

IDF Hull Data Transfer Format

A HydroComp Technical Report Report 133

OVERVIEW

The IDF file is a publicly-available ACSII format developed for the transfer of hull and propeller geometric data between software products. The concept for the IDF file was originally presented by the IMSA software group in 1991, and the format has evolved over time to support not only the interests of its creators, but also those of other marine software developers, government agencies and interested third-parties.

For example, the symbols used are derived from ITTC computer symbols and terminology. In January 1993, the ITTC Symbols and Terminology Group identified the need for an Interim Standard Transfer Set (ISTS) as a subset to their comprehensive database-oriented collection of computer symbols. The current specification of the IDF file (spec 3.03) was developed using these ISTS symbols.

The file provides for the transfer of hull data in a variety of forms - sectional data (in traditional stations, waterline, buttocks), surface mesh, NURBS surface, and a parametric definition of the hull's "wetted" geometric properties. It is this parametric data that can be imported and exported by NavCad via information written to a particular entity within the file (the HYDRO entity, as described below). This information (length on waterline, displacement or trim, for example) is representative of a single vessel load condition.

IDF file syntax (HYDRO entity)

The IDF file is an ASCII text file with information such as units definitions and the data source, followed by the parametric data. The general form of the file is:

```
$IDF
3.03
$ENTITY
HYDRO
$VESSEL NAME (optional)
Identifier for this vessel
$DATA SOURCE (optional)
Program that wrote the file
```

```
$DATE (optional)
mm/dd/yy
$TIME (optional)
hh:mm:ss
$UNITS
This line must be either SI or User Defined
If User Defined, these line(s) must be specified:
# of user units/meter
# of user units/square meter
# of user units/cubic meter
# of user units/kg
$COMMENTS (optional)
This is a comment about the ship to be described.
$GEOMETRY
n (number of parts, NavCad considers the first part)
part 1 (names of parts)
$PART
part name
entry 1
.
.
entry n
$END ENTITY
```

Each entry is one of the symbols described below in the following form:

```
computer symbol=value
```

For example, the symbol for length of waterline is LWL. For a ship with a waterline length of 451.5, the data would be entered in the file as:

```
LWL=451.5
```

As many entries as desired may be made in this form using the symbols.

To eliminate redundancy and potential confusion, the HYDRO parameters follows the ISTS philosophy to only use symbols based on geometric items (displaced volume, for example) rather than parameters (such as block coefficient). In addition to these geometric data items, a number of conversion references are defined within the entity.

Abbreviations used in the format description below are:

FP - forward perpendicular. This is a reference datum for the forward point of the length between perpendiculars (LPP).

AP - after perpendiculars. This is a reference datum for the aft point of the length between perpendiculars (LPP).

MIDP - midship. This is located midway between FP and AP.

Standard reference definitions used by the HYDRO entity of the IDF are:

International nautical mile - 6076.1155 feet, 1852.00 meters.

Gravitational constant - G 32.174 ft/s², 9.80665 m/s².

SYMBOLS

Symbol	Units	Description
ABT	Area	Total area of transverse cross-section of bulbous bow. Full (port and starboard) cross sectional area at the FP.
AM	Area	Midship section area. Immersed transverse sectional area located at MIDP.
APB	Area	Planing bottom area. Horizontally projected planing bottom area (at rest), excluding area of external spray strips. (Area outlined by the chine as projected onto a horizontal plane.)
ATR	Area	Total area of immersed transom. Full (port and starboard) cross-sectional area of a transom stern below the waterline.
AVL	Area	Longitudinal area exposed to wind. Area of portion of ship above waterline projected onto a longitudinal plane (as viewed from the side).
AVT	Area	Transverse area exposed to wind. Area of portion of ship above waterline projected onto a transverse plane (as viewed from ahead).
AW	Area	Area of the waterplane. Area enclosed by the outline of the waterplane.
AX	Area	Maximum immersed transverse sectional area.
BETD	Deg	Principal deadrise angle of planing bottom. Angle of the tangent slope of the planing bottom. (For a temporary solution, the tangent slope of the planing bottom at a point BPX/4 off the centerline, located at the mid-point of LPRC, is recommended).
BETTR	Deg	Deadrise angle of planing bottom at transom. Angle of the tangent slope of the planing bottom at the transom, (For a temporary solution, the tangent slope of the planing bottom at a point BTR/4 off the centerline, located at the aftmost point of LPRC, is recommended).
BM	Length	Midship breadth on waterline. Molded breadth on the waterline located at MIDP.
BPX	Length	Maximum breadth over chines. Maximum breadth of the outside of the chine (excluding external spray strips).
BTR	Length	Breadth of the chine at the transom. Breadth of the outside of the chine (excluding external spray strips) at the transom (the aftmost point of LPRC).

BX	Length	Maximum breadth on waterline.
DISV	Vol	Displacement volume. Immersed volume of the hull, neglecting appendages. (Large added volumes, such as skegs may have a contribution to hull volume, so there should be data agreement between SWH and DISV.)
ENTA	Deg	Half angle of entrance. Angle of waterline at the bow with reference to centerplane, neglecting local shape at stem. (For a temporary solution, the tangent slope of the waterplane at a point BX/10 off the centerline is recommended.)
LOS	Length	Overall submerged length. Entire length of the submerged portion of the vessel, including items such as bulbs that extend beyond the limits of LWL.
LPP	Length	Length between perpendiculars. Reference length that defines the distance between FP and AP.
LPRC	Length	Projected chine length. Overall longitudinal length of chine projected onto a horizontal plane. (Longitudinal limit of APB.)
LWL	Length	Length of waterline. Overall longitudinal length of the waterplane.
RHOW	Mass Vol	Mass density of water in the form of Mass / Vol. You must insure that Mass and Volume units conversions from the \$UNITS section are applied properly. Standard ITTC values at 15degC/59degF are: Fresh 999.01 kg/m ³ ; 1.9384 slug/ft ³ (lbf-s ² /ft ⁴); specific grav 0.9990 Salt 1025.86 kg/m ³ ; 1.9905 slug/ft ³ (lbf-s ² /ft ⁴); specific grav 1.0259 NOTE: Specific gravity uses the international convention of distilled water at 3.98degC (999.97 kg/m ³ , 1.9403 slug/ft ³).
SWH	Area	Wetted surface of the hull. Entire immersed surface of the hull, neglecting appendages. (Large added volumes, such as skegs may have a contribution to hull volume, so there should be data agreement between SWH and DISV.)
TM	Length	Draft at midship. Molded hull draft on centerline, located at MIDP. Value reflects the principal hull volume and should not be confused with a keel draft that includes the effect of appendages or skegs.
TR	Length	Trim. Vessel trim by the stern. Equals the draft at AP less the draft at FP.
XFB	Length	Longitudinal center of buoyancy from FP. Longitudinal distance of the center of buoyancy aft of FP.
XFG	Length	Longitudinal center of gravity from FP. Longitudinal distance of the center of gravity aft of FP.
XLWL	Length	Location of length on waterline. Distance of the forward-most point of LWL aft of FP. (Registers location of LWL with respect to FP.)
XLPRC	Length	Location of projected chine length. Distance of the forward-most point of LPRC aft of FP. (Registers location of LPRC with respect to FP.)

SAMPLE FILE

The following is a sample of an IDF file for a Series 60 cargo ship, as exported from NavCad. The data is in units of Feet and Long Tons, so the appropriate *User Defined* units conversions are included. There is a single "part"

and it is given the name "MAINHULL". The file includes data for midship and waterplane areas, beam, displaced volume, half angle of entrance, lengths, mass density of the condition, wetted surface, draft and LCB. (The indentation shown is optionally included in the exported file simply to make it easier for someone to read.)

```
$IDF
3.03
$ENTITY
HYDRO
$DATA SOURCE
HydroComp NavCad 4.20
$DATA
05/10/02
$TIME
10:02:12
$UNITS
User Defined
3.280839895
10.7639104167
35.3146667215
.0009842065
$GEOMETRY
1
$PART
MAINHULL
  AM=1513.5
  AW=21127.3866
  AX=1513.5
  BX=62.07
  DISV=450851.003705525
  ENTA=12.9
  LOS=457.5
  LPP=450
  LWL=457.5
  RHOW=.028590376630101
  SWH=37230
  TM=24.83
  XFB=231.93
$END ENTITY
```

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