Thirtieth Meeting of the Cross Polar Trans East Air Traffic Management Work Group (CPWG/30)

(Virtual September 14-15, 2021)

Agenda Item x:

Proposed Space Based ADS-B with HF Communications Minima

(Presented by FAA)

SUMMARY

This paper provides an update on the FAA efforts to create a Space Based ADS-B with HF Communications (SBAHF) separation minima and requests ISPACG member assistance with creating the minima.

1 Introduction

1.1. ICAO developed the separation minima using ATS surveillance systems where VHF voice communications is not available, more commonly known as the ASEPS minima. For brevity in this paper, we will refer to the separation minima as ASEPS. ASEPS utilizes RCP 240 (Required Communication Performance) as the primary communication method. When ASEPS was initially developed, a decision was made not to develop SBAHF Voice minima at that time.

1.2. Application of the ASEPS and Performance Based ADS-C minima is dependent on the availability of CPDLC RCP240 communications. RCP 240 communications have been subject to periodic outages that render the above minima unusable. When RCP 240 communication fails, HF voice most often serves as the backup means of communication. Controllers must revert to much larger conventional oceanic and remote minima even though in most cases Space Based ADS-B (SBA) is still available.

1.3. Many different global traffic flows have lower levels of Future Air Navigation Systems (FANS) equipage that support Performance-based Communication and Surveillance (PBCS) RCP 240 and reduced separation minima. These traffic flows include the Central East Pacific (CEP) between California and Hawaii and the Western Atlantic Route System (WATRS).

1.4. With the global COVID-19 pandemic having a disastrous economic impact on aviation, it is unlikely that operators will be able to upgrade aircraft in those traffic flows for many years. Thus, these operators will be unable to take advantage of RCP 240 reduced separation minima. Most of the aircraft in those traffic flows have ADS-B out and HF voice capability.

1.5. To assist operators in recovering from the global COVID-19 pandemic, SBAHF minima would leverage current aircraft equipage to allow aircraft to operate on profiles that are more efficient. Preliminary Collision Risk Modelling (CRM) indicates that the 10-minute (about 80 NM) oceanic longitudinal minima could be reduced to ~18 NM and the 50 NM lateral minima could be reduced to ~25 NM with RNP4.

1.6. The Aircraft Data Link network is subject to periodic outages. Unfortunately these data link network outages are unpredictable. There is no way to know when they will occur and how many aircraft will be affected. Development of SBAHF separation minima could greatly reduce the impact and risk of RCP 240/RSP 180 (Required Surveillance Performance) outages. For example, when route systems are developed utilizing the performance-based 23 NM lateral minimum requiring RCP 240/RSP 180 capabilities and a data link network outage occurs, there is currently no similar alternate separation minima. ANSPs are required to attempt to establish another larger separation minimum or allow the minima to continue without the PBCS capabilities. When traffic levels are heavy in these route systems, it isn't feasible for controllers to establish another larger separation minima. A SBAHF 25 NM lateral separation standard would provide an alternate separation minimum for controllers to use when RCP 240/RSP 180 data link outages occur. In this scenario, risk would not be increased when data link network outages occur.

1.7. With SBA surveillance and known HF communication capabilities, SBAHF lateral minima would help support development of route systems spaced by the reduced minima. With most current route systems being separated by 50 NM, a 25 NM SBAHF lateral minimum would allow ANSPs to establish another route between two existing routes if the uncleared deviation rate supported it. That would double airspace capacity and provide operators with more efficient routing options.

2 CRM Timing and Intervention Model

2.1. The development of the ASEPS minima created an accepted CRM for SBA. One of key parameter inputs to the CRM for ASEPS is a communication and intervention timing model. This accepted A22 model (Appendix A, Figure A) utilizes different paths based on the likelihood of how long it will take for ATC to intervene under normal and failure conditions. In order to use the ASEPS CRM for the SBAHF separation development, a similar timing intervention model based on HF performance will need to be developed.

2.2. The FAA has started early development of a new HF timing model based on US HF clearance delivery times. When a US oceanic controller sends an HF clearance, the ATOP Oceanic ATC system sends a digital message to the HFRO. Research of ATOP data allows us to calculate how long it takes the HFRO to deliver the clearance to the aircraft by measuring the time between the controller sending the clearance and when the WILCO response is received. Using the paradigms in the PBCS Manual for calculating Actual Communications Performance (ACP), ATC routing, communication change and island departure clearances were removed from the US HF ACP calculations. More details on this are in Attachment 1, ICAO SASP 3 Flimsy 08.

2.3. Based on the US HF Clearance data gathered in 2.2, the A22 model was modified to reflect the performance of HF communications. For this paper, we will refer to this as the A22HF communication and intervention-timing model (Appendix A, Figure B).

3 Discussion

3.1. ICAO SASP agreed at the last meeting to forward a Job Card to the ICAO ANC for approval to begin work on SBAHF minima. One of the things that SASP needs to progress the development of a global SBAHF minima is HF Clearance data from other ANSPs. The clearance data should have the time from ATC sending the clearance until the WILCO is received, ideally it would exclude communication changes and routing clearances. The HF clearance data can be in any format that is available (CSV, Excel, ACP chart or other format).

4 Recommendation

4.1 The Meeting is invited to note the information provided in this paper.

SEPARATION AND AIRSPACE SAFETY PANEL (SASP)

SASP 3rd Meeting

VIRTUAL MEETING – 3 to 14 May 2021

Agenda Item 2: En-Route Separation Minima and Procedures - Horizontal

Flimsy: US HF Clearance delivery data to support SASP 3 WP09

(Presented by John Warburton)

(Prepared by Dennis Addison)

SUMMARY

This Flimsy provides information on HF clearance delivery times based on data collected from the US ATOP Oceanic control system. This information is provided as support for SASP 3 WP09 discussions.

1. INTRODUCTION

1.1 Data was collected from January 1, 2021 through March 31, 2021 on the HF clearance delivery times. The information is provided to support discussions on a ADS-B minima with HF communications.

2. DISCUSSION

2.1 The HF clearance delivery graph times for the Oakland, Anchorage and New York Oceanic FIRs are provided in Figure 2-1. The RCP 240 and RCP 400 95.0 and 99.9 percentile communication benchmarks were included on the graph to give a frame of reference for the discussions. Figure 2-1 includes delivery times for all HF clearances except routing and departure clearances were removed when possible. You can see in the graph that Anchorage Oceanic line is not a smooth line like Oakland and New York Oceanic FIRs. The level of FANS equipped aircraft in the Anchorage FIR is very high and most communications are accomplished over CPDLC. Anchorage had 172 HF clearances during the data collection period versus Oakland and New York Oceanic, which had over 9,000 HF clearances each during the same time period.

1.1

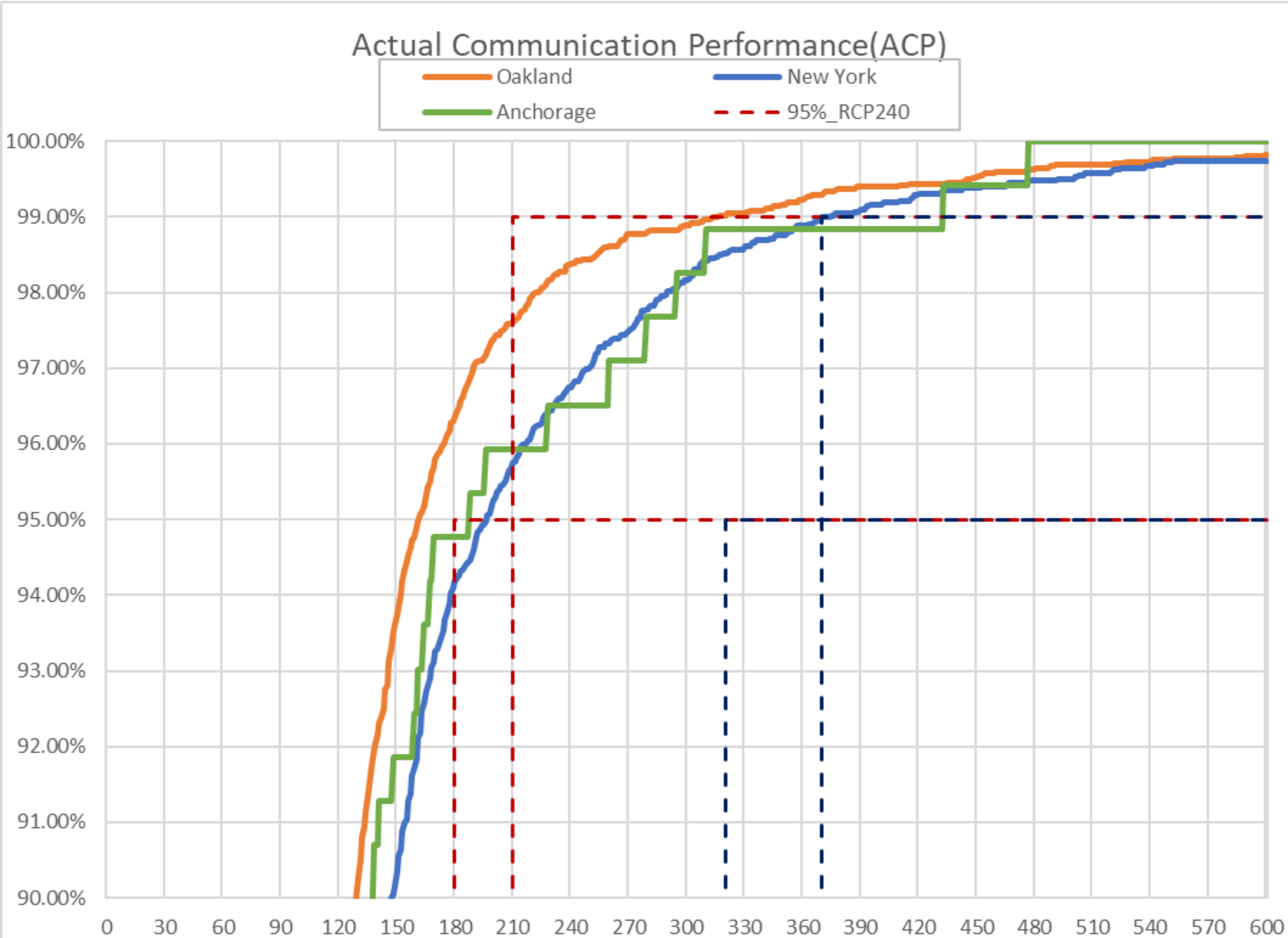


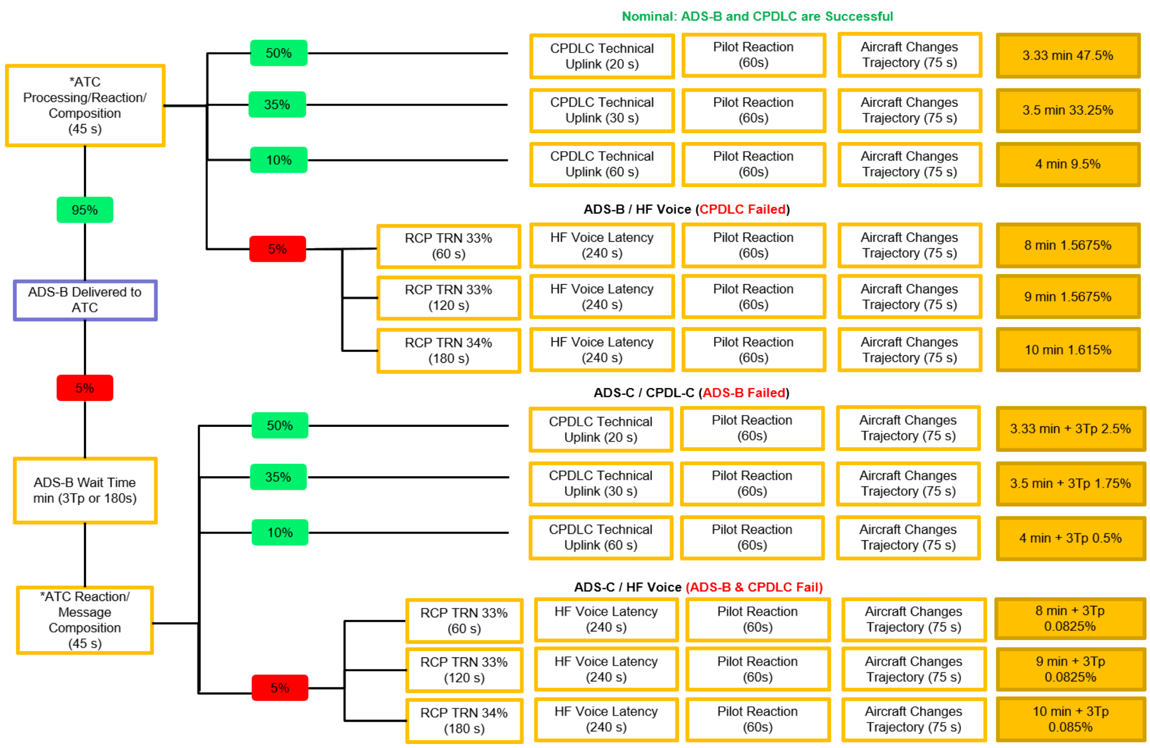
Figure 2-1 HF Clearance ACP

3. **Action**

3.1 The meeting is requested to note the information in this FLimsy.

1. APPENDIX A

A.1 The A22 (and A22HF timing and intervention model are included here for ease of reference.



2. Figure A: ASEPS Timing and Intervention Model

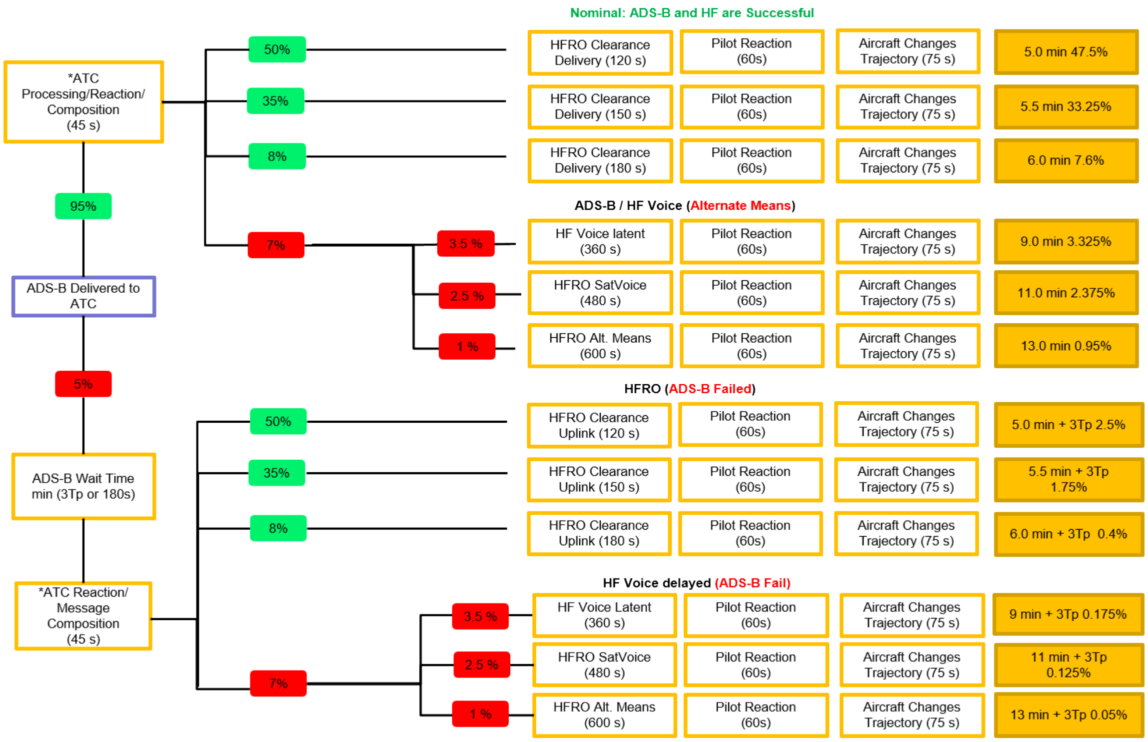


Figure B: A22 HF Timing and Intervention