Air Traffic Control Upgrades Essay, Research Paper

Introduction

It has been estimated that air traffic will double within the next ten years. Maintaining our current accident rate, with double the traffic, would mathematically lead to twice as many accidents as we currently experience every year. That prospect is unacceptable (UK and International Press). There has been obvious growing concern with our airspace due to the anticipated expected growth in air traffic in the years to come. These concerns are not unwarranted with technology increasing at a furious pace and sophisticated equipment becoming more and more available. This paper will discuss what is currently being done to meet the demanding needs of future air travel. The main focus will be on the Wide Area Augmentation System (WAAS) in association to the concept of free flight, with respect to the Global Positioning System (GPS), and Air Traffic Control (ATC) automation. The ATC automation portion of this report will give specific attention to datalink applications, conflict probe, and next generation aviation safety.

Wide Area Augmentation System (WAAS)

The Federal Aviation Administration?s (FAA) WAAS is being developed as the next generation aviation navigation system. It will provide en route coverage through Category I precision approach capabilities by increasing the accuracy, availability, and integrity of signals from the U.S. Department of Defense?s Global Positioning System (GPS) satellites ( Raytheon 1998). Category I precision approaches are a decision height of 200 feet and a runway visual range of 2,400 feet (1,800 feet with touchdown and centerline lighting). Before the WAAS can be fully understood, knowledge of the GPS system must be addressed. The information provided on GPS will be brief and its purpose is to supplement the understanding of the WAAS. GPS is constellation of 24 satellites that was declared operational in December 1993 and is used for navigation and mapping purposes by a wide variety of industries, including aviation (Hughes 1999). The GPS has three main components: the 24 satellites, the ground-based monitors, and the receivers. GPS offers two levels of service, Standard Positioning Service, and Precise Positioning Service (Flight Training 1998). The latter of the two is available for military use only. The Jet Propulsion Laboratory (JPL) began to develop state-of ?the-art GPS receivers, a software component for the most sophisticated and accurate GPS analysis software available, and an experimental component where field measurements were made and GPS data were analyzed (Lichten 1997). Throughout the 1990?s JPL had been working on different ways to analyze the GPS data with minimal time. JPL realized that it would be possible to process the information in real time if a few dozen data-link ground sites could be established (Lichten 1997). This is the premise for which the WAAS is based on, providing real-time precise navigation capabilities to aircraft through the enhancement of GPS data. The following graphical representation is the system the Federal Aviation Administration (FAA) is planning on using for the WAAS.

The WAAS will result in improvements to the efficiency of the national airspace system including direct route navigation, reduced aircraft separation, increased airspace capacity and significant fuel savings for airline and cargo industries (Hughes 1999). The savings to society envisioned from WAAS are unofficially estimated to be more than $12B to airlines and aviation agencies over the first 10 years, largely due to fuel savings (more efficient navigation with GPS) and higher capacity in airports (more accurate navigation and efficient scheduling) (Lichten 1997). The use of these new technologies in an integrated global air traffic management system would provide the same freedom to airspace users that is now being advocated as ?free flight? (Air Traffic Technology International, 1998, p. 115). The term free flight has been interpreted in different ways. Some may perceive free flight as complete freedom for a pilot to fly an aircraft anywhere, at any time, and to be able to change altitude, speed and heading without needing to involve anyone else (Air Traffic Technology International, 1998, p. 116). A good definition would be the safe and efficient operational capability under instrument flight rules (IFR), in which the operators have greater flexibility in selecting the flight path and speed of their aircraft in real time (Heijl, ICAO Canada 1998). Although the free flight system will no doubt have a great affect as far as choosing preferred routes and altitudes, the concept of a chaotic, unmanaged airspace system is unrealistic. In the transition to the future global air traffic management system, safety must continue to be the first priority, and the separation assurance provided by ATC will remain an essential element of the future system (Heijl, ICAO Canada 1998). There are too many variables that can go wrong in a totally ?free flight? system of operation. Weather, last minute collision avoidance, and runway convergence are a few. The original plan for the Phase One implementation of the WAAS was scheduled for late 1998 (Lichten 1997). This has been delayed due to the main contractor, Rayethon, could not finish the necessary software in time. WAAS?s debut will be delayed by 14 months. The program has been plagued for the past several years by cost overruns, the firing of the program?s prime contractor (JPL), and the uncertainties over the system?s security and congressional funding (Flying, April 1999 p. 27)

The WAAS and free flight is the new wave of aviation. WAAS works by enhancing the current GPS signal to be accurate enough for navigation from en route to Category I precision approaches. In simple terms, it will do this by correcting atmospheric and other errors in the GPS signal and transmitting that corrected signal back to the surface. Despite the delay, the new signal will be broadcasting this summer, though its use will be restricted to visual flight rules until phase one officially begins (Flying, April 1999 p. 27)

Air Traffic Control Automation

The aforementioned topics would not be complete without mentioning what is being done to improve ATC. There are many improvements on the horizon for ATC. These improvements cannot take place without a gradual introduction into the current system. The change has to be more evolutionary than a complete drastic changeover. The new systems must integrate with the current systems to provide a smooth transition that will lead to eventual all upgraded and modernized components. This report will concentrate on three specific aspects of automation for ATC. They are datalink applications, conflict probe, and next generation aviation safety.

Datalink Applications

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