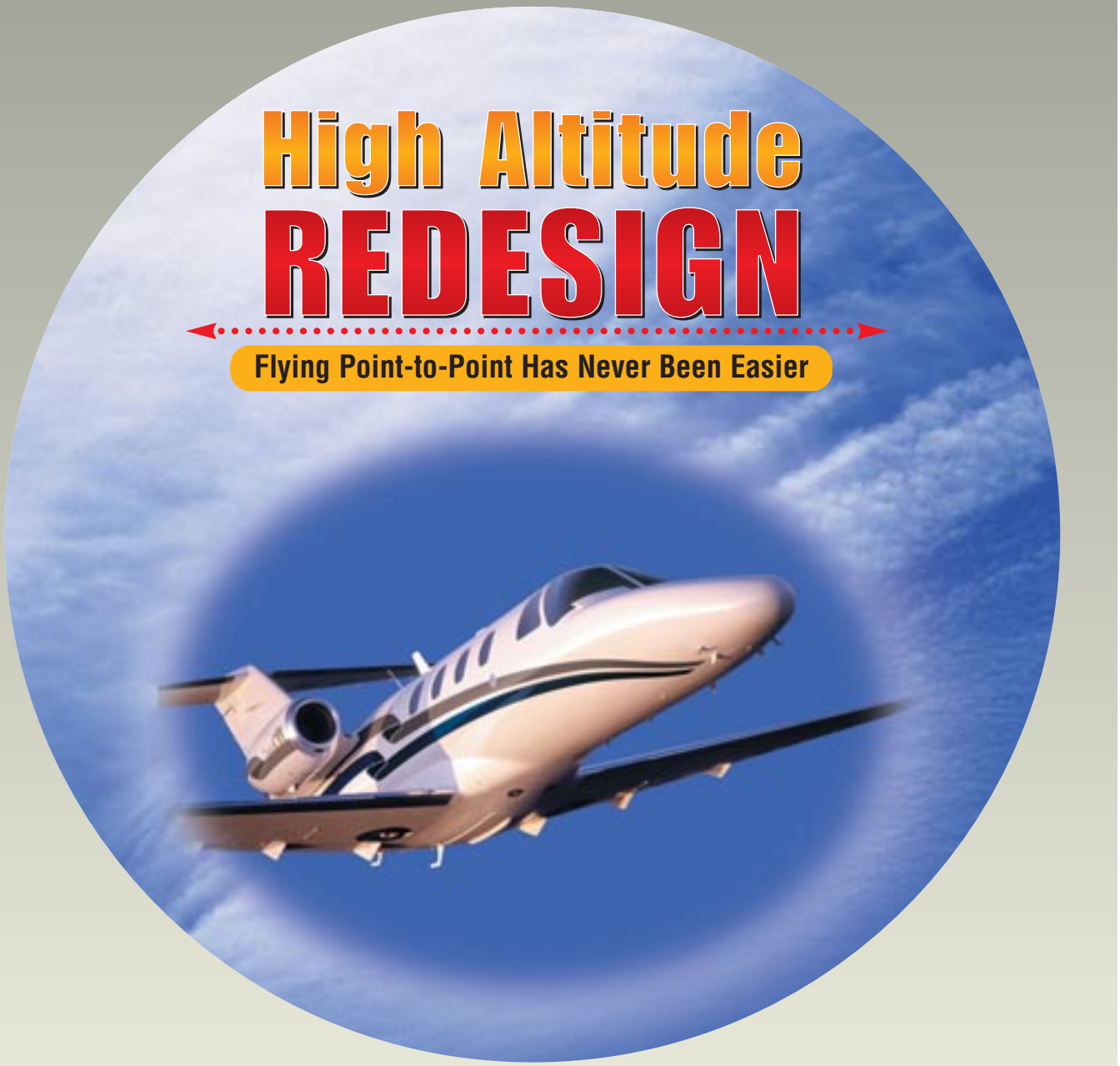
High Altitude REDESIGN

Flying Point-to-Point Has Never Been Easier



Efficiencies May Save You Time and Money

by Mike Mikolay

Just when you thought you were safe digesting the changes and costs handed to you from the impending implementation of RVSM, here comes a new FAA program aimed directly at the Flight Levels. However, don't be alarmed. This change won't cost you a dime and is designed to actually save you money while improving the efficiency of the nation's high altitude airspace.

Labeled High Altitude Redesign (HAR), this program is one of several the FAA has deployed under the National Airspace Redesign (NAR) initiative whose focus is to add capacity, increase efficiency and accelerate the matching of technological advances in all aspects of aviation to the nation's airspace system.

NAR – The Fuel Behind HAR

To fully understand HAR, it important to note how it fits into the broader picture of the FAA's National Airspace Redesign. NAR is a multi-year initiative that is a collaborative effort between FAA management and the National Air Traffic Control Association (NATCA). NAR is also the primary means of the FAA to modernize the nation's airspace by shifting reliance from a ground-based navigation system to the technologically advanced satellite-based system. There are two distinct but parallel approaches that spearhead this shift: Bottom-up and top-down.

The bottom-up approach tackles the optimization and redesign of the local airspace surrounding congested areas. Thirty-five airports currently qualify as congested according to the FAA's Airport Capacity Benchmarks study. This ongoing study, which was first released in April 2001, looks at how many aircraft can take off and land in an hour in both optimum and poor conditions. Eventually all 35 airports will see the optimization and redesign of NAR, but current resources are being applied to the areas with the greatest needs. Those already underway include the major metropolitan areas of New York/New Jersey, Philadelphia, Baltimore, Boston and Los Angeles. This bottom-up effort strives to make changes to airports by adding capacity (i.e. runways) and driving changes up into the en route airspace with optimization to both arrival and departure routes.

The top-down approach is simply the redesign of the airspace at high altitudes to exploit the current advancement in technologies, such as GPS, to allow aircraft to fly point-to-point rather than along the system of ground-based navigational aides. As previously stated, the FAA has named this approach High Altitude Redesign (HAR) and it made its debut the summer of 2003 with changes to operations at and above FL390 in the seven most northwest Air Route Traffic Control Centers (ARTCC) of Chicago, Minneapolis, Salt Lake, Seattle, Oakland, Denver and Kansas City.

HAR Evolution and Design

In simplest terms, HAR is a step toward embracing the many features and benefits of the often-heralded concept of Free Flight. In a historical perspective, HAR was influenced by the concepts recommended to the FAA by RTCA, Inc., a private, not-for-profit corporation that develops consensus-based recommendations to the FAA on a variety of subjects. Acting as the FAA's Federal Advisory Committee, RTCA was requested by the FAA's Air Traffic Airspace Management Office (ATA) to develop a forum where both government officials and those in the private sector could collaborate on changes to the nation's airspace. As a result, RTCA formed sub-committee 192 (SC 192), which examined and suggested the possibility of defining a high-altitude airspace structure where the FAA could implement many of the Free Flight concepts, deploy new technology and procedures in a controlled environment, and allow users to achieve economic benefits by selecting their own routes and altitudes with fewer restrictions.

Using RTCA's suggestions, the FAA created HAR with several design objectives. Point-to-point navigation in lieu of radar vectors, the use of area navigation (RNAV) and parallel RNAV routes in high density corridors, efficient routing around active Special Use Airspace (SUA)/Air Traffic Control Assigned Airspace (ATCAA), an improved knowledge of SUA/ATCAA activity, and non-restrictive routing wherever efficient.

The FAA's vision for HAR is to balance flexibility versus structure to obtain maximum system efficiency. As one can imagine, simply removing the structure of our current ground-based navigational aides that define the airways and jet-ways we currently fly would most likely cause more problems than benefits for both controllers and operators due to the order the current structure provides. Not to mention, with HAR's reliance on satellite-based navigation, some operators may be left out in the cold much the same way RVSM will affect those without the right equipment. Therefore, the FAA has decided to handle HAR as an evolutionary implementation based on emerging technology. It is initially limiting the affected airspace to at and above FL390 though the eventual goal is to encompass the airspace at and above FL290.

In the first phase in this evolution, the FAA selected the seven Northwest ARTCC's to implement the HAR program since they cover 59 percent of the total U.S. airspace, contain a relatively low traffic density, average 5,000 flight per day at and above FL390 and contain numerous SUA/ATCAA for which to develop and evaluate deviation waypoints.

As the program progresses and adds additional ARTCC's, the floor of the program will first lower to FL350 and ultimately to FL290. For now, FAA studies verified that the majority of aircraft above FL390 are properly equipped with the requisite GPS navigation required to participate.

Acronyms/Definitions

ATCAA = Air Traffic Control Assigned Airspace

ARTCC = Air Route Traffic Control Centers

HAR = High Altitude Redesign

NAR = National Airspace Redesign

NAS = National Airspace System

NATCA = National Air Traffic Controllers Association

NRR = Non-Restrictive Routing

NRP = National Route Program

NRS = Navigational Reference System

RNP = Required Navigational Performance

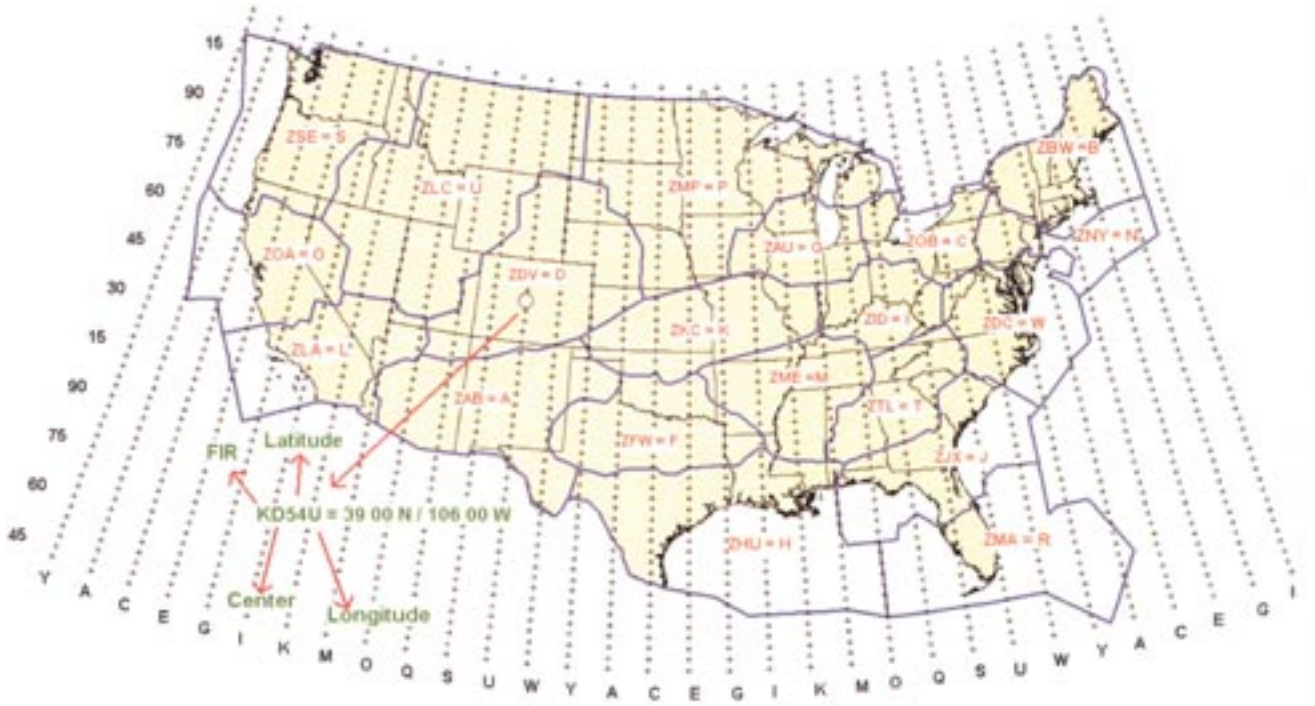
RNAV = Area Navigation

RVSM = Reduced Vertical Separation Minimum

SUA = Special Use Airspace

Navigation Reference System

Waypoints every 30 minutes of latitude and every 2 degrees of longitude
(Grid origin is at the Equator south of Greenwich, England)



How It Works

The building blocks for HAR will be a system of waypoints called the Navigational Reference System (NRS). This grid system will ultimately name a waypoint every 10 minutes of latitude and every one degree in longitude. Since the database storage capacity of most current day FMS or GPS units could not handle the 6,514 waypoint generated by this resolution, the initial phases of HAR will make use of a system that places a waypoint's every 30 minutes of latitude and every two degrees in longitude.

NRS waypoints are used within HAR to define "Pitch" and "Catch" gates as well as waypoints for both weather and SUA/ATCAA deviations. "Pitch" and "Catch" gates can be equated to the entry and exit points to the HAR airspace. Since HAR is intended to allow for an aircraft to fly from point-to-point of their choosing (the FAA calls this Non-Restrictive Routing or NRR), there still must be ways in which ATC can funnel traffic as they exit and enter the terminal areas at either end. In theory, the "pitch" and "catch" gates will match up to the Standard Instrument Departures (SID) and Standard Terminal Arrivals (STAR) already in place today.

If we were to take a sample flight from Chicago O'Hare to San Francisco that includes a cruising altitude at or above FL390 to test out the changes HAR offers, a noticeable change would be quickly apparent in our clearance. You may have to pull out a set of high-altitude en route charts to really see the benefit. But it will still be very apparent once you compare the two clearances on paper due to one being long and complex while the other is shorter and easier to follow. For example, the old Air Traffic Control preferred route would be ORD.RV(Radar Vectors). IOW.J192.HGO. .HBU.J28.MLF.J58.OAL.MOD2.SFO. In today's environment, making use of HAR, the new assigned clearance would simply be ORD.RV.IOW("Pitch" Gate). NRR(Non-Restrictive Routing).HAZLE ("Catch" Gate). .OAL.MOD2.SFO. Using that route, 70 percent of the route would be NRR or user selected and not confined to the many zigs and zags today's jet routes follow!

Since weather or SUA/ATCAA deviations often time can cause large increases in both flight time and miles traveled, the NRS waypoints will go a long way in helping alleviate those reroutes. By simply navigating to the closest point around an SUA/ATCAA or line of weather, aircraft can easily keep on track to the closest path from point A to point B.

NRS will also be the basis for a new type of area navigation route (RNAV) called "Q" routes. Eleven of these "Q" routes have been developed in the initial HAR airspace and allow ATC structured routes where it is most efficient to do so between the Pacific

Northwest and various airports in California and Nevada. Why add back structure in an environment that is designed to alleviate aircraft from following a confined path? Think of it as a strategic tool that ATC can use on heavily traveled routes. These routes are often times parallel to each other, which leads to greater efficiency and less conflicts between common routes. "Q" routes have been charted, but as of the writing of this article have been NOTAM'd N/A until they have been flight checked by the FAA.

Unlike RVSM, HAR will not cost the end user by requiring special certification or money toward additional avionics or equipment.

Phase Timeline & Benchmarks

As previously mentioned, Phase 1 has been initiated in the northwest United States. Sometime in 2004, Phase 1 will be expanded to include seven additional ARTCC's west of the Mississippi and Florida arrivals/departures from both Jacksonville and Miami Centers In addition, the floor of the HAR airspace will be lowered across all 13 Centers to FL350. Phase 1 will be considered complete when the six remaining Centers are introduced in 2005/2006. It is important to note that the geographical expansion to the remaining Centers is dependent of the bottom-up initiatives of the Great Lakes Redesign and the NY/NJ/PHL Redesign. Vertical expansion to the lower flight levels is dependent on users being properly equipped with an FMS or GPS.

Phases 2 and 3 are tied to the evolutionary approach to HAR in that Phase 2 (beginning in 2005) takes into account changes to the current automation system and aircraft equipped for RVSM and RNP while Phase 3 (2008 and beyond) takes into account the benefits of a new ground automation system and a new digital environment.

Regardless, as the program progresses, the FAA will measure their progress through their ability to perform the following objective; Improvement of system efficiency, reduction of route structure, elimination of "airspace" miles-in-trail restrictions, and an increase in flexibility for both controllers and users.

Dollars and Sense

Unlike RVSM, HAR will not cost the end user by requiring special certification or money toward additional avionics or equipment. HAR will also most likely be experienced by those in the general or corporate aviation arena first since this segment routinely operates both above FL390 and with the latest and greatest in avionics equipment. What is certain, however, is that the efficiency brought about by HAR will save both time and money. Projections from the FAA show that in this first phase in the seven participating Centers, users will experience a total of seven million dollars in savings and see an average distance savings of eight nautical miles per flight. Expand both the geographic and vertical expanse of HAR and you can imagine the savings passed on to the user.

Obviously, this program is designed for the high-altitude operator in mind and many of us will not get to experience the benefits as we fly along below. However, look for the advances and lessons learned to trickle down to the lower levels over time. HAR components such as "Q" routes and the waypoints associated with the NRS will most likely become additional tools that ATC can use to help move us through the airspace both safely and efficiently in the future. Until then, keep an eye out for many of the changes the National Airspace Redesign may bring to an en route or terminal airspace near you!

T&T

Mike Mikolay is the director of operations at Guardian Jet, a consulting and brokerage firm that offers pilot services and maintenance oversight along with an umbrella of services for light jet operators that include RVSM LOA packages, Minimum Equipment List preparation and both standard and customized Operations Manuals. Mike has held positions at Raytheon Aircraft, Cessna Citation and Piedmont Hawthorne Aviation. He is an ATP, CFII, MEI with 1,600 hours and is type-rated in the Raytheon Premier I. For more information on how Guardian Jet can help your organization, visit www.guardianjet.com or call them at (203) 458-2500.

Web Sites For More Information

http://www.faa.gov/programs/oep/ - *Explains the FAA's Operational Evolution Plan (OEP)*

http://www1.faa.gov/ats/nar/ - *Explains the FAA's National Airspace Redesign initiatives*

http://www1.faa.gov/ats/nar/har_section.htm - *Explains the FAA's High Altitude Redesign*

http://www.rtca.org – *Website for the organization that formed the committee to study airspace changes*