Constant Force Module (CFM)

Semi-Passive Module for Gravity Off-loading and Artificial Force Generator

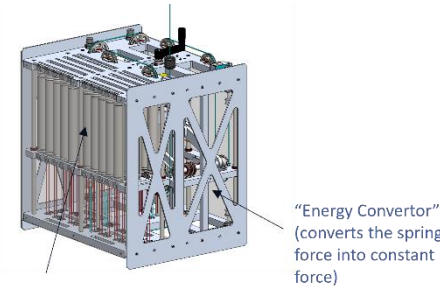
Overview

The Constant Force Module (CFM) is a semi-passive actuation system developed by Space Applications Services. This independent module generates an adjustable constant force output, which can be utilized for simulating or counteracting the Earth gravity force.

The actuation kinematics of the CFM relies on a passive spring-based mechanism, effectively harnessing the potential energy exerted by the user, thereby eliminating the need for an external energy supply.

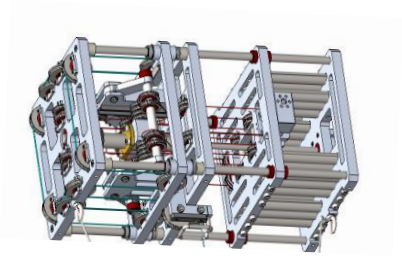
System Features

SpaceApps has several years of experience in the development of constant force mechanisms. These modules have been successfully integrated as core components in several countermeasure exercise systems, as well as used for gravity off-loading in ground facility moon simulators.



Medium Constant Force Module

The Constant Force Module is composed of two segments: a "Battery", which utilizes tension springs to store potential energy, and a "Converter", which transforms the linear force exerted by the spring into a constant output force. A steel cable then transfers the output constant force to the designated application point.



Small Size Constant Force Module

The internal mechanism used to generate the constant force, operates independently of the Earth gravity influence. Consequently, this system can operate effectively both on ground (at 1g) and in a microgravity environment (at 0g).

The system is designed to be free of inherent inertia, leveraging small moving internal components operating at low internal velocities. This characteristic is particularly advantageous for high-speed motion, such as during dynamic jumping.

Depending on the selected unit, a hand lever or an integrated motor will drive the internal adjustment mechanism, permitting continuous modulation of the generated constant force from nearly zero force to its maximum value. Electrical power is only required when a change in the constant force output is requested.

The Large Constant Force Module can be combined with an active winch allowing for further extension of the cable stroke.

APPLICATIONS

- The Constant Force Module provides an adjustable constant force output based on a passive spring design, free of inherent inertia
- Artificial Force Generator
- Artificial Reduced Gravity
- Exercise Device

OTHER SERVICES AVAILABLE

- Installation on site
- System commissioning
- Operators training
- Maintenance

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ABOUT SPACE APPLICATIONS SERVICES

Space Applications Services NV/SA is an independent Belgian company founded in 1987. Aerospace Applications North America is our Partner company in Houston, USA.

Our aim is to research and develop innovative systems, solutions and products and provide services to the aerospace and security markets and related industries. Our activities cover manned and unmanned spacecraft, launch/re-entry vehicles, control centres, robotics and a wide range of information systems.

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Constant Force Module (CFM)

Semi-Passive Module for Gravity Off-loading and Artificial Force Generator

Constant Force Module Specifications

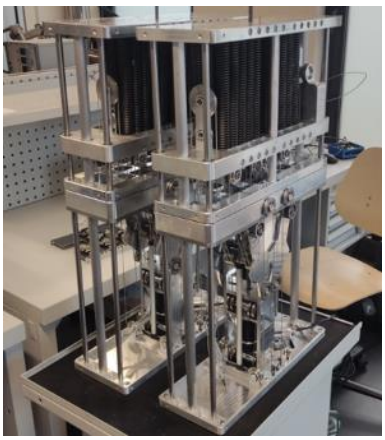
Small Size Constant Force Model		
Dimensions	65 x 30 x 35 cm 26 x 12 x 14 in	
Mass	40 kg 88 lbs	
Off-loading capacity	1 – 100 kg 2 – 220 lbs	Applicable to 0.1g to 1.0g
Max stroke	1.0 m 3.3 ft	

Medium Size Constant Force Model		
Dimensions	70 x 52 x 62 cm 28 x 20 x 25 in	
Mass	110 kg 243 lbs	
Off-loading capacity	4 – 150 kg 9 – 330 lbs	Applicable to 0.1g to 1.0g
Max stroke	2.0 m 6.6 ft	

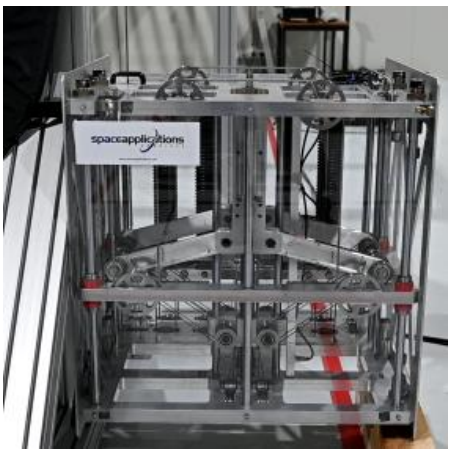
Large Size Constant Force Model		
Dimensions	85 x 65 x 55 cm 34 x 26 x 22 in	
Mass	140 kg 309 lbs	
Off-loading capacity	5 – 250 kg 11 – 550 lbs	Applicable to 0.1g to 1.0g
Max stroke	2.0 m 6.6 ft	

Optional Active Winch		
Mass	60 kg 132 lbs	To be added to the CFM mass
Load capacity	up to 250 kg up to 550 lbs	No high dynamics motion
Winch stroke	8 m 26 ft	Configurable

Double-stacked CFM unit for exercise device



CFM unit for Gravity Off-loading



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