

APPENDIX B

EXAMPLES OF CURRENT OPERATIONAL BENEFITS ENABLED BY INTEGRATED GNSS/INS

1. ALASKA AIRLINES JUNEAU OPERATIONS

1.1 Alaska Airlines is able to pursue significantly reduced decision heights on the Gastineau Channel approach to Juneau by using GPS to achieve navigation performance with integrity as low as 0.15 NM. These operations are possible because the FMS in the Boeing B737 aircraft contains a GPS/INS solution. The continuity provided by that solution guarantees that in the event of loss of GPS, the aircraft will have the navigation capability to conduct a missed approach. As is common in considerations to limit approach minimums, the nature of the terrain in the Gastineau channel dictates that aircraft equipped only with GPS are not able to achieve such low DHs.

2. FANS I OCEANIC AND REMOTE OPERATIONS

2.1 Boeing FANS I equipped aeroplanes have greater than 99.999 per cent availability for RNP 4 and greater than 99.999 per cent availability of RNP 2 provided there are 22 or more satellites operational. (The current constellation has 27 satellites and a case of less than 23 satellites operational has not been observed for many years.) FANS I includes a loosely coupled GNSS/INS system that improves the availability of navigation system performance to support RNP by coasting through GNSS/RAIM/FDE outages. This capability has enabled the introduction of new economically beneficial routes in the South Pacific and over portions of Asia.

3. AIRWORTHINESS CERTIFICATION AT AIRBUS

3.1 The current implementation of Airbus tightly-coupled architectures provide 100 per cent availability for the current RNP 0.3 certification for those aircraft (provided the GPS constellation is fully operational). This availability translates into two benefits for the user:

- a) No requirement for pre-flight or in-flight GNSS service availability prediction.
- b) The aircraft may be operated without having to have access to any non-GPS procedures for take-off, en-route or destination and the associated alternates.

4. MISSED APPROACH ENHANCEMENTS

4.1 The Regional Airline Association is working through the FAA's Terminal Area Operations Aviation Rule-making Committee (TAOARC) to try to establish a special aircraft and aircrew requirements (SAAR) approach procedure. The objective of this SAAR is to take advantage of the fact GNSS/INS can be used to ensure that loss of RNP will not be a cause of a missed approach. Consequently the obstacle clearance area for the missed approach can be reduced to that of the inbound RNP. This strategy is designed to reduce DH in obstacle rich environments.

5. FANS I CERTIFICATION

5.1 The Boeing FANS I system was the first integrated GNSS/INS system to be certified for use on commercial air transport aeroplanes. At the time little existed with respect to certification criteria for GPS. TSO-C129 was published. There were many requirements within TSO-C129 that are inappropriate for a multi-sensor implementation such as FANS I. Furthermore, the FANS I design incorporated the concept of RNP as a means to manage the performance of the multi-sensor navigation system. Consequently it was necessary for Boeing to work with the FAA to establish a basis for certifying FANS I.

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