

10. CONCLUSIONS/SUMMARY

World Geodetic System 1984 is a state-of-the-art system based on the use of data, techniques, and technology available in early 1984. As a result, WGS 84 is more accurate than WGS 72 and replaces the latter as the geocentric system officially authorized for DoD use.

The origin and orientation of the WGS 84 Reference Frame are more accurately defined than they were for WGS 72. In addition, Doppler-derived Local Geodetic System-to-WGS 84 Datum Shifts are more accurate than analogous WGS 72 values, and are available for many more datums (83 for WGS 84 versus 27 for WGS 72). Further, the WGS 84 EGM and geoid are considerably more accurate than their WGS 72 counterparts, and minor scale errors inherent in WGS 72 are reduced in WGS 84. These improvements translate into:

- More accurate maps and charts of scale 1:50,000 and larger
- More accurate geodetic coordinates, geoid heights, heights above the geoid (approximately mean sea level), and distances.
- An improved capability for satellite orbit determination and prediction.
- The capability to place many more local geodetic systems on a world geodetic system, and do it more accurately.

The latter is particularly important for those local geodetic systems affected by large distortions. Placement of such local datums on WGS 84, using the variable datum shifts made possible by a well dispersed set of Doppler sites, effectively removes these distortions. Thus, it is beneficial for nations to participate in cooperative Doppler observation programs where additional accuracy can be obtained through the use of precise rather than broadcast satellite ephemerides.

The value of WGS 84 will become increasingly evident in the early 1990s when NAVSTAR GPS will be fully operational. Since the reference system for NAVSTAR GPS is WGS 84, high quality geocentric coordinates can be provided automatically by NAVSTAR GPS User Equipment. For those using NAVSTAR GPS but still utilizing local geodetic systems and products, the availability of the more accurate WGS 84-to-Local Geodetic System Datum Shifts will lead to an improved recovery of local coordinates. Again, the value of having all MC&G products and navigational activities referenced to WGS 84 is noted. But if local geodetic systems are in use, requiring a WGS 84-to-Local Geodetic System Transformation, then the value of having variable datum shifts (made possible by a well dispersed set of satellite-derived geocentric positions throughout the region) is apparent.

The replacement of a world geodetic system is not an endeavor that is undertaken lightly. Therefore, it is anticipated that WGS 84 will remain in use for many years, with future updates being made in the context of WGS 84. This is based on the fact that:

- An in-use WGS should be replaced only if it cannot satisfy current and/or future data accuracy requirements or if it does not provide sufficient data, information, or geographic coverage.

- Some WGS 84 parameters and components may later require revision, but the revised values would be utilized within the framework of a retained WGS 84.

- WGS 84 is a state-of-the-art system which incorporates results through 1984 from various data sets and space systems (Satellite Doppler, Satellite Laser, NAVSTAR GPS, Very Long Baseline Interferometry), and is based on an internationally sanctioned figure and reference frame.

As a result of these factors, for example, maps and charts placed on WGS 84 (even large scale products) should be able to remain on this reference for years to come.

From an international standpoint, the trend towards the use of a world geodetic system is unmistakable. The International Hydrographic Organization (IHO) has already adopted such a system. The United Nations also needs a world geodetic system, e.g., for the resolution of disputes involving the national boundaries of Exclusive Economic Zones (EEZs). This trend is furthered by the adoption of an earth-centered system by Canada, Mexico, and the United States for NAD 83 and the efforts underway for the replacement of ED 50. Isolated and/or additional positions can easily be incorporated into an earth-centered system and such a system is automatically suitable for supporting space-related activities and is more closely related to the navigation and positioning activities of NAVSTAR GPS users.

Due to increased requirements for MC&G data of improved accuracy, and the difficulty and confusion caused by the continued use of local geodetic systems as the reference for certain MC&G products, DMA plans to intensify efforts to eliminate the use of non-WGS products within the DoD. The objective is to have all MC&G products used by United States Forces referenced to WGS 84 by Calendar Year 2000, including the removal (by that time) of all non-WGS referenced items from MC&G archives and storage depots.

The conversion of WGS 72-referenced mapping, charting, geodetic, gravimetric, and digital products to WGS 84 is well underway within DMA. Questions regarding product conversion schedules, user interface problems, etc., should be referred to Director, Defense Mapping Agency, ATTN: PR, United States Naval Observatory, Building 56, Washington, DC 20305-3000; AUTOVON 294-1453, Commercial 202-653-1453.

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