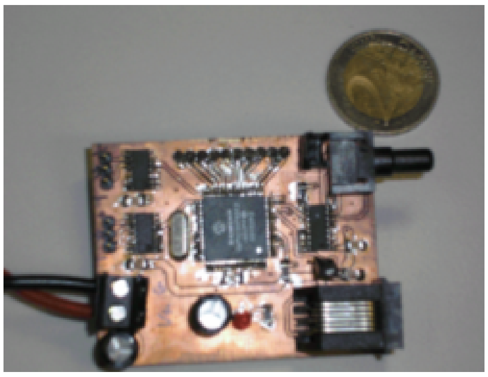

Figure 2. OBS tester photograph

3. Conclusions
At this moment, the system is almost finished. We only have to calibrate the sensors and ensemble some parts of the microprocessor's program that have already been tested separately. As the main characteristics of the device, we can say it gets data from the seismological sensors every 4 ms, data from the environmental conditions every minute and data from electrical signals every 4 ms. Now we are thinking about how to improve the device by incorporating new sensors as a tilt sensor and trying to get data from electrical signals more often.

MiniDOBS Stability and Floatability

M. Hausmann, M. Moreno (1,2)

(1) Dep. Física e Ingeniería Nuclear
Escuela Universitaria Politécnica de Vilanova i la Geltrú
Universidad Politécnica de Cataluña
Avda. Víctor Balaguer, s/n 08800-Vilanova i la Geltrú (España)
(2) SARTI
Centro Tecnológic de Vilanova i la Geltrú
Rambla Exposició, s/n 08800-Vilanova i la Geltrú (España)
manuel.moreno@upc.edu

Introduction
Marine Seismometers (OBS:Ocean Bottom Seismometers) are instruments that are widely used [1]. Their mission is to register and store different data series of physical magnitudes, as water pressure and ocean bottom vibrations, etc.. They are used for the geological study of the marine bottom structure and seismicity. Marine Technological Unit (UTM) of CSIC is in charge of the Spanish OBSs which are called MiniDOBS (Mini Digital Ocean Bottom Seismometer). The first ones were built in 1997 in Bullard Labs of the Cambridge University (UK).

The empirical knowledge of the mechanical behaviour of such equipment [2] has taken us to carry out a stability and floatability study and finally a mechanical characterization. To do that, it was necessary to gather the related technical documentation. Ten sketches were obtained from the original ones drawn by T. Owen from Cambridge university. The rest were carried out from direct measurements of different elements of the MiniDOBS.

This study contains the stability and floatability calculations of the MiniDOBS in 3 stages of its operation cycle: the immersion, ocean bottom deployment and rise to the surface.

2. Results and Discussions
In order to analyse the mechanical behaviour of the MiniDOBS, a study of each component was carried out using the autoCAD software tool [3]. In table I, the mechanical features are shown: material type, density and mass of each component of the instrument.

Once each element is identified and characterized, the geometrical centre (CG) that depends on the geometry, and centre of gravity (CM) that depends on the material, in the indicated situations (immersion, ocean bottom and rise), were calculated. Elements made of one material were separated from the ones composed of several types. A standard analytical method (that is often used in elements with simple geometrical shape, therefore the ones that can be decomposed to simple figures: cube, sphere, cylinder, cone, etc.) was used, and when needed, a consistent manual method to find the intersection of vertical lines, perpendicular to floor passing through different subjection points [4], [5].

All the data relative to decomposition as well as sketches drawn and the results of the calculations are available at www.cdsarti.org.

3 Conclusions
The results obtained allow us to characterize the MiniDOBS mechanically and obtain a better knowledge of the behaviour during different operation cycles (immersion, ocean bottom deployment, rise). The stability and floatability of the equipment are studied and analysed in detail, establishing a general method applicable to other volumetric bodies.

Specifically, the results can be summarized in the following way. At immersion stage, the equipment is in total equilibrium stability (CG and CM in the same line of action). When the instrument is sitting on the ocean bottom, it is at total equilibrium. At the rising stage, the instrument is at partial stability. There is a small displacement between CG and CM. The horizontal force due to water current does not provoke instability. It is found that the angle between the equipment base and the ocean floor (considered as rocky) has to be over 6.3º in order to be able to slide.

The MiniDOBS floatability calculations [6] confirm that during the immersion, it is negative as the weight is bigger than the drive and drag forces. The result is obtained when the equipment is sitting on the bottom. During the emersion, the instrument rises (positive floatability) as the drive force is bigger than the weight and drag.

The study carried out will be extended with correction of the stability of the equipment in the rising stage, analysis of behaviour of different types of surfaces in the ocean floor (sand, sediments, etc.) and the development or adaptation of a simulator that allows us to manipulate an existing model of an equipment and its working conditions. Between few existing software, the one that better adapts to our requirements is Unigraphics NX. It is a simulator that models a body and introduces a movemen variable.

		Material	Density (Kg/m^3)	Mass (Kg)
01	Anchor	steel	7850	36,36
02	mechanical release	PA	1090-1140	0,47
03	Blue base	PA	1090-1140	4,90
04	Hydrophone	epoxy resin	1110-1800	0,31
05	data acquisition and acoustic release systems	Borosilicate crystal	2230 -	25,40 3,10
06-a	Superior protection	High density poly-ethelene (HDPE)	935-965	1,43
06-b	Inferior protection	HDPE	935-965	1,44
07	Arm	PA	1090-1140	0,65
09	Geophone	Aluminium 3005-H18	2670	2,70
10	Transducer and subjection	(diverso)	-	1,75
11	handles	PA	1090-1140	0,48
13	Floatability sphere	Borosilicate crystal	2230	10,40
14-a	superior float	HDPE	935-965	1,25
14-b	Inferior float	HDPE	935-965	1,25
32	Cord	Fibre	1450	23,00
	Total			114,89

Table I. Material type, Density and mass of different MiniDOBS components considered in the study. The numbers assigned to each element (first column) correspond to sketches drawn for each element. The data acquisition and acoustic release systems have been included in the same group. It is assumed that the volume occupied is the same as the glass sphere protection structure. The subjection element of the transducer is included. The elements not included in the table are:the geophone support and release system, radar reflector, anchor fixing and damping systems

4. References

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