

TECHNICAL FEATURES

# CYBER SABOTS™

TECHNOLOGY AT OUR FEET



*InTech* | We have the technology

InTech

# CYBER SABOTS™

TECHNOLOGY AT OUR FEET

Cyber-Sabots™ is the device that has received more agreements from the International Comitee on Posture and Stabilometry. Its purpose is to provide automatic measurement of the forces applied to the floor by an individual standing upright and to determine the general pattern of force distribution in relation to a specific position inside a supporting polygon defined by the plantar contact area.

The use of two uncoupled force platforms, one for each foot, permits to provide separate measurements of forces distributed between the heel and forefoot.

Cyber-Sabots™ are destined mainly to evaluate and rehabilitate postural abnormalities and to evaluate posture for sports activities.

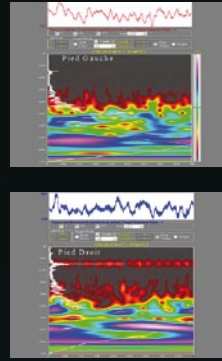
## SABOTS

Milled entirely from a single block of aviation-quality metal alloy, Cyber-Sabots™ feature excellent mechanical properties: sturdy, compact, lightweight, and reduced heat sensitivity. The system is available in several anodized finish tones.

The platform surface is specially designed to ensure thermal and electrical insulation and carries a footprint pattern to assist proper foot placement in function of the subject's foot size.



## WAVELET DISPLAY MODE



The wavelet display mode provides a time-frequency trace of the stabilometric signal. Wavelets can be compared to a FFT displayed in a ticker signal window. Representation is three-dimensional (time-frequency-intensity). Single plane presentation is the preferred mode in most cases. Intensity is indicated by the conventional temperature color coding method.

The two figures on the left show wavelets in comparison with sagittal excursions for each foot. A 6.62 Hz tremor confirmed by the superposed FFT is confined to the right foot. This display technique is useful for analyzing posture sequence.

## STATOKINESIGRAMS AND RELATED CONFIDENCE ELLIPSES

By comparing statokinesigrams (STKG) made under different conditions (eyes open vs. eyes closed) and related to foot position (standardized vs. free), users can obtain a range of valuable information including:

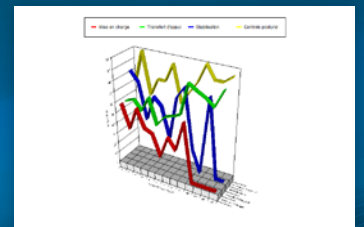
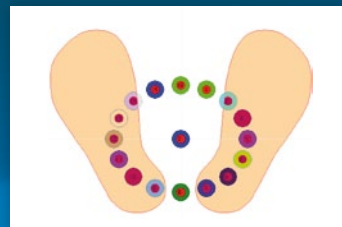
- Mean placements of unilateral and bilateral STKG in relation to feet.
- Weight distribution in relation to 4 pressure points on the foot.
- Notion of support foot, drive foot, weight-bearing foot, and leading foot.
- Estimation of the amplitude of oscillation in both directions (surface and elliptical form).
- Comparison of parameters under both conditions (eyes open vs. eyes closed).
- Estimation of the mean general direction of oscillations (slope of ellipse).



## REHABILITATION AND BIOFEEDBACK

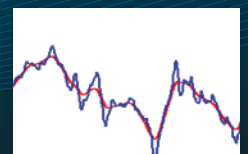
SABOTGAME is an application designed in accordance with the recommendations of Dr. BORGEL to assist in rehabilitation activities. SABOTGAME presents each phase of the postural exercises in a clearly understandable sequence that develops 5 skills: loading, transfer of weight, stabilization, postural space, and postural control.

It is designed to assist postural rehabilitation therapy using biofeedback. It can be used with the standard platform, Cyber-Sabots, and the unstable «BESSOU» platform. The purpose of this rehabilitation software is to provide the user with visual and audio feedback for assessing the position of his center of pressure. The patient's performance is presented in the form of tables and selection of 16 graphs.



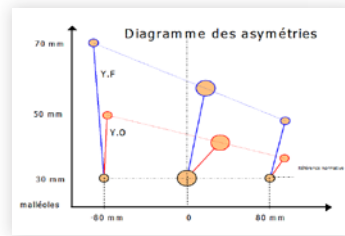
## CENTER OF PRESSURE AND CENTER OF MASS

Using an Ad-Hoc procedure, SABOTSOFT estimates the center of pressure (blue) and center of weight (red). By superposing these two traces it is possible to determine the mechanical forces necessary to right balance of the body weight center in case of destabilization (falling) or when getting up (standing).



## ASYMMETRY DIAGRAMS

Asymmetry diagrams are designed to detect asymmetry in relation to the mean position of the center of pressure. The reference standard is obtained by statistical calculation of the position of the mean center of pressure in a control population.

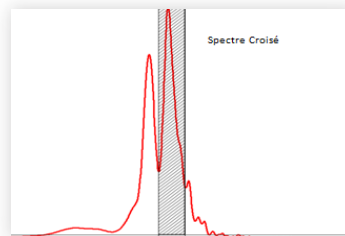
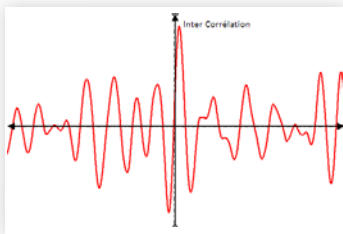


Positional and directional displacements are determined in relation to vectors originating from the standard point and ending at the real center of pressure. In the figure presented on the right, once the eyes open (red) and once closed (blue) recordings place the means in front of the reference standard (approximately +30 mm in front of the malleolar axis). Asymmetry is more pronounced on the eyes closed recording.

## NORMAL AND EXCESS CONTROL OF OSCILLATIONS: SPECTRAL DENSITY OF INTERACTION

The AP/ML inter-correlation implies a correlation between AP and ML oscillations. Despite the ample pseudoperiodic aspect of this function, these movements are controlled and anticipated.

They can therefore involve simulation. In that case the interaction energy exhibited in the 0.3 Hz band of the interspectrum (down) will be greater than 60%.

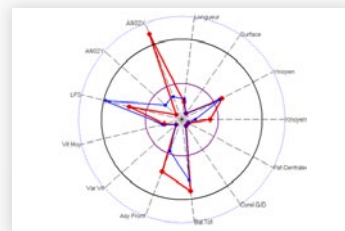
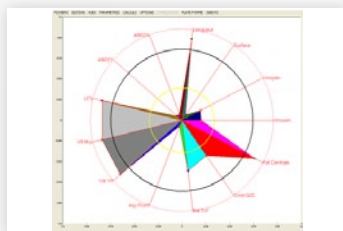


## POSTURAL PROFILE ©

Indicators of postural instability can constitute a overwhelming mass of information for clinicians. Postural Profile© was developed as a tool to assist the clinician in interpreting the posturogram.

Postural Profile© provides a composite representation of the patient's postural evaluation.

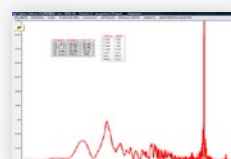
This display mode allows the clinician to identify the most meaningful postural parameters at a single glance by recapping key data including precision, energy expenditure, symmetry, muscle tension, degree of freedom, and relation to the different sensors.



## SPECTRUM OF VERTICAL FORCES

The FFT of the total vertical force ( $Z(t)$ ) is sensitive to velocity and acceleration of high-frequency vertical movements. Tremors that do not appear on FFTX or FFTY can sometimes be detected and thus allow diagnosis of neurological disease.

The figure presented here shows a large peak around 7 Hz that confirms a neurological condition.

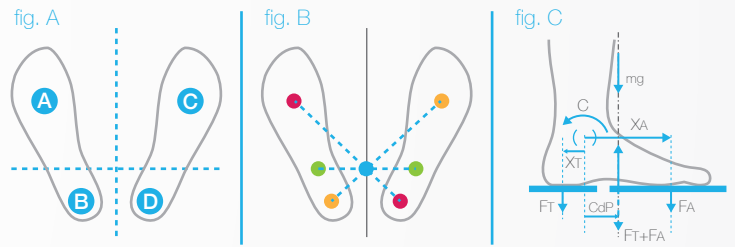


## INNOVATION

fig. A: system is able to acquire simultaneously but separately the movement of each zone of the foot (A, B, C, D).

fig. B: There are an infinite number of way to produce a same center of forces.

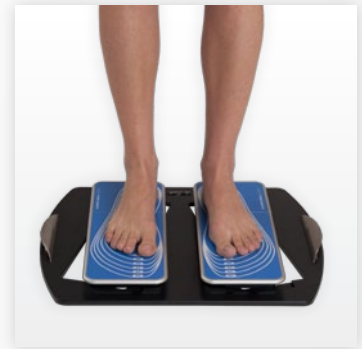
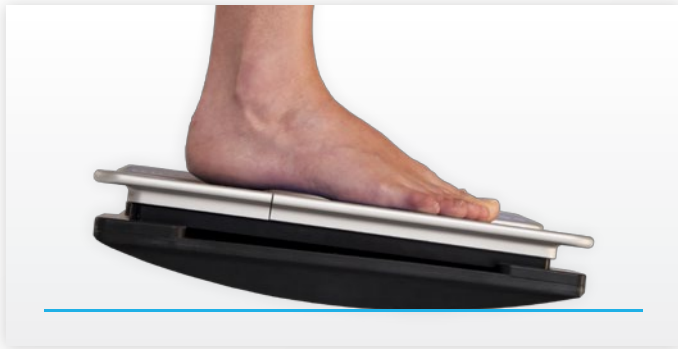
fig. C: In an individual standing upright, the gravity load ( $mg$ ) is generally returned restraints on (FT) and (FA) at the ends of the plantar arch, in according to the inclination angle of the subject.



## ROCKING PLATFORM

The rocking platform, a.k.a. «Bessou» unstable platform, is the result of a carefully study to meet the requirements of the Toulouse school:

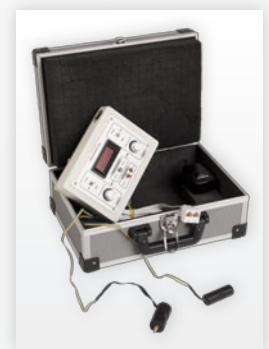
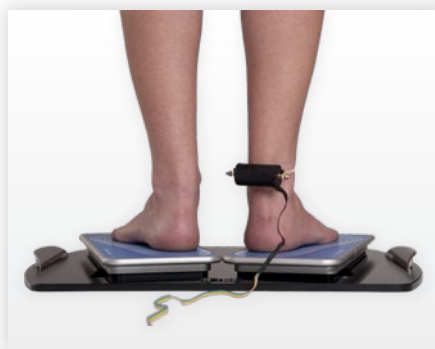
- 1) Maintain curve radius.
- 2) Allow sagittal and frontal control of sabots.
- 3) Maintain plantar arch at a constant height of 60 mm.



## MECHANICAL VIBRATORY STIMULATOR

It is possible to choose a long-life brushless electric motor of various sizes and intensity depending on the required frequency of the vibration. The built-in electronic components allow servo control with less than 1% frequency error.

The data processing software provided with the Cyber-Sabots system features a stimulation window allowing parameterization (delay, duration, frequency, frequency profile, etc.) up to 4 motors during stabilometric recording.



## SABOTSOFT

This application is based on more than 20 years of experience and includes all standardized parameters described in AFP 12/05 and AFP 40/16 standards.

In addition to standardized parameters, SABOTSOFT provides a wide range of data as illustrated by the graphs beside.



## SELECTED OPTIONS

Cyber-Sabots can be equipped with various options including:

- Device to measure relative foot position/orientation (PO)
- «Bessou» platform
- Piezo-electric touch-sensitive surface
- Mechanical Vibratory Stimulator
- Wireless connection
- 4 to 16 degrees of freedom

## DECLARATION OF CONFORMITY

Fulfills the requirements of:

- Directive 93/23/EEC, annex VII on conventional medical devices

Is also in conformity with the following European directives:

- Low Voltage Directive 73/23/ECC and amendments;
- Electromagnetic Compatibility Directive 89/336/ECC and amendments.

## TRAINING COURSES AND SUPPORT

Each device is supplied with a training package that provides one to one lessons customized according to specific user needs.

Periodic updates on usage methods are held quarterly. The package includes also remote control assistance and technical support to avoid unnecessary stops.



MADE IN FRANCE BY:

*InTech*

Innovative Technologie  
1, impasse Gémy  
13013 Marseille (France)

[www.cybersabots.com](http://www.cybersabots.com)  
[info@cybersabots.com](mailto:info@cybersabots.com)

DISTRIBUTED IN EUROPE BY:



SPRINTIT  
via Adami, 14  
30033 Noale, Venezia (Italy)  
Web. [www.sprintit.net](http://www.sprintit.net)  
e-Mail. [info@sprintit.net](mailto:info@sprintit.net)

Tel. (IT) +39 041 8876323  
Tel. (FR) +33 1 82883373  
Fax. +39 041 8872100  
Support +39 041 8876322