

FOURTH MEETING OF THE ALLPIRG/ADVISORY GROUP

(Montreal, 6 – 8 February 2001)

Agenda Item 2.1: Interregional coordination and harmonization mechanism – Harmonization of air navigation systems

IMPLEMENTATION OF WGS-84 IN THE EUROPEAN REGION

(Presented by the Secretariat)

SUMMARY

- WGS-84 is a major component of CNS/ATM systems. Its implementation should be considered as a transition issue only and as such it should be managed by States, PIRGs and ICAO through dedicated, but existing, mechanisms.
- The status of implementation of WGS-84 in the EUR Region, together with comments on the way ahead on this matter, is discussed below.
- Proposed action by ALLPIRG/4 is at paragraph 3.1.

1. INTRODUCTION

1.1 In preparation for ALLPIRG/4, all ICAO Regional Directors had been invited to provide updated information on the implementation of WGS-84 by each State in their area of accreditation in a standard format similar to the one developed for the Third Caribbean and South American (CAR/SAM) Regional Air Navigation (RAN) Meeting (i.e. the new facilities and services implementation document (FASID) table “Status of WGS-84 Implementation”). This new table stemmed from an analysis of the status of implementation of WGS-84.

1.2 The status of implementation of WGS-84 in the EUR Region, including the latest information received from States, is presented in Appendix A. This information is also reflected in the draft *ICAO European Region Transition Plan to CNS/ATM* which is continuously updated as new information is received. Furthermore, the European Air Navigation Planning Group (EANPG) and its working groups determine how the information should be presented as well as the level of detail to be included in the transition plan.

1.3 Provider States in the EUR and NAT Regions have therefore not yet been consulted in order to obtain detailed information on the status of implementation of WGS-84 along the format of the

proposed new FASID table “Status of WGS-84 Implementation” (as reproduced in Appendix B for ease of reference).

2. DISCUSSION

2.1 The ICAO Standards and Recommended Practices (SARP) included in Annexes 4, 11, 14 and 15 govern, in very precise terms, the requirements for the implementation of WGS-84 data (measurements, quality and publication). The specific requirements for WGS-84 data, as proposed for identification in the FASID table “Status of WGS-84 Implementation”, are defined in Appendices 1 and 7 to Annex 15. The information should be published in national aeronautical information publications (AIPs) by States. However, it is noted that the proposed FASID table “Status of WGS-84 Implementation” does not identify all requirements for WGS-84 data as indicated in Appendix 1 to Annex 15. This could possibly induce States to implement WGS-84 at variance with the SARPs, and therefore affect the efficient and safe implementation of the CNS/ATM systems and, in particular, its global navigation satellite systems (GNSS) component. It is also underlined that the air navigation plan (ANP) and FASID should only reflect requirements and not the status of implementation.

2.2 The implementation of WGS-84 must be considered by States and planning and implementation regional groups (PIRGs) as a priority item and its management should be considered as a transition issue only. For these reasons, the subject must be handled with speed and efficiency as a stand-alone issue. In that perspective, it must be appreciated that updating the proposed FASID table “Status of WGS-84 Implementation” will require time and effort from both States and ICAO. In addition, considering the time needed for the publication of amendments to the ANP/FASID, any delay in that process may affect the efficiency of the exercise. This could result in the publication of outdated data.

2.3 In light of the above, the need to further identify requirements for WGS-84 data in the ANP/FASID by means of the proposed new FASID table “Status of WGS-84 Implementation” is questioned. As indicated above, the *ICAO European Region Transition Plan to CNS/ATM* is under development within the EANPG framework and is published by the EUR/NAT Office of ICAO. This document reflects the latest information on the implementation and plans for implementation of WGS-84 among all States in the EUR Region.

2.4 Although it is fully appreciated that the implementation of WGS-84 deserves the highest attention by all parties concerned, it is proposed that the subject be undertaken as follows:

- a) recognizing that WGS-84 should have been implemented since 1998, all States publish under sub-section GEN 1.7 of their AIPs any differences and/or non-implementation of WGS-84 data. In this context, States should also indicate planned dates for implementation of any remaining data. A format based on the one presented in Appendix B, which would include all WGS-84 information, could be used to that effect;
- b) all efforts be made to identify WGS-84 data not published by States as required in relevant ICAO SARPs and ANP/FASID, as well as the reasons for non-implementation;
- c) the implementation of WGS-84 be considered as a transition issue and be given highest attention by States, PIRGs and ICAO in that perspective;

- d) the survey of implementation of required WGS-84 data shall be considered by PIRGs in the frame of the ICAO Regional Transition Plan to CNS/ATM;
- e) the proposed FASID table “Status of WGS-84 Implementation” (Appendix B) shall not be included in ANP/FASID; and
- f) time and resources of States, PIRGs and ICAO should be concentrated on finding ways and means to ensure that the required level of WGS-84 is properly implemented (e.g. bilateral cooperation between States, special implementation projects (SIPs), etc).

3. **ACTION BY THE MEETING**

3.1 ALLPIRG is invited to:

- a) note the information presented herein;
 - b) agree that PIRGs should be tasked with monitoring and documenting the implementation of WGS-84;
 - c) agree that that the proposed FASID table “Status of WGS-84 Implementation” should not be included in the FASID; and
 - d) note the requirement of States to publish differences in section GEN 1-7 of their national AIPs.
-

APPENDIX A

**STATUS OF IMPLEMENTATION OF WGS-84
IN
EUROPEAN AND NORTH ATLANTIC REGIONS
as of 12 January 2001**

Note: Changes or updates since last issue of this document (dated 09 June 2000) are highlighted.

STATE	WGS-84 in FULL	WGS-84 in PART	UNDER WAY	PLANNED DATE	NO PLAN ----- REMARKS
1	2	3	4	5	6
Albania					●
Algeria		● (08/98)	● comment below		
Armenia			● comment below	● (12/00) comment below	SIP (03/01)
Austria	● (11/98)				
Azerbaijan		● (09/99) comment below		March 2001 comment below	SIP (03/01)
Belarus			● comment below		● comment below
Belgium	● (01/98) comment below		● comment below	2001 comment below	
Bosnia and Herzegovina					●
Bulgaria			●		●
Canada	● comment below				
Croatia	● (01/98)		comment below		
Cyprus	● (11/98)				
Czech Republic	● (11/98)				
Denmark		● (10/98)	● (09/99) comment below		
Estonia		● (02/00) comment below			
Finland	● (06/97)				
France	● (01/98)				
Georgia	● (03/99)	● (03/99)	●		SIP (02/01)
Germany	● (01/98)		● comment below		
Greece	● (06/00) comment below				

STATE	WGS-84 in FULL	WGS-84 in PART	UNDER WAY	PLANNED DATE	NO PLAN ----- REMARKS
1	2	3	4	5	6
Hungary	● (01/98)				
Iceland	● (01/98)				
Ireland	● (07/97)				
Italy	● (06/99) comment below				
Kazakhstan					● comment below
Kyrgyzstan					●
Latvia	●				
Lithuania	● (01/98)				
Luxembourg	● (01/98)				
Malta	● (12/00) comment below				
Monaco	(see France)				
Morocco		● (03/99)	● (03/99) comment below		
Netherlands, Kingdom of the	● (10/96) comment below				
Norway	● (12/98)				
Poland	● (12/98) comment below				
Portugal	● (11/98)				
Republic of Moldova		● (08/99) comment below	● comment below	● (TBD) comment below	
Romania		● (04/97)	● comment below		
Russian Federation			2001 comment below	2002 comment below	
San Marino	(see Italy)				
Slovakia	● (01/98)				
Slovenia	● (05/99) comment below				
Spain	● (01/98)		● (12/01) comment below		
Sweden	● (04/98) comment below				
Switzerland	● (06/97)		● comment below		

STATE	WGS-84 in FULL	WGS-84 in PART	UNDER WAY	PLANNED DATE	NO PLAN ----- REMARKS
1	2	3	4	5	6
Tajikistan			2001 comment below	2002 comment below	
The former Yugoslav Republic of Macedonia	●				
Turkey		● (03/99)	● comment below		
Turkmenistan			2001 comment below	2002 comment below	
Ukraine			● comment below		● comment below
United Kingdom	● (01/00)				
United States	● (10/92)				
Uzbekistan					● comment below
Yugoslavia (Federal republic of)	● (04/99) comment below				
ECAC States	96% data completed (information provided by Eurocontrol / comment below)				

COMMENTS FROM STATES

ALGERIA

WGS-84 is not fully implemented. Facilities already published in accordance with WGS-84 (SUP AIP – AIRAC N° 024/035) are: Aerodrome reference points; Runway thresholds; Radio navigation aids

Facilities still to be published in accordance with WGS-84 are: Obstacles on the aerodromes; Entry/exit points at FIR's limits; Reporting points on RNAV routes

ARMENIA

Implementation of WGS-84 in Armenia is under way. It is planned to implement it in a part prior December 2000. WGS-84 is not the native geodetic datum used in Armenia. By the end of Year 2000, it will be implemented only for official use for civil aviation.

AZERBAIJAN

All the co-ordinates of BAKU/Buna were re-calculated according to WGS-84 and published in September 1999. These are: Co-ordinates of BAK VOR; NDB; runway threshold, and stands. The publication of the FIR boundary significant points on ATC route is expected by September 2000. The co-ordinates of GYANDZHA aerodrome will be published in November 2000. The aerodrome of NAKHICHEVAN will be surveyed in accordance with WGS-84 by March 2001.

BELARUS (Republic of)

WGS-84 is not the main geodetic system in the Republic of Belarus. The official geodetic system of the Republic is the system of 1942. WGS-84 is used only for civil aviation needs. WGS-84 is planned to be implemented in our State. The following types of facilities should be published in accordance with WGS-84: aerodrome reference points, runway thresholds, radio navigation facilities, ATS route significant points, aircraft parking spaces, obstacles in the approach and take-off areas. The implementation date has not been established, as yet. A high precision geodetic aerodrome reference network has been established in the Republic in WGS-84 for all civil aerodromes (4 WGS-84 reference points at each aerodrome). A topographic survey was conducted at all civil aerodromes and co-ordinates calculated for the following points: aerodrome reference points, runway thresholds, aircraft parking spaces and taxiways, obstacles in the approach and take-off areas. No date has been established for the completion of work to determine co-ordinates of the radio navigation facilities and ATS route main points.

BELGIUM

BELGOCONTROL cannot pronounce itself on the full implementation of WGS-84 in Belgium as we cannot speak for other official Organisations involved in (geodetic) aeronautical services. The same for uncontrolled or military aerodromes. Within Belgocontrol however and as far as its own aeronautical publication AIP Belgium and Luxembourg is concerned Belgocontrol has carried out a conversion program of the former ED50 data in its possession into WGS-84 co-ordinates. This work is finished with the exception described below:

- a) No extra surveys as to the correctness or completeness of our former data has been carried out, neither has the vertical element been introduced in our publication.
- b) Neither the publication of aircraft stands in hundreds of seconds has yet been carried out since these data have not been surveyed or communicated yet.
- c) All geographical co-ordinates on our AIP aeronautical charts have been published in WGS-84.
- d) A few charts (grid: parallels and meridians) are still in ED50. An appendix for these charts with the transformation of co-ordinates for these charts was attached. The charts will be re-edited in the course of 2000/2001.

CANADA

Canada has adopted the NAD-83 Geodetic reference which is, in essence, the same as WGS-84.

CROATIA

Radio navigation aids, runway thresholds, parking stands, ARP, and Radar position were all surveyed in September 1997. Significant points were the subject of transformation only. All these points have been published on 10 January 1998. The geographical co-ordinates of some significant points are still to be changed when adjacent States complete their WGS-84 projects. Thus, the date of completion of these changes depend on action by adjacent States.

CZECH REPUBLIC

Ellipsoidal height of all runway thresholds and DME antenna was published on 5 November 1998.

DENMARK

Facilities already published (October 1998) in accordance with WGS-84: Radio navigation aids; significant points; ATS routes and ATS airspace. Facilities still to be published (second/third quarter of 1999) in accordance with WGS-84: Runway thresholds.

ESTONIA

Co-ordinates of parking positions and taxiway centreline significant points are not marked because they are not defined by operational requirements.

GERMANY

Data of the vertical component of WGS-84 for all IFR aerodromes are available. They will be published when user benefits can be expected (e.g. implementation of 3D-GNSS or 3D-RNAV approach procedures). Taxiway centre line significant points and aircraft stand points (INS points) have not been published in accordance with WGS-84 because further details in the guidance material (WGS-84 Manual) are needed and are still outstanding (publication differing from state to state should be avoided). Furthermore, it should be stressed that a full quality system, especially with respect to the integrity requirements for each item as specified by ICAO, can only be realised with hard difficulties.

GREECE

Required changes of the relevant data have already been converted by the HCAA in WGS-84. It is intended that these changes be incorporated in the AIP as soon as the new format of the document – actually in progress – be issued.

IRELAND

A listing of positional data in WGS-84 was provided in AIC N° 14/97 which included all radio navigation aids, aerodrome data, terminal and en-route fixes.

ITALY

Most of the facilities are published in accordance to WGS-84 (AIRAC effective date 28 January 1999). ATS significant points are transformed, while RWY thresholds and radio navigation aids are surveyed. Remaining radio aids and runway thresholds should be surveyed by June 1999.

KAZAKHSTAN (Republic of)

"WGS-84 is not implemented. At present, we are unable to implement WGS-84 because we work in close co-ordination with the Russian Federation and most of our documents, including charts, are published by them. Therefore, the date of implementation of WGS-84 within our territory depends on Russian one and is not defined yet."

MALTA

Due to its geographical location, Malta has encountered great difficulties in the implementation of WGS-84. After considerable efforts, a campaign was conducted in 1996 with the result that certain points in Malta were obtained in WGS-84. Based on these points, others were surveyed including all navigational facilities, runway thresholds etc. At that time, due to lack of human resources, it was not possible to transform ATS significant points. However, it was decided to publish the available WGS-84 co-ordinates so as to become effective on 24 February 2000. The published co-ordinates consisted of all navigational facilities and FIR/UIR boundary points. The transformation of all ATS significant reporting points started. This process is still not completed but it is anticipated that publication will be such that WGS-84 will be fully implemented by the end of 2000.

MOROCCO

All WGS-84 co-ordinates will be fully implemented on 31 March 1999.

THE NETHERLANDS

WGS-84 fully implemented since October 1996, except for the vertical component.

POLAND

All controlled and uncontrolled civil aerodromes are fully surveyed and published in December 1998, including geoid undulation point specified in Annex 15. These data have been already published in AIP Poland. Military aerodromes (including some MIL aerodromes available for civil, non controlled operations) are in course of survey by MIL authorities. The surveys are made on the basis of Eurocontrol's "Surveying Navigational Facilities" manual. Obstacles higher than 100 meters AGL are not surveyed nor transformed from local datum except those erected close to civil controlled aerodromes (as stated earlier WGS-84 in Poland is a native datum for aviation only). Taxiways centre points are not surveyed due to lack of guidance material for this type of survey.

REPUBLIC OF MOLDOVA

WGS-84 is not fully implemented. The flight information region boundary points have already been published in accordance with WGS-84 on 08/99. The geographical co-ordinates of significant points on ATS routes published on 08/99 have been transformed/calculated into WGS-84 co-ordinates but their accuracy of original field work does not meet the requirements in ICAO Annexes 4, 11, 14 and 15. A draft for an implementation plan has been elaborated and a method has been defined for geodetic, aerodrome and en-route surveys in order to meet the requirements in Annexes 4, 11, 14 and 15

ROMANIA

WGS-84 is partly implemented within Romania, in conformity with relevant ICAO provisions contained in Annexes 4, 11, 14 and 15, as below:

- a) Romania completed its survey work and has published in the AIP in accordance with WGS-84 all the enroute navaids and aerodrome significant points (radio navigation aids, threshold, INS points) since April 1997.
- b) The enroute charts and the data for 12 out of the existing 17 aerodromes are redesigned and published by now using WGS-84 co-ordinates (the obstacles are also expressed in WGS-84). The work to redesign and to complete the publication of the remaining 5 aerodromes in the AIP, although delayed, is under current progress.
- c) The published border points between Romania and Bulgaria, Moldova and Ukraine are expressed in WGS-84 using WGS-84 calculated or measured co-ordinates of the significant points on Romanian territory but non WGS-84 co-ordinates for the points located in Bulgaria, Moldova and Ukraine. Hence the accuracy of these border points co-ordinates does not meet the requirements contained in Annexes 4, 11, 14 and 15. Completion of this work to the desired degree of accuracy depends on the completion of the field work by Bulgaria, Moldova and Ukraine.

RUSSIAN FEDERATION

The decision to publish, starting from 2001, the aeronautical data in the RF AIP in WGS-84, has been taken in principle. At present, a plan is developed for a geodetic survey of aeronautical reference points at Russian aerodromes and along air routes in WGS-84. The plan envisages implementation in 2000-2002. Correlation parameters required for the transfer of co-ordinates from the State geodetic system of 1942 to WGS-84 are fine-tuned. Planning of publication dates for aeronautical reference points in WGS-84 at Russian international aerodromes and along air routes is under way.

SLOVENIA

The horizontal data of WGS-84 co-ordinates are fully implemented and published, except for elements of taxiways and aircraft stands. (*Note: The taxiway centre line points and aircraft stand points [INS points] have not been defined pending more specific requirements in this respect*) The vertical elements (geoid undulation at airports Ljubljana, Maribor and Portoroz) has been published in May 1999.

SPAIN

Fully implemented and published except for co-ordinates of parking position and obstacles that have already been measured and will be fully published before the end of 2001.

SWEDEN

"It has been found difficult to publish the aircraft stands with an accuracy of hundredths of seconds, as one stand may host several different aircraft types.. This will require re-survey of all aircraft positions and as a consequence the aerodromes also have to change the figures of all signs at the gates, and probably also change the whole sign when we are going from five to eight figure values. The guidelines do not give enough information on how and where these new, more precise measures are to be published. At Stockholm – Arlanda aerodrome there are 7 different nosewheel positions for each gate depending on type of aircraft. However, which one is to be defined at this new requested accuracy? A suggested solution is that each aerodrome gives the gate-position with a fix for the nosewheel for one type of aircraft. Established "*delta-values*" for different types of aircraft could then be converted depending on the headings of each gate. Furthermore, we have no indication from the users that this accuracy is requested for the aircraft positions at the gate. It would be useful if ICAO make available Recommendations about which position shall be surveyed. At this stage Sweden will await, until the operational requirement and avionics can co-operate with, and the airlines can use this high accuracy and keep tenth of minutes in the AIP."

SWITZERLAND

Switzerland has achieved a full two-dimensional (2D) WGS-84 implementation in June 1997. No vertical elements have been published yet. This will be published when 3D-GNSS or 3D-RNAV instrument approach procedures will be implemented.

TAJIKISTAN

WGS-84 is not implemented in the Republic of Tajikistan yet.

At present, representative state organisations the Republic of Tajikistan work in close co-ordination with corresponding state organisations the Russian Federation and most of our documents, including charts, are published by them. Therefore, the date of implementation of WGS-84 within our territory depends on Russian one and is not defined yet.

TURKEY

Facilities already published in accordance with WGS-84

100% of enroute navigation aids	25 March 1999
100% of significant points on ATS routes	25 March 1999
80% of aerodrome facilities	15 May 1999

Facilities still to be published in accordance with WGS-84

20% of navigation aids and facilities of small aerodromes

TURKMENISTAN

The WGS-84 system is not implemented.

UKRAINE

Decision about implementation of WGS-84 in Ukraine was accepted on 22 December 1999. Implementation of WGS-84 system is under way.

UZBEKISTAN

The WGS-84 system is not implemented.

YUGOSLAVIA (FEDERAL REPUBLIC OF)

WGS-84 fully implemented since 22 April 1999, except for vertical component.

ECAC States

(Note: information provided by Eurocontrol)

As by 30 June 1999, the status of implementation of WGS-84 within ECAC States was reported as follows:

Horizontal component: Out of a total of 750 aerodromes, 717 have been reported as completed. Out of a total of 2074 en-route navigation aids, 1993 have been reported as completed.

Vertical component: By July 1998, 13 States had completed their determination of the geoidal undulation at applicable aerodromes. These 13 States represent some 51% of the ECAC aerodrome data.

EANPG activities vis à vis WGS-84

The Aerodrome Operations Group (AOPG) and the All Weather Operations Group (AWOG) of the European Air Navigation Planning Group (EANPG), during a combined session (9 December 1998), considered the subject. The following reflects the outcome of the discussions.

"The Group was presented with the outcome of a regional survey on the status of implementation of WGS-84 within the European region. Although a large majority of States had or were about to complete the implementation of WGS-84 in accordance with relevant ICAO SARPs, it was noted that some States have not done so or had no plan.

It was appreciated that the next step to be engaged by States in that domain would be the implementation of the vertical component of any data expressed in accordance with WGS-84. It was also underlined that the maintenance of integrity of relevant data was an essential issue if one wants to maintain confidence in the implementation of CNS.

From the comment received from States, it appeared that the specific issue of survey and publication of **aircraft stand positions**, as well as **taxiway centreline significant points**, would necessitate further work in order to contemplate relevant **Operational Requirements, still to be defined**.

It was agreed that the AOPG would investigate the above subjects, continue to survey the status of implementation of WGS-84 throughout the European Region and report to EANPG any deficiencies and shortcomings in that domain."

APPENDIX B

FASID Table “STATUS OF WGS-84 IMPLEMENTATION”

EXPLANATION OF THE TABLE

Column

- | | |
|----|---|
| 1 | <p>Name of the State, territory or aerodrome for which WGS-84 co-ordinates are required with the designation of the aerodrome use:</p> <p style="margin-left: 40px;">RS — international scheduled air transport, regular use</p> <p style="margin-left: 40px;">RNS — international non-scheduled air transport, regular use</p> <p style="margin-left: 40px;">RG — international general aviation, regular use</p> <p style="margin-left: 40px;">AS — international scheduled air transport, alternate use</p> |
| 2 | Runway designation numbers |
| 3 | <p>Type of each of the runways to be provided. The types of runways, as defined in Annex 14, Volume 1, Chapter I, are:</p> <p style="margin-left: 40px;">NINST — non-instrument runway;</p> <p style="margin-left: 40px;">NPA — non-precision approach runway</p> <p style="margin-left: 40px;">PA1 — precision approach runway, Category I;</p> <p style="margin-left: 40px;">PA2 — precision approach runway, Category II;</p> <p style="margin-left: 40px;">PA3 — precision approach runway, Category III.</p> |
| 4 | Requirement for the WGS-84 co-ordinates for FIR, indicated by the expected date of implementation or an “X” if already implemented. |
| 5 | Requirement for the WGS-84 co-ordinates for Enroute points, indicated by the expected date of implementation or an “X” if already implemented. |
| 6 | Requirement for the WGS-84 co-ordinates for the Terminal Area, indicated by the expected date of implementation or an “X” if already implemented.. |
| 7 | Requirement for the WGS-84 co-ordinates for the Approach points, indicated by the expected date of implementation or an “X” if already implemented. |
| 8 | Requirement for the WGS-84 co-ordinates for runways, indicated by the expected date of implementation or an “X” if already implemented. |
| 9 | Requirement for the WGS-84 co-ordinates for Aerodrome/Heliport points (e.g. aerodrome/heliport reference point, taxiway, parking position, etc.), indicated by the expected date of implementation or an “X” if already implemented. |
| 10 | Requirement for geoid undulation indicated by the expected date of implementation or an “X” if already implemented. |
| 11 | Requirement for the WGS-84 Quality System, indicated by the expected date of implementation or an “X” if already implemented. |
| 12 | Requirement for publication of WGS-84 co-ordinates in the AIP indicated by the expected date of publication or an “X” if already published. |
| 13 | Remarks. |
-

[illegible]

— END —