaluation was conducted over a four month period and followed a measured and incremental approach to assess any safety, technical or operational impact issues at each phase, including any effects on the Inmarsat Network before progressing to the next phase. A full report was issued jointly by Airservices and Inmarsat, detailing the evaluation and results and will be available to relevant organizations to further enhance guidance development around Normal Aircraft Tracking.

4.3.3 Analysis of the data by Airservices and Inmarsat demonstrated no deterioration in ADS-C communication performance throughout the evaluation. Both ADS-C messaging and Controller Pilot Datalink Communications (CPDLC) variations were within daily and monthly expectations. The evaluation also demonstrated that by allowing a 30/30 nautical mile separation service to be provided, potential efficiency benefits, both operational and environmental to operators were supported by improved access to preferred altitudes and routing.

4.3.4 The evaluation demonstrated that suitably equipped aircraft could comply with normal tracking requirements of 15 minutes or less through reduced contract periods with their ANSP. As a result of that evaluation Airservices adopted 14 minute ADS-C periodic reporting across the entire FIR as a standard operating procedure. Neighboring FIRs in the Pacific Region, namely Honiara, Nauru, New Zealand, Anchorage, and Oakland have also introduced 14 minute ADS-C periodic reporting.

4.3.5 Based on the results of the Australian Enhanced Flight Tracking Evaluation Trial, the NATII considered that ICAO should encourage ANSPs which currently provide ADS-C services over Oceanic Areas at greater than 15 minutes to establish periodic contracts at 15 minutes or less as a way to support normal aircraft tracking. The Trial demonstrated that this provided the added benefit of a reduction to the separation standards being applied (e.g. 30/30).

4.3.6 The NATII also recognized the value of ANSPs increasing surveillance coverage (e.g. SSR, ADS-B). From a Normal Aircraft Tracking perspective, this could reduce the requirement for operators to equip and implement Normal Aircraft Tracking technology and processes.

NATII Recommendation 4/11

The NATII recommended that ICAO continues to encourage States to increase the use of surveillance technologies in their respective airspace

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NATII Recommendation 4/12

The NATII recommended that ICAO consider encouraging ANSPs which provide ADS-C services over Oceanic Areas to establish periodic contracts at 15 minutes or less.

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5 Implementation Considerations for Normal Aircraft Tracking

5.1 Implementation Considerations

5.1.1 The NATII evaluated the policies and procedures required for the practical implementation of the proposed Normal Aircraft Tracking SARPs. This evaluation identified areas where significant challenges existed, and the NATII recognized the need for the development and publication of guidance material to create a better understanding of how these issues could be addressed.

5.1.2 The NATII recognized that the proposed SARPs were the foundation to achieve Normal Aircraft Tracking, however the discussions and activities identified areas that required further development. The NATII concluded that there was a requirement for complementary SARPs to address implementation issues identified which were not covered by the proposed SARPs. Most significantly, the NATII identified scenarios where the prescriptive nature of the proposed SARPs imposed an unrealistic operational burden across industry stakeholders. The proposed SARPs have the potential to result in a number of unintended consequences to operations especially when elements required for Normal Aircraft Tracking become unavailable, as described in Section 4.

5.1.3 To address this, the NATII concluded that complementary risk based variations to the prescriptive requirements should be developed (this approach was successfully used in the development of Extended Diversion Time Operations (EDTO), Fuel and Fatigue Risk Management Systems (FRMS) provisions). It was also determined that successful implementation of Normal Aircraft Tracking required a number of dependant tasks to be addressed, which included but was not limited to:

- making information readily available for operators to determine the area(s) of applicability of Normal Aircraft Tracking requirements;
- Collation of operational contact information for ATS units and operators for use in the event of a missed 4D/15 tracking report;
- Development of guidance material; and
- Installation of equipment to enable only automated systems be used in fulfilling the Normal Aircraft Tracking requirements and recommendations.

5.1.4 Aware of the ICAO processes, the NATII determined that an implementation period to the proposed SARPs should be established that would permit the necessary time for all of the aforementioned tasks to be completed. This could be accomplished by extending the proposed applicability date to November 2018.

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NATII Recommendation 5/1

The NATII recommended that ICAO consider extending the proposed applicability date to 2018 to allow time for tasks identified in Section 5 of this report to be completed.

5.1.5 Figure 5.1 describes a proposed timeline for all provisions based on the NATII recommendations to be in place.

Normal Aircraft Tracking Proposed Timelines

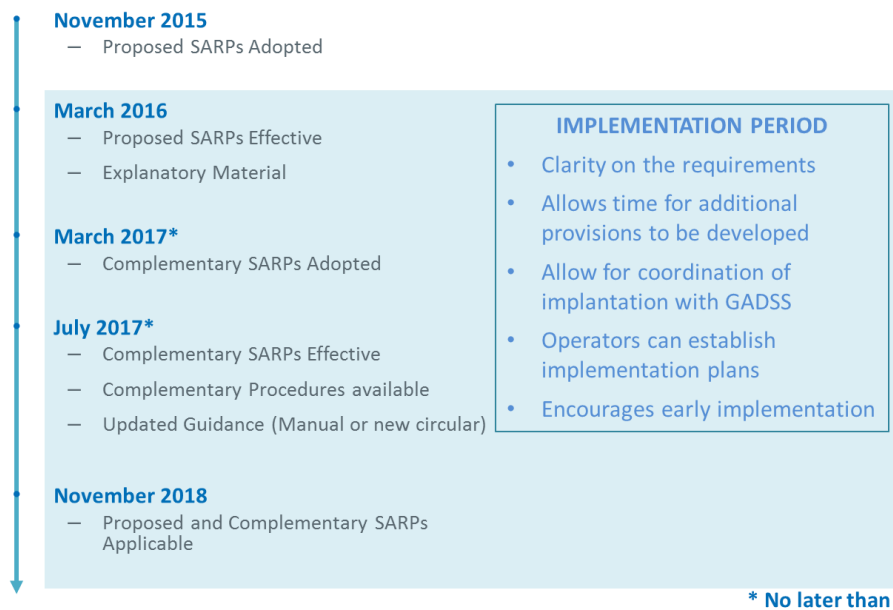


Figure 5.1

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6 Recommendations

6.0.1 Based on the discussions and activities of the NATII, a series of implementation challenges were identified, detailed in Section 5, which resulted in a number of recommendations. These are divided into two categories; those that ICAO should consider regarding the proposed SARPs; and those that would complement the proposed SARPs.

6.1 Recommendations for Proposed SARPs:

6.1.1 The NATII recommendations regarding the proposed SARPs are:

NATII Recommendation 4/1 (see § 4.2.4) The NATII recommended that ICAO consider using the following definition for “Oceanic Area” in the proposed SARPs:

Oceanic Area- The airspace which overlies waters beyond the outer limit of the territorial sea.

Note 1 - The territorial sea is up to 12 nautical miles as measured from baselines in accordance with the U.N. Convention on the Law of the Sea.

Note 2 – Airspace that is not covered by the definition of Oceanic Area is referred to as non-Oceanic Area.

NATII Recommendation 4/2 (see § 4.2.4) The NATII recommended that ICAO consider referring to non-Oceanic Areas instead of Remote Areas in proposed Provision 3.3.3.

NATII Recommendation 4/5 (see § 4.2.8) The NATII recommended that ICAO consider amending proposed Provisions 3.3.2 and 3.3.3 so that only automated systems be used in fulfilling the Normal Aircraft Tracking requirements and recommendations.

NATII Recommendation 4/10 (see § 4.2.13) The NATII recommended that ICAO consider amending proposed Provisions 3.3.4 to clarify that aircraft tracking data retention should only be for the purpose of assisting SAR in determining the last known position of the aircraft.

NATII Recommendation 5/1 (see § 5.1.4) The NATII recommended that ICAO consider extending the proposed applicability date to 2018 to allow time for tasks identified in Section 6.2 of this report to be completed.

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6.2 Recommendations for Complementary SARPs and Procedures:

6.2.1 The NATII recommendations regarding the proposed complementary SARPs and procedures are:

NATII Recommendation 4/3 (see § 4.2.6) The NATII recommended that ICAO consider complementing the proposed Provisions with a requirement for ANSPs to publish, in the AIP, current information on all system(s) used by ATS units to receive aircraft position information (e.g. ADS-C, MLAT), their associated coverage area(s) and for non-surveillance system(s) the periodic reporting intervals (time).

Note: Annex 15 currently contains provisions addressing some of these systems.

NATII Recommendation 4/4 (see § 4.2.6) The NATII recommended that ICAO consider complementing the proposed Provisions with a requirement that system information described in Recommendation 4/3 be made available centrally and in a standardized format that is useable by automated systems.

NATII Recommendation 4/6 (see § 4.2.10) The NATII recommended that ICAO consider complementing the proposed Provisions with procedures to establish a centralized location (preferably hosted by ICAO) for ANSPs to publish all relevant means of contact that operators should use to report a 4D/15 Tracking missed report(s) and to keep this information current.

NATII Recommendation 4/7 (see § 4.2.10) The NATII recommended that ICAO consider complementing the proposed Provisions with procedures to establish a centralized location (preferably hosted by ICAO) for aircraft operators to publish all relevant means of contact for their Operations Control Centres (OCC) for ANSPs and to keep this information current.

NATII Recommendation 4/8 (see § 4.2.11) The NATII recommended that ICAO consider developing guidance material to support the operators and ANSPs in the implementation of the Normal Aircraft Tracking requirements.

NATII Recommendation 4/9 (see § 4.2.12) The NATII recommended that ICAO consider complementing the proposed SARPs with provisions to address aircraft tracking to allow for risk based variations to prescriptive requirements, acceptable to the State of the operator, which would allow flights to commence lacking a 4D/15 Tracking capability.

NATII Recommendation 4/11 (see § 4.3.6) The NATII recommended that ICAO continues to encourage States to increase the use of surveillance technologies in their respective airspace.

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NATII Recommendation 4/12 (see § 4.3.6) The NATII recommended that ICAO consider encouraging ANSPs which provide ADS-C services over Oceanic Areas to establish periodic contracts at 15 minutes or less.

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Appendix A Proposed SARPs

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

1. ~~Text to be deleted is shown with a line through it.~~ text to be deleted
2. **New text to be inserted is highlighted with grey shading.** new text to be inserted
3. ~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading. new text to replace existing text

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**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

OPERATION OF AIRCRAFT

ANNEX 6

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART I

INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

...

CHAPTER 1. DEFINITIONS

...

Aircraft tracking. A ground-based process that maintains and updates, at standardized intervals, a record of the four dimensional position of individual aircraft in flight.

...

CHAPTER 3. GENERAL

...

Insert new section 3.3 as follows and renumber subsequent paragraphs accordingly.

3.3 Aircraft Tracking

3.3.1 The Operator shall establish an aircraft tracking capability to track aeroplanes throughout its area of operations.

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Note.— Guidance on aircraft tracking capabilities is contained in Circular XX.

3.3.2 The Operator shall track the position of an aeroplane at least every 15 minutes for the portion(s) of the inflight operation(s) that is planned in an oceanic area(s) under the following conditions:

- a) the aeroplane has a maximum certificated take-off mass of over 27 000 kg and a seating capacity greater than 19; and
- b) where an ATS unit obtains aeroplane position information at greater than 15 minute intervals.

Note.— Access to ATS aeroplane position data meets aeroplane tracking requirements.

3.3.3 **Recommendation.**— *The Operator should track the position of an aeroplane at least every 15 minutes for the portion(s) of the inflight operation(s) that is planned in a remote area(s) under the following conditions:*

- a) the aeroplane has a maximum certificated take-off mass of over 27 000 kg and a seating capacity greater than 19; and*
- b) where an ATS unit obtains aeroplane position information at greater than 15 minute intervals.*

Note.— Access to ATS aeroplane position data meets aeroplane tracking requirements.

3.3.4 The Operator shall establish procedures, approved by the State of the Operator, for the retention of aircraft tracking data to determine a known position of the aircraft as necessary.

Note.— Refer to 4.2.1.3.1 for Operator responsibilities when using third parties for the conduct of aircraft tracking under 3.3.1.

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End of new text.

...

4.6 Duties of flight operations officer/flight dispatchers

...

4.6.1 A flight operations officer/flight dispatcher in conjunction with a method of control and supervision of flight operations in accordance with 4.2.1.3 shall:

...

- d) notify the appropriate ATS unit when the position of the aeroplane cannot be determined by an aircraft tracking capability and attempts to establish communication are unsuccessful.

Origin:	Rationale:
Secretariat	These SARPs address the compelling need for an aircraft tracking requirement in the short term, as determined by the MMGFT and described in the Concept Steps of the GADSS (AT.03 – Develop and implement basic provisions for aircraft tracking in Block 0).

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Appendix B Membership

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State

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Australia	Birdsall, Jennifer
Australia	Owusu-Akyeampong, Kojo
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China	Zhu, Yan Bo
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IATA	Wee, Leonard
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IATA	Caunt, Sharron
IATA	Malik, Javed

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IATA	Hoey, Mark
IFALPA	Bollweg, Carl
IFALPA	Kelly, Boyd

Vendors that participated in the NATII Workshop

<u>Organization</u>	<u>Name</u>
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Astronautics Corporation of America	Bernie Newman
ATH Group Inc	James Dean
Blue Sky Network	Jon Gilbert
DRS Technologies Canada Lt.	Tom Herbert
FLYHT Aerospace Solutions Ltd	Richard Hayden
FLYHT Aerospace Solutions Ltd	Graham Ingham
Globalstar	Skip Nelson
Globalstar	Tony Navarra
Honeywell Aerospace	Chris Benich
INMARSAT	Stephen Angus
INMARSAT	Gary Colledge
International Communications Group Inc	Tim Rayl
International Communications Group Inc	Andrew Mayfield
IRIDIUM	Mike Hooper
Panasonic Avionics Corporation	Jeffrey Rex
Rockwell Collins	Yuri Maslov
Rockwell Collins	Yun Chong
SITA	Philip Clinch
SkyTrac Systems Ltd	Steven Sorocky
SkyTrac Systems Ltd	Brian O'Flynn
Spider Tracks	James McCarthy
Star Navigation Systems Group Ltd	Amir Bhatti
Star Navigation Systems Group Ltd	Neil Prasad
The Boeing Company	Tim Murphy

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Participation in NATII Table Top Exercise

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ICAO Secretariat Support

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C/AMO	Chris Dalton
D/RD	Imawaka Yoshiki
TO/AMO	Miguel Marin
TO/PBN	Ian Knowles
TO/AMO	Mike Barton
TO/AMO	Mike Boyd
TO/AMO	Mie Utsunomiya
TO/AMO	Vaughn Maiolla
TO/OPS	Henry Defalque
AMO	Mark Rios
ANB	Samuli Vuokila
OPS	Gordon Marginso
RTO/ATM-SAR	Len Wicks
RTO/FS	Amal Hewasam

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Appendix C Terms of Reference

NATII SC TERMS OF REFERENCE

Normal Aircraft Tracking Implementation Initiative Steering Committee (NATII SC)

Background

The second High Level Safety Conference (HLSC, Montreal 2 – 5 February 2015) agreed that ICAO should lead a global aircraft tracking implementation initiative in a multinational context designed to demonstrate best use of equipment in use today and integrate the outcome into guidance material. The initiative should include but not be limited to operator flight monitoring; air traffic services; search and rescue; and civil/military cooperation. Additionally, the conference agreed that planning of the activities should begin shortly after the HLSC and be concluded by 31 August 2015 in order to enhance guidance material used to advance normal tracking procedures.

Scope

- a) Identification of oceanic areas where an ATS Unit obtains aeroplane position information at greater than 15 minutes intervals.
- b) Identification of best practices used to transmit and receive 4D position reports from aircraft flying in oceanic areas to the operator (e.g. flight operations control centre), directly or indirectly, using various technologies currently available;
- c) Identification of any challenges to meet position reports at 15 minute intervals (gap analysis);
- d) An analysis of processes and procedures required by Operators to manage information generated through normal tracking reports so as to identify anomalies that may impede effective tracking; and
- e) Hold and analyze a scenario-based exercises in the Asia/Pacific region which will identify systemic or scalability issues that must be resolved in order to enable normal tracking implementation as described in the GADSS including coordination between the Operators, ATS units, RCC's and other relevant stakeholders.

Required Expertise

The NATII SC shall preferably be composed of a multi-disciplinary team of experts familiar with the GADSS and knowledge or access to:

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- a) Technical solutions related to aircraft tracking;
- b) Capabilities of Operators to track aircraft;
- c) Capabilities of ATS providers to determine aircraft position; and
- d) Understanding of the ICAO SARPs and guidance material development processes.

Objective(s)

Provide input for development of guidance material to support the implementation of aircraft tracking provisions. The initiative will identify existing practices used by operators to determine the location of their aircraft when operating in oceanic areas, as well as any limitations that may impede the tracking of aircraft globally. The results of this work may also provide input for future SARPs development.

Specific Working Arrangements

NATII SC is expected to meet regularly by teleconferences. The members of NATII SC will assist to coordinate and help develop the scenarios/routes that will be used in the initiative.

Proposed NATII SC composition, chaired by ICAO ANB:

- ICAO Bangkok RO
- Australia
- China
- Japan
- Indonesia
- Malaysia
- Singapore
- United States
- EASA
- EUROCONTROL
- IATA
- CANSO

Expected Delivery Timeline

The NATII SC will provide oral update(s) to the Air Navigation Commission as agreed separately and is expected to deliver the final outcome of its work by the end of August 2015.

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NATII WG Terms of Reference

Normal Aircraft Tracking Implementation Initiative Steering Committee (NATII SC)

Initiative Working Group

Background

The second High Level Safety Conference (HLSC, Montreal 2 – 5 February 2015) agreed that ICAO should lead a global aircraft tracking implementation initiative in a multinational context designed to demonstrate best use of equipment in use today and integrate the outcome into guidance material. The initiative should include but not be limited to operator flight monitoring; air traffic services; search and rescue; and civil/military cooperation. Additionally, the conference agreed that planning of the activities should begin shortly after the HLSC and be concluded by 31 August 2015 in order to enhance guidance material regarding normal aircraft tracking provisions as proposed on State Letter AN 11.1.1.29-15/12.

Scope, Phase 1, Scenario Development, timeline end of April 2015;

- Identification of Oceanic routes, including dynamic routing (i.e. User Preferred Routes, Flex Tracks, Dynamic Oceanic Track System Plus), that reasonably reflect the nature of operation and technologies in the Asia/Pacific Region where ATS Units obtain aircraft position information at greater than 15 minutes intervals; and
- For each route, identification of
 - ATS Unit(s) reporting rate in minutes;
 - operators that use that route ; and
- SAR alerting procedures.
- Contact Operators identified by the Airspace Group for given routes and invite them to participate in the initiative by;
 - Describing what means, if any, they use to track their aircraft;
 - What is required for the Operator to meet the 15 minute tracking requirement on that route;
 - Establish a timeframe for the participating operators to track their aircraft on that route at 15 minute intervals;
 - Report on the technology used to track their aircraft including Pros & Cons;
 - Demonstrate the ability to manage information generated through normal aircraft tracking and procedures and to detect instances in which:
 - the tracking function is interrupted;
 - anomalous information is received; and
 - Organize and execute a table top exercise as agreed with the NATII SC.

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Scope, Phase 2, Trial and Analysis, timeline 15 July 2015;

- Validation of scenarios to test and refine the following functions :
 - The operator’s ability to detect and respond to an interruption of an aircraft’s reporting function;
 - The operator’s ability to contact the aircraft to determine its position and whether the aircraft has a problem;
 - The operator’s ability to contact the appropriate ATS unit when the aircraft’s position cannot be determined;
 - The ATS Unit’s ability to contact the relevant operator;
 - The ATS Unit’s ability to contact the relevant SAR point of contact (SPOC); and
- Prepare analysis based on the Trial outcome.

Expected Deliverables;

The Initiative Working Group will deliver the outcomes via the rapporteur to the NATII Steering Committee according to the schedule indicated in the Phases 1 and 2 and overall timeline of the NATII. The rapporteur is expected to deliver periodic reports during the teleconferences between the NATII SC and the Initiative Working Group.

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Appendix D Table of Contents for PROPOSED GUIDANCE MATERIAL

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 - 4.1.2.3 Contact ATS Unit (missed report form example in Appendix C)
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Appendix A – Dedicated Aircraft Tracking Solutions

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References

— END —