

# Constant Force Module (CFM)

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



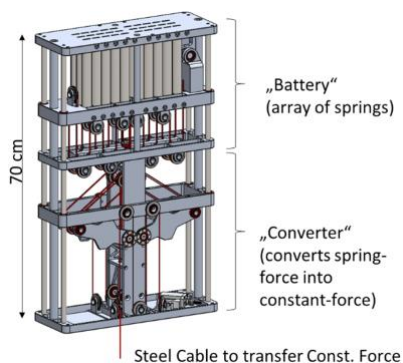
### Overview

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

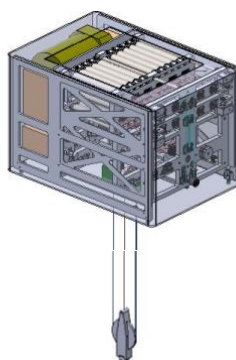
SpaceApps has several years of experience in the development of constant force mechanisms. These modules have been successfully integrated as core components in several countermeasure exercise systems, as well as used for gravity off-loading in ground facility moon simulators.



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.



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

### APPLICATIONS

- Artificial Force Generator
- Artificial Reduced Gravity
- Exercise device

### SERVICES AVAILABLE

- The Constant Force Module provides an adjustable constant force output based on a passive spring design, free of inherent inertia

### OTHER SERVICES

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

For more information:  
[spaceapplications.com](http://spaceapplications.com)  
[aerospaceapplications-na.com](http://aerospaceapplications-na.com)

Or contact us:  
[guillaume.fau@spaceapplications.com](mailto:guillaume.fau@spaceapplications.com)  
[tom.hoppenbrouwers@spaceapplications.com](mailto:tom.hoppenbrouwers@spaceapplications.com)

### 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.

## Space Applications Services NV/SA

Leuvensesteenweg 325,  
1932 Sint-Stevens-Woluwe  
(Brussels Area) – Belgium

+32 (0)2 721 54 84  
[info@spaceapplications.com](mailto:info@spaceapplications.com)  
[www.spaceapplications.com](http://www.spaceapplications.com)



[www.icecubesservice.com](http://www.icecubesservice.com)  
[www.aerospaceapplications-na.com](http://www.aerospaceapplications-na.com)

# Constant Force Module (CFM)

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



## Constant Force Module Specifications

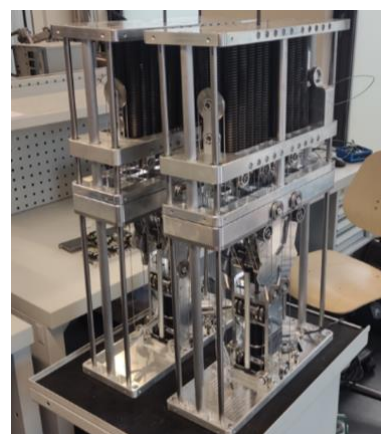
Small Size Constant Force Model		
Dimensions	60 x 25 x 24 cm 23 x 10 x 9 in	
Mass	25 kg 55 lbs	
Load/Offloading capacity	5 – 50 kg 11 – 110 lbs	Applicable to 0.1g to 1.0g
Max stroke	1.0 m 3.3 ft	

Medium Size Constant Force Model		
Dimensions	75 x 45 x 17 cm 30 x 17 x 7 in	
Mass	60 kg 132 lbs	
Load/Offloading capacity	5 – 80 kg 11 – 176 lbs	Applicable to 0.1g to 1.0g
Max stroke	2.0 m 6.6 ft	

Large Size Constant Force Model		
Dimensions	95 x 65 x 60 cm 37 x 26 x 24 in	
Mass	120 kg 265 lbs	
Load/Offloading capacity	20 – 300 kg 44 – 660 lbs	Applicable to 0.1g to 1.0g
Max stroke	1,2 m @300kg, 2,4 m @ 150kg 3.9 ft @660 lbs, 7.8 ft @330 lbs	Work range of passive CFM, configurable

Optional Active Winch		
Mass	60 kg 132 lbs	To be added to the CFM mass
Load capacity	up to 300 kg up to 660 lbs	No high dynamics motion
Winch stroke	10 m 33 ft	Configurable

Double-stacked CFM unit for exercise device



CFM unit for Gravity Off-loading



## Space Applications Services NV/SA

Leuvensesteenweg 325,  
1932 Sint-Stevens-Woluwe  
(Brussels Area) – Belgium

+32 (0)2 721 54 84  
info@spaceapplications.com  
www.spaceapplications.com



www.icecubesservice.com  
www.aerospaceapplications-na.com