

IGC FORMAT FOR WAYPOINT DATA

IGC STANDARD FORMAT
FOR
DATA FOR ACCURATELY DEFINED GEOGRAPHICAL POINTS



Published by FAI on behalf of the International Gliding Commission

FIRST EDITION - MAY 2000

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INTRODUCTION

1. Scope

1.1. Data presentation. The data may be presented either in hard copy, in electronic format, or both.

1.2. Photographic evidence and written flight declarations. A paper-based Waypoint (WP) list or equivalent data on a computer screen, is suitable as a basis for photographic evidence purposes and for written flight declarations.

1.3. Use with GNSS FRs. Electronic formats are designed for use with computer Database systems, and provision for direct entry of data into a GNSS FR is encouraged. If a paper-based list is used, the data will have to be manually entered into the FR.

1.4. Electronic format. The system is designed to work with a basic level of PC and software as well as with high-specification devices. This is consistent with what is already stated in the IGC GNSS FR Technical Specification.

2. Data Fields. Data for each precise Geographical Point is divided into a number of subject areas or "fields". Fields include those that are the minimum for input into a GNSS FR, additional fields which are essential to precisely describe the Point in a WP list, and those which are optional but have been found to be useful in addition to the essential data. The fields are in a specific sequence, with those needed for input into a Flight Recorder, first.

2.1. Characters in a Field. If the full number of characters in a field are not needed, all do not have to be used. To avoid fields becoming too long, most have a recommended maximum number of alphanumeric characters. Alphanumerics are from the ASCII set and conform to the "valid characters" already listed in the IGC data file format. If extra characters are needed, the alphanumeric option in ISO 8879 should be used.

For instance a letter “U” with an umlaut is coded as “Üaut;” an acute accent on a letter “E” as “É”, similarly È, Ê (circumflex). Note the leading ampersand (&) and the final semi-colon. Lower case letters can also be coded, for instance “é”, “è” etc.

3. Electronic versions and Field Boundary Systems. Field boundary markers must be recognised by commonly available software such as database and other systems. For hard copy WP lists, the field marker codes should be replaced by table boxes or spaces on the line. It is intended that freeware programs will be available for transformation between the approved field boundary systems. These will be placed on the IGC/GNSS web pages. In this paper, the vertical stroke symbol | with a space on either side, is used to designate an IGC-approved field boundary system marker. The following systems are currently approved, and others may be added later if they become commonly available industry standards.

3.1. XML. This stands for eXtensible Markup Language and has been designed for Web pages as an extension to the existing HyperText Markup Language (HTML). It is a meta-language, that is one capable of implementing other languages and text standards, and will produce flexibility for the future in the way that Waypoints are described. A field is opened by boundary markers that have plain text between arrow symbols. The text describes the nature of the field. A field is closed by repeating the opening marker and adding a forward slash symbol. For instance <text>field</text>. One advantage is that the nature of the field is always described in its arrowed boxes, and does not depend on a set order of fields.

3.2. Comma-separated. This is an industry-standard ASCII format commonly used with database software and other systems. In a WP list, the first set of fields should have the field titles between the separators (see the example at the end). This positively identifies the subsequent sequence of fields for each WP. It should be noted that the separator symbol is the comma, but to avoid any ambiguity with commas in text in the field, the entire field may be enclosed in quote marks where the comma is used as the field separator. Many database and spreadsheet programs omit the quote marks wherever possible. Where no ambiguity exists it is equally correct to insert or omit the quotes.

3.3. Tab-separated. This is an industry-standard ASCII format commonly used with database software and other systems. It is similar to comma-separated but with tabs replacing the commas and any quote marks.

3.4. Industry Standards. This document does not cover the complete definition of any industry-standard file format for which there is already a defined standard. If the data for a WP is created with a commonly available database or spreadsheet program (for example Microsoft EXCEL), and saved in one of the above formats, it should be universally acceptable.

3.5. ASCII and Word Processing System formats. Some existing WP lists use ASCII or a Word Processor format (such as Word for Windows or Word Perfect), particularly for printing hard copy versions. The equivalent of "field boundaries" in electronic versions of these formats may be a hard return or a table box, and the equivalent of boundaries between one WP and another may be two hard returns (giving a space on the page) or another row in a table. For such systems, it is intended that short freeware programs will be developed which will automatically convert to one of the field boundary systems above that can be used with a database program.

4. Authority and Responsibility for Waypoint Data. Authority and responsibility for the correct and exact definition of geographical points is with the National Airspace Control (NAC, the National FAI member) whose National Territory includes the point concerned.

4.1. Delegation of Authority. Authority can be delegated by the NAC to other bodies. These include the National Gliding or other Sporting Organisation, competition organisers, or even the NAC of an adjoining Nation whose pilots may wish to use the point concerned.

4.2. Responsibility for WPs in Official Lists. Responsibility for oversight and any delegation of authority remains with either with the NAC in whose National Territory the point is located, or the national organisation to which the authority for gliding may be delegated. The national gliding organisation may further delegate authority to regional or other bodies for the selection and production of official WP data. These organisations and bodies should ensure that the data is correct, unambiguous, and does not conflict with other data produced by delegated bodies. In some nations, waypoints in official WP lists are selected so as to be clear of sensitive or restricted airspace, in others, appropriate airspace warnings are given as part of the data set.

MINIMUM FIELDS FOR ENTRY INTO A GNSS FR

5. **Minimum Requirement.** What follows is the minimum requirement, but the FR manufacturer may make provision for storage of additional data for each geographical point. Entry into the FR may be made field by field, or fields may be combined into one element of data when being entered manually.

CCCCCC | NN | DD MM.mmmN/S | DDD MM.mmmE/W |

5.1. Unique Identification or code for the point. This is shown as CCCCCCC (Code) and has not more than six characters, unique within the nation in the NN field which follows. If letters are used, they should have an obvious relation to the full Title for the WP (TTT field). No accented letters are to be used, since the characters will always be entered into the FR, and most FRs have no provision for accented letters. However, spaces and break-characters such as hyphens can be used. There is no obligation to use all six characters, and national systems using less can continue to do so. The CCCCCCC characters can either be chosen by the official administrator of the WP system, or derived from the full name in the TTT field by using an automatic “truncation program”. Where WPs from more than one Nation are being entered, the national designator in the next field is also needed for each point.

5.2. Written declarations. An NAC may accept this field as an identifier for a Waypoint in a written flight declaration, in multinational flights together with the NN field that follows. If the CCC field is used in a written declaration without the exact point (EEE field) being quoted, the data date (YYYY-MM-DD or a National WP list date) for the CCC field should also be on the declaration in order to ensure that there is no doubt about the exact Waypoint which is declared.

5.3. National designator. This is shown as NN and has not more than two characters, using the ISO 3166 two-character codes (shown in Annex A). This is also used for internet addresses and is listed in the IGC FR Specification document. No accented letters to be used in this field.

5.4. WGS 84 Lat/long. This is shown as DD MM.mmmN/S | DDD MM.mmmE/W in degrees, minutes and, for WPs which have defined features on the ground, at least three decimals of minutes. This is the format already used in the IGC data file but with a space between degrees and minutes and a dot between minutes and decimal minutes. Either this form or the one without the space and dot, may be used. The territory of some Nations is entirely in one N/S and/or E/W hemisphere, and some Nations close to the Greenwich meridian have leading zeros in longitude figures. If the FAI/IGC gliding authority for such Nations wishes, the hemisphere letters or leading zeros need not be repeated for every set of WP data, as long as the method is shown in an overall key published for that nation as part of the relevant WP lists. The intention is that other users of the WP system should have no doubt about what the full lat/long figures should be. Equally, such Nations can also choose to use the full IGC data file format for each WP set of lat/long data.

FIELDS NEEDED FOR EXACT DEFINITION OF A POINT

6. Some additions are needed to those fields defined above, particularly if a point that has precise ground features is to be defined fully and without ambiguity:

CCCCCC | NN | DD MM.mmmN/S | DDD MM.mmmE/W | TTTTTT | EEEEE | YYYY-MM-DD

6.1. TTTT.... (T for Title) is the full title for the point, unique within the Nation concerned. It is recommended that not more than 20 characters are used in this field. Examples might be Hahnweide Tower, Elmira Hangar NW, Oxford East, Lasham Start South. If this field is left blank, it is assumed that the full title is the same as the 6-character code in field CCCCCCC.

6.2. Accents and Abbreviations. Accented letters may be used in hard copy in the TTTT and subsequent fields because they are for pilot information and are not an essential entry into the FR. However, if the FR provides for their entry, accents may not appear, and may also be lost in electronic formats that use the ASCII set. Commonly accepted abbreviations in the language concerned may be used, such as, in English, Br for bridge, Cbh for clubhouse, Ch for Church, Int for Intersection (eg between two runways), NSEW for North, South, East, West, R for river, Rbt for roundabout, R/W for runway(s), Stn for rail station, Xrd for crossroads,

Twr for control tower, etc. Lower or upper-case letters may be used as appropriate (eg Twr in the T field, twr in the E field).

6.3. EEEE (E for Exact) if the point is a physical feature on the ground, this is a description of the exact point. It is recommended that not more than 50 characters are used in this field. eg | Runways 24/18 | Gliding Clubhouse | A230/B456 Crossroads | River/A4074 Bridge | etc. Abbreviations can be used as in the TTTT field. An exact point should be used, and if the chosen feature has a large area, a more precise point should be specified such as “NW corner of the hangar”. Where a Church is used, the spire or tower is assumed unless specified differently. The word “Station” (rail station) is not exact enough, a specific point such as a bridge or road crossing of the rail line should be specified in addition.

6.3.1. Features with area. Where a feature with a small area is used, it is assumed that the exact point is the geometric centre of the area (eg a Gliding or Aero Club Clubhouse, a Control Tower, etc.).

6.3.2. WPs with no physical ground feature. The IGC allows WPs to be used that have no physical presence on the ground but are simply a lat/long which is to be reached in flight (such as for wave flights above cloud or points out to sea). In these cases the E field will be blank.

6.4. YYYY-MM-DD - is the date, month and year of the latest official update of data for the point concerned, in ISO-8601 format. Experience has shown that, over time, airfield and road layouts change. Therefore, changes in Waypoint data may have to be made and errors may have to be corrected. Only by including a “data date” can such potential ambiguities be resolved.

6.5. The next Waypoint. Each set of waypoint data must start on a new line.

6.6. Minimum data requirement. The above constitutes the minimum information to completely and unambiguously describe a point, which can then be entered into the FR using only its Code, National Designator (for multinational databases), and its WGS84 lat/long. Other fields are optional depending on the requirements of the NAC or delegated body holding the complete data in the Waypoint list. The complete data for the Point concerned will be held outside the FR in electronic and hard copy form.

OPTIONAL FIELDS

7. As well as data fields described above, there are other fields which Nations or activities may wish to include. Examples include the altitude/elevation of the point above sea level and an appropriate radio frequency. It has been found that listing the map sheet is useful to pilots for pre-flight planning. Also the approximate bearing and distance of the Point from a large and well-known feature. Some nations list Grid Reference as well as lat/long. For instance:

| AAAAam/f | TTTT | FF | DDD | BBB | FFFFFFFF | LLLLLLLLLL | MMM | SSS | RRR.rrr | PPPPPP | SPARE | SPARE | GGGG11111E/W22222N/S |

7.1. AAAA.am or AAAAaf. Altitude/elevation of the point above sea level in metres (m) or feet (f), generally taken from contours or spot heights on an accurate map of the area. In the case of metres, with up to one decimal place after a dot (to match the resolution of data in feet, where data is available to this accuracy). For start and finish points and those with safety implications like mountain peaks, cols and ridges, altitude/elevation data should be exact, but for many Waypoints an approximation or a blank will suffice. In the future this field may be expanded to allow for GPS altitude above the WGS84 ellipsoid as well as the present geometric altitude above the local sea level datum (the local Geoid (gravitational equipotential) surface, or very close to it). The hash symbol (#) after the figures should be added if an approximation has been used, otherwise it will be assumed that this is an accurate figure. As well as the suffixes “m” for metres and “f” for feet, “E” for exact implies an accurate figure, “W” indicates altitude/elevation above the WGS84 ellipsoid. For instance, 384.3mE is an exact 384.3 metres above sea level, and 1261fE is its equivalent in feet.

7.2. TTT Type of point. A for airfield with hard runway(s), G for a grass airfield or strip, H for the Home Point, L for a possible glider landing site, S for start point, F for finish, T for turn point, N for no physical presence on the ground. A hash (#) may be used for points in or near sensitive or active airspace, and is a warning for pilots to check the air activity/airspace situation before using the point. Multiple codes

may be used. In accordance with the Sporting Code, points without a physical presence on the ground may be used, in these cases the lat/long completely describes the nature of the point.

7.3. FF Findability of the point. This is a letter A, B, C, D or E for the ease of finding the point from the air, and N indicates No physical presence on the ground. Category A is good and marked on commonly-used air maps (scale about half million), E is poor and might need local knowledge. For competitions other than local ones, A- or B-category WPs would be preferred. Additional letters can be used such as P for a private point not on a National or Regional list, T for a Test point (for instance for comparison of software, sizing of future tasks, etc)., and U for Unclassified where the data is not established and needs confirming.

7.4. DDD BBB FFFFFFF DDDk/nm/mi is the approximate distance (k=km, nm=Nautical Miles, mi=Statute Miles) and BBB is the approximate bearing (degrees True) from a large well-known Feature FFF. Distance units in kilometres are encouraged, and a maximum of 12 characters are suggested for FFF. The intention is to allow pilots to quickly identify the location of points, without having to plot the lat/long exactly. Also it allows a group of WPs near a main feature to be searched for and easily listed without others in a WP list. The data in these fields is not intended to be exact, only the WGS84 lat/long is exact and definitive. In the UK system, about 50 well-known features FFF (such as OXFORD, CAMBRIDGE, LASHAM, etc) are used during flight planning to find the 800 exact points that are listed.

7.5. LLL (L for Long) is for further details of the point, where needed. It is recommended that not more than 70 characters are used in this field. For instance OXS---UK is the "A4074 bridge over R Thames, dual carriageway 300m N of small rail bridge over river".

7.6. MMMMMM is the Map type or scale, SSSSS the sheet number, of the detailed map on which the exact point can be found. Normally to a scale of at least as detailed as 1:100,000 and preferably 1:50,000 or more detailed. The ratio symbol "1:" need not be used, and the abbreviation "k" should be used for "thousand", so a 1:50,000 map will appear in this field as "50k".

7.7. RRR.rrr Radio frequency in MHz relevant to the point. This may be a local or area frequency, whichever is most relevant.

7.8. P P P P P P P. P for Pictures or graphics. This is intended for the references of any associated files containing maps, diagrams or photos of the point. Multiple references should be separated by a space. For instance, PxCCCCCC.jpg and MxCCCCCC.jpg, where P=photo, M=map, X=1 to 9, CCCCCCC=TP code.

7.9. SPARE These are spare fields for any other data at the discretion of the NAC or delegated authority responsible for the list. These extra fields can be used as long as the earlier sequence is adhered to so that the fields that are common to all can always be recognised by software designed to read IGC-format data. Some nations such as the UK use Grid References as well as the definitive WGS84 lat/longs and the suggested form is GGGG1111122222 where GGGG is the description of any Grid Reference system used, for instance "UTM", or "OSGB" for the UK, and 1 and 2 are the grid references themselves.

Annexes:

- A. ISO 3166 country letters - examples
- B. Examples of formats

ISO 3166 NATIONAL DESIGNATORS

ISO 3166 gives codes for 241 nations and regions of the world. Three code formats are listed, a two-letter format, a three-letter format, and a three number format. Reference: <ftp.ripe.net>

The two-letter format is the most economical, and is used in the IGC Waypoint system. The following list is based on the H-record section of the Technical Specification for IGC-approved GNSS Flight Recorders.

AR	ARGENTINA	GHANA	OM	OMAN
AT	AUSTRIA	GR	PE	PERU
AU	AUSTRALIA	HR	PK	PAKISTAN
BA	BOSNIA		PL	POLAND
BE	BELGIUM	HU	PT	PORTUGAL
BR	BRAZIL	ID	RO	ROMANIA
BY	BELARUS	IE	RU	RUSSIAN FEDERATION
CA	CANADA	IL	SA	SAUDI ARABIA
CH	SWITZERLAND (CH=Confederation Helvetica)	IN	SE	SWEDEN
CL	CHILE	IT	SI	SLOVENIA
CN	CHINA	JO	SK	SLOVAKIA
CO	COLOMBIA	JP	TR	TURKEY
CY	CYPRUS	KE	TW	TAIWAN
CZ	CZECH REPUBLIC	KR	TZ	TANZANIA
DE	GERMANY	LT	UA	UKRAINE
DK	DENMARK	LU	UK	UNITED KINGDOM
EC	ECUADOR	LV	US	UNITED STATES
EE	ESTONIA	MX	UY	URUGUAY
EG	EGYPT	MY	VE	VENEZUELA
EN	ENGLAND	NA	YU	YUGOSLAVIA (Serbia and Montenegro)
ES	SPAIN (ES=Espagna)	NG	ZA	SOUTH AFRICA
FI	FINLAND	NL	ZM	ZAMBIA
FR	FRANCE	NO	ZW	ZIMBABWE
		NZ		

----- end of Annex A -----

EXAMPLES.

Here are three formats for a point named “Lasham Start South”, one of six Lasham start points in the UK BGA list. First in a hard copy format, then comma-separated, then XML text. In hard copy, line 1 is essential data and lines 2 & 3 contain optional data. When printed it is neater as a Word or Word Perfect table, with lined boxes round each field, in landscape format and all on one line for each WP:

B.1 Hard Copy format.

Code	Nat	WGS 84 Lat/Long	Title	Exact Point	Date of Data
LA4	UK	51 10.147N 001 02.555W	Lasham Start S	A339/Bentworth Xrd	060198

Alt	Type	Find	Dist	Brg	Feature	Description
445f	ST#	C	001.8k	205	Lasham	Minor road runs Lasham/Bentworth

Map Sheet	Radio	NATIONAL OPTIONS:	Grid	East	North
50k 185	129.900		OSGB	466.93	141.59

B.2 “Comma separated” format. When in electronic form, this is ready for use in a database. Fields must be entered in the same order as the first field set, which contains the titles. If a field is not used the data should be blank within the comma separators. This is to ensure that programmes designed to manipulate the IGC format can know what data is in what field.

"waypoint","wpcode","nation","wgs84lat","wgs84long","wptitle","exact point","data date","altitude/elevation","wptype","findability","distance","bearing","main Feature","description","map type","map sheet","radio frequency","osgb Grid","waypoint"

"waypoint","LA4","UK","5110.147N","00102.555W","Lasham Start South","A339/Bentworth Xrd","060198","430f","ST#","C","1.8k","205","Lasham","Minor road runs Lasham/Bentworth"," 50k","185"," 129.900","466.93 141.59","waypoint"

B.3 XML text format. Note the indents which separate the waypoint title from the data fields

```
<waypoint>
  <code>LA4</code>
  <nation>UK</nation>
  <wgs84lat>5110.147N</wgs84lat>
  <wgs84long>00102.555W</wgs84long>
  <title>Lasham Start S</title>
  <exact-point>A339/Bentworth Xrd</exact-point>
  <data-date>060198</data-date>
  <altitude-elevation>430f</altitude-elevation>
  <type>ST#</type>
  <findability>C</findability>
  <distance>1.8k</distance>
  <bearing>205</bearing>
  <main-feature>Lasham</main-feature>
  <description>Minor road runs Lasham/Bentworth</description>
  <map-type-scale>OS 50k</map-type-scale>
  <map-sheet>185</map-sheet>
  <radio-frequency>129.900</radio-frequency>
  <grid>OSGB466.93 141.59</grid>
</waypoint>
```

----- end of Annex B -----