Astrobee System Overview

POIWG #41 Astrobee Splinter

April 25, 2017

Astrobee Elements
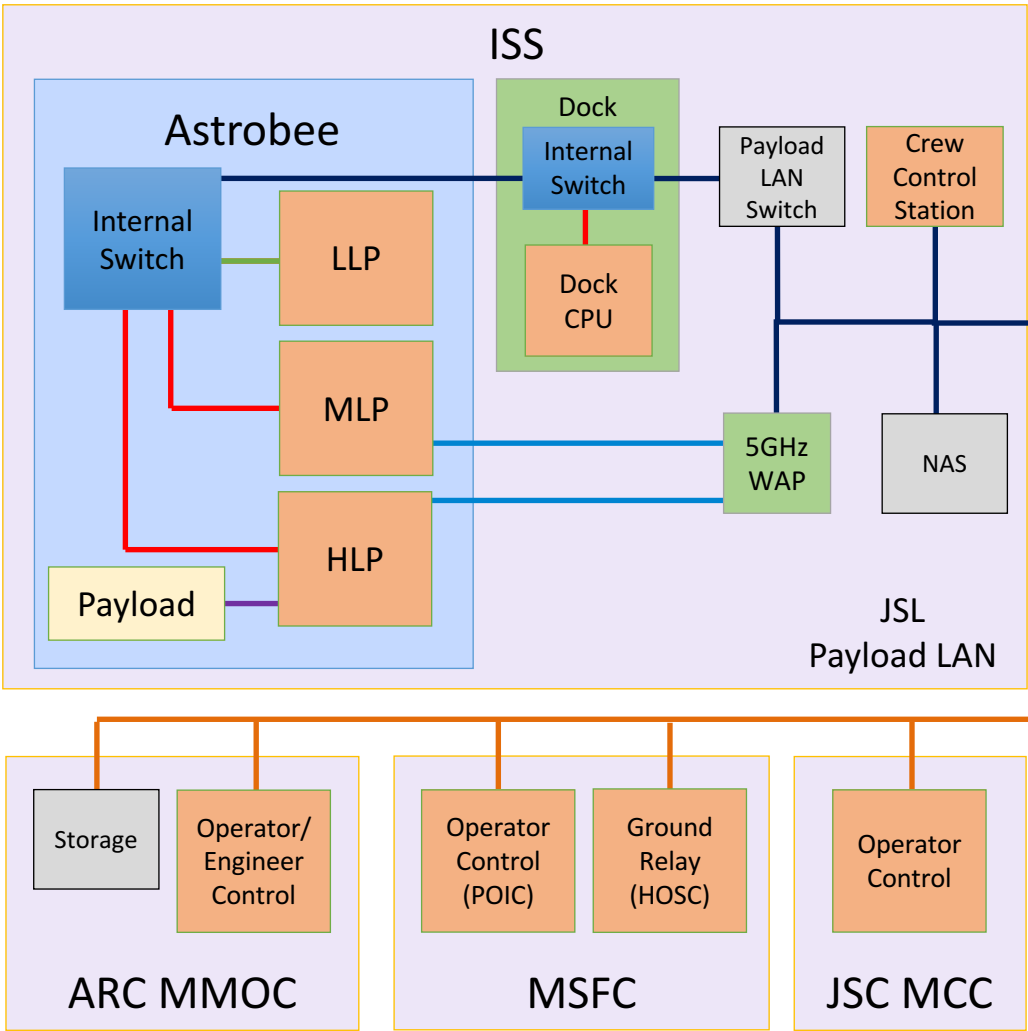

Astrobee
- Free Flyer
- Dock
- Ground Data System
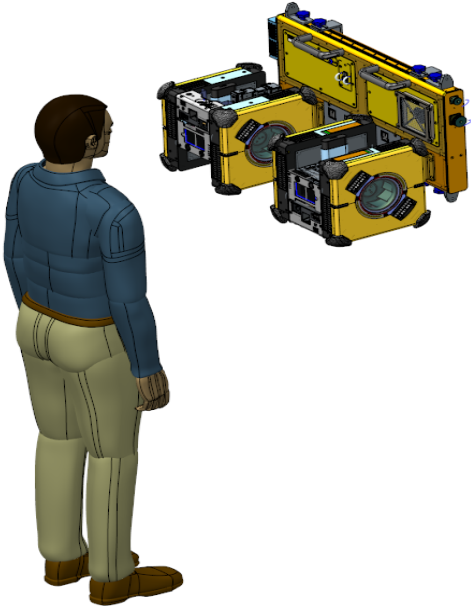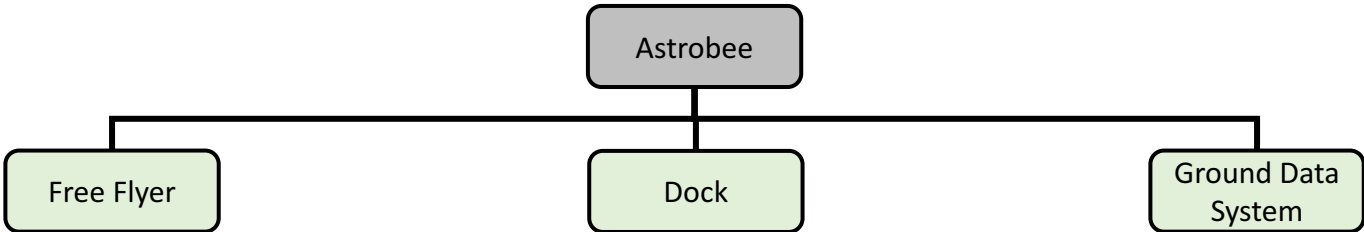
System Data Flow Diagram

Astrobee

Speed Camera

Battery

Perching Arm

Not visible:
Dock Camera
3D Perch Camera
Docking Port
Aft Light
Status LEDs

Terminate Button

Speaker/Microphone

Laser Pointer

3D Hazard Camera

Science Camera

Navigation Camera

Power Switch

Fwd Light

Wake Button

Touch Screen

Status LEDs

NASA ARC

ASTROBEE

LED Signal Light Strips
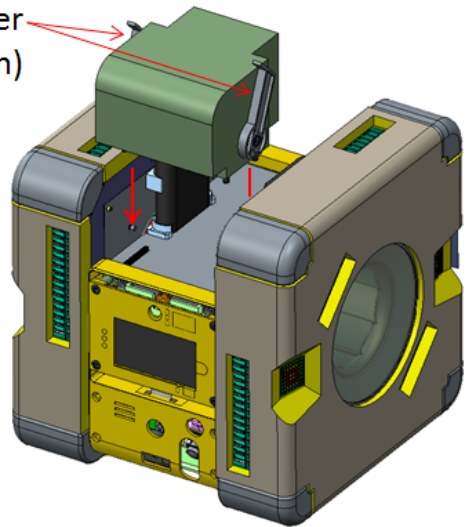
Impellor
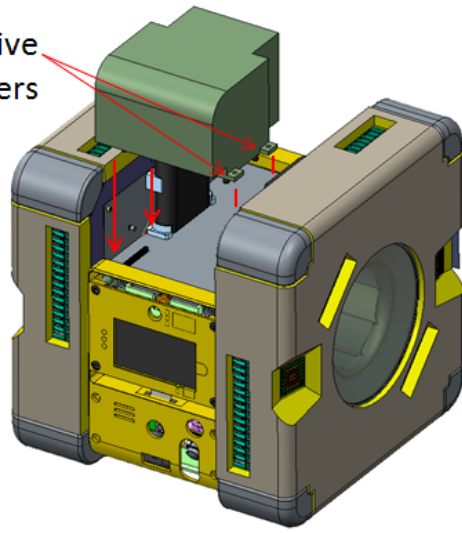
Nozzle

Corner Bumpers
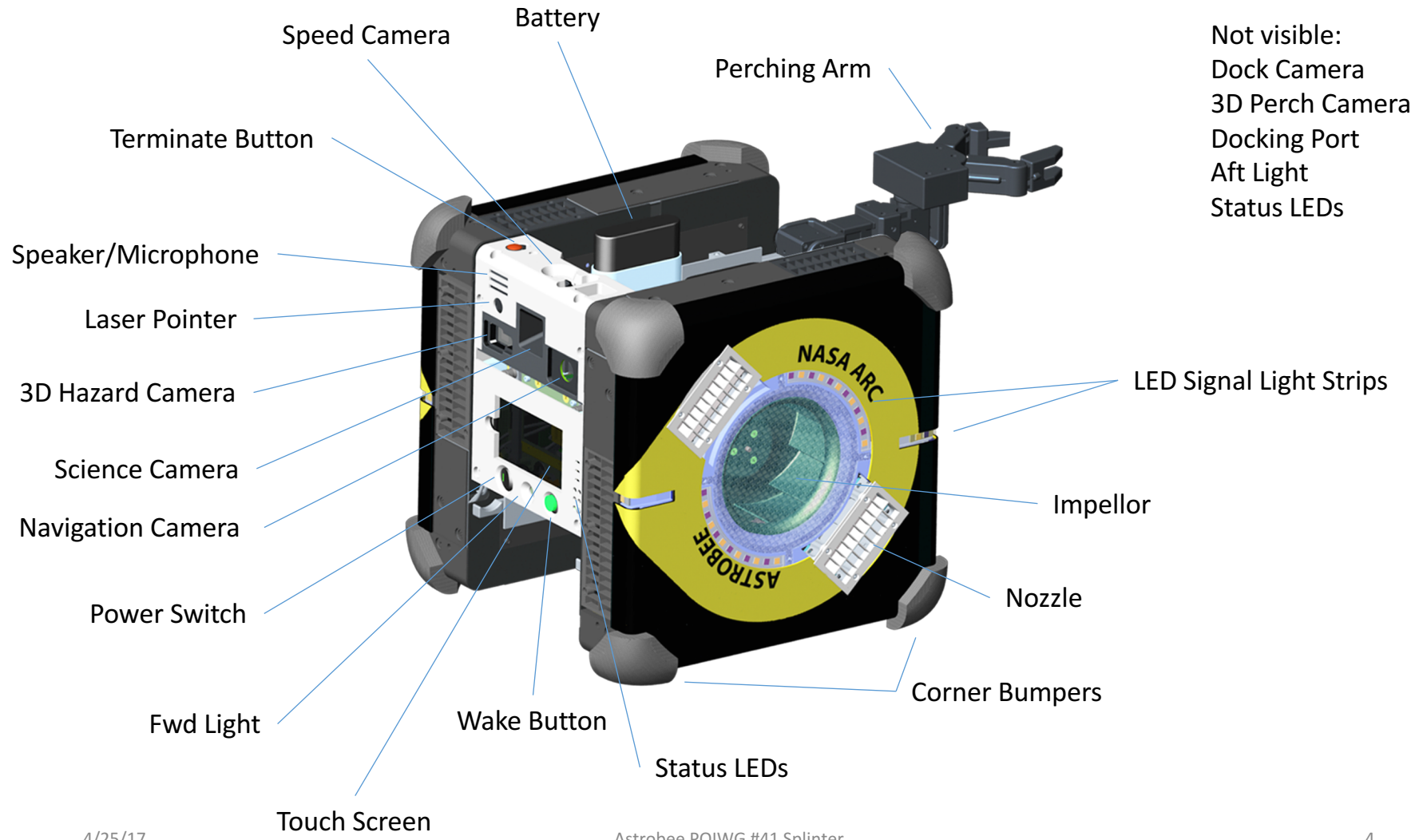
Payload Attachment Options

Quick "No Tool" Payload Attachment

2X Lever (open position)

Lever engages and disengages payload connector and provides mechanical attachment

Lever in "Locked" position

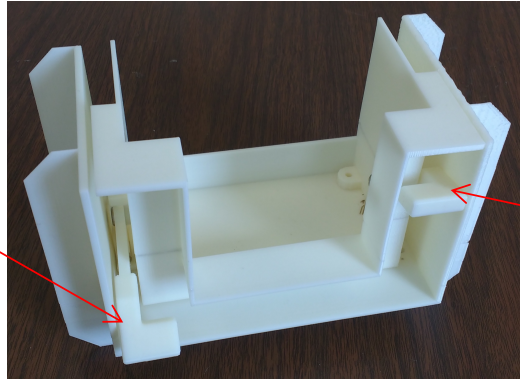4X Fastener Payload Attachment
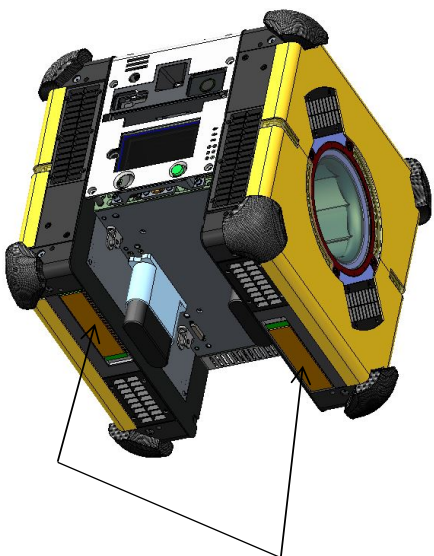
4X Captive Fasteners
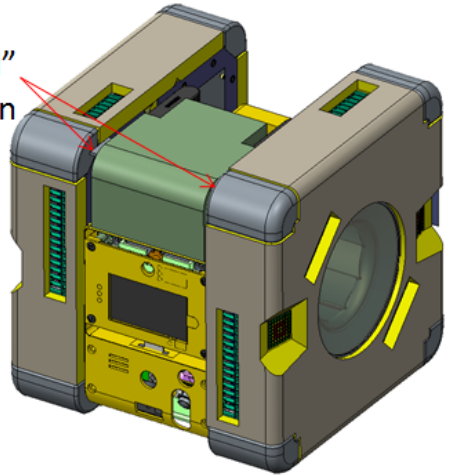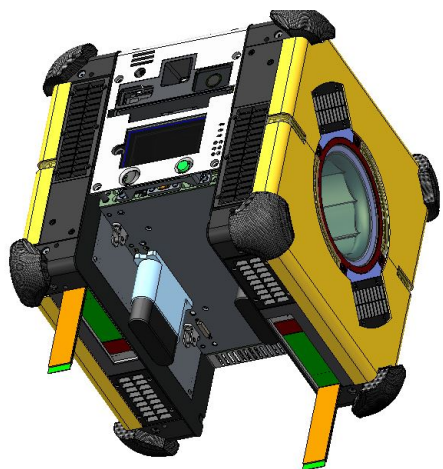
"Un-Lock" Position

"Lock" Position
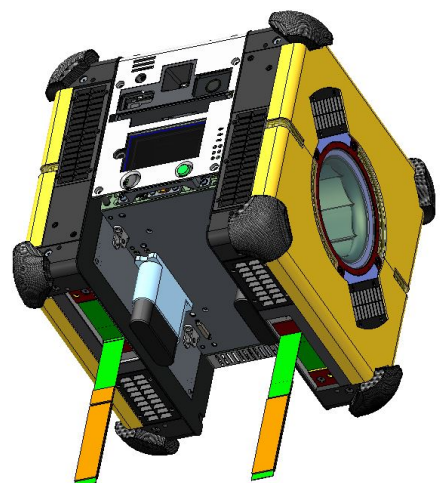
Restraint Straps

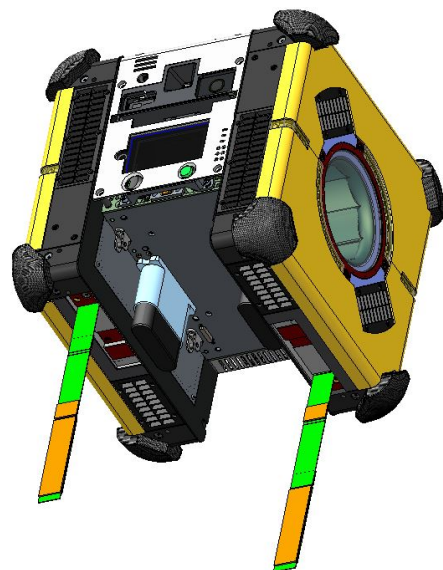Strap with Velcro hook allows Astrobee to be restrained to ISS loop patches

Two deployable straps for restraining Astrobee on station. Velcro Hook on ends of straps

Strap is unfolded 1 fold

Strap is unfolded 2 folds

Fully Deployed ~ 10" Strap
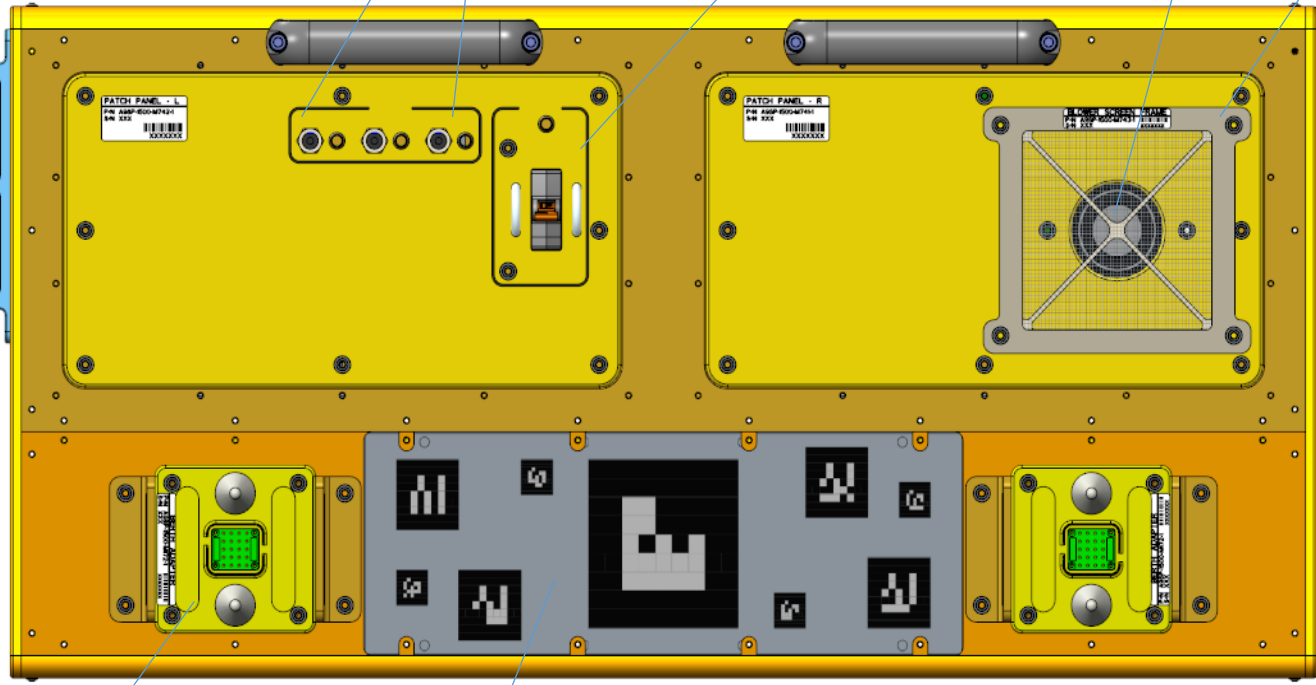
Dock

Air Vent Deflector

Subsystem Breakers

Main Power Breaker

Cooling Fan

Cooling Fan Screen

RJ-45 Connector

Power Connector

Free Flyer Berth

AR Target

Run Plan Tab

Teleoperation Tab

Guest Science Tab

ISS Commissioning Activities

- Planned Activities:
  - Installation
  - Comm Checks
  - Component Checkouts
  - Initial Mapping
  - Basic Mobility
  - Autonomous Mobility
  - Crew Interface Checkout
  - Incremental Mapping – no crew needed
  - Astrobee "B" and "C" Commissioning
  - Demonstration – no crew needed other than payload installation in advance of demo

Initial Mapping Activity

- Example of an activity explicitly involving crew

Component Activites/Tests	Description
Setup	Astrobee engineering prepares free flyer for activity (wakes, initializes system, etc.)
AR Localization Test	Crew physically "flies" the robot around in the vicinity of the dock to test AR target localization
Crew mapping	Crew physically "flies" the robot around in the module containing the dock to collect initial map data
Shutdown	Astrobee engineering downlinks files and shuts down the free flyer

Autonomous Mobility Activity

- Example of an activity that does not explicitly involving crew for the entire duration

Component Activites/Tests	Description
Setup	Astrobee engineering prepares free flyer for activity (wakes, initializes system, etc.)
Demonstrate autonomous undock/dock	Crew manually places robot in 4 initial positions for docking tests
Demonstrate complex trajectory	Astrobee engineering commands the free flyer to fly one simple, one moderate, and one challenging trajectory
Demonstrate autonomous perching	Astrobee engineering commands the free flyer to fly to a perch location and perch
Demonstrate pan/tilt	Astrobee engineering commands the free flyer to pan and tilt while perched
Shutdown	Astrobee engineering returns the free flyer to the dock, downlinks files and shuts down the free flyer