U.S. Department
of Transportation
Federal Aviation Administration

Advisory Circular

Subject: HIGH ALTITUDE AIRSPACE REDESIGN PHASE 1

Date: 9/22/03 **AC No:** 90-99
Initiated by: ATA-301 **Change:**

THE PURPOSE OF THIS ADVISORY CIRCULAR

This Advisory Circular (AC) is not mandatory and does not constitute a regulation. This AC describes the National Airspace Redesign (NAR) program to redesign high altitude airspace, High Altitude Redesign (HAR), and provide recommended processes for flight planning and operations in the first segment of the redesigned airspace during Phase 1.

HIGH ALTITUDE REDESIGN PROJECT

As part of the NAR, the HAR program's focus is to develop and implement fundamental changes in navigation structure and operating methods for more flexible and efficient enroute operations in the high altitude airspace environment. This involves a fundamental shift from defining the airspace structure based on the required overflying of ground-based NAVAIDs to one leveraging the flexibility of a satellite-based and point-to-point navigation environment. It is anticipated that aircraft with the equipment accompanying transponder suffixes E, F, G, and R may participate in the initial phase of HAR. Required Navigational Performance (RNP), Area Navigation (RNAV), and point-to-point navigation will incrementally replace the present jet-route structure at the higher altitudes. The redesign activities are founded on industry/government recommended concepts from the RTCA Special Committee 192 (SC192). The goal is to provide more freedom to properly equipped users and to achieve economic benefits.

The redesign implementation will be done in phases and will progress based on customer equipage and technological advancement in ground based Air Traffic Control systems. The initial implementation is at altitudes at or above 39,000 feet Mean Sea Level (FL390) in the northwest portion of the U.S. Additional airspace, flight levels, and functionality will be added as technology and systems allow.

HIGH ALTITUDE REDESIGN PHASE 1

HAR Phase 1 provides navigation changes that couple with operational capabilities for properly equipped users. The functional capabilities in Phase 1 include RNAV routes, waypoint navigation around Special Use Airspace (SUA), user defined Non-Restrictive Routing (NRR), Point-To-Point navigation (PTP), and initial implementation of a

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reference grid of waypoints for flight navigation planning and tactical rerouting called the Navigation Reference System (NRS).

AIRSPACE IMPLEMENTATION IN PHASE 1

The initial affected redesigned airspace is within the northwestern seven (7) Air Route Traffic Control Centers (ARTCC's): Chicago, Denver, Kansas City, Minneapolis, Oakland, Salt Lake City, and Seattle ARTCC's at FL390 and above. The affected airspace will be expanded to additional ARTCC's and lower flight levels as operational experiences are gained and user equipage levels permit. Included in this first phase is the publishing and use of Air Traffic Service "Q" routes for RNAV along predefined tracks in high-density areas.

While the initial overall HAR implementation will be at FL390 and above, some of the features may be used at lower altitudes. Some of the Q routes may be used as low as FL180.

1. What is Non-Restrictive Routing (NRR)?

Non-Restrictive Routings are portions of a proposed route of flight where a user can flight plan the most advantageous flight path if RNAV equipped.
There are two NRR levels of service:

a. HAR - Full service, identified in the beginning of flight plan remarks as "HAR." This level of service is for aircraft that have all waypoints associated with the HAR program in their flight management systems or RNAV equipage.

b. PTP - A limited service capability is identified in the beginning of flight plan remarks as "PTP." This level of service is for aircraft that have the traditional waypoints in their flight management systems or RNAV equipment, but do not have all the NRS waypoints for the area in which the flight is operating.

2. Where can NRR be used?

Although NRR will be accommodated by the ATC system to the maximum extent practical, structured routings will be needed in busier, complex terminal areas and for the departure and arrival portions of a flight to achieve the greatest overall system efficiency. Where current Preferred IFR Routes are established, HAR transition points called "pitch" and "catch", will also be established for flights within HAR airspace that will reflect the enhanced system efficiency and flexibility. The new HAR preferential routes will provide information on the initial route structure, the point at which a flight can transition to NRR, the point where preferential arrival route structure begins, and where the preferential arrival route structure should be filed. These HAR preferential routes will be published in the appropriate AFD.

NRR service level (HAR or PTP) should be filed in remarks. Currently, aircraft must file at least 1 fix in each center area for NRR portions of the flight plan. Full service HAR aircraft are requested to use NRS waypoints for defining routings within NRR portions. PTP aircraft may use any fixes within their navigational capability to define their routing.

3. Will a new chart be published depicting this airspace?

New waypoints (using the traditional five letter pronounceable format) have been published on IFR Enroute High Altitude U.S. charts. These waypoints will be used to define Q routes and to aid navigation around SUA. Q routes were published on July 10, 2003. Navigation Reference System waypoints are scheduled to be published on October 30, 2003. Development of a new series of Enroute High Altitude charts for RNAV operations is also under consideration and prototype development.

4. What is the Navigation Reference System (NRS)?

The NRS is a grid of waypoints overlying the U.S. that will be the basis for flight plan filing and operations in the redesigned high altitude environment. It will provide increased flexibility to aircraft operators and controllers. The NRS supports flight planning in a NRR environment and provides Air Traffic Control the ability to more efficiently manage tactical route changes for aircraft separation, traffic flow management and weather avoidance. It provides navigation reference waypoints that pilots can use in requesting route deviations around weather areas that will improve common understanding between pilots and ATC of the desired flight path.

5. What is the spacing of the NRS waypoints?

Initially, to minimize the database requirements of aircraft navigation and flight management systems, NRS will be populated with waypoints every 30 minutes of latitude and every two degrees of longitude. In its final version, the NRS waypoints will have a grid resolution of 1-degree longitude by 10 minutes of latitude. As database capabilities for the preponderance of aircraft operating in the high altitude airspace environment becomes adequate to support the more dense NRS resolution, the additional NRS waypoints will be established.

6. How are the NRS waypoints named?

It is proposed that NRS waypoints be assigned a five-character designator. The first character for NRS waypoints within the contiguous 48 U.S. states will be a “K”, which is the ICAO identifier for the associated Flight Information Region (FIR). The second character will designate a geographical portion of the FIR using a single alpha character used to identify specific ARTCC airspace that contains the waypoint. The two numbers represent a latitude increment; and the last letter represents a longitude increment. Note

that the numbers used to represent specific points differ from the actual latitude and longitude numbering reference currently in use.

Example, KD54U.

Phraseology: "Kilo Delta Fifty-four-Uniform," "Kilo Delta Five-Four-Uniform," "KD Fifty-four-Uniform," or, " KD Five-Four-Uniform."

The latitude increment numbers start at the equator, which is designated "00." Each 10 minute increment is then identified by a number between "01" and "90." The latitude numbering sequence repeats each fifteen degrees of latitude. The longitude letters start at the Greenwich Meridian and go from west to east around the globe repeating every 26 degrees. See *Appendix 1*.

7. What type of navigation equipment is required?

It is anticipated that aircraft with the equipment accompanying transponder suffixes E, F, G, and R may participate in the initial phase of HAR. However, aircraft that currently do not have navigation and performance capabilities to utilize these types of navigation equipment in the high altitude airspace environment will not be excluded from the jet route airspace during HAR Phase 1.

8. How do users who intend to operate in HAR airspace indicate in their flight plans that they have the equipment capabilities to participate in the HAR program?

Aircraft operators that have the equipage and performance capabilities to participate in HAR should file the appropriate HAR service level capabilities (HAR or PTP) in the beginning of the remarks portion of the flight plan. They should include NRS waypoints within NRR portions of their flight plans. ATC will assume that aircraft not filing NRS waypoints are not capable of receiving full HAR service levels for their functionality. Aircraft filing any portion of their flight plan in HAR/PTP will be treated as NRP when transiting to/from HAR airspace.

9. How will the North American Route Program (NRP) be affected?

Within the HAR airspace, NRR provides route-filing capabilities with greater flexibility and ATC compatibility tailored to the specific operational environment and traffic flows. NRP flights that enter HAR are expected to flight plan over one of the "pitch" fixes defined in the AFD, Preferential Route section, denoting the beginning of NRR. Similarly, NRR flights that exit HAR airspace are expected to do so over one of the "catch" fixes listed in the AFD HAR Section. All of the "pitch" and "catch" points will be listed, however they will not be specifically identified as "pitch" or "catch." Those aircraft that file NRP outside of/below HAR airspace must flight plan in accordance with the flexibility allowed for NRP.

10. What route should I file if I am outside of HAR airspace and there are no published preferential routes between my point of departure and my destination?

You may file any appropriate route as defined by your requested altitude.

11. How will Special Use Airspace (SUA), Military Operations Areas (MOA), and Air Traffic Control Assigned Airspace (ATCAA) within the HAR areas affect NRR flight planning and operations?

To minimize the impact of SUA and ATCAA's for flights within the HAR environment, waypoints have been established strategically around the perimeter of those areas where there is substantial use of that airspace by the military and there is also an expected significant number of en route aircraft that could be impacted when that airspace is not available for civilian flights. Aircraft operators should flight plan around those areas by use of the new waypoints when the SUA and ATCAA's are anticipated to be active. These waypoints can also be utilized by Air Traffic Control to reroute aircraft around those areas should unanticipated activation occur or aircraft flight plan through active areas. Use of these waypoints by ATC may occur below HAR airspace when it is operationally advantageous.

12. How can I find out when the SUA's and ATCAA's areas are scheduled to be in use?

The FAA has two processes where you may access this information. One way is through any Automated Flight Service Station at 1-800-992-7433 (1-800-wxbrief).

The second way is through an internet-based system that reflects both real-time and scheduled SUA/ATCAA usage. The web address is "http://sua.faa.gov."

13. When I file a flight plan, must it include a fix in each center's airspace?

Initially, yes. The concept of Non Restrictive Routing permits the pilots to fly direct routes, great circle routes, routes that avoid active military areas, and routes that take advantage of favorable winds aloft. The only way to assure that flight plan information is processed to the appropriate sectors is by knowing where the flight intends to fly. By filing at least one fix in each center's airspace, accurate flight plan processing can occur. Increased flight plan route processing capabilities are anticipated that will eliminate this requirement in the future.

14. What will happen if I request descent or reroute because of winds or turbulence that takes my flight out of the HAR airspace?

You can expect to be recleared via jet routes/traditional routing or, if ATC operations permit, you may be allowed to continue on your filed routing.

15. What will happen to my routing if I initially intend to operate below FL390 for my final cruise, and then request to climb to FL390 or above due to weather or turbulence?

Based on anticipated impacts on the ATC system, you may continue on the routing already cleared or may request to be recleared via Non Restrictive Routing.

16. May I file a NRR, point to point, when my initial or final cruising altitude will be below FL390?

No. We are working to lower the vertical "floor" of this redesigned airspace but it has not yet been processed and approved. The new Non Restrictive Routes are only for flights that will have a cruising altitude at or above FL390. For routes or altitudes other than NRR you may use NRP.

17. How can I get this A/C and other FAA publications?

a. You can get the Federal Aviation Regulations and those ACs for which there is a fee from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. You can view a list of all ACs at http://www.faa.gov/achome.htm.

b. You can view the Federal Aviation Regulations at http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_14/14tab_00.html. To request free advisory circulars, contact:

U.S. Department of Transportation
Utilization and Storage Section, M-443.2
Washington, D.C. 20590

c. To be placed on FAA's mailing list for free ACs contact:

U.S. Department of Transportation
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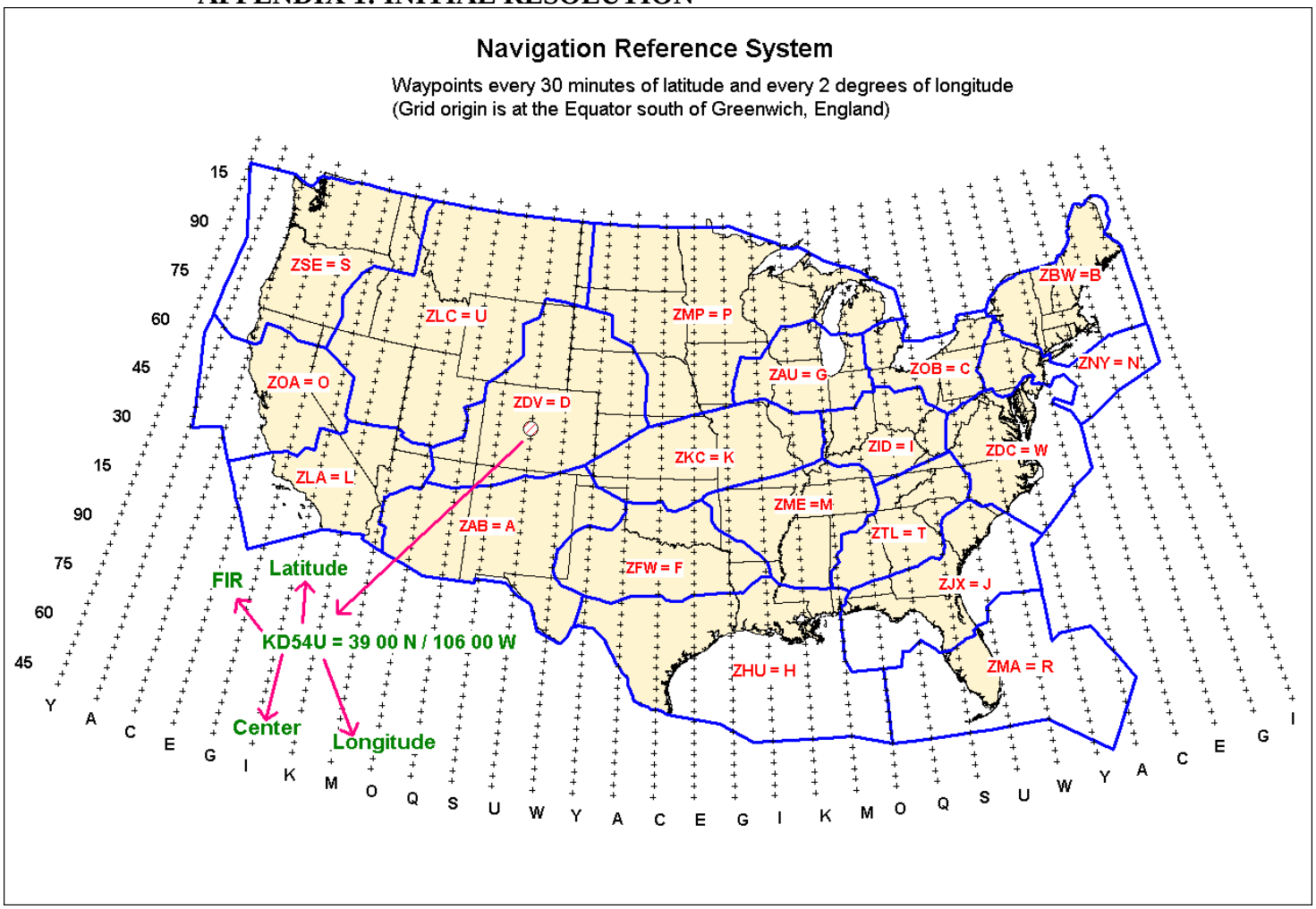
Section, M-494.1
Washington, D.C. 20590



Sabra W. Kaulia
Program Director for Air Traffic
Airspace Management Program

APPENDIX 1: INITIAL RESOLUTION



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