FLIGHT CONTROL SYSTEM

User Manuel

1. REVISION HISTORY

Revision	Date	Author	Information
1	24/08/2020	Morgan Guillou	Creation
2	09/02/2021	Morgan Guillou	Add connectorised braid to system
3	17/08/2022	Corentin JEGAT	Add Maintenance-Parameters section

2. PREFACE

The TF35 is a hydrofoil catamaran being able to take off in very light wind conditions and once flying, it can be controlled in winds above 30 knots.

The TF35 is a boat accessible to either professional sailors nor experienced amateurs. Its electronic flap control system ensures as much stability as possible while flying.

This document aims information and crucial recommendations to the discovery and use of the TF35 flight control system.
The whole functioning instructions and recommendations make best use of the system control in pitch and altitude. It's strongly recommended to carefully read them.

The descriptions and figures are not binding. Technical specifications, equipment and accessories may be modified by the supplier.

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4. VOCABULARY

Trim: This is defined as the boat's longitudinal inclination.

Pitch: this is a rotational movement around the transverse axis.

Incidence angle: or angle of attack is the angle between the reference chord of the profile of the carrier plane, and the longitudinal velocity vector.

5. BOARD INSTRUMENTS

5.1 *Controller keypad*

This control keypad communicates with the Exocet Gold via the J1939 protocol, it allows the user to turn on the autopilot, change the altitude and trim targets of the flight control system.

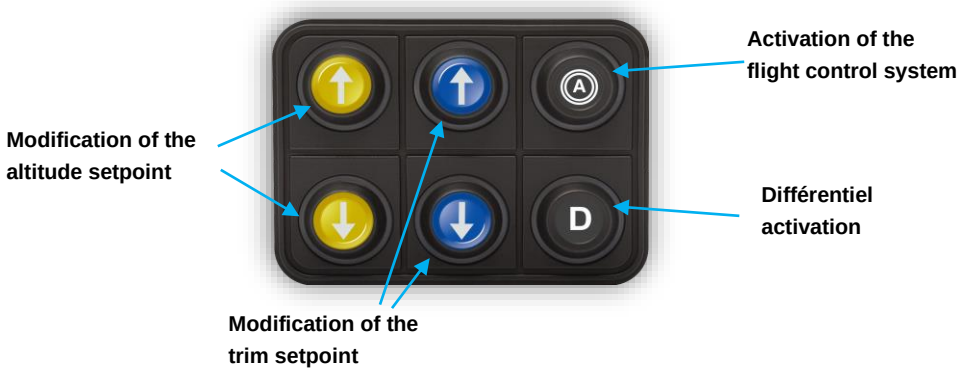
It has 6 keys with the following functions :

Altitude target plus and minus

Trim target plus and minus

Control system start button

Partial rudder differential activation button (see chapter **Erreur ! Source du renvoi introuvable.** page **Erreur !**



Signet non défini.)

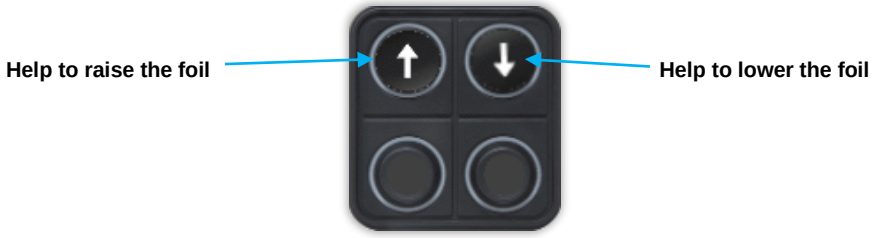
Before switching to automatic mode, it is imperative to perform a global self-test. See section Erreur ! Source du renvoi introuvable.

5.2 *Foil management keypad*

During the manoeuvres, the lowered and raised aid facilitates their movements.

When the foil is in the up position, by pressing the "Down" button, the flap is positioned at -5° for 15 seconds. Similarly, when the foil is in the lowered position, pressing the "Up" button positions the flap at +9° for 10 seconds.

If the foil is already in the down position and the " Down " button is pressed, then the shutter is repositioned at -5° for 2 seconds. Similarly, when the " Up " button is pressed, the shutter is repositioned at +9° for 2 seconds.



5.3 Flight Data Display

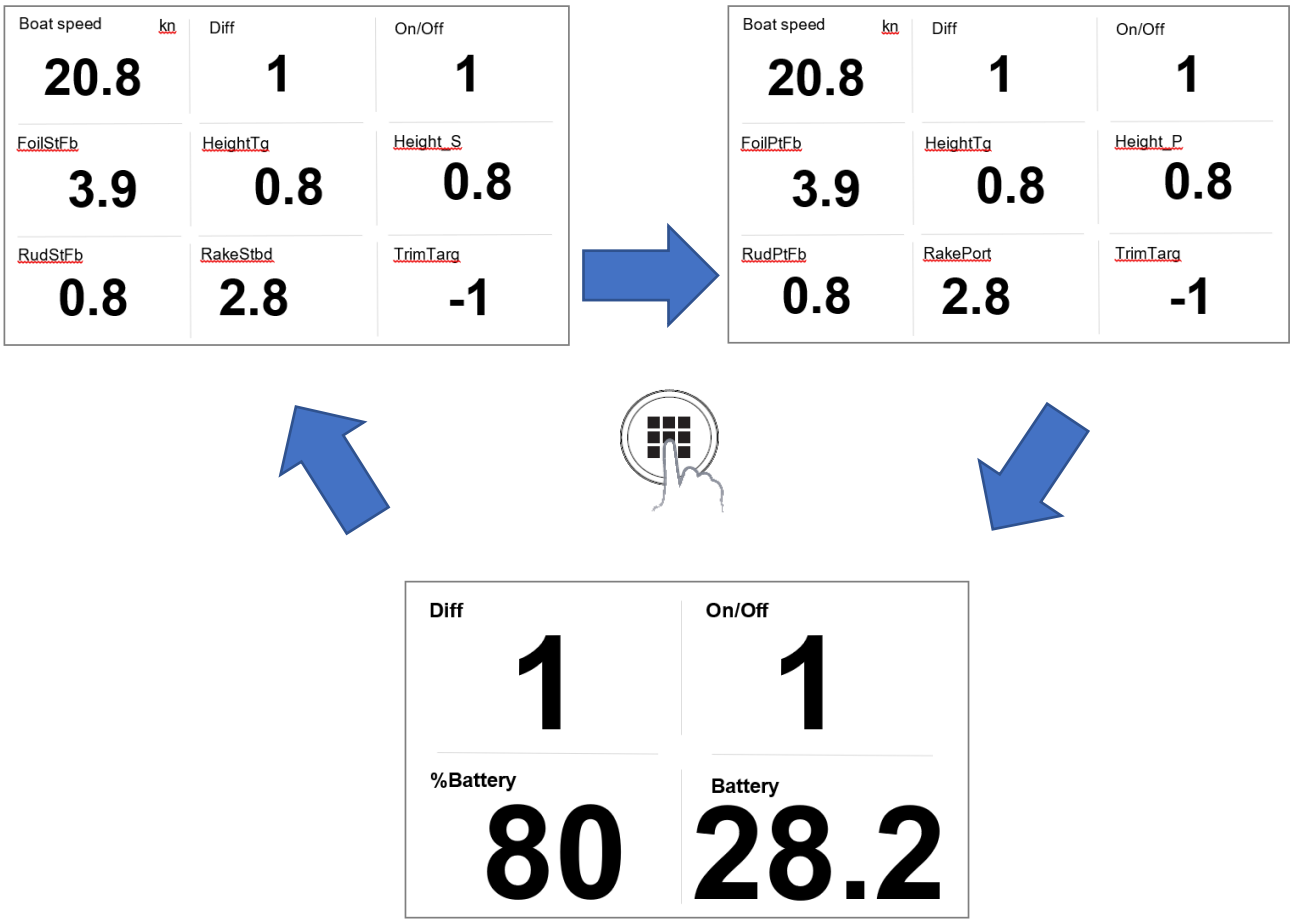
- Default pages

The display shows information about the flight control system. The available data are :

Function	Menu	Name in the menu	Dis	Unité	Commentaire
Control Mode	User	ControlMode	On/Off	NA	0= Off, 1 = On
Differential	User	Differential	Diff	NA	0= Off, 1 = On
Battery voltage	User	Battery Voltage	Vbatt_v	Volt	
Battery percent	User	Battery Percent	Vbatt_p	Pourcentage	
Height target	User	Height Target	HeightTg	Mètre	
Trim target	User	Trim Target	TrimTarg	Degrés	
Port hull height	User	Height_Port	Height_P	Mètre	
Staboard hull height	User	Height_Starboard	Height_S	Mètre	
Port foil attack angle	User	Rake_Port	RakePort	Degrés	
Starboard foil attack angle	User	Rake_Starboard	RakeStbd	Degrés	
Port rudder flap angle target	User	Rud Stbd Target	RudStTg	Degrés	
Starboard rudder flap angle target	User	Rud Port Target	RudPtTg	Degrés	
Port foil flap angle target	User	Foil Stbd Target	FoilStTg	Degrés	
Starboard foil flap angle target	User	Foil Port Target	FoilPtTg	Degrés	
Port rudder flap angle feedback	User	Rud Stbd FB	RudStFb	Degrés	
Starboard rudder flap angle feedback	User	Rud Port FB	RudPtFb	Degrés	
Port foil flap angle feedback	User	Foil Stbd FB	FoilStFb	Degrés	
Starboard foil flap angle feedback	User	Foil Port FB	FoilPtFb	Degrés	
Trim angle feedback	Vessel	Trim Angle	Trim	Degrés	
Heel angle	Vessel	Heel Angle	Heel	Degrés	
Speed over ground	Speed/Depth	Speed Over Ground	SOG	Noeud	
Heading	Vessel	Heading	Hdg	Degrés	

- Pages configuration

Data pages transition :



It is possible to replace a data in a page by another one, here is the procedure:

1 From a data page, press Menu

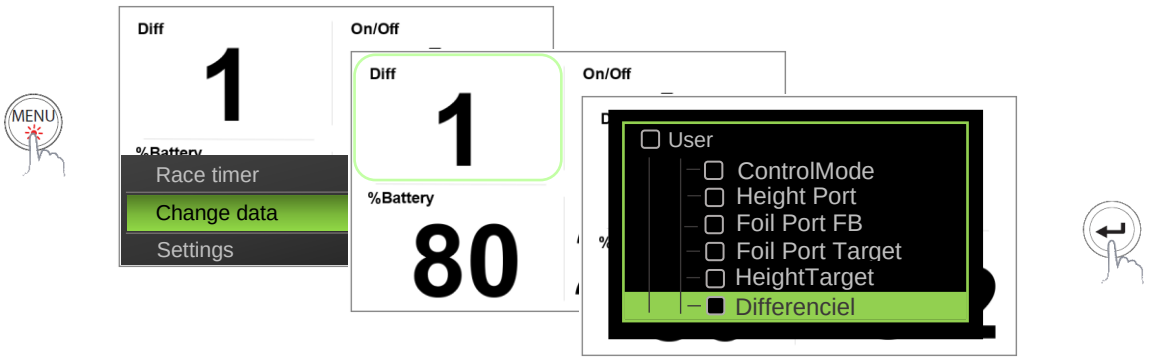
2 Select Change data

3 Select the data that you want to change and press Enter.

4 Scroll with the up and down arrow buttons to select the new data.

5 Press Enter to confirm the entry and exit the selection menu.

6 Press Page to exit the data change function.



It is also possible to activate, deactivate or replace one page with another. To do so, please refer to the B&G manual: http://downloads.bandg.com/

5.4 Dashboards

Since the data available on the displays is limited to a certain number, it can be difficult to monitor all the information necessary for the proper functioning of the system by this means alone. The Exocet Gold has a well-designed and compact instrument panel allowing a quick analysis of the boat's entire flight control system.

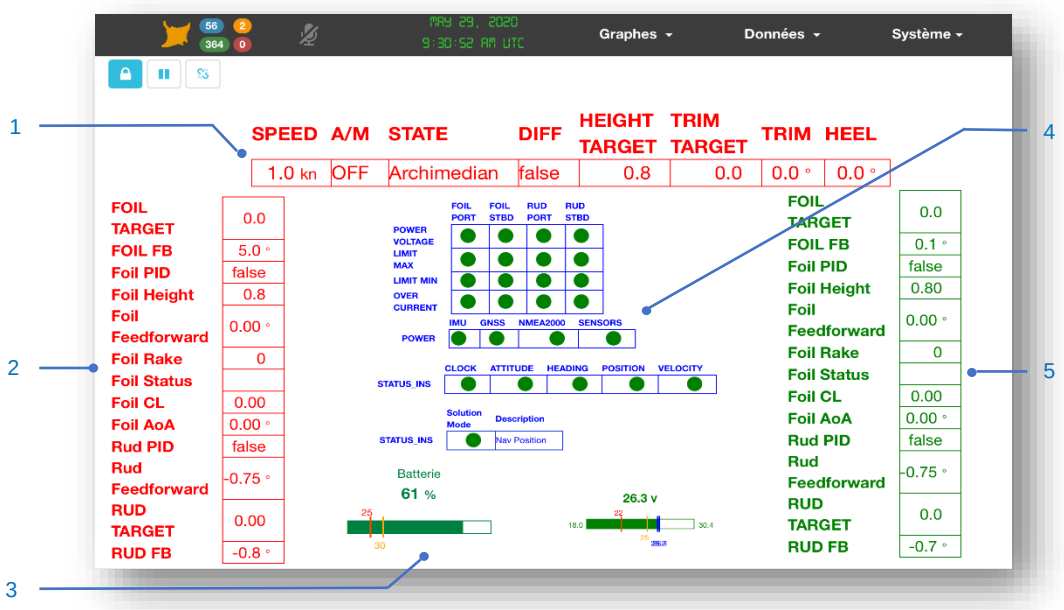
It is strongly recommended to have a tablet to visualize this data and to have a global view of the flight control system.

To access this dashboard you must establish a wifi connection between your tablet or computer and the control system. You can refer to the paragraph 6.6 page 11 to establish a wifi connection.

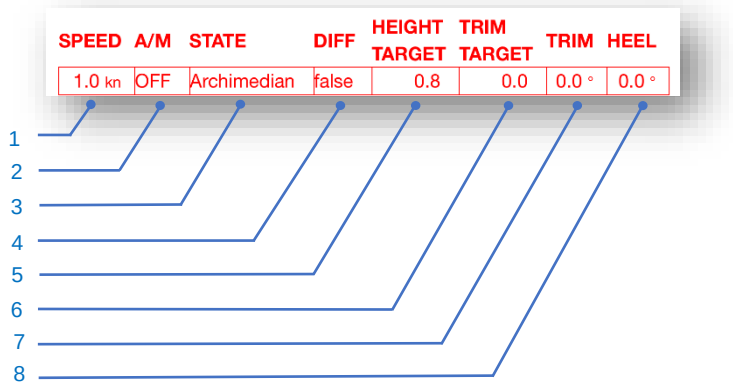
When the connection is established, open a web browser and enter the following address :

http://192.168.201.35/

Open the **DATA** menu and select the **FOILING_CONTROL** dashboard.



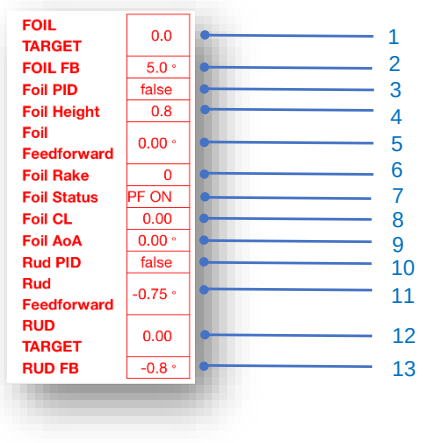
1- Dashboard of the general state of the servo system



No.	Description
1	Speed Over Ground
2	Flight control system On
3	Indicates the status of the boat (Archimedian or flying)
4	Indicates whether the rudder differential is active.
5	Indicates user altitude setpoint
6	Rudder blade angle target
7	Trim of the boat

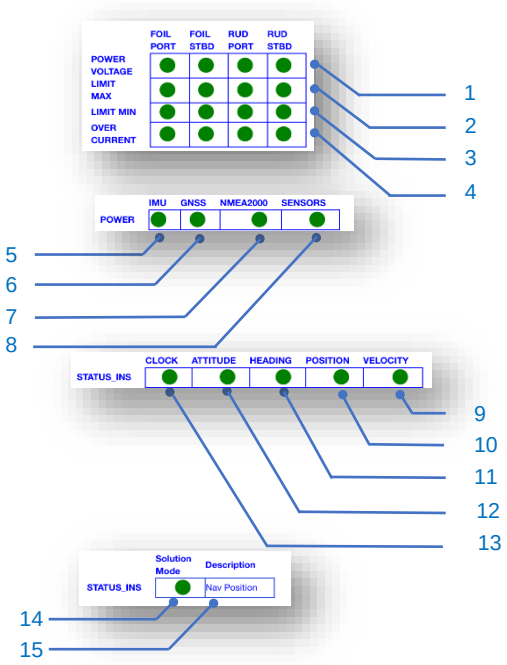
8	Heel of the boat

2- Array of the foil and rudder control



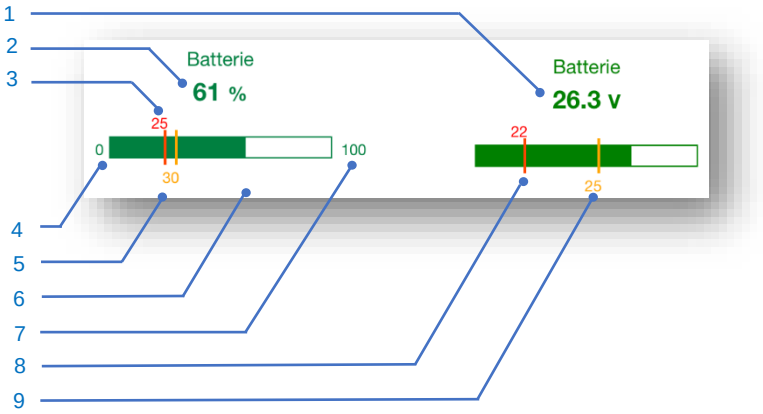
No.	Description
1	Foil flap angle set point
2	Measuring the angle of the foil flap
3	Indicates whether the foil PID control is on or off.
4	Height of the hull at the level of the foil recess in relation to the water
5	Theoretical flap angle given by the ship model
6	Angle of the foil in relation to the hull of the boat
7	Foil status (high or low position, up or down, ...)
8	Foil coefficient of lift
9	Angle of attack of the foil with respect to the water surface
10	Indicates whether the PID control of the rudder is on or off.
11	Rudder flap angle assistance
12	Rudder flap angle setpoint
13	Measuring rudder flap angle

3- Status array of the servo drive and the inertial control unit



No.	Description
1	Status indicating the presence of servo power voltage
2	Status indicating whether the flap is above the maximum limit
3	Status indicating whether the component is below the minimum limit
4	Status indicating whether the servo control fuse is tripped
5	Status indicating the presence of the INS power supply
6	Status indicating the presence of GNSS power supply
7	Status indicating the presence of NMEA2000 power supply
8	Status indicating presence of sensor power supply
9	Status indicating the correct operation of the GNSS clock
10	Status indicating the proper functioning of the INS attitude
11	Status indicating the correct operation of the compass heading INS
12	Status indicating good consistency of GNSS position data
13	Status indicating good consistency of speed data on 3 axes
14 et 15	● None Initialized (uninitialized INS)
	● Vertical Gyro (Functional trim and heel)
	● AHRS (Functional compass attitude and heading)
	● Nav Velocity (Attitude and heading compass and speeds on 3 axes are functional)
	● Nav Position (absolute GNSS position, all data are calculated)

4- State of the battery



No.	Description
1	Battery voltage
2	Battery percentage
3	Percentage alarm threshold
4	Minimum percentage
5	Low Percentage" Alert Thresholds
6	Battery percentage bar graph
7	Maximum percentage
8	Voltage threshold of the "low voltage" alarm
9	Voltage threshold of the "low voltage" alert

5.5 Mobile pages dashboard

Navigation data can also be displayed on the mobile pages. To access the mobile pages, you must establish a wireless connection between your phone and the control system. You can refer to the section 6.6 page 11 to establish a wifi connection.

When the connection is established, open a web browser on your phone and enter the following address :

http://192.168.201.35/

There are two pages that allow you to find the main data according to the navigation edge as well as a general page that displays the main data of the system.

These pages can be viewed as follows:

6. HARDWARE OF THE FLIGHT CONTROL SYSTEM

6.1 Actuator

There are two types of actuator on the TF35, the foil actuator and the rudder actuator. These are jacks that use an electric motor driving a rod through a screw and nut system.

These jacks are positioned above the foil and rudder. They control the flaps of the bearing planes by means of a rod which circulates freely in a tube mounted inside the daggerboard.

A potentiometric sensor inside the cylinder measures the position of the rod extension.

6.2 Exocet Red

The exocet Red is a servo-control that transforms the angle targat from the autopilot into electric control of the actuator motors.

The actuator feedback sensor is connected to the Exocet Red in order to continuously check the flap angle.

A cylinder position calibration must be performed to convert a cylinder rod output position into a flap angle. This calibration is described in chapter **Erreur ! Source du renvoi introuvable.** page **Erreur ! Signet non défini.**.

The function of the Exocet Red is to maintain a shutter angle set point. As the command is issued by the autopilot, the flap position is corrected according to the measurement of the actuator position. A PID control allows the flaps to be servo-controlled in position.

6.3 Altimeter

The altimeter measurement is divided into two parts : a sensor part and a data processing part. The data is provided by the Exocet Gold.

The altimeter sensor is an instrument used to measure the boat's altitude above the water by measuring the time it takes for the sound waves to return to the sensor after water reflection.

The sensor is installed in a through-hull grommet positioned at the rear of the central hull.

6.4 Inertial unit

The inertial unit is divided into two distinct parts:

1. The inertial unit which is positioned in the electronic box.
2. The two GNSS antennas that are installed on the aftbeam of the vessel.

The position of these elements are used in the calculation of the inertial data, consequently the position of the elements constituting the inertial power unit is fixed and cannot be moved in any case, the quality of the flight depends on it.

The inertial unit includes accelerometers and gyroscopes based on MEMS (Micro-Electro Mechanical System) technology to provide raw inertial data such as accelerations and rotation rates on 3 axes. Associated with a GNSS compass, these data are merged using a Kalman filter to provide orientation data: heading, heel, attitude, yaw, heave, and position.

The raw inertial data as well as the orientation data are used to compensate for the sensor's forward speeds on the 3 axes.

6.5 Exocet Gold

The Exocet Gold is the flight control computer of the TF35.

To carry out this function it collects data from different sensors:

- Height of the boat on port and starboard
- Position of foil and rudder flaps
- Foils status : Board on, off, up or down…
- Speed over ground, pitch attitude, speed X, Y, Z, acceleration X, Y, Z, rotation X, Y, Z of the inertial unit
- The angle of the foils in relation to the hull
- The upper and lower limits of the flaps and rudders
- Height and trim user settings

It calculates in real time the foil and rudder flaps angles settings and send them to the Exocets Red.

It exports the useful data from the sensors or the result of the calculations to the displays, the various instrument panels or to an UDP port to supply the navigation system, on the NMEA2000 bus.

6.6 WiFi connexion

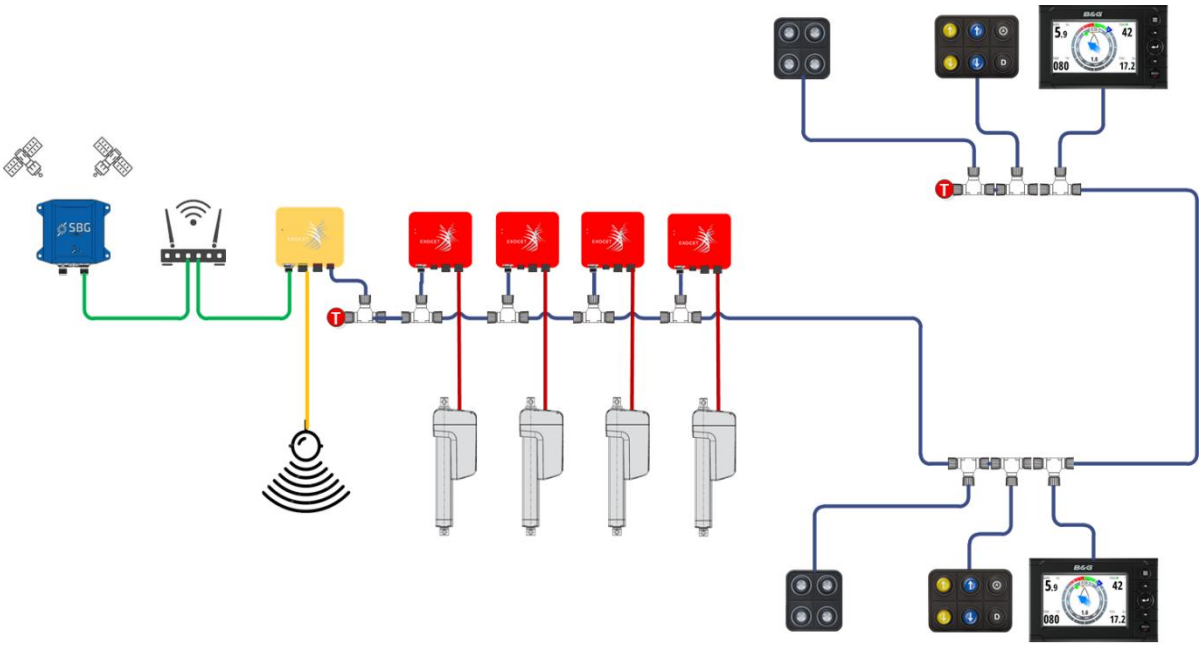
A WIFI access point allows to connect a tablet or computer to the flight control system instrument dashboards, the foil and rudder flaps calibrations and the general self-test instrument panel.

The default settings for the WiFi network are:

WIFI SSID : **TF35-X** (X est le numéro de fabrication du bateau : 0, 1, 2, 3)

The WiFi password is displayed on the serial number label of the "fridge".

6.7 Schematic :



7. PRINCIPLE OF THE TF35 FLIGHT CONTROL SYSTEM

The control software of the TF35 is composed of several distinct interconnected entities. We can distinguish:

- Collection of sensor data
- Calculation of port and starboard hull heights
- A PID control of the boat's altitude
- A model of the boat for altitude control
- A PID trim regulator for the vessel
- An appendix and inertial unit status manager

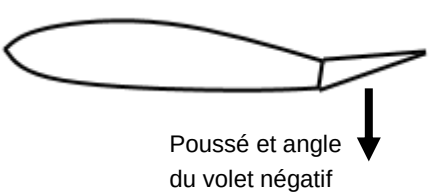
The autopilot has two ways of operation:

The archimedean mode and the flying mode. Between these two modes there is a short transition phase which is called the take-off phase.

In flying mode the flap of the foils and rudders are fully slaved by the altitude and trim controller. While in Archimedean mode the servo control is stopped. The flaps of the appendages are then positioned statically, according to speed for the foils or according to altitude and speed for the rudders.

The theoretical take-off point is around 14 knots. Below this value the boat is in archimedean mode.

Regardless of the operating mode, the use of the manoeuvre management keypads positions the foil flaps at angles to assist the drop or rise of the foils during manoeuvres. However, the use of these keypads has no influence on the rudder flap angles.



Poussé et angle
du volet négatif

Poussé et angle
du volet positif

7.1 Flap foils management

In order to limit the drag of the foils in Archimedean mode the flaps are positioned at zero, then above 9 knots they are slightly positive in order to create a little vertical lift to help accelerate the boat by lifting the boat.
When the boat is at take-off speed the flaps are lowered significantly to force take-off. At the same time the altitude controller is activated and will take control of the flaps. If the boat is not flying above the takeoff point, the controller will force the takeoff by lowering the flaps step by step.

The angle values are described in the following table:

	Speed		
Speed	0 – 9kn	9 – 13,5kn	13,5 - ∞
Foil flap	0°	2°	auto
Rising button	5°	5°	5°
Drop button	-9°	-9°	-9°

A correction of the flight controller's angle setpoints according to the boat's speed is taken into account in order to reduce these angles when the speed increases.

7.2 Flap rudder management

In Archimedean mode the rudder flap angle depends on the altitude as well as the boat speed. At low speed the angles are neutral to limit drag. When the boat speed approaches the take-off speed, the rudder flaps are positioned around -1.5° to allow the bow to be lifted.

When the boat is in flying mode, then the trim controller automatically manages the rudder flap angle. These calculated angles are also dependent on the boat speed but completely independent of the height control of the foils.

The windward rudder actuator receives the same angle order as the leeward one, which under certain conditions can be harmful by causing the heel to increase. To counteract this effect, it is possible to disable the boat's trim control from the windward rudder using the "Diff" button on the servo control keypad. The rudder position will then be set to zero.

7.3 Height calculation

The sensor measures the height at the back of the center hull. The flight controller performs calculations for heel compensation, boat trim, bad wave reflections and repositioning of the measurement between the leeward boat hull at the foil embedment and the water surface.

7.4 Status manager

This function reports in real time the status of the battery, inertial unit and servo motors.
These statuses are visible on the FOILING_CONTROL page. This page is described in chapter 5.4. The statuses are displayed in the form of a green or red dot. They are representative of the general status of the system. If a status is in red, it will not be possible to fully use all the functions of the flight controller.
Case of non-operation :

- Low battery that goes below 22 volt. The controller is stopped.
- Controller are stopped if they are in error for low voltage or not present.
- Too high current of the motors

Before starting the autotest, it is useful to check that the inertial control unit is correctly initialized by verifying that statuses are all green. In fact, launching the autotest immediately after powering on the system does not allow the inertial unit to completely stall and would make the autotest fail.

8. BATTERY AND CHARGE

The battery of the TF35 is a 24v lithium-ion battery. Unlike lead batteries, lithium-ion is a low-maintenance battery. No need of full charge or discharge cycles. But it does not tolerate very low discharges.

To prevent damage to the battery, the height and trim controls are disabled when the battery voltage drops below 22v.

An ultimate internal battery protection cuts the battery output voltage if the voltage drops below 20v. The batteries must then be recharged as soon as possible to not damage them.

Recharging a battery

Take the battery out of the boat and put it in a ventilated place to recharge it.

First connect the battery to the Mascot Charger, then connect the 220v plug to the mains.

The time to fully charge a battery is about five hours.

Meaning of the charge indicator :

Battery charged

No battery

Error

Charge finishing

Charging

9. SECURITY

9.1 General Autotest

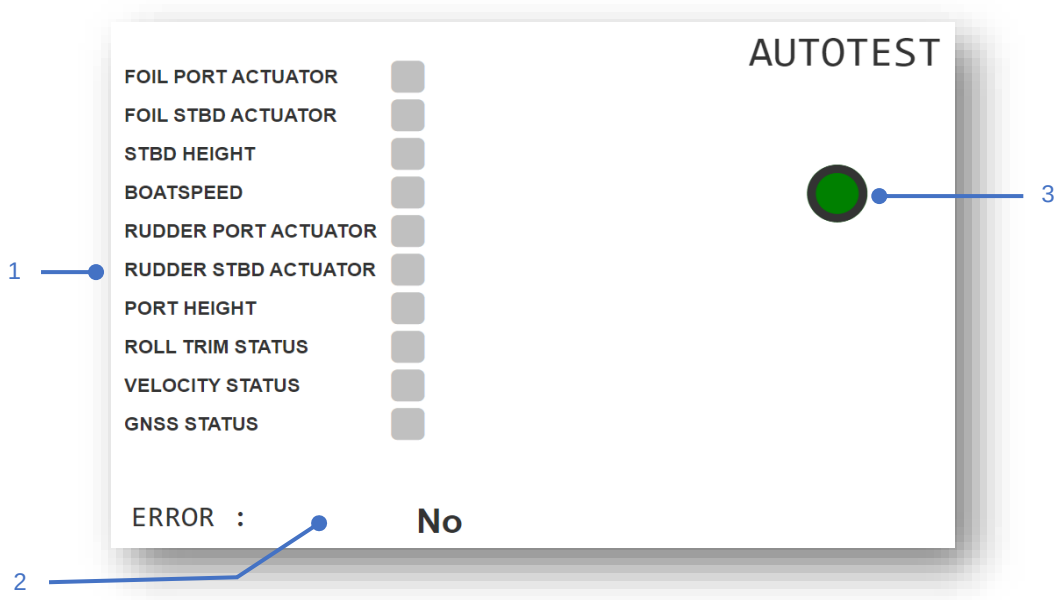
The Autotest is used to check the correct operation of the jacks, altimeters and inertial sensors. It is imperative to launch it early enough before navigation in order to prevent a sensor or ram failure.

The general Autotest is done using a dashboard, to access this dashboard you must establish a wifi connection between your tablet or computer and the control system. You can refer to the paragraph 6.6 page 11 to establish a wifi connection.

When the connection is established, open a web browser and enter the following address:

http://192.168.201.35/

Open the **DATA** menu and select the **AUTOTEST** instrument panel.



The self-test verifies the integrity of certain parts of the TF35 flight control system.

This test can only be done with the boat stopped (bottom speed less than 3 knots), either in the water at the dock or on a boat on bers.

From the dashboard, start the test by pressing the button. To stop the test while it is running, press the same button again..

WARNING: Before starting the Autotest, make sure that nothing can prevent the rams or flap rods from moving.

The tests carried out are:

- Each ram is actuated to move to the stop furthest from the starting position and then return to zero.
- Test of the correct reception of the port and starboard height.
- Test of good reception of the speed over ground
- GNSS Status Reception Test
- Test the good reception of the status of the inertial unit.

Test status indicators can have the following statuses:

Not tested

Testing

Test ok

Test failed

Sensor tested	Reason	
Test doesn't start	Boat speed greater than 3 knots	The boat must be stop to perform the test.
Test doesn't start	Height control activated	The autopilot must be stopped to allow to be started the test.
Appendix does not move	Actuator stop	Switch to commissioning mode to unlock the actuator

Appendix does not move	Ram in mechanical stop	Switch to commissioning mode to move the cylinder to zero
Height measurement failure	Out-of-range data	The boat must be at anchor, the heel must be almost zero.
Trim measurement failure	Out-of-range data	The boat must be at docking, the heel must be almost zero.
Failure of pitch and heel measurement	Unusable data	Incorrect sensor initialization, switch the system off and on again
GNSS status measurement failure	Inconsistent or no data	Before starting the test, you must wait until the GNSS receiver has finished booting. Check the status of the INS on the Foiling Control page
Boatspeed measurement failure	No data	Before starting the test, you must wait until the GNSS receiver has finished booting. Check the status of the INS data on the Foiling Control page.

9.2 Height sensor

When the boat is being mounted or serviced on out of water, it is recommended not to walk under the sensor within a distance of two meters in diameter. The ultrasonic waves emitted by the sensor are dangerous when exposed for long periods of time.

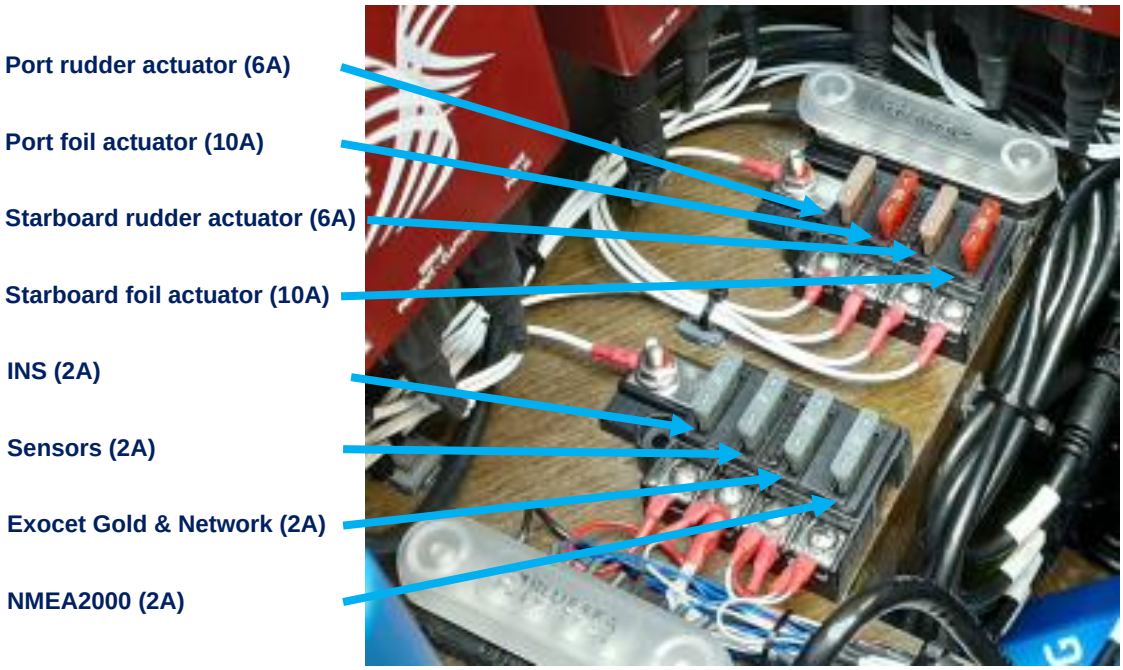
9.3 GNSS antenna

The inertial sensor uses a GNSS compass, which uses the position of the two GNSS antennas to determine the true course of the ship. This data is essential to maintain quality performance. Consequently, if the antennas are masked, the performance of the altitude control and the boat's trim control will be altered.

9.4 Fuse

There are several fuse to protect the flight control system components :

- Main fuse: It protects all the electronics. It is accessible on the outside of the electronic box.
- Battery fuse: it is on the battery pack and protects it from short circuits that could appear on the general power supply.
- Actuator power fuse: each Exocet Red has its own fuse, the foil fuses are breakers, while the rudder fuses are disposable. They are used to protect actuators in the event of the rams go over the mechanical limits. The condition of the fuse can be checked from the FOILING_CONTROL control panel. If a fuse breaks, you need to open the electronic box to reset it.



9.5 Electrostatic Discharge

In stormy weather it is obligatory to connect the four appendices and the vessel to electrical dissipation electrodes submerged under water.

10. MAINTENANCE

10.1 care of electronic

During periods of non-navigation, when the boat is at anchor, or for example when it is ashore, the flight control system must be protected against electrostatic charges accumulated in the air during storms and can be discharged onto the electronic system through the mast or appendages. Generally speaking, when the flight controller system is not powered, it is recommended to earth the boat to divert electrostatic discharges and avoid damage to the equipment.

To do this, a braid must be connected instead of the battery. This braid is stationary and is connected to the carbon of the boat, an anode must be hooked to this braid and immersed in the water when the boat is at anchor.

This link is mandatory to divert electrostatic discharges, it must be systematically installed when the electronic system is not powered and when the boat is outside.

10.2 Disassembling the electronic box

The electronic box must be removed from the boat to be winterized, for that it is enough to unscrew the four screws which are in the four corners of the box, the others allow to open the box.

Then the box must be placed on the deck, the length of the cables allows it.

Disconnect all the connectors from the box. Make sure that once the box is disconnected the connectors on the harness side and on the box side are not exposed to sea or rain water. Protect them !

10.3 Connectors maintenance

It is highly recommended to maintain the connectors.

Connectors are designed to be watertight when connected, therefore it is not recommended to leave them open unprotected. Each connector has a protective cover, use it to close each connector when a pair of connectors is disconnected.

If some passivation on the contacts appears, use an electronic dry contact spray to brush off the passivation.

10.4 Dismantling the electronic cables

Each boat is different (position of displays, keyboards, therefore it is strongly recommended to take pictures before dismantling in order to facilitate the reassembly of cables and equipment to the same level.

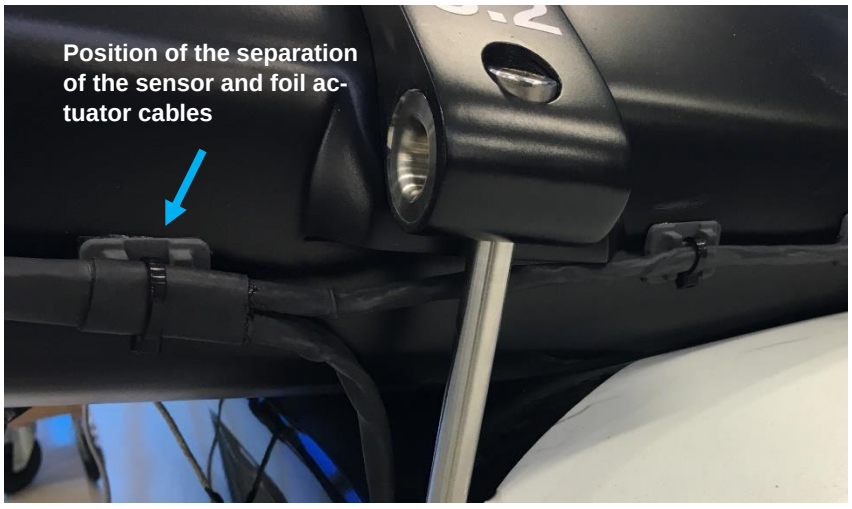
When the vessel has to be dismantled for transport or winter storage, particular attention must be paid to the servo system to ensure that it is not damaged when the hulls, arms and pod are handled.

Here is the chronological order of disassembly of the flight control system to be respected:

- Switch off the electronics.
- Remove the battery and put the plugs on the connectors.
- Disconnect and dismantle the four actuator housings. Insert the cap.
- Disconnect the foil down position sensors and the foil incidence angle sensors. Put the cap on the sensors only. Remove the plug on the third connector that is in the shells.
- Take the cables out of the hulls through the cable gland starting with the foil incidence angle and low position sensors and ending with the third cable whose connector is larger than the first two.
- Disconnect the foils management keypads. Remove the cable extension between this keypad and the display panel and the flight control keypad.
- Disconnect the display panel.
- Disconnect the GNSS antennas.
- Remove all cable clamps on the front and rear arms and on the nets.
- Wind up the cable strands and hook them to the four outlets of the central pod..

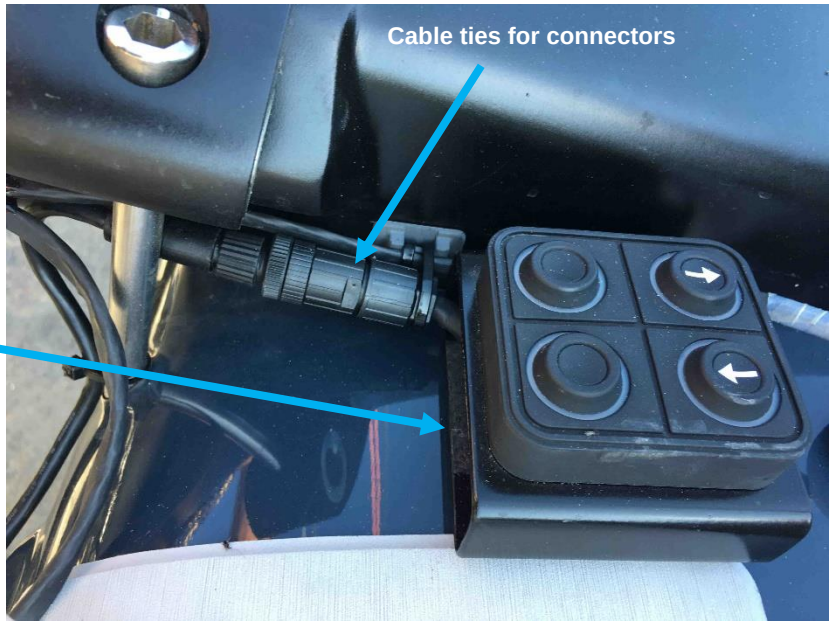
10.5 Reassembly of the electronic cables

- Pass the front cables through the drifter bracket.
- Attach the loom to the front beam as shown in the picture below.



- Lead the cables of the foil position and angle of incidence sensors through the hulls. Connect the foil position and angle of incidence sensors in the foils.

- Mount the 4 buttons keyboards



- Run the keyboards cables and the foils actuator along the beam to the point of attachment of the net. Route the keyboard cable to the rear console.

- Attach the connector to the thread as shown in the picture above.

Attach the eye of the textile sheath so that the tension of the slack is taken up by the sheath and not by the cable and connector.

Hooking of the sheath

- Check that the slack adjuster pulley is correctly positioned so that when the foil is in the down position, the cable does not rub against the 4-buttons keyboard and the beam which is on the front beam as well as the cable from the 4-buttons keyboard which is hooked to the net and goes to the rear console.

- Pass the foil rope extension through the two opening pulleys. Connect the cable to the cylinder and secure it with clamps.

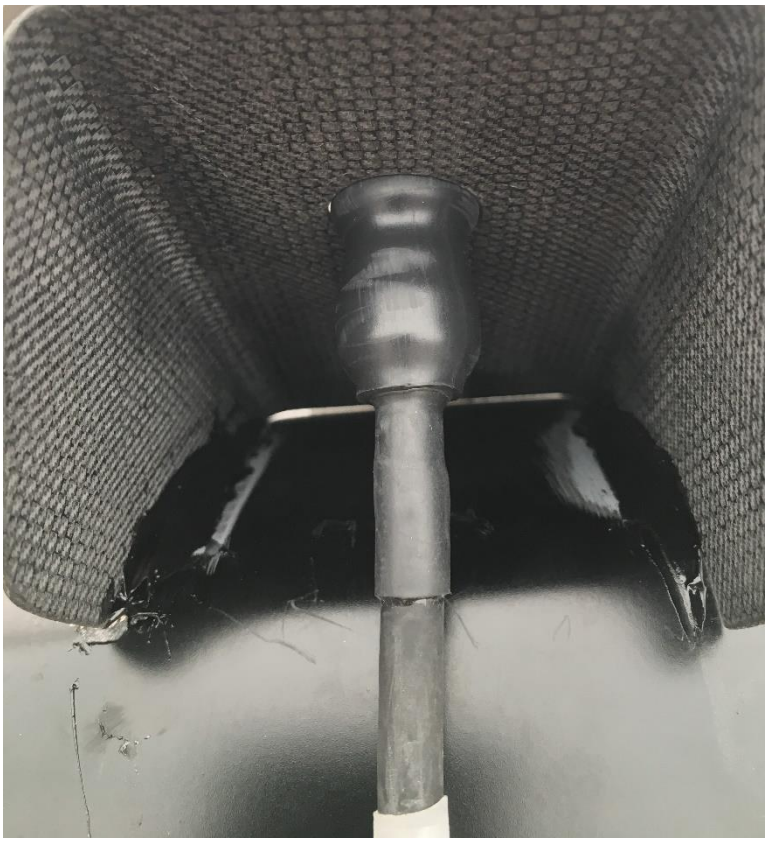
Hooking the cable to the foil

- Attach the rear loom along the net.

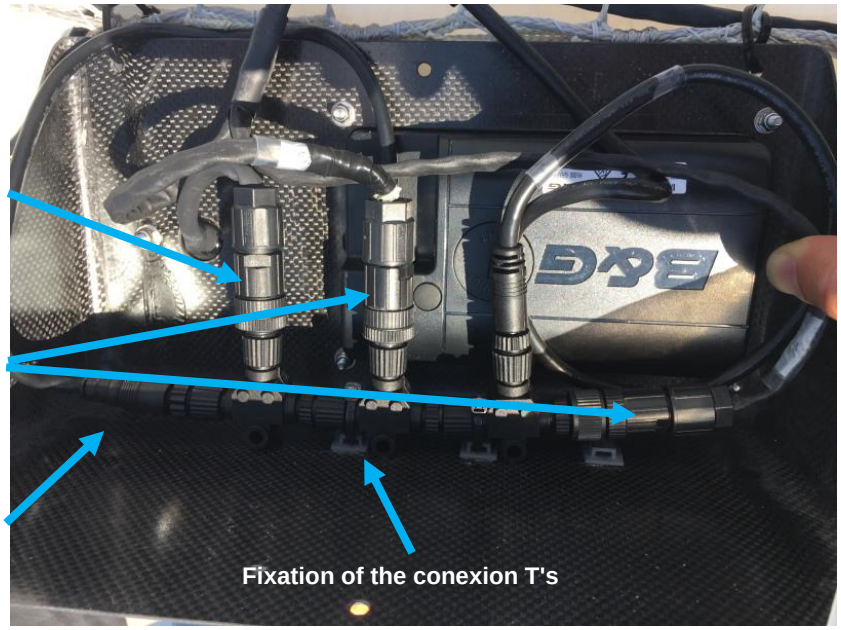
Routing of the rear beam along the net

- To mount the GNSS antennas follow the mounting order:
    1. The aluminium washer
    2. The insulation washer
    3. Both teflon washers

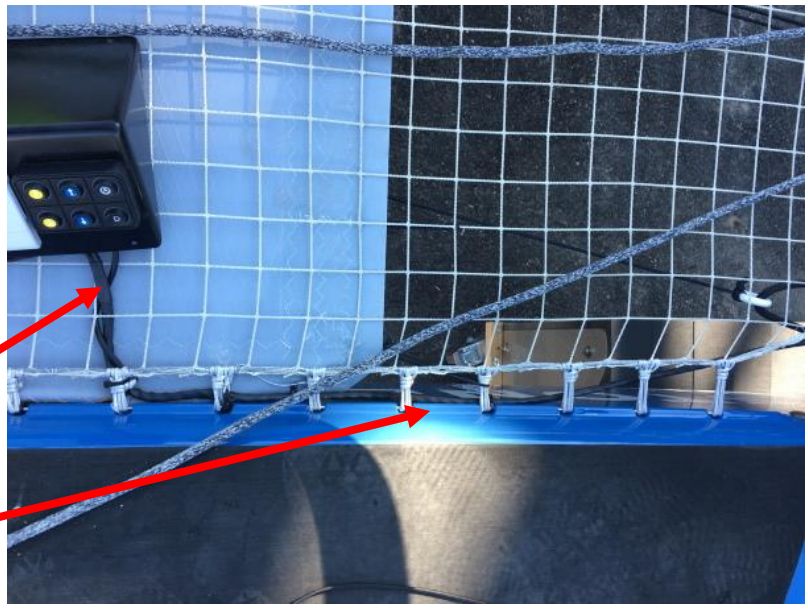
4. Adhesive 19.6mm heat shrinkable tubing 50mm long as below.



- Attach the eyes of the rudder slack adjuster cable extensions to the nets.
- Connect the servo control keypad, the display and the cables of the foils management keypads, hang the console on the net.



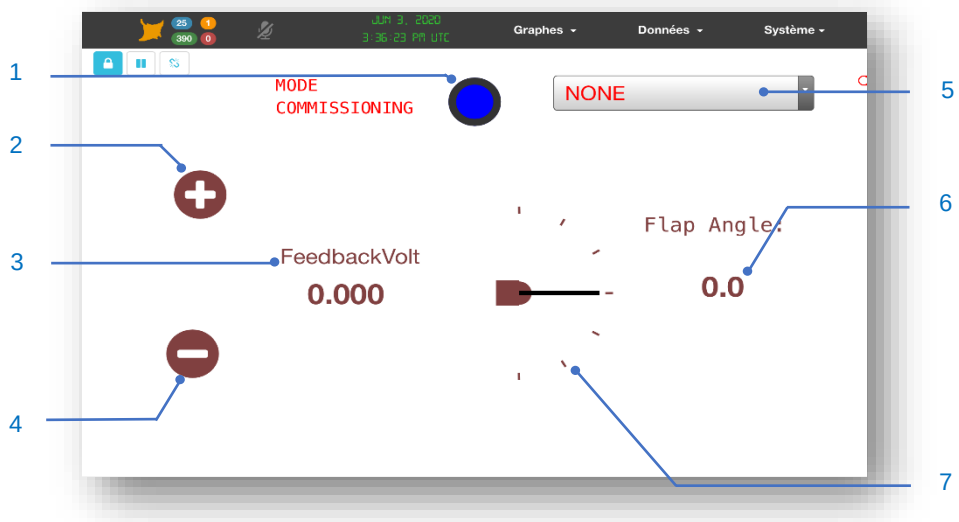
- Install the 4 buttons keypads cables along the nets and connect the keypads.



- Mount the actuator housings on the foils and rudders.
- Install the extensions of the slack catches in the pulleys for the foils and in the rings for the rudders.
- Connect the extensions to the foils and rudders actuators.
- Attach the eyes of the extensions to the bridges provided for this purpose.
- Stretching the bungee

10.6 Checking foil and rudder flaps angles

It is possible to move the flaps of the appendages, this can be done using the "Commissioning" dashboard.
To access this dashboard you have to establish a wifi connection between your tablet or computer and the control system. You can refer to the paragraph 6.6 page **Erreur ! Signet non défini.** to establish a wifi connection.
When the connection is established, open a web browser and enter the following address:
http://192.168.201.35/
Open the **DATA** menu and select the **COMMISSIONING** control panel.



No.	Description
1	Activates the calibration mode
2	Plus button
3	Current value in volt of the actuator rod position sensor
4	Minus button
5	Selection list of the appendix to be moved
6	Current value of the component in degrees
7	Visual of the angle

harness side and on the box side are not exposed to sea or rain water. Protect them !

10.7 Parameters

To facilitate the setting of Reds, the following parameters can be saved in a dedicated json file for each actuator :

- InvertMotor
- IntFeedbackVoltMin
- IntFeedbackVoltZero
- IntFeedbackVoltMax
- IntFeedbackVoltDeadBand
- MechanicalStopAngleMin
- MechanicalStopAngleMax
- MechanicalStopAngleMargin
- Motor Output Maximum
- Motor Output Minimum
- Motor Output Commissioning
- Kp
- Ki
- Kd
- Fuse Threshold
- Over Duration
- Fuse duration

These files will make it easy to transfer settings between multiple boats.

A hidden control panel named __**Maintenance** is made to facilitate the recording of the parameters of each Exocet Red.

On the left side of this dashboard, four statuses are displayed. If the indicator is green, the corresponding Red is detected and sending data. If it turns red, the Red is not connected or not sending data.

A json file is created for each Red to save its parameters. For a configuration of four Reds, four json files are created, named as follow :

- Foil_port_103.json
- Foil_stbd_101.json
- Rudder_port_100.json
- Rudder_stbd_102.json

Maintenance procedure :

Saving data to json file :

- Choose the Red you want to process (*selectedRed*)
- Click on the “update” button to store the Red parameters in Gold’s memory
- Click on the “save” button to copy selected Red parameters to corresponding json files

Restore json parameters to selected Red :

- Choose the Red you want to overwrite parameters (*selectedRed*)
- Choose the json file (*selecteFile*) which will serve as reference
- Click on the “InvertMotor” switch if you want to change the direction of the motor
- Click on the “restore” button to apply *selectedFile* parameters to *selectedRed*

The json file corresponding to *selectedRed* will also be overwritten by the *selectedFile* parameters

File recovery :

Json files are created in an internal folder, not available from the FTP.

The “display” switch creates a dynamic copy of each file in the archive folder available on the FTP for download. Once the maintenance done, you can deactivate the switch, each file will be erased from the visible folder.

Warning: uploading a file to the FTP will have no effect. It is an uploading system only.