

Teledyne Webb Research Slocum Glider Training

With Ben Allsup &
Friends



Brief History of Teledyne Webb Research

Doug Webb had a
vision



Support Philosophy & Structure

- “Triage”
- glidersupport@teledyne.com
 - Wide distribution list including support, service, sales, engineering, and executive personnel
 - Will be answered during off-hours if subject is compelling enough and if personnel are available
- The “Batphone” (for emergencies only)
 - (508) 524-8106
 - (855) 720-3915 (toll-free)



Objective of Glider Training Class

A trainee should be comfortable configuring & preparing a glider for a qualification or test flight

We recommend starting slow and building a base of comfort and knowledge



Day 1

- Classroom: Introduction to Dockserver, Glider Terminal, and Software
- Ballast Tank: Introduction to Glider Hardware



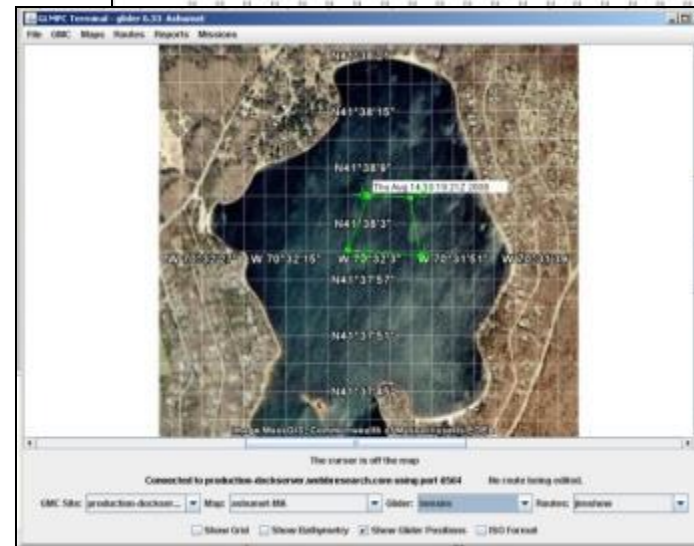
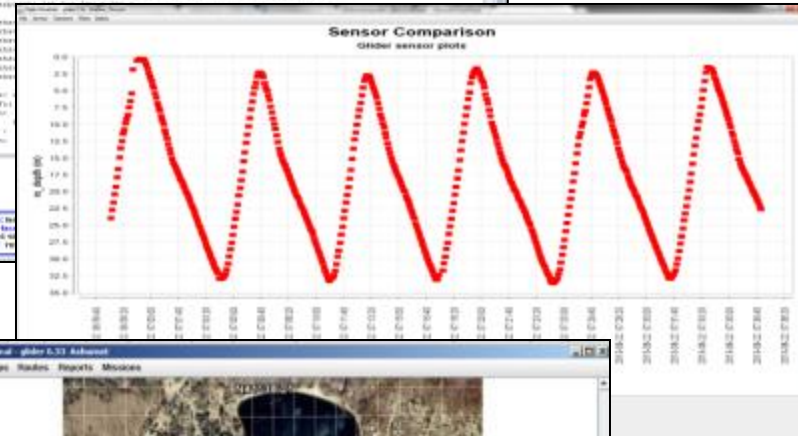
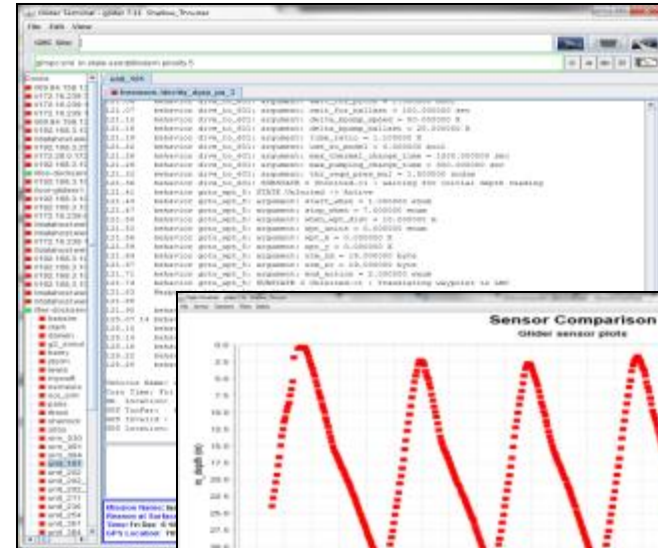
Day 1 & 2

- **Glider control & TWR tools**

- Glider Terminal (glider communications)
- Data Visualizer
- GLMPC Terminal (maps & waypoints)
- File transfer & Scripting
- Simulation
- Mission Planning

- **Preparation for Training Deployment**

- Assembly & Disassembly
- Ballasting
- Pre-mission Testing



Day 3 (or 4, depending on the weather)

Field Trip!

- Glider flight qualification training
 - Operational use of TWR tools
-
- Where do YOU test your gliders?



Day 4



- Glider Simulation
- Wrap-up & Open Discussion

The Datahost

- Most of the information we will discuss during training is available on the Datahost, our Glider User Forum:
<https://datahost.webbresearch.com>
- On the forum, you will be able to access:
 - Posts from fellow users & TWR employees on the use of gliders
 - Manuals
 - Software Releases
 - Glider Resources
 - Client Tools
- [Register now!](#)
- Teledyne Guest Internet Access
 - Can be provided by request





TWR Forum

Slocum Glider support and ideas

Search... Search
Advanced search

[Board index](#)



[User Control Panel](#) (0 new messages) • [View your posts](#)

[FAQ](#) [Members](#) [Logout](#) [bshaw]

It is currently March 12th, 2014, 1:00 pm

Last visit was: March 12th, 2014, 9:39 am

[View unanswered posts](#) • [View unread posts](#) • [View new posts](#) • [View active topics](#)

[Mark forums read](#)

GLIDERS	TOPICS	POSTS	LAST POST
FAQ Look here first.	45	110	by bshaw March 4th, 2014, 2:36 pm
Operation Things to do with a glider in a boat	37	103	by admin February 27th, 2014, 3:55 pm
Missions Mission development	31	91	by admin September 21st, 2013, 1:29 pm
lab testing	12	27	by Khalid August 30th, 2012, 12:56 pm
Suggestions	18	65	by Alan January 22nd, 2014, 10:48 am
Aborts	8	17	by bshaw January 14th, 2014, 11:49 am
NEWS!!! Teledyne Webb Research news and share stories of your programs accomplishments!	4	5	by arvindpereira November 29th, 2012, 12:57 am
Dockserver post all GMC questions here	36	104	by bshaw March 12th, 2014, 9:39 am
Resources Links to online glider resources	1	1	by admin February 17th, 2014, 7:11 am

WHO IS ONLINE

In total there is **1** user online :: 1 registered, 0 hidden and 0 guests (based on users active over the past 5 minutes)

Most users ever online was **13** on June 26th, 2012, 1:41 pm

Registered users: bshaw

Legend: *Administrators*, *Global moderators*

[Board index](#) • [Glider Resources](#) • [Client Tools](#)

[The team](#) • [Delete all board cookies](#) • All times are UTC - 5 hours

Links & Resources

- Visit [Glider Resources](#) at the Datahost for helpful links & information

formerly www.glider.webbresearch.com

by **admin** » February 17th, 2014, 7:11 am

These are the links formerly at <http://www.glider.webbresearch.com>
Please contact glidersupport@webbresearch.com
with any questions or call at 508.563.1000 request glider support

Glider service bulletins

https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/doco/glider-service-bulletins&sid=

Glider manual

https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/doco/MANUAL&sid=

GMC user guide

https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/gmc-bin&sid=

masterdata

https://datahost.webbresearch.com/download/glider/RELEASE_7_13/masterdata

Production read me:

https://datahost.webbresearch.com/download/glider/RELEASE_7_13/readme.txt

Production code - glider and science

https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/target-glider&sid=
https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/target-science&sid=

windows .EXE tools

https://datahost.webbresearch.com/files.php?cwd=glider/RELEASE_7_13/windoze-bin&sid=

Webb Customer Dockserver

<http://datahost.webbresearch.com/gmcclient.php>

Density Calculator

<http://fermi.jhuapl.edu/denscalc.html>

Degrees, Minutes, Seconds and Decimal Degrees Latitude/Longitude Converters:

<http://www.fcc.gov/mb/audio/bickel/DDDMMSS-decimal.html>

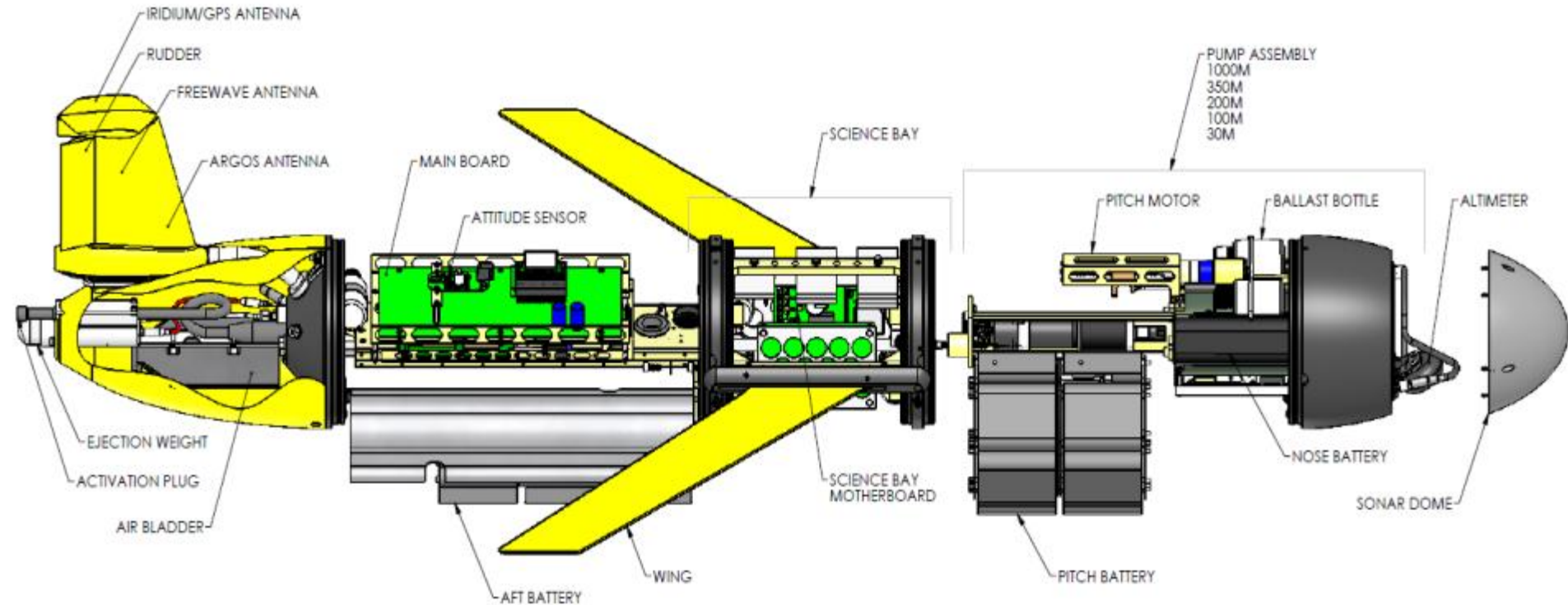
<http://www.uky.edu/KGS/gis/converter.htm>

The Basics

- Glider components
- Glider flight fundamentals
- Glider communication
- Shore side software
- On-board glider software hierarchy

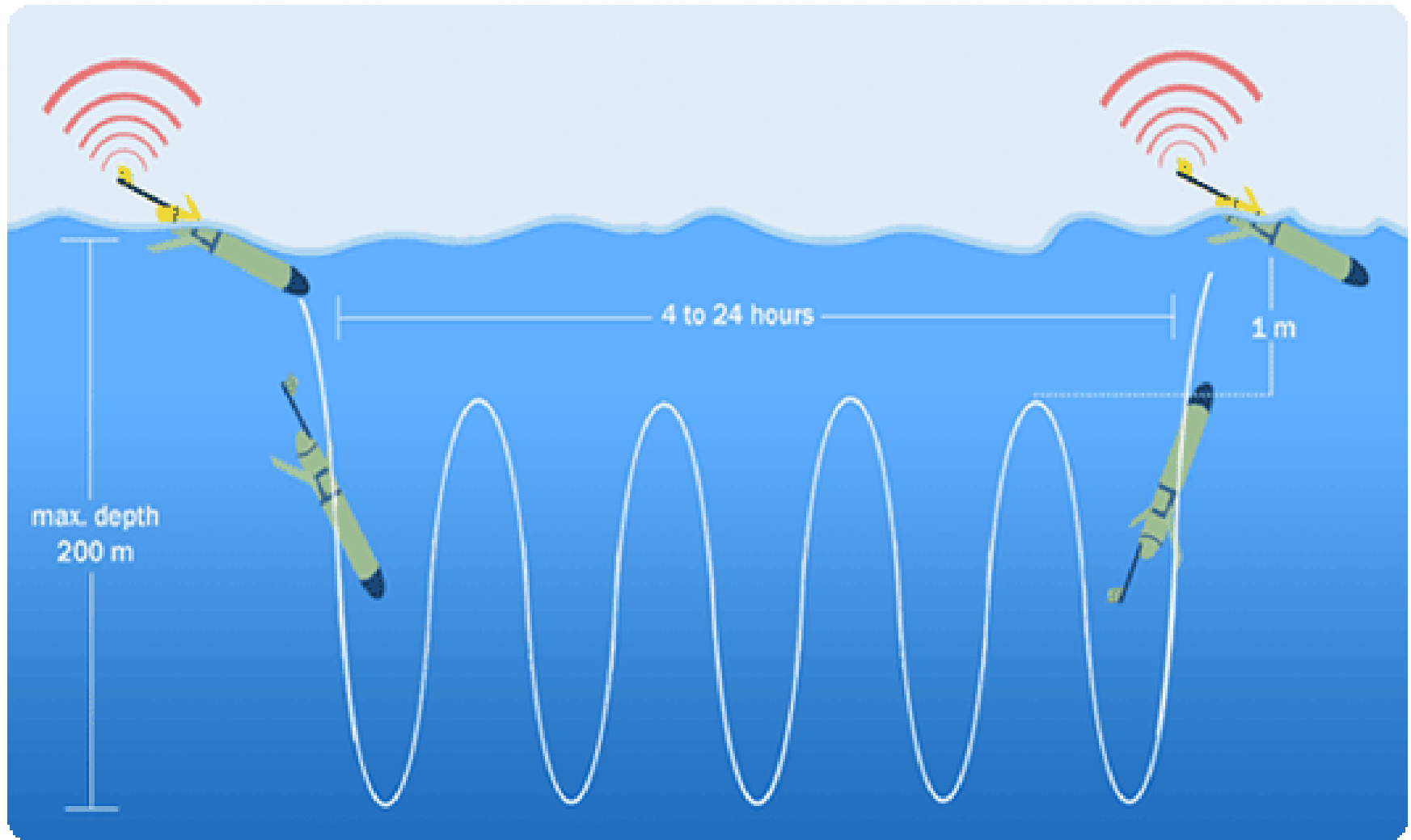


Glider Components

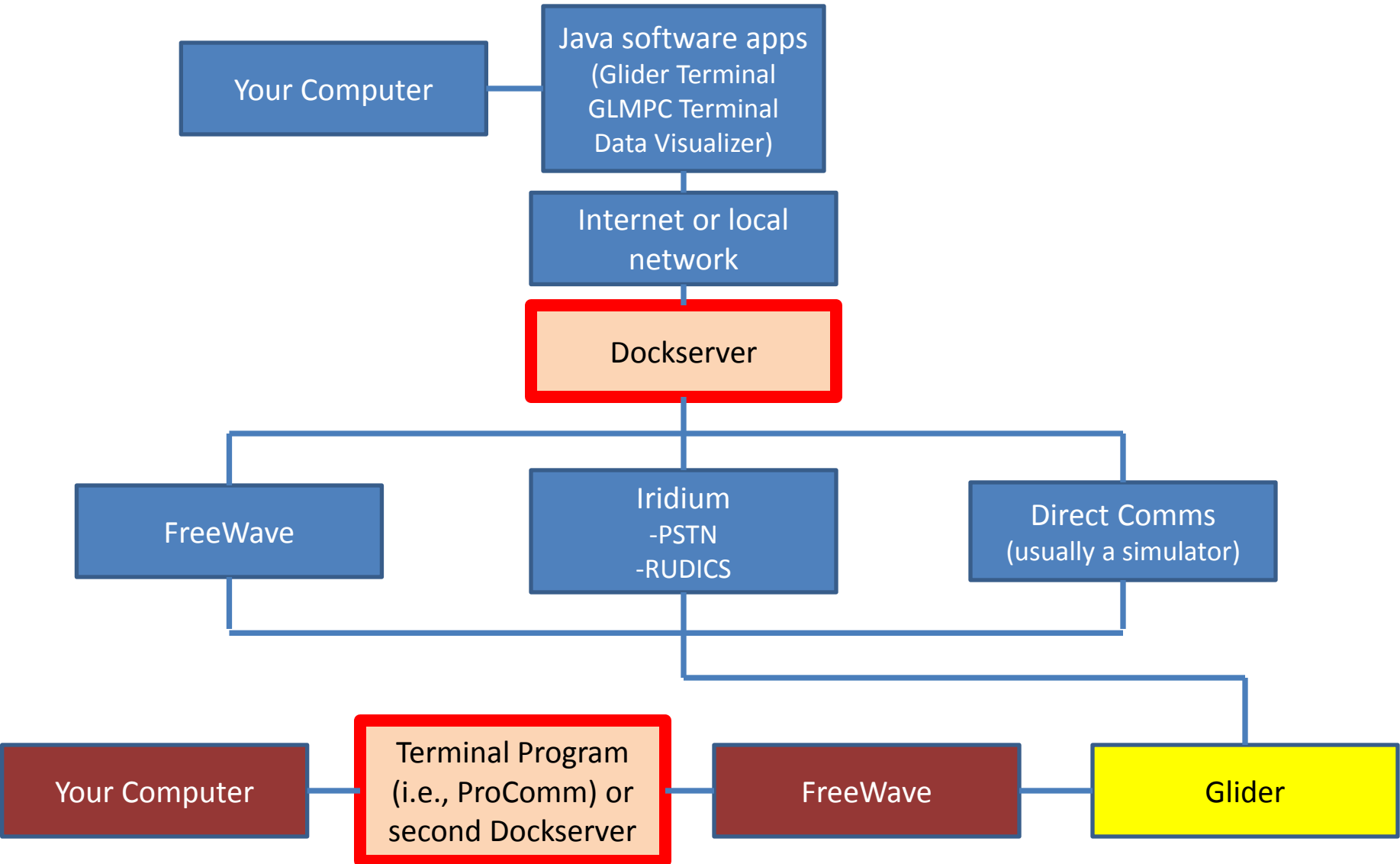


**Remember:
O-ring care is essential!**

Glider Flight Fundamentals

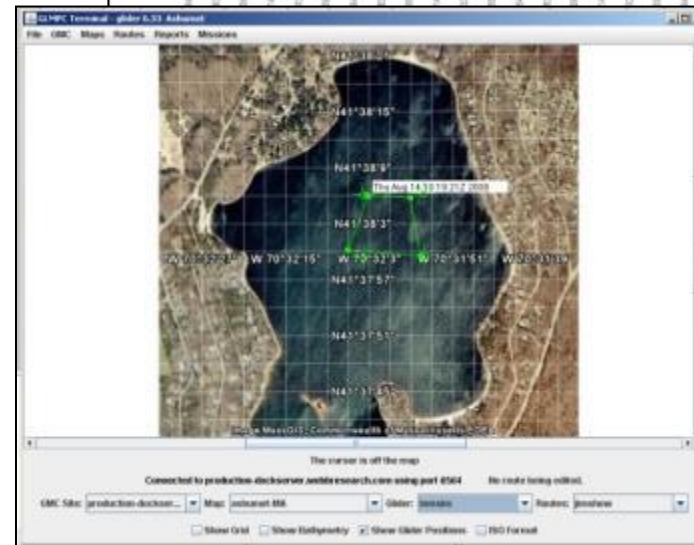
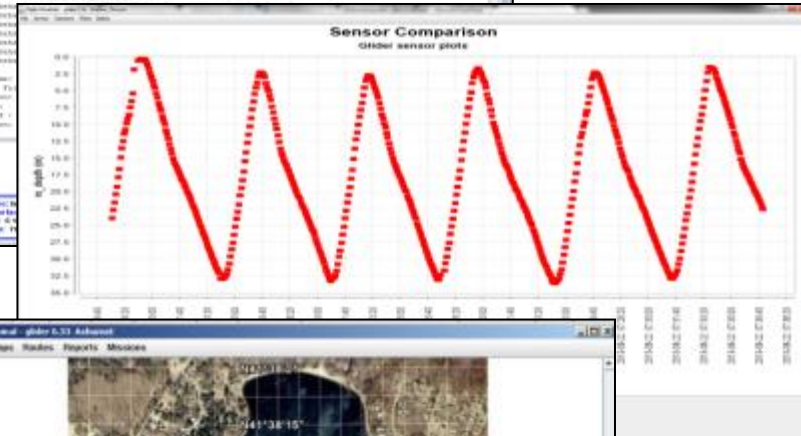
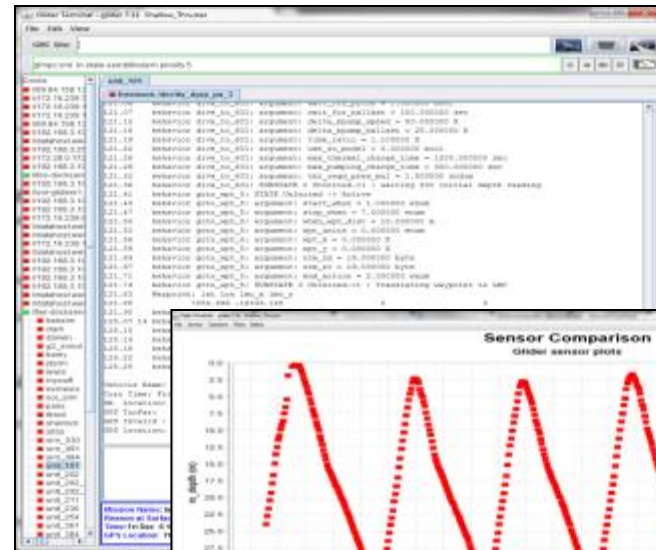


Glider Communication



Shore-side Software

- Dockserver
 - Stand-alone, rack-mounted, or laptop Linux machine
- Glider Terminal
 - Text-based glider communication
- Data Visualizer
 - MySQL database
- FTP client
 - Used to send files to/from glider



Glider Terminal

Glider Terminal - glider 7.11 Shallow_Thruster

File Edit View

GMC Site:

glmpc.xml in state sendzModem priority 5

Docks

- //69.84.158.13
- //172.16.239.3
- //172.16.239.1
- //172.16.239.1
- //69.84.158.13
- //192.168.3.10
- //datahost.wet
- //192.168.3.25
- //172.29.0.172
- //192.168.3.10
- //lbs-dockserv
- //192.168.3.10
- //ooi-gliders1
- //192.168.3.10
- //192.168.3.10
- //192.168.3.10
- //172.16.239.6
- //datahost.wet
- //datahost.wet
- //172.16.239.1
- //datahost.wet
- //192.168.3.10
- //192.168.3.10
- //192.168.3.10
- //192.168.3.10
- //192.168.3.10
- //datahost.wet
- //datahost.wet
- //twr-dockserv
- bensim
- clark
- darwin
- g2_simul
- henry
- jdsim
- lewis
- mvicroft

unit_191

freewave-/dev/tty_dgrp_pa_3

```

122.14 behavior goto_wpt_5: argument: utm_zd = 19.000000 byte
122.17 behavior goto_wpt_5: argument: utm_zc = 19.000000 byte
122.20 behavior goto_wpt_5: argument: end_action = 2.000000 enum
122.24 behavior goto_wpt_5: SUBSTATE 0 UnInited->1 : Translating waypoint to LMC
122.33 Waypoint: lat lon lmc_x lmc_y
122.35          7054.658 -16333.419          0          0
122.40 behavior goto_wpt_5: SUBSTATE 1 ->2 : waiting an initial cycle
125.56 14 behavior dive_to_601: SUBSTATE 1 ->3 : Starting the dive
125.60 behavior dive_to_601: SUBSTATE 3 ->4 : diving
125.64 behavior goto_wpt_5: SUBSTATE 2 ->3 : Waiting until we get to waypoint
125.68 behavior goto_wpt_5: STATE Active -> UnInited
125.71 behavior surface_2: STATE Waiting for Activation -> Active
125.74 behavior surface_2: SUBSTATE 0 UnInited->1 : climb_to the surface

Vehicle Name: unit_191
Curr Time: Fri Dec 6 19:44:48 2013 MT:      846
DR Location: 7054.553 N -16333.485 E measured      2.034 secs ago
GPS TooFar:  69696969.000 N 69696969.000 E measured      1e+308 secs ago
GPS Invalid : 7054.559 N -16333.481 E measured      48.07 secs ago
GPS Location: 7054.553 N -16333.485 E measured      2.876 secs ago
  
```

Mission Name: lastgasp.mi Mission Number: unit_191-2013-339-3-0 (0085.0000)

Reason at Surface: Start of Mission

Time: 05 Sep 2012 03:53:41 Z Mission Time: 0

GPS Location: 7054.553 N -16333.485 E at: Fri Dec 06 19:44:45 2013

GLMPC Terminal

GLMPC Terminal - glider 6.33 Ashumet

File GMC Maps Routes Reports Missions

N41°38'21"
 N41°38'15"
 N41°38'9"
 Thu Aug 14 10:19:21Z 2008
 N41°38'3"
 W 70°32'27" W 70°32'15" W 70°32'3" W 70°31'51" W 70°31'39"
 N41°37'57"
 N41°37'51"
 N41°37'45"
 Image MassGIS, Commonwealth of Massachusetts EOE

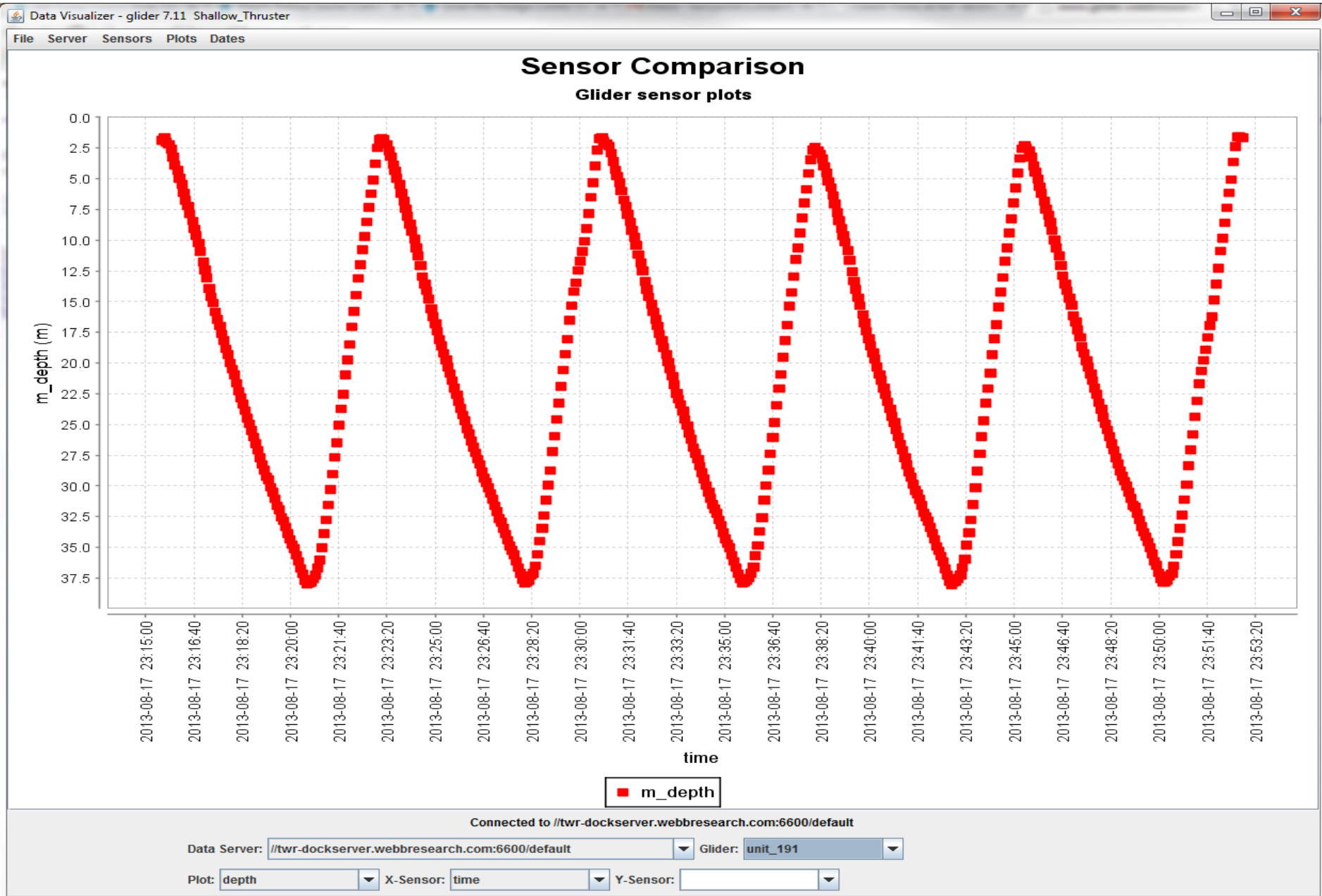
The cursor is off the map

Connected to production-dockserver.webbresearch.com using port 6564 No route being edited.

GMC Site: production-dockser... Map: ashumet-MA Glider: bensim Routes: jimshow

Show Grid
 Show Bathymetry
 Show Glider Positions
 ISO Format

Data Visualizer



Dataserver

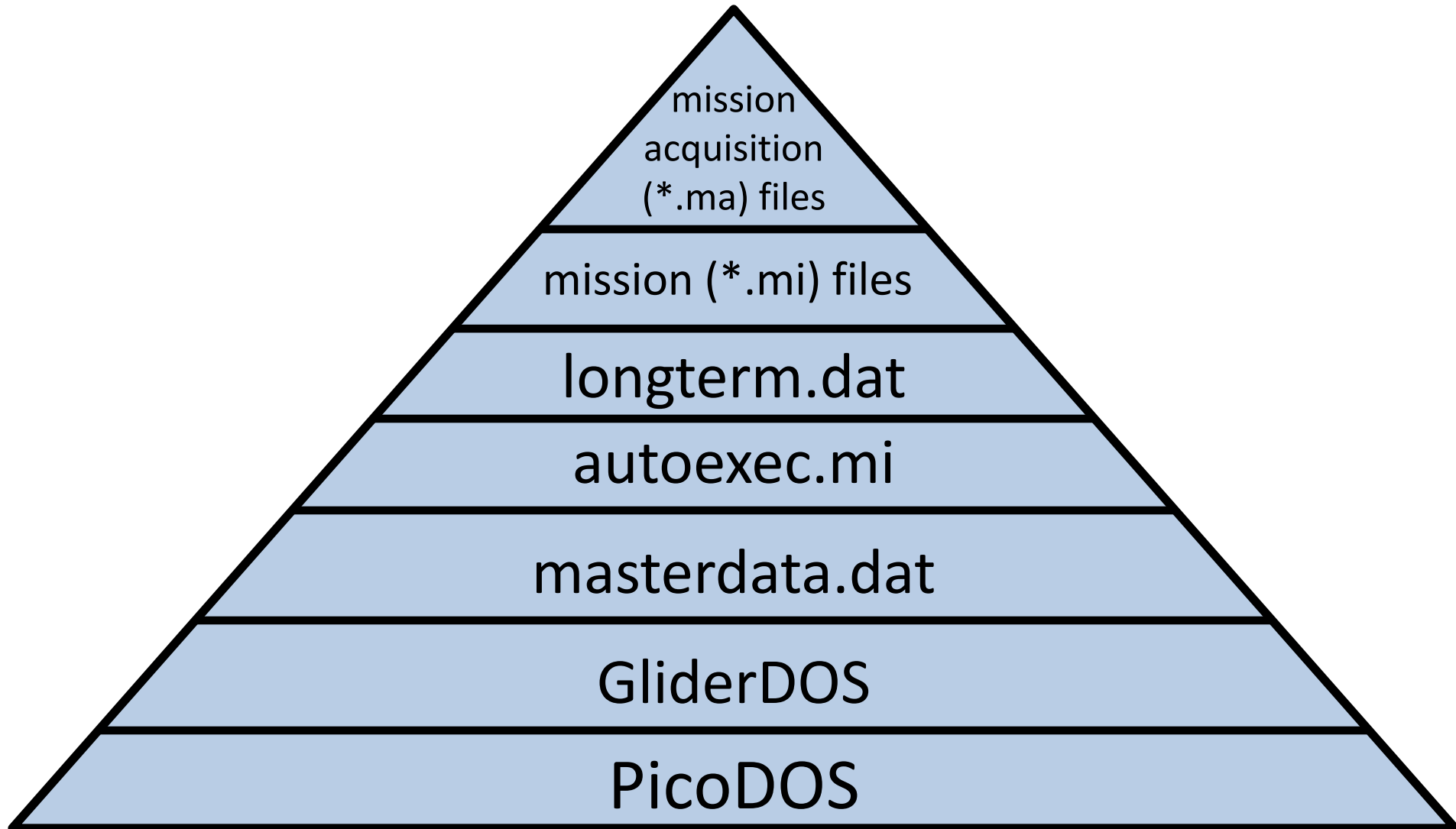
- Dataserver builds a MySQL relational database from all incoming glider data on a Dockserver.
- You can also point your Dataserver at a dataset.



Time for a Tour!

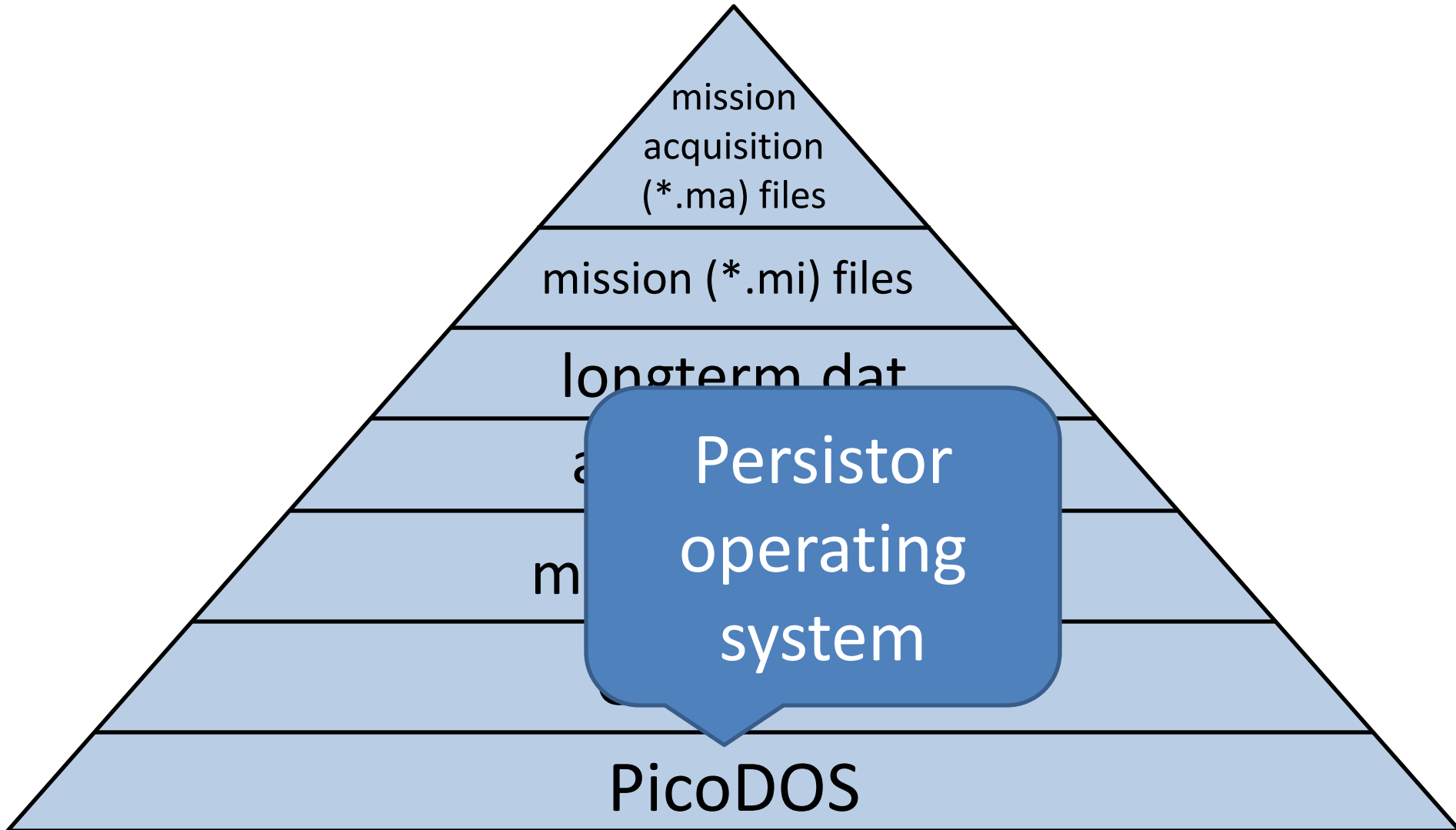


On-board Glider Software



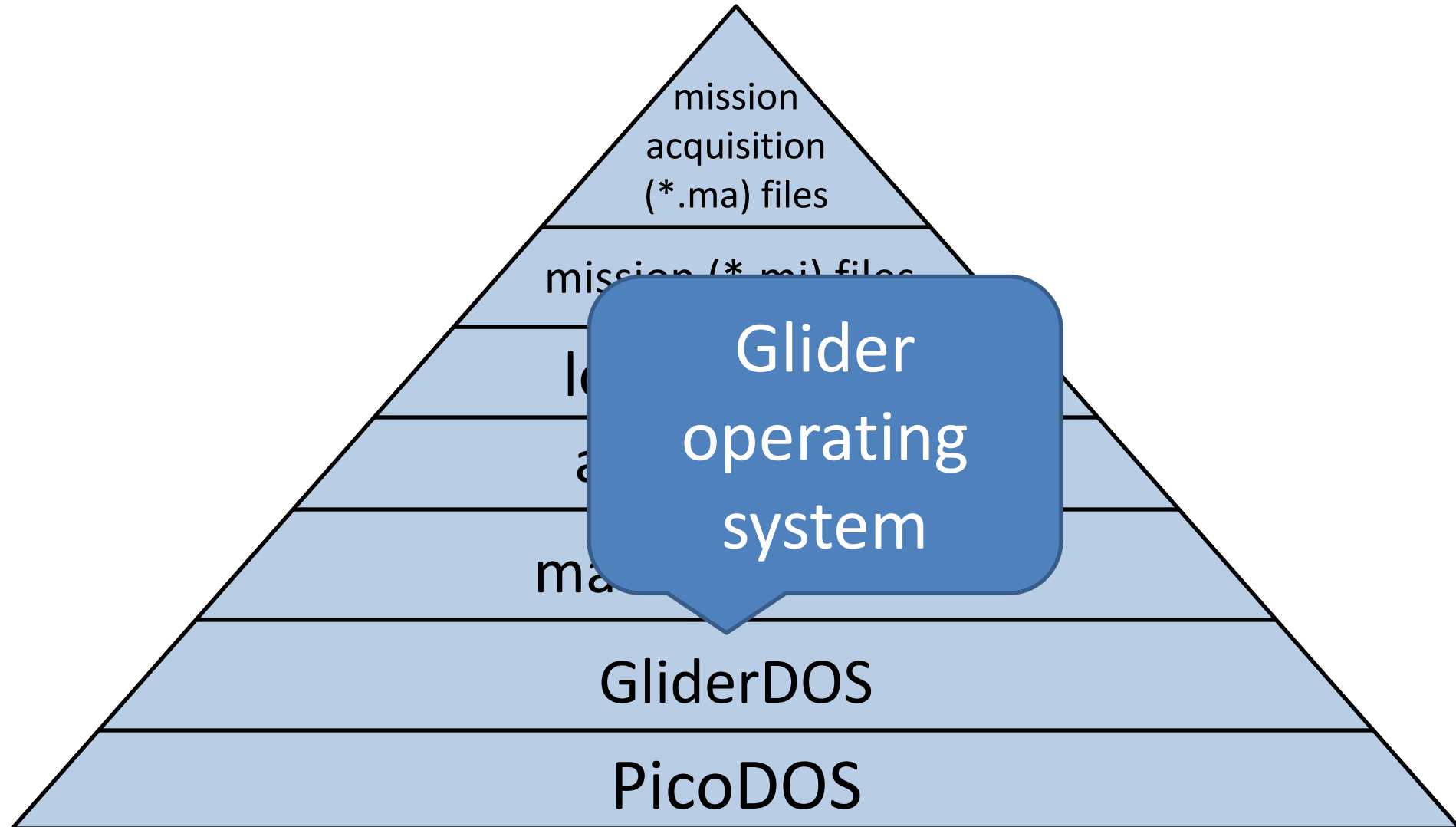
Slocum's Hierarchy of ***G2 Glider Software*** Needs

On-board Glider Software



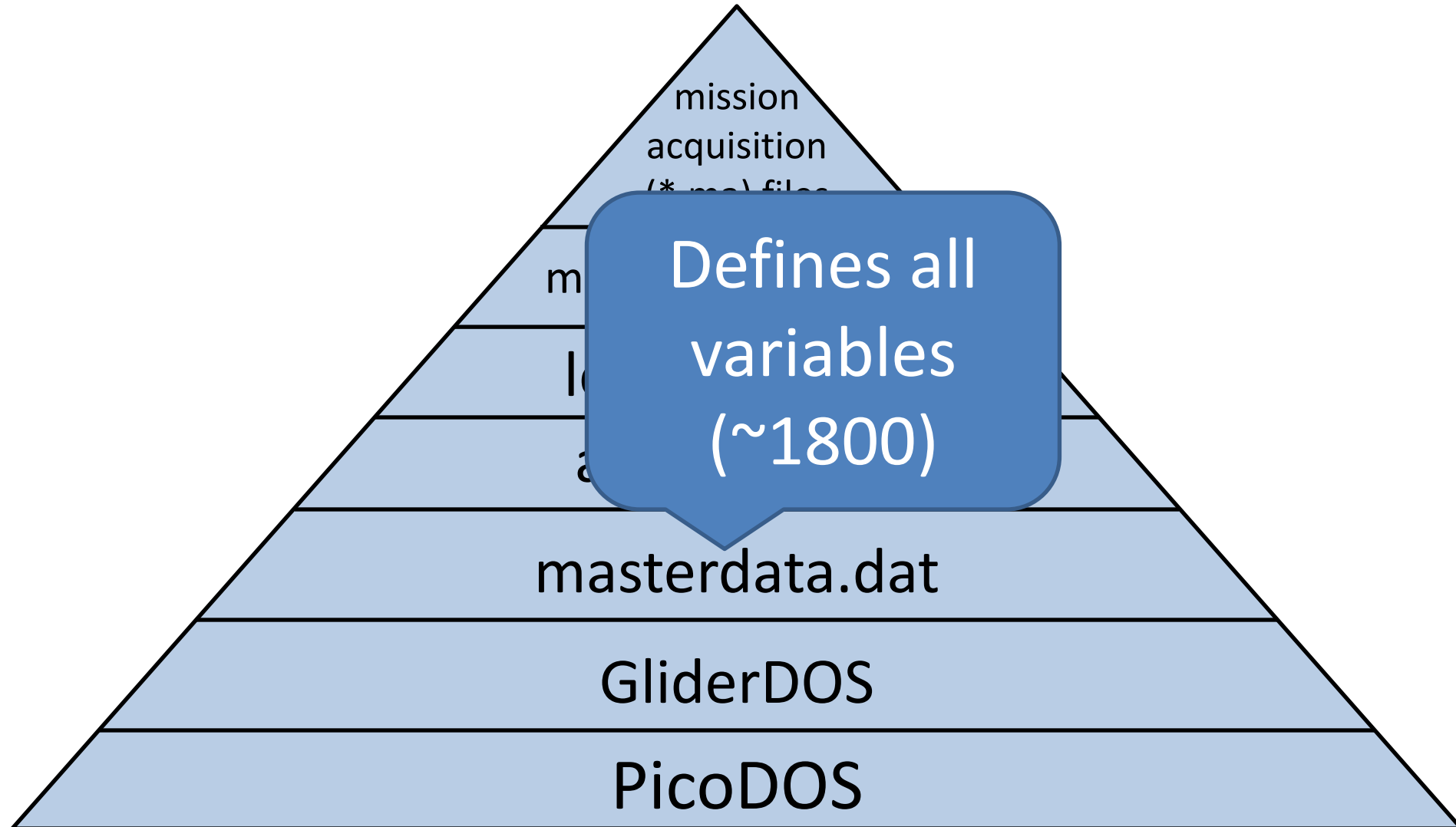
Slocum's Hierarchy of ***G2 Glider Software*** Needs

On-board Glider Software



Slocum's Hierarchy of ***G2 Glider Software*** Needs

On-board Glider Software



On-board Glider Software

Defines glider
specific
variables

mis

long

autoexec.mi

masterdata.dat

GliderDOS

PicoDOS

Slocum's Hierarchy of ***G2 Glider Software*** Needs

On-board Glider Software

Maintains
variables on
power cycle

mi

longterm.dat

autoexec.mi

masterdata.dat

GliderDOS

PicoDOS

Slocum's Hierarchy of ***G2 Glider Software*** Needs

On-board Glider Software

Defines mission
variable or
behavior

mission (*.mi) files

longterm.dat

autoexec.mi

masterdata.dat

GliderDOS

PicoDOS

Slocum's Hierarchy of **G2 Glider Software** Needs

On-board software

Defines mission
behavior

mission
acquisition
(* .ma) files

mission (* .mi) files

longterm.dat

autoexec.mi

masterdata.dat

GliderDOS

PicoDOS

Slocum's Hierarchy of **G2 Glider Software** Needs

Key Glider Software Components

- Flight Persistor
 - glider.app
 - masterdata
 - autoexec.mi
 - longterm.dat
 - missions
 - ma files
- Science Persistor
 - supersci.app
 - proglets.dat

Data Files

	Flight Side	Science Side
ALL data	*.DBD	*.EBD
Small data files	*.SBD	*.TBD
User-defined, custom	*.MBD	*.NBD
Log files	*.MLG	*.NLG

Common Glider Commands

- help
- lab_mode
- wiggle
- use
- report ++
- get
- put
- longterm_put
- ! (bang)
- consci
- whoru
- where
- zero_ocean_pressure
- dir
- run
- loadmission
- exit
- exit reset

NOTE: List all available commands by typing `help`

Sensor Prefixes

Prefix	Significance
m_	Measured
c_	Commanded
u_	User-defined before run-time
f_	Set in factory
x_	Computed at run time (never set these values!)
s_	Simulated state variables
sci_	Science sensor

Installed Devices

```

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
      [I Installed] [- Not_Installed]
          [u In_use] [- Not_In_use] [X Out_of_Service]
            name      limits      stats (#total/#mission/#segment)
0      simdrv       -
1      test_driver  -
2      ARGOS*      I u  -1  20   5  0
3      WATCHDOG    I u  -1  -1  -1  0
4      DEADMAN     I u  -1  20   5  0
5      CONSOLE*    I u  -1  20   5  0
6      GPS         I u  -1  20   5  0
7      pinger      -
8      attitude    -
9      attitude_tcm3 -
10     attitude_rev I u  3  20   5  0 [ 0 0 0] [ 1 0 0] [ 0 0 0]
11     ocean_pressure I u  3  20   5  0
12     vacuum      I u  3  20   5  0
13     battery     I u  3  20   5  0
14     lithium_battery -
15     air_pump    I u  3  20   5  0
16     pitch_motor I u  3  20   5  0
17     science_super I u  3  20   5  0
18     roll_motor  -
19     fpitch_pump -
20     fin_motor   -
21     digifin     I u  3  20   5  0
22     altimeter   I u  3  20   5  0
23     ctd         -
24     IRIDIUM*    I u  -1  20   5  0 [ 0 0 0] [ 0 0 0] [ 2 0 0]
25     leakdetect  I u  3  20   5  0
26     recovery    I u  3  20   5  0
27     coulomb     I u  3  20   5  0
28     veh_temp    I u  3  20   5  0
29     BUOYANCY_PUMP I u  3  20   3  0
30     THERMAL_ACC_PRE -
31     THERMAL_ENGINE -
32     THERMAL_PUMP -
33     DE_PUMP     -
34     thruster_g1 -
35     thruster    I u  3  20   5  0
devices:(t/m/s) errs: 0/ 0/ 0 warn: 1/ 0/ 0 odd: 2/ 0/ 0
  
```

Installed Devices

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
 [I Installed] [- Not_Installed]
 [u In_use] [- Not_In_use] [X out_of_service]
 limits stats (#total/#mission/#segment)

	name			limits	stats (#total/#mission/#segment)
0	simdrv	-			
1	test_driver	-			
2	ARGOS*	I u	-1	20	5 0
3	WATCHDOG	I u	-1	-1	-1 0
4	DEADMAN	I u	-1	20	5 0
5	CONSOLE*	I u	-1	20	5 0
6	GPS	I u	-1	20	5 0
7	pinger	-			
8	attitude	-			
9	attitude_tcm3	-			
10	attitude_rev	I u	3	20	5 0 [0 0 0] [1 0 0] [0 0 0]
11	ocean_pressure	I u	3	20	5 0
12	vacuum	I u	3	20	5 0
13	battery	I u	3	20	5 0
14	lithium_battery	-			
15	air_pump	I u	3	20	5 0
16	pitch_motor	I u	3	20	5 0
17	science_super	I u	3	20	5 0
18	roll_motor	-			
19	fpitch_pump	-			
20	fin_motor	-			
21	digifin	I u	3	20	5 0
22	altimeter	I u	3	20	5 0
23	ctd	-			
24	IRIDIUM*	I u	-1	20	5 0 [0 0 0] [0 0 0] [2 0 0]
25	leakdetect	I u	3	20	5 0
26	recovery	I u	3	20	5 0
27	coulomb	I u	3	20	5 0
28	veh_temp	I u	3	20	5 0
29	BUOYANCY_PUMP	I u	3	20	3 0
30	THERMAL_ACC_PRE	-			
31	THERMAL_ENGINE	-			
32	THERMAL_PUMP	-			
33	DE_PUMP	-			
34	thruster_g1	-			
35	thruster	I u	3	20	5 0

devices:(t/m/s) errs: 0/ 0/ 0 warn: 1/ 0/ 0 odd: 2/ 0/ 0

Type `use` to see all devices installed in `autoexec.mi`

Installed Devices

```

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
[I Installed] [- Not_Installed]
[u In_use] [- Not_In_use] [X out_of_service]
limits stats (#total/#mission/#segment)

```

```

0   simdrv -
1   test_driver -
2   ARGOS* I u -1 20 5 0
3   WATCHDOG I u -1 -1 -1 0
4   DEADMAN I u -1 20 5 0
5   CONSOLE* I u -1 20 5 0
6   GPS I u -1 20 5 0
7   pinger -
8   attitude -
9   attitude_tcm3 -
10  attitude_rev I u 3 20 5 0 [ 0 0 0] [ 1 0 0] [ 0 0 0]
11  ocean_pressure I u 3 20 5 0
12  vacuum I u 3 20 5 0
13  battery I u 3 20 5 0
14  lithium_battery -
15  air_pump I u 3 20 5 0
16  pitch_motor I u 3 20 5 0
17  science_super I u 3 20 5 0
18  roll_motor -
19  fpitch_pump -
20  fin_motor -
21  digifin I u 3 20 5 0
22  altimeter I u 3 20 5 0
23  ctd -
24  IRIDIUM* I u -1 20 5 0 [ 0 0 0] [ 0 0 0] [ 2 0 0]
25  leakdetect I u 3 20 5 0
26  recovery I u 3 20 5 0
27  coulomb I u 3 20 5 0
28  veh_temp I u 3 20 5 0
29  BUOYANCY_PUMP I u 3 20 3 0
30  THERMAL_ACC_PRE -
31  THERMAL_ENGINE -
32  THERMAL_PUMP -
33  DE_PUMP -
34  thruster_g1 -
35  thruster I u 3 20 5 0
devices:(t/m/s) errs: 0/ 0/ 0 warn: 1/ 0/ 0 odd: 2/ 0/ 0

```

Type use - sensor_name to temporarily remove devices

Type use + sensor_name to reinstall devices that have been taken out of service

Type use all or use none to install or remove all devices

Installed Devices

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
 [I Installed] [- Not_Installed]
 [u In_use] [- Not_In_use] [X Out_of_Service]
 limits stats (#total/#mission/#segment)

	name			limits	stats (#total/#mission/#segment)	
0	simdrv	-				
1	test_driver	-				
2	ARGOS*	I u	-1 20	5 0		
3	WATCHDOG	I u	-1 -1	-1 0		
4	DEADMAN	I u	-1 20	5 0		
5	CONSOLE*	I u	-1 20	5 0		
6	GPS	I u	-1 20	5 0		
7	pinger	-				
8	attitude	-				
9	attitude_tcm3	-				
10	attitude_rev	I u	3 20	5 0	[0 0 0] [1 0 0] [0 0 0]	
11	ocean_pressure	I u	3 20	5 0		
12	vacuum	I u	3 20	5 0		
13	battery	I u	3 20	5 0		
14	lithium_battery	-				
15	air_pump	I u	3 20	5 0		
16	pitch_motor	I u	3 20	5 0		
17	science_super	I u	3 20	5 0		
18	roll_motor	-				
19	fpitch_pump	-				
20	fin_motor	-				
21	digifin	I u	3 20	5 0		
22	altimeter	I u	3 20	5 0		
23	ctd	-				
24	IRIDIUM*	I u	-1 20	5 0	[0 0 0] [0 0 0] [2 0 0]	
25	leakdetect	I u	3 20	5 0		
26	recovery	I u	3 20	5 0		
27	coulomb	I u	3 20	5 0		
28	veh_temp	I u	3 20	5 0		
29	BUOYANCY_PUMP	I u	3 20	3 0		
30	THERMAL_ACC_PRE	-				
31	THERMAL_ENGINE	-				
32	THERMAL_PUMP	-				
33	DE_PUMP	-				
34	thruster_g1	-				
35	thruster	I u	3 20	5 0		
devices:(t/m/s)		errs:	0/ 0/	0 warn:	1/ 0/ 0 odd:	2/ 0/ 0

Total # of errors

of errors in segment

[0 0 0]

of errors in mission

Installed Devices

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
 [I Installed] [- Not_Installed]
 [u In_use] [- Not_In_use] [X Out_of_Service]
 limits stats (#total/#mission/#segment)

	name			limits	stats (#total/#mission/#segment)	
0	simdrv	-				
1	test_driver	-				
2	ARGOS*	I u	-1 20	5 0		
3	WATCHDOG	I u	-1 -1	-1 0		
4	DEADMAN	I u	-1 20	5 0		
5	CONSOLE*	I u	-1 20	5 0		
6	GPS	I u	-1 20	5 0		
7	pinger	-				
8	attitude	-				
9	attitude_tcm3	-				
10	attitude_rev	I u	3 20	5 0	[0 0 0] [1 0 0] [0 0 0]	
11	ocean_pressure	I u	3 20	5 0		
12	vacuum	I u	3 20	5 0		
13	battery	I u	3 20	5 0		
14	lithium_battery	-				
15	air_pump	I u	3 20	5 0		
16	pitch_motor	I u	3 20	5 0		
17	science_super	I u	3 20	5 0		
18	roll_motor	-				
19	fpitch_pump	-				
20	fin_motor	-				
21	digifin	I u	3 20	5 0		
22	altimeter	I u	3 20	5 0		
23	ctd	-				
24	IRIDIUM*	I u	-1 20	5 0	[0 0 0] [0 0 0] [2 0 0]	
25	leakdetect	I u	3 20	5 0		
26	recovery	I u	3 20	5 0		
27	coulomb	I u	3 20	5 0		
28	veh_temp	I u	3 20	5 0		
29	BUOYANCY_PUMP	I u	3 20	3 0		
30	THERMAL_ACC_PRE	-				
31	THERMAL_ENGINE	-				
32	THERMAL_PUMP	-				
33	DE_PUMP	-				
34	thruster_g1	-				
35	thruster	I u	3 20	5 0		
devices:(t/m/s)		errs:	0/ 0/	0 warn:	1/ 0/ 0 odd:	2/ 0/ 0

Total # of warnings

of warnings in segment

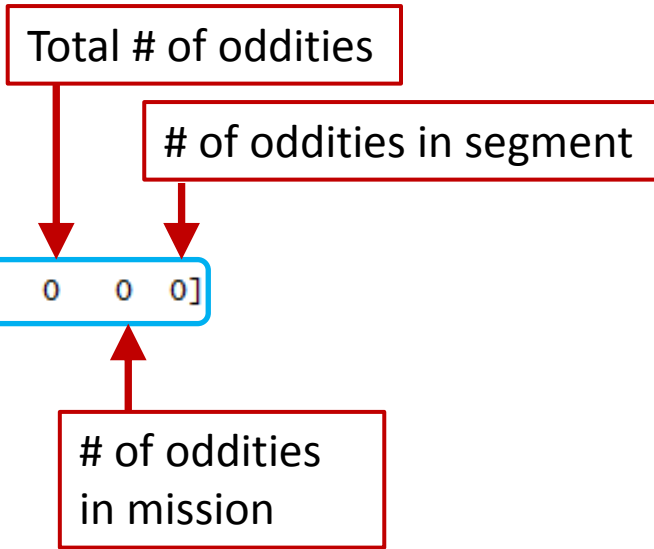
[0 0 0]

of warnings in mission

Installed Devices

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)
 [I Installed] [- Not_Installed]
 [u In_use] [- Not_In_use] [X Out_of_Service]
 limits stats (#total/#mission/#segment)

	name			limits	stats (#total/#mission/#segment)
0	simdrv	-			
1	test_driver	-			
2	ARGOS*	I u	-1 20	5 0	
3	WATCHDOG	I u	-1 -1	-1 0	
4	DEADMAN	I u	-1 20	5 0	
5	CONSOLE*	I u	-1 20	5 0	
6	GPS	I u	-1 20	5 0	
7	pinger	-			
8	attitude	-			
9	attitude_tcm3	-			
10	attitude_rev	I u	3 20	5 0	[0 0 0] [1 0 0]
11	ocean_pressure	I u	3 20	5 0	
12	vacuum	I u	3 20	5 0	
13	battery	I u	3 20	5 0	
14	lithium_battery	-			
15	air_pump	I u	3 20	5 0	
16	pitch_motor	I u	3 20	5 0	
17	science_super	I u	3 20	5 0	
18	roll_motor	-			
19	fpitch_pump	-			
20	fin_motor	-			
21	digifin	I u	3 20	5 0	
22	altimeter	I u	3 20	5 0	
23	ctd	-			
24	IRIDIUM*	I u	-1 20	5 0	[0 0 0] [0 0 0] [2 0 0]
25	leakdetect	I u	3 20	5 0	
26	recovery	I u	3 20	5 0	
27	coulomb	I u	3 20	5 0	
28	veh_temp	I u	3 20	5 0	
29	BUOYANCY_PUMP	I u	3 20	3 0	
30	THERMAL_ACC_PRE	-			
31	THERMAL_ENGINE	-			
32	THERMAL_PUMP	-			
33	DE_PUMP	-			
34	thruster_g1	-			
35	thruster	I u	3 20	5 0	
devices:(t/m/s)		errs:	0/ 0/	0 warn:	1/ 0/ 0 odd: 2/ 0/ 0



Installed Devices

name in ALLCAPS means CRITICAL device (* => SUPERCRITICAL)

[I Installed] [- Not_Installed]

[u In_use] [- Not_In_use] [X Out_of_Service]

limits stats (#total/#mission/#segment)

name

```

0   simdrv -
1   test_driver -
2   ARGOS* I u -1 20 5 0
3   WATCHDOG I u -1 -1 -1 0
4   DEADMAN I u -1 20 5 0
5   CONSOLE* I u -1 20 5 0
6   GPS I u -1 20 5 0
7   pinger -
8   attitude -
9   attitude_tcm3 -
10  attitude_rev I u 3 20 5 0 [ 0 0 0] [ 1 0 0] [ 0 0 0]
11  ocean_pressure I u 3 20 5 0
12  vacuum I u 3 20 5 0
13  battery I u 3 20 5 0
14  lithium_battery -
15  air_pump I u 3 20 5 0
16  pitch_motor I u 3 20 5 0
17  science_super I u 3 20 5 0
18  roll_motor -
19  fpitch_pump -
20  fin_motor -
21  digifin I u 3 20 5 0
22  altimeter I u 3 20 5 0
23  ctd -
24  IRIDIUM* I u -1 20 5 0 [ 0 0 0] [ 0 0 0] [ 2 0 0]
25  leakdetect I u 3 20 5 0
26  recovery I u 3 20 5 0
27  coulomb I u 3 20 5 0
28  veh_temp I u 3 20 5 0
29  BUOYANCY_PUMP I u 3 20 3 0
30  THERMAL_ACC_PRE -
31  THERMAL_ENGINE -
32  THERMAL_PUMP -
33  DE_PUMP -
34  thruster_g1 -
35  thruster I u 3 20 5 0
devices:(t/m/s) errs: 0/ 0/ 0 warn: 1/ 0/ 0 odd: 2/ 0/ 0
  
```

Can modify value of SETDEVLIMIT & SETNUMWARN to increase/decrease glider sensitivity

Testing Your New Glider

- Make sure to confirm the following:

- FreeWave comms
- Iridium comms
- Wiggle (exercise all motors)
- Science sensor output

Functional Checkout Procedure
(4095-FCP)

- Personalize your glider!

- Rename it
- Add your phone numbers
- Connect to your dockserver



Glider DOs

- Secure it properly in crate with all three straps for shipping.
- Use fresh desiccants on each deployment.
- Monitor internal vacuum before launch (less vacuum indicates a leak; positive pressure may indicate dangerous gas accumulation).
- Simulate missions before launch.
- Test Iridium and Argos telemetry before launch.

Glider DON'Ts

- Never power up a shallow glider without a vacuum.
- Never run a simulation on a glider other than “on_bench.”
- Never deploy a glider in simulation.
- Never deploy a glider in “boot pico.”
- Never exit to pico during a deployment.
- Never power on a glider with more than 15 vDC from an external power supply.
- Never deploy a glider in lab_mode.
- Never perform the top of a yo below 30 meters (with 100 or 200 meter glider).
- Never secure the glider to the cart while over railing or in the water.

Mission Commands

- `loadmission mission1.mi`
 - Sets glider sensor values found in `mission1.mi`
- `run mission2.mi`
 - Instructs glider to begin running `mission2.mi`
- `sequence mission3.mi mission4.mi mission5.mi`
 - Instructs glider to run `mission3.mi`. When `mission3.mi` completes glider will run `mission4.mi`, and when that finishes it will run `mission5.mi`

Config Directory

- config.srf
 - Customize your surface dialog
- sbdlist.dat
 - Customize content of SBD file
- tbdlist.dat
 - Customize content of TBD file
- longterm.dat
 - Customize list of sensors that are stored whenever glider powers down

config.srf

- Customize your surface dialog

```
Vehicle Name: bensim
Curr Time: Fri Jul 6 20:05:02 2012 MT:      19
DR Location: 3549.325 N -12204.651 E measured      19.808 secs ago
GPS TooFar: 69696969.000 N 69696969.000 E measured      1e+308 secs ago
GPS Invalid : 3549.325 N -12204.651 E measured      1.424 secs ago
GPS Location: 69696969.000 N 69696969.000 E measured      1e+308 secs ago
  sensor:c_wpt_lat(lat)=0                      1e+308 secs ago
  sensor:c_wpt_lon(lon)=0                      1e+308 secs ago
  sensor:m_battery(volts)=13.1215629514988      1.433 secs ago
  sensor:m_coulomb_amphr(amp-hrs)=0             1e+308 secs ago
  sensor:m_coulomb_amphr_total(amp-hrs)=0       20.004 secs ago
  sensor:m_final_water_vx(m/s)=0               1e+308 secs ago
  sensor:m_final_water_vy(m/s)=0               1e+308 secs ago
  sensor:m_iridium_signal_strength(nodim)=-1    1e+308 secs ago
  sensor:m_leakdetect_voltage(volts)=2.5        1.488 secs ago
  sensor:m_leakdetect_voltage_forward(volts)=-1 1.501 secs ago
  sensor:m_lithium_battery_relative_charge(%)=0  1e+308 secs ago
  sensor:m_tot_num_inflections(nodim)=22709     20.007 secs ago
  sensor:m_vacuum(inHg)=6.50223565323565       1.611 secs ago
  sensor:m_water_vx(m/s)=0                     1e+308 secs ago
  sensor:m_water_vy(m/s)=0                     1e+308 secs ago
  sensor:u_use_current_correction(nodim)=1     20.692 secs ago
  sensor:x_last_wpt_lat(lat)=3640.8665         19.96 secs ago
  sensor:x_last_wpt_lon(lon)=-12152.5347       19.964 secs ago
```

sbdlist.dat

Customize
content of
SBD file

c_battpos	600
c_wpt_lat	
c_wpt_lon	
m_battpos	600
m_de_oil_vol	600
m_depth	600
m_gps_lat	
m_gps_lon	
m_lat	600
m_lon	600
m_pitch	600
m_water_vx	
m_water_vy	
m_present_secs_into_mission	
m_present_time	
m_battpos	600
m_coulomb_current	600
m_coulomb_amphr_total	600
m_speed	600
x_low_power_status	300

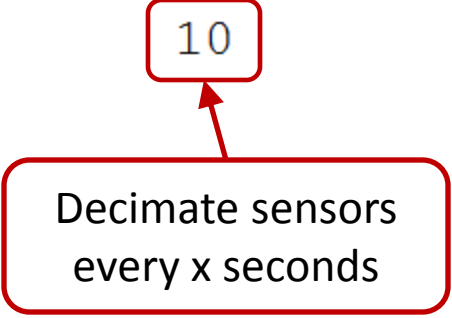
600

Decimate sensors
every x seconds

tbdlist.dat

Customize
content of
TBD file

```
|SCI_M_PRESENT_TIME  
SCI_M_PRESENT_SECS_INTO_MISSION  
SCI_WATER_COND 30  
SCI_WATER_TEMP 30  
SCI_WATER_PRESSURE 30  
sci_c3sfl_chlorophyll 10  
sci_c3sfl_phycoerythrin 10  
sci_c3sfl_turbidity 10  
sci_c3sfl_cdom 10
```



Decimate sensors
every x seconds

longterm.dat

Oil bladders/bellaframs
require replacement
every 20,000 half cycles

Glider's "fuel gauge"

```
m_avg_climb_rate  
m_avg_upward_inflection_time  
★ m_tot_num_inflections  
m_tot_horz_dist  
m_lat  
m_lon  
m_tot_ballast_pumped_energy  
m_battery  
m_iridium_call_num  
m_iridium_dialed_num  
★ m_coulomb_amphr_total  
s_water_depth_avg  
s_water_depth_delta  
s_water_depth_wavelength  
f_ocean_pressure_min  
m_avg_speed  
x_last_wpt_lat  
x_last_wpt_lon  
x_de_avg_oil_vol_ierr_on_ascent  
x_de_avg_oil_vol_ierr_on_descent  
x_hover_ballast_shallow  
x_hover_ballast_deep  
x_hover_depth_shallow  
x_hover_depth_deep
```

Customize list of
sensors that are
stored whenever
glider powers down

Mission Planning

Ballast & H-Moment

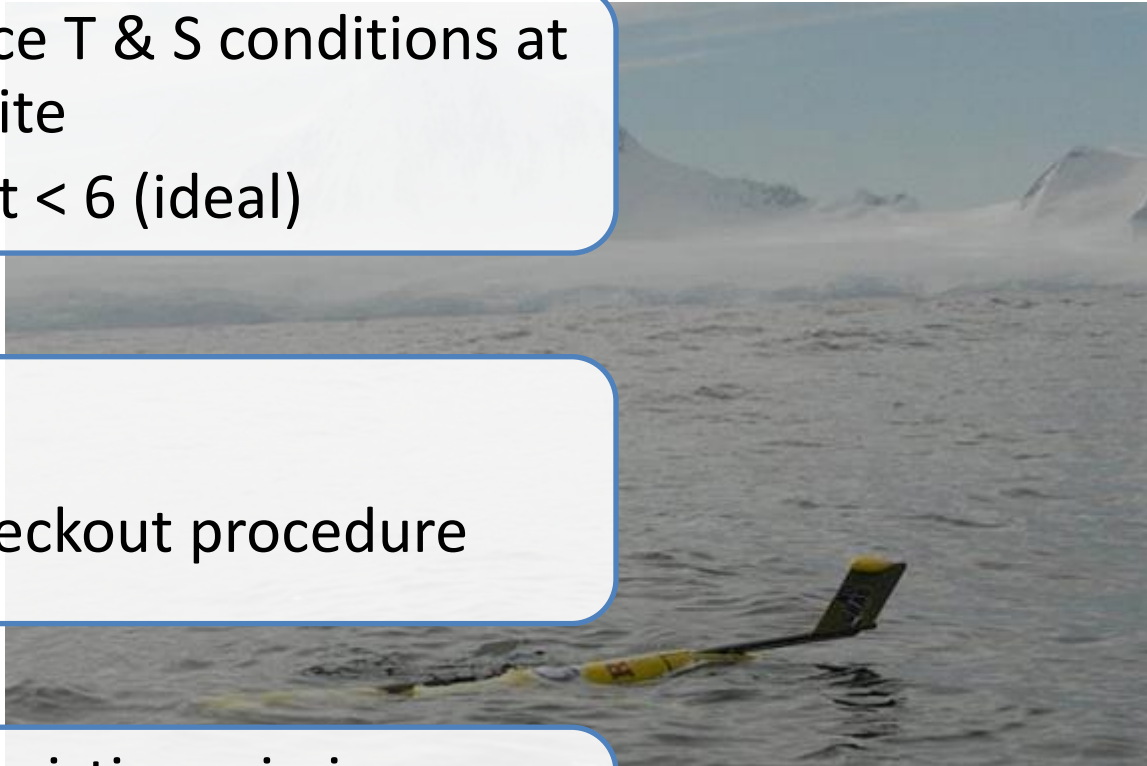
- Identify surface T & S conditions at deployment site
- $5 < \text{H-moment} < 6$ (ideal)

Testing & Functional

- Vacuum test
- Functional checkout procedure

Simulate Missions

- Easy: modify existing missions
- Harder & riskier without experience: write your own



Water Space Management

- Consider the following when planning your deployment:
 - Tides
 - Shipping lanes
 - Recreational traffic
 - Fishing grounds
 - Bathymetry & sea floor characteristics



Endurance

- Mission length
 - Power consumption
 - [Calculation tool](#)
- Sampling strategy
 - How frequently do you need science data?
- Do you need to use the altimeter?
 - Can be uninstalled in deep water
 - Remember not to overwrite altimeter settings in mission



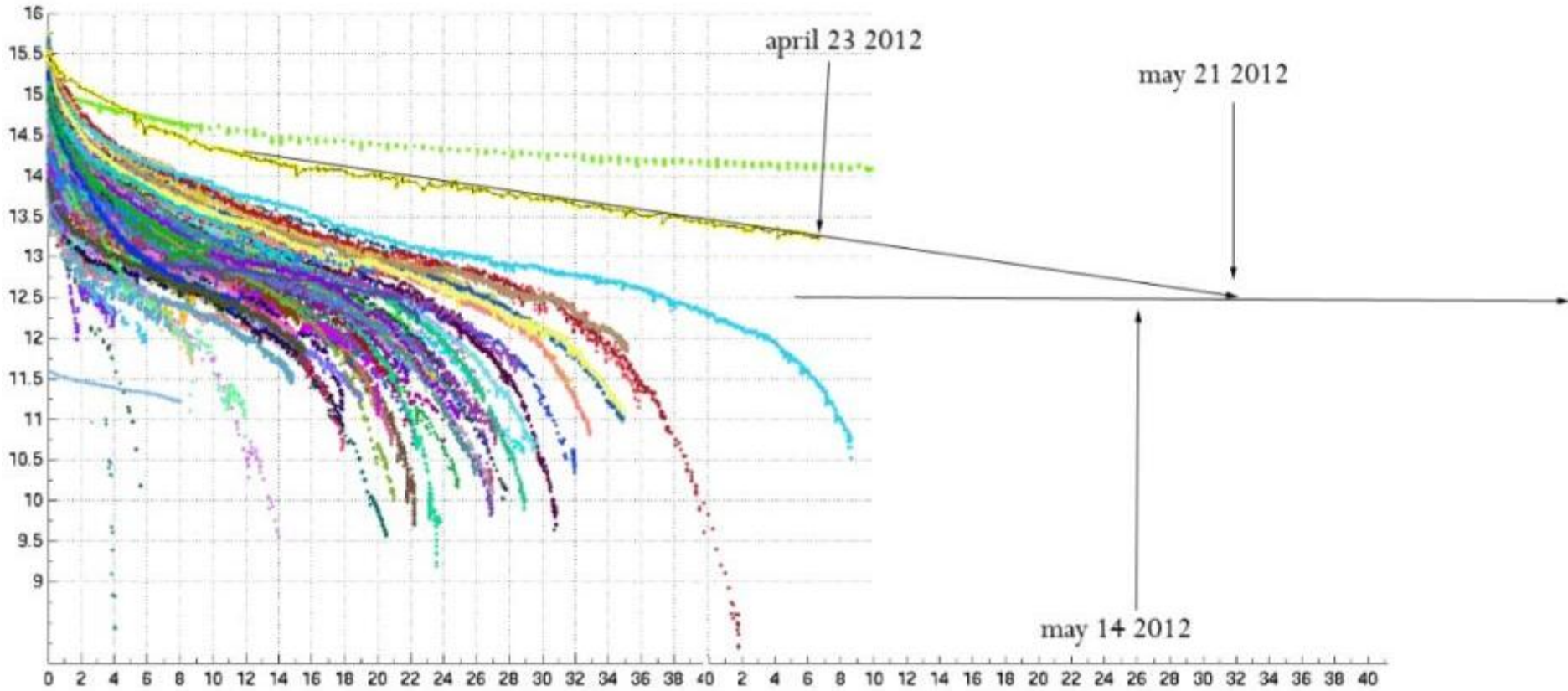
Coulomb Counter



- The coulomb counter is the glider’s “fuel tank”
- Important for lithium battery sets.
 - Lithium batteries have a nominal value of 720 amp-hrs
 - Gliders will begin aborting for low remaining energy when `m_coulomb_amphr_total` reaches 650 (10% remaining)
 - Must zero this value when batteries are replaced:

```
put m_coulomb_amphr_total 0
```

Voltage Curve



Crisis & Mission End Management

- Make sure you have answers to the following questions when it comes time to recover your glider:
 - Who?
 - Where?
 - When?
 - How?



24HR
Emergency Recovery

The Glider Aborted – Now What??

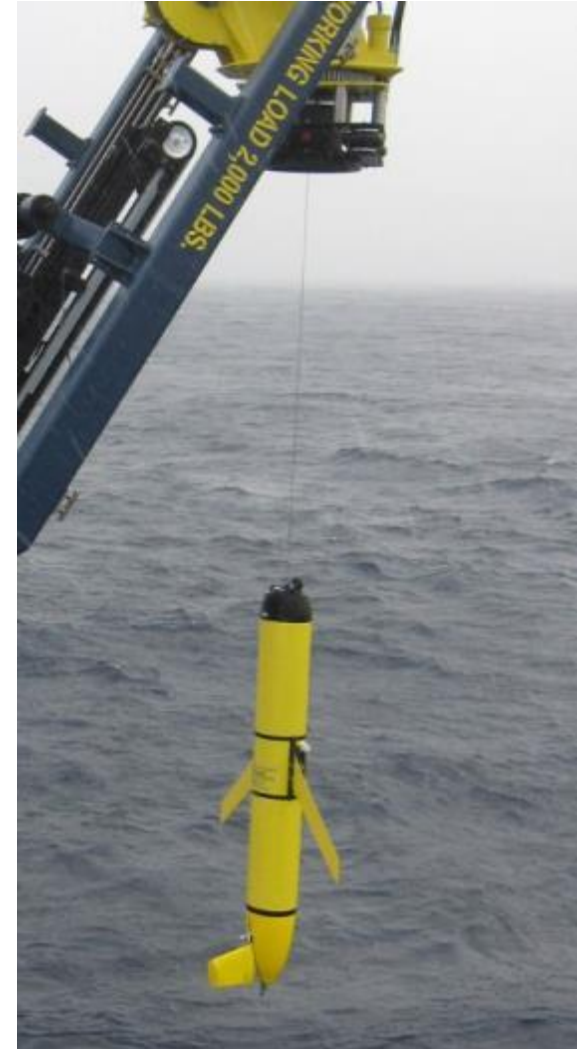
- Send the following commands to the glider:
 - `where` (prints surface dialog to screen)
 - `why?` (explains why glider aborted)
 - `use` (prints list of installed devices)
- Download the relevant MLG (maybe the DBD)
- Increase time in GliderDOS so that glider doesn't sequence into `lastgasp.mi`
- Run callback 30 script
 - Remember: GPS & Iridium share the same antenna. Only one works at a time!

<https://datahost.webbresearch.com/files.php?cwd=/glider/production/doco/how-it-works/abort-sequences.txt>

<https://datahost.webbresearch.com/viewforum.php?f=7>

Recovery

- Small boat?
- Big boat?
- Strobe on?
- Recovery system?
- GPS format on recovery boat:
is translation needed?
- ARGOS data?



Mission Writing

- Start simple!
- Modify stock.mi
 - Default mission
 - flies around 4 points in Ashumet Pond
- You will likely need to adjust:
 - max_wpt_distance
 - Surface intervals
 - No comms timeout
 - Every x minutes
 - Surfacing at every waypoint



Modify Waypoints

- The [goto l10.ma](#) file controls waypoints

```

<start:b_arg>
b_arg: num_legs_to_run(nodim) -1 # loop
b_arg: start_when(enum) 0 # BAW_IMMEDIATELY
b_arg: list_stop_when(enum) 7 # BAW_WHEN_WPT_DIST
b_arg: initial_wpt(enum) -2 # closest
b_arg: num_waypoints(nodim) 4
<end:b_arg>
<start:waypoints>
-7032.0640    4138.1060
-7031.9200    4138.1090
-7031.9170    4138.0000
-7032.0610    4137.9980
<end:waypoints>
  
```



Modify Dive Characteristics

- The [yo10.ma](#) file controls:
 - Dive to depth
 - must be less than max working depth
 - Climb to depth
 - must be shallower than 30m for piston-driven gliders
 - Inflecting at depths deeper than 30m will cause mission to abort (preventing damage to hardware)
 - Altitude
 - 6m off bottom for piston-driven gliders
 - 15m off bottom for oil-driven gliders

Science Sensors

- The “clothesline”
 - Communication between the Flight & Science persistors
- Specify sampling scheme in [sampleXX.ma](#) files
 - state_to_sample (diving, climbing, hovering, on sfc)
 - intersample_time (# seconds between measurements)
 - nth_yo_to_sample (sample only nth yo after 1st yo)
 - intersample_depth (# meters between measurements)
 - min_depth
 - max_depth



Simulation

- Three different types of simulator are available
 - Pocket Simulator (just a persistor, all electronics and motors are simulated)
 - Shoebox Simulator (persistor & mainboard, all motors are simulated; can be connected to a science board)
 - Full glider (all motors & electronics are used, some sensors simulated)

simul.sim

- simul.sim file controls the type of simulation
- This file must be placed in the flight config directory with the appropriate text:
 - no_electronics (pocket simulator)
 - just_electronics (shoebox simulator)
 - on_bench (full glider)

loadsim.mi

- Set your variables in this file (sensors with prefix “s_”)
- loadmission loadsim.mi

```
sensor: s_ini_lat(deg) 4138.1060          # Ashumet pond
sensor: s_ini_lon(deg) -7032.0640        # Ashumet pond

sensor: s_water_depth_avg(m)            200.0 #master data default is 30
sensor: s_water_depth_delta(m)          0.0
sensor: s_water_depth_wavelength(m)    100.0

sensor: s_wind_speed(m/s)               9.0   # how fast the wind is blowing,
                                             # 3.0 ==> 5.4 knots
sensor: s_wind_direction(rad) 0.0        # Direction wind is blowing FROM

sensor: s_water_speed(m/s)              0.05  # Current speed, 0.5 ==> 1knot
sensor: s_water_direction(rad) 4.712     # direction current is going TO,
                                             # toward the west
```


Tips for Simulating

- You can modify autoexec.mi for simulation
 - Change the name? (unit_XXX_sim)
 - Uninstall iridium?
- For pocket simulators, set the time & date

Note Regarding Qualified Personnel

- Only trained and qualified personnel should operate and maintain the glider.
- Teledyne Webb Research conducts regular training sessions several times a year. Glider users should attend a training session and understand basic glider concepts and terminology.
- Contact glidersupport@teledyne.com for information regarding training sessions.
- Company policy is to fully support only properly trained individuals and groups.
- Only personnel who have attended a Teledyne Webb Research training session should use this document

Thank You!

- We would like to thank you for attending this training session and look forward to assisting you as you deploy your gliders!
- Glider Support Team (glidersupport@teledyne.com)
 - Ben Allsup (ben.allsup@teledyne.com)
 - Chris DeCollibus (chris.decollibus@teledyne.com)
 - John Dingess (john.dingess@teledyne.com)
 - A player to be named later
 - Draft pick 2015

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Teledyne Webb Research
49 Edgerton Drive, North Falmouth, MA 02556
www.webbresearch.com