

# Crawl-Walk-Run-Fly!

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## Crawl

-Present a problem or challenge

–”The greatest risk to space missions comes from non-trackable debris”  
- Nicholas Johnson  
Chief Scientist for Orbital Debris 2014

-Birth of an idea

-Research,  
-Find heritage to support  
-Present your idea to peers

-Develop a mission

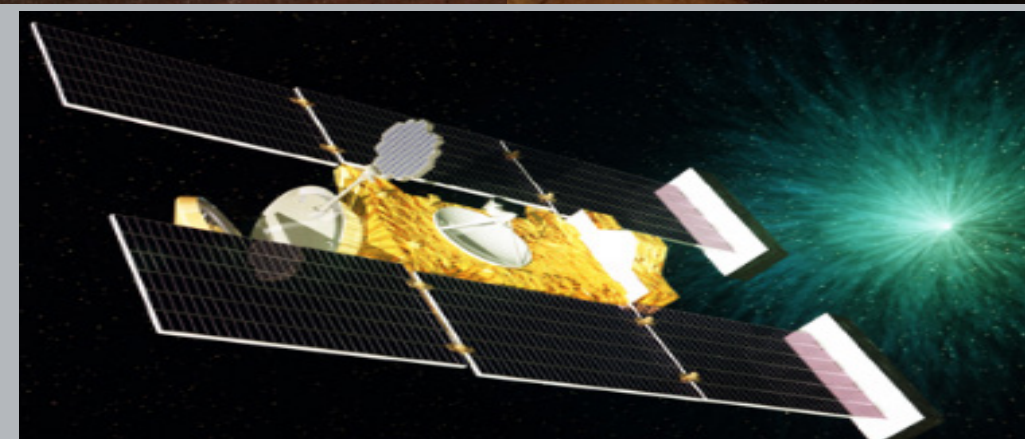
-Define mission statement  
-Establish Goals and Objectives

-Create early concepts, models, drawings

Original TRAPSat Prototype to Initial CAD Model  
2013

Initial Cardboard Prototype of TRAPSat Design

Initial CAD drawing of TRAPSat



NASA Stardust Mission:  
02/1990 - 03/2011  
Initial inspiration/heritage

## Walk

-High Altitude Balloon Testing

- Excellent Test Environment  
- Cost Effective  
- Increases Test Readiness Levels

-Model and Test

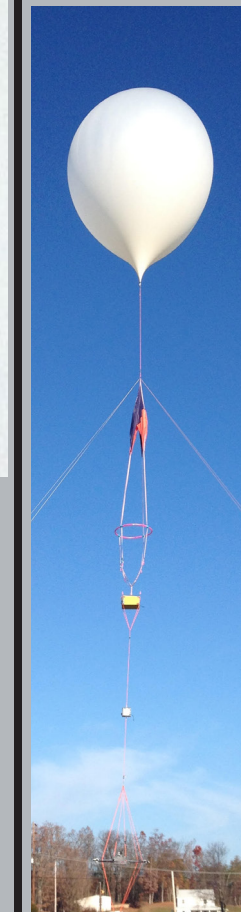
-Integrate Systems  
-Continue Ground Testing

-Validate Mission

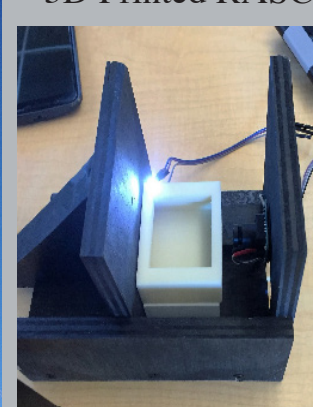
-Present findings to peers  
-Publish in accredited resources

Multiple UMD Collaborative High Altitude Balloon Launch/  
Camera & Aerogel Prototyping  
11/2013-3/2016

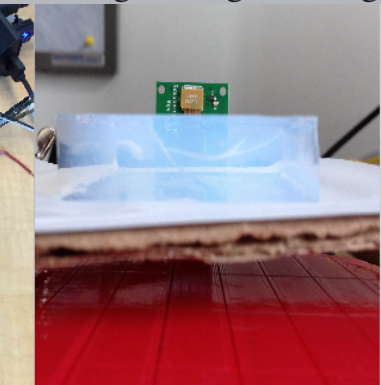
First HAB



3D Printed RASC



Optics Grade Silica  
Aerogel Image Testing



HAB Launch to ~70,000 ft



## Run

-Sounding Rocket Flights

-Full Exposure to space  
-Proves payload can survive launch

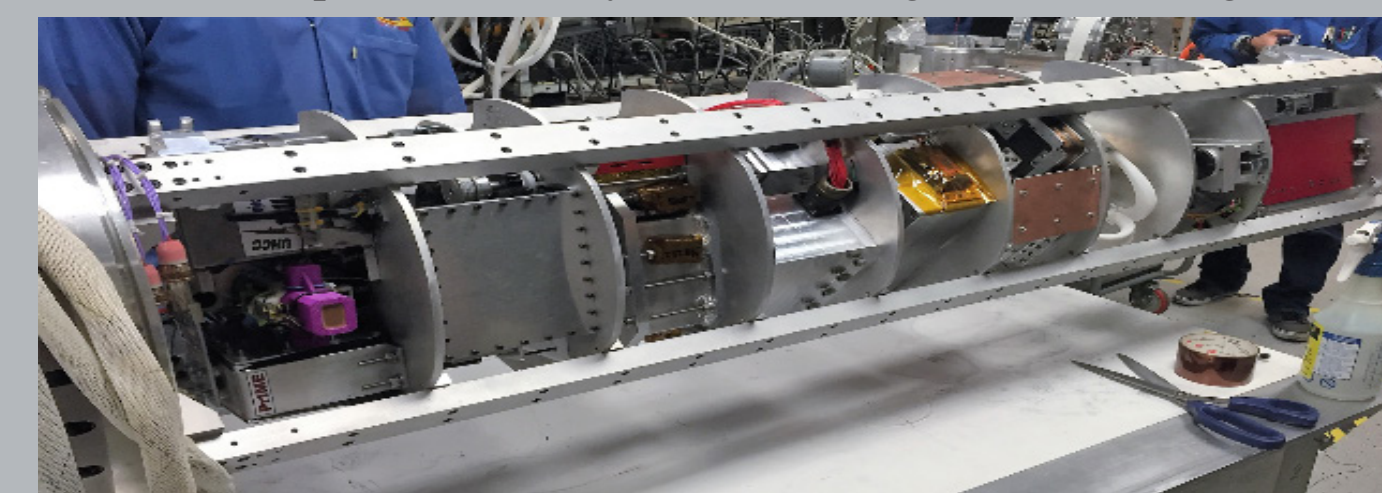
-Full Mission Testing

-Subsystem testing  
-FlatSat Testing  
-Day in the Life Testing

-Industry Testing

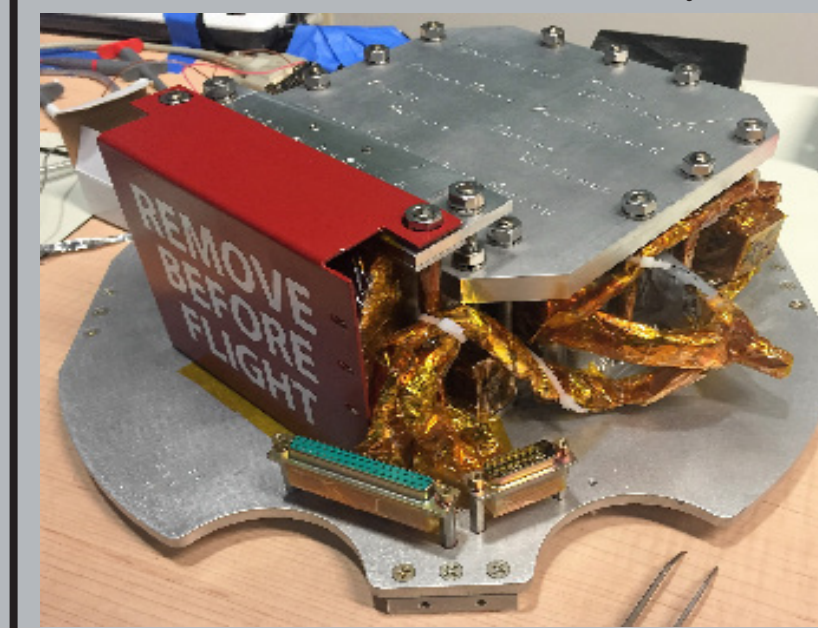
-NASA accredited testing  
-Testing to expected specific environment  
-Vibration/ Thermal Testing

2016 RockSat-X TRAPSat Launch  
Incorporated Industry Manufacturing / NASA Testing



Top: 2016 Integrated RockSat-X Payloads

Bottom Left: 2016 TRAPSat Rocksat-X Payload Bottom Right: 2016 Rocksat-x Terrior Improved Malemute



## Fly

-Full Orbital Mission

-Achieved Test Readiness Levels  
-Continue Developing Heritage  
-Students conduct Mission Operations

-Student Benefits

-Real mission experience  
-Creates well rounded individuals  
-Provides problem solving experience  
-Provides a real world STEM application

Projected CACTUS-1 2018 CSLI NASA ELaNa Launch



Above:CSLI Award Map

Below: Virgin I CubeSat deployment system



## Why

The Crawl, Walk, Run development cycle was introduced to CapTechU engineering teams by Dr. Terry Teays, former Assistant Director of the Maryland Space Grant Consortium. This development cycle creates a standardized path to mission success, funding, environmental and systems testing. Methodologies such as this provides and standardized procedure that works well with state space grant consortia as well as similar sources of support. This model is great for taking student projects from an idea or concept to a full space flight mission.