A Table of Requirements

ID	Description	FRETISH	Pattern	Source
1	During an experiment: Two context images taken at different times of a PIXL experiment will be compared to detect unplanned movement (drift) of the rover arm likely to arise from temperature changes.	In Experiment PIXL shall eventually satisfy Take2Picture & ComparePicture	MODAL REACTION	[10]
2	PIXL's hexapod can compensate for X-Y drift if it is found to exceed a pre-defined threshold	In Experiment whenever !inthreshold Rover shall eventually satisfy inthreshold	MODAL DELAYED REACTION	[10]
3	In order to ensure that PIXL's XRF and OFS subsystems are behaving in the expected manner, the instrument's performance is periodically checked by measuring the onboard calibration target, and then comparing the results of those measurements against pre-flight measurements of those standards.	whenever timetocheck=1 PIXL shall at the next timepoint satisfy check and timetocheck	PROMPT REACTION	[10]
4	Once a safe target has been selected, the spacecraft adjusts its trajectory in propulsive powered flight to land at the target.	if safetargetlocated shuttle shall immediately satisfy AdjustToLand	TRIGGERED INSTANT REACTION	[10]
5	Deploy the parachute using navigated position information once safe parachute deployment velocities have been reached	if parachutedistance <= safeparachutedistance EDL shall immediately satisfy DeployParachute	TRIGGERED INSTANT REACTION	[10]
6	LVS begins taking pictures at 4.2 km altitude and matching them up to an onboard map.	Whenever Altitude <= 4.2 LVS shall immediately satisfy TakePictures & Match	INSTANT REACTION	[10]
7	Only once the rover is safely on the martian surface will flight software command the preparation and downlink of EDL Camera images and microphone data.	Upon SafeLanding EDL shall at the next timepoint satisfy Preparation & DownLink	TRIGGERED PROMPT REACTION	[10]
8	Stand-by mode: In IM stand-by mode only components necessary to monitor the system and to survive the external environment shall be active	In STANDBYMODE IM shall always satisfy necessary_components_only	MODAL MAINTAIN SAFE SPACE	[12]

9-A	Safe mode: In IM safe mode all components are activated at limited level (adopted in case of contingency)	In SAFEMODE IM shall always satisfy components_limited_level	MODAL MAINTAIN SAFE SPACE	[12]
9-B	The IM shall be isolated in case of contingency.	In SAFEMODE whenever CONTINGENCY IM shall immediately satisfy isolated	MODAL INSTANT REACTION	[12]
9-C	In case of contingency safe mode is employed	Whenever CONTINGENCY IM shall immediately satisfy SAFEMODE	INSTANT REACTION	[12]
10-A	Check mode all components necessary to check system's health before starting the tests are active	In CHECKMODE IMCOMPONENT shall before StartingTests satisfy necessary_check_components_active	MODAL SCHEDULING	[12]
10-B	If testing is imminent enter check mode	whenever TESTING_IMMINENT IM shall at the next timepoint satisfy Checkmode	PROMPT REACTION	[12]
11-A	Nominal testing mode: all components necessary to perform tests are active	In NOMINALTESTINGMODE IMCOMPONENT shall always satisfy necessary_testing_components_active	MODAL MAINTAIN SAFE SPACE	[12]
11-B	data are transmitted to SM to be elaborated, then transmitted to ISS and eventually to Ground Segment	In NOMINALTESTINGMODE whenever SMConnection & ISSConnection & GroundSegment & !files IM shall until files satisfy transmit	MODAL TRANSMIT	[12]
12	Nominal crew mode: all main functionalities are active and access of the crew to perform visual inspections is allowed.	In NOMINALCREWMODE IM shall always satisfy main_functionalities_active & crew_access	MODAL MAINTAIN SAFE SPACE	[12]
13-A	During the Launch Phase the only mode of operation in use is STANDBY mode which should be done when the IM is in a stowed configuration	In LAUNCHPHASE whenever stowed IM shall eventually satisfy STANDBYMODE	MODAL DELAYED REACTION	[12]
13-B	During the Separation Phase the only mode of operation in use is STANDBY mode which should both be done when the IM is in a stowed configuration	In SEPARATIONPHASE whenever stowed IM shall eventually satisfy satisfy STANDBYMODE	MODAL DELAYED REACTION	[12]
13-C	During the Transfer Phase the only modes of operation in use is STANDBY and SAFE mode which should both be done when the IM is in a stowed configuration	In TRANSFERPHASE whenever stowed IM shall eventually satisfy STANDBYMODE & SAFE	MODAL DELAYED REACTION	[12]

13-D	During the Rendezvous Phase the only modes of operation in use is STANDBY and SAFE mode which should both be done when the IM is in a stowed configuration	In RENDEZVOUSPHASE whenever stowed IM shall eventually satisfy STANDBYMODE & SAFEMODE	MODAL DELAYED REACTION	[12]
13-E	During the Berthing Phase the only modes of operation in use is STANDBY and SAFE mode which should both be done when the IM is in a stowed configuration	In BERTHINGPHASE whenever stowed IM shall eventually satisfy STANDBYMODE & SAFEMODE	MODAL DELAYED REACTION	[12]
13-F	During the Cargo delivery Phase the only modes of operation in use is STANDBY and SAFE mode which should both be done when the IM is in a stowed configuration	In CARGODELIVERYPHASE whenever stowed IM shall eventually satisfy STANDBYMODE & SAFEMODE	MODAL DELAYED REACTION	[12]
13-G	During the Inflatable deploying Phase the only modes of operation in use is CHECK, SAFE, NOMINAL TESTING mode which should be done when the IM is in a stowed or deployed configuration	In INFLATABLEPHASE whenever (stowed|deployed) IM shall eventually satisfy SAFEMODE & CHECKMODE & NOMINALTESTINGMODE	MODAL DELAYED REACTION	[12]
13-H	During the On orbit tests and ops Phase the only modes of operation in use is CHECK, SAFE, NOMINAL TESTING and NOMINAL CREW mode which should be done when the IM is in a deployed configuration	In ONORBITSPHASE whenever deployed IM shall eventually satisfy SAFEMODE & CHECKMODE & NOMINALCREWMODE & NOMINALTESTINGMODE	MODAL DELAYED REACTION	[12]
13-I	During the Undocking delivery Phase a mode of operation in use is STANDBY which should both be done when the IM is in a deployed configuration	In UNDOCKINGPHASE whenever deployed IM shall eventually satisfy STANDBY	MODAL DELAYED REACTION	[12]
13-J	During the Undocking delivery Phase a mode of operation in use is SAFE which should both be done when the IM is in a deployed or stowed configuration	In UNDOCKINGPHASE whenever (stowed|deployed) IM shall eventually satisfy SAFE	MODAL DELAYED REACTION	[12]
13-K	During the Destructive re-entry a mode of operation in use is STANDBY which should both be done when the IM is in a deployed configuration	In DESTRUCTIVEPHASE whenever deployed IM shall eventually satisfy STANDBY	MODAL DELAYED REACTION	[12]

14-A	The launch phase begins ends at burn out.	Upon LaunchPhase System shall eventually satisfy burnout	PHASES	[12]
14-B	The Separation phase begins with burn out,	Upon burnout System shall at the next timepoint satisfy SeparationPhase	PHASES	[12]
14-C	The Separation phase ends with transfer orbit insertion.	Upon SeparationPhase System shall eventually satisfy orbitinsertion	PHASES	[12]
14-D	Orbit insertion leads to the beginning of the transfer phase.	Upon orbitinsertion System shall at the next timepoint satisfy TransferPhase	PHASES	[12]
14-E	During transfer, the spacecraft moves toward the Cygnus arrival near the ISS	Upon TransferPhase System shall eventually satisfy cyngusarriaval	PHASES	[12]
14-F	Finally, the rendezvous phase covers the approach.	Upon cyngusarriaval System shall at the next timepoint satisfy RendezvousPhase	PHASES	[12]
14-G	Finally, the rendezvous phase covers the approach and capture by the robotic arm	Upon RendezvousPhase System shall eventually satisfy capturerboticarm	PHASES	[12]
15	Autonomously release the SEPM when the right jettison attitude is reached	Upon Currentattitude <= Rightattitude ReleaseBepiColombo shall immediately satisfy release_SEPM	TRIGGERED INSTANT REACTION	[11]
16	Autonomously release MMO when the polar orbit is reached	Upon polar_orbit_reached BepiColombo shall immediately satisfy release_MMO	TRIGGERED INSTANT REACTION	[11]
17	Autonomously determine a steering law	whenever operating BepiColombo shall eventually satisfy determine_steering_law	PROMPT REACTION	[11]
18	Use low thrust to achieve capture around Mercury	whenever capturing BepiColombo shall immediately satisfy low_thrust	INSTANT REACTION	[11]
19	Autonomously acquire the escape procedure and use it to leave Mercury if necessary	Upon need_mercury_escape BepiColmbo shall immediately satisfy acquire_escape_procedure & escape	TRIGGERED INSTANT REACTION	[11]
20-A	Autonomously detect the presence of high solar irradiation	whenever high_solar BepiColombo shall eventually satisfy detect	DELAYED REACTION	[11]
20-B	In case of presence of high solar irradiation the system will be able to shield the electronics by turning them off	Whenever solar_irradiation >Normal_solar_radiation BepiColmbo shall immediately satisfy turn_off_electronics	INSTANT REACTION	[11]

20-C	In case of presence of high solar irradiation the system will be able to shield the electronics	`Whenever solar_irradiation >Normal_solar_radiation BepiColmbo` shall `immediately` satisfy `shield_electronics`	INSTANT REACTION	[11]
20-D	Autonomously detect the presence of high solar irradiation and get away if possible, by using chemical propulsion.	`Whenever solar_irradiation >Normal_solar_radiation BepiColmbo` shall `immediately` satisfy `get_away_chemically`	INSTANT REACTION	[11]
21	Autonomously maintain the onboard equipment and the spacecraft structure in proper temperature range.	`BepiColmbo` shall `always` satisfy `MaintainEquipment & MaintainTemperature`	MAINTAIN SAFE SPACE	[11]
22	The algorithm first selects the vernier jet or the group of primary jets whose acceleration has the largest scalar (dot) product with the desired rotational acceleration vector.	`SRC` shall `at the next timepoint` satisfy `(SelectFirstJet | SelectPrimaryJets) & !(SelectFirstJet & SelectPrimaryJets)`	PROMPT REACTION	[3]
23	If second and third jets are required, they are similarly selected on the basis of the second and third largest scalar products.	`Whenever SecondJet | ThirdJet SRC` shall `immediately` satisfy `SelectNeededJet`	INSTANT REACTION	[3]
24-A	If three jets satisfying the given thresholds cannot be found, the algorithm considers pairs, or, as a last resort, single jets	`Whenever !ThreeJets SRC` shall `immediately` satisfy `Considerpairs`	INSTANT REACTION	[3]
24-B	If three jets satisfying the given thresholds cannot be found, the algorithm considers pairs, or, as a last resort, single jets	`Whenever !TwoJets SRC` shall `immediately` satisfy `Considersingle`	INSTANT REACTION	[3]
25	During the final phase of Shuttle flight, the orbiter must enter a "heading alignment cylinder"	`In FinalPhase Orbiter` shall `eventually` satisfy `HeadingAlignmentsCylinder`	MODAL DELAYED REACTION	[3]
26	if three Shuttle main engines fail sequentially or simultaneously begin calculating/commanding safe abort manoeuvres.	`Upon 3EngineFailure 3E/O` shall `immediately` satisfy `CalculatePlan & SafeManoeuvres`	TRIGGERED INSTANT REACTION	[3]
27	If it is required to know the state of the spacecraft, even during the section of the orbit without a communication link with ground segment, store telemetry data.	`If StateRequired & !CommunitcationLink CubeSat` shall `immediately` satisfy `StoreData`	TRIGGERED INSTANT REACTION	[8]

28-A	in charge of providing the ground segment with telemetry data about the state and health of the spacecraft, therefore this service shall be able to automatically collect telemetry data.	`Cubesat` shall `always` satisfy `CollectData`	MAINTAIN SAFE SPACE	[8]
28-B	in charge of providing the ground segment with telemetry data about the state and health of the spacecraft, therefore this service shall be able to automatically store telemetry data.	`Cubesat` shall `always` satisfy `StoreData`	MAINTAIN SAFE SPACE	[8]
28-C	in charge of providing the ground segment with telemetry data about the state and health of the spacecraft, therefore this service shall be able to automatically transmit telemetry data.	`Whenever groundsegmentconnection & !telemtrydata` `Cubesat` shall `until telemtrydata` satisfy `Transmit`	TRANSMIT	[8]
29	At least one side shall be the pilot flying side.	`FGS` shall `always` satisfy `PilotFlying <= 1`	SEMI-AUTONOMOUS	[4]
30	At most one side shall be the pilot flying side.	`FGS` shall `always` satisfy `PilotFlying >= 1`	SEMI-AUTONOMOUS	[4]
31	Pressing the Transfer Switch shall always change the pilot flying side.	`Upon TransferSwitch` `FGS` shall `immediately` satisfy `SwitchSides`	TRIGGERED INSTANT REACTION	[4]
32	The system shall start with the Primary Side as the pilot flying side.	`Upon Startup` `FGS` shall `at the next timepoint` satisfy `PrimarySide`	TRIGGERED INSTANT REACTION	[4]
33	The system shall not change the pilot flying side unless the Transfer Switch is pressed.	`FGS` shall `until switch` satisfy `!SwitchSides` + `FGS` shall `eventually` satisfy `switch`	WAIT	[4]
34	Exceeding sensor limits shall latch an autopilot pullup when the pilot is not in control (not standby) and the system is supported without failures (not apfail).	`Whenever Limits & !Standby & supported & !apfail` `FSM` shall `immediately` satisfy `Pullup`	INSTANT REACTION	[7]
35	While flying, remain separated from an intruder aircraft by at least 250 ft horizontally or 50 ft vertically	`In FlightMode` `AirCraft` shall `always` satisfy `( horizontalIntruderDistance >250 | verticalIntruderDistance >50 )`	MODAL MAINTAIN SAFE SPACE	[1]

36	The probability that the aircraft leaves the taxiway, i.e., —cte— >8 meters, shall be extremely low	`Aircraft` shall `with probability <= 0.001` `eventually` satisfy `absReal(cte) >8`	PROBABILISTIC MAINTAIN SAFE SPACE	[1]
37	The probability that the aircraft turns more than a prescribed degree (—he— $\leq 35°$) shall be extremely low	`Aircraft` shall `with probability` $\leq$ `0.002` `eventually` satisfy `absReal(he)` $\leq$ `35`	PROBABILISTIC MAINTAIN SAFE SPACE	[1]
38	We also require that the rear propeller be always used, except in HC mode	`If not in HCMode` `LPC` shall `always` satisfy `RearPropeller`	MODAL MAINTAIN SAFE SPACE	[9]
39	If the vehicle is slowing down from the wing-borne mode (WB), the transition to semi-wing-borne (SWB) kicks in at an indicated airspeed of 90 knots (kias <= 90.0)	`In Wbmode` `whenever airspeed <= 90` `LPC` shall `eventually` satisfy `SWBMode`	MODAL DELAYED REACTION	[7]
40	whereas if the vehicle is speeding up from a SWB mode, the transition to WB mode occurs at kias >100.0 knots	`In SWBmode` `whenever airspeed >100` `LPC` shall `eventually` satisfy `WBMode`	MODAL DELAYED REACTION	[7]
41	The vehicle remains in the thrust-borne mode (TB) as long as kgs <= 20.0 knots and Hover Control (HC) mode is selected.	`In HCmode` `whenever TBMode & Kgs <= 20` `LPC` shall `always` satisfy `TBmode`	MAINTAIN MODE IN HIERARCHY	[9]
42-A	during takeoff and landing, the aircraft motion is controlled by the lifting rotors only	`In TakeoffMode` `LPC` shall `always` satisfy `LiftingRotors & !FlightSurfaces`	MODAL MAINTAIN SAFE SPACE	[9]
42-B	during takeoff and landing, the aircraft motion is controlled by the lifting rotors only	`In LandingMode` `LPC` shall `always` satisfy `LiftingRotors & !FlightSurfaces`	MODAL MAINTAIN SAFE SPACE	[9]
43	On the other hand, during the higher speeds of the en-route phase, the wings provide lift, the rear propeller provides thrust, and the lifting rotors are inactive (wing-borne mode, WB)	`In EnRoute` `LPC` shall `always` satisfy `!LiftingRotors & ThrustRearPropeller & WingsLift`	MODAL MAINTAIN SAFE SPACE	[9]
44	In a SLM survey, crew takes measurements at locations described in procedures, attempting to take the measurement as close to the described point as possible	`Astrobee` shall `eventually` satisfy `SoundLocation & SLMSurvey`	VISIT WITH REACTION	[2]

45	This type of data could be supplemented with denser, though shorter duration, measurements from a mobile platform. The Radiation Environment Monitor (REM) hardware developed at the University of Houston and NASA Johnson Space Center is an example of the sort of small, light-weight sensor that Astrobee could carry to create higher resolution maps of the ISS environment.	`Astrobee` shall `eventually` satisfy `RadiationLocation & RadiationSurvey`	VISIT WITH REACTION	[2]
46	The SPHERES satellites, however, triangulate their position using infrared/ultrasonic beacons, preventing them from navigating outside the two-meter cube defined by the fixed beacon locations.	`Whenever moving` `SPHERES` shall `immediately` satisfy `x<2 & y<2 & z<2`	STAY-IN-PERIMETER	[6]
47	Like SPHERES, Int-Ball cannot operate without a direct line-of-sight to its markers.	`whenever Operating` `IntBall` shall `immediately` satisfy `LOS1 & LOS2`	STAY-IN-PERIMETER	[6]
48	The PerchCam is identical to the HazCam and it turns on to detect ISS handrails when Astrobee perches autonomously	`Whenever Perched` `Astrobee` shall `immediately` satisfy `PerchCam`	INSTANT REACTION	[2]
49	the top-facing SpeedCam sensor package provides an independent over-speed cutoff function, estimating velocity using its own optical flow, infrared ranging, and IMU sensors	`Whenever Moving` `Astrobee` shall `always` satisfy `cutoff >currentspeed`	MAINTAIN SAFE SPACE	[2]
50	After a sortie, Astrobee transfers large files through a hard-wired Ethernet connection with its dock	`whenever ISSConnection & Ethernet & !LargeFile` `Astrobee` shall `until LargeFile` satisfy `Transfer`	TRANSMIT	[2]
51	Once Astrobee grasps a handrail, it powers down its propulsion system.	`Upon Perched` `Astrobee` shall `at the next timepoint` satisfy `!PropulsionSystem`	TRIGGERED PROMPT REACTION	[2]
52	Initially, Astrobee will use these components primarily to help crew understand its state and intentions (for example, by providing turn signals)	`whenever Turning` `Astrobee` shall `at the next timepoint` satisfy `Indicate`	PROMPT REACTION	[2]

53	When docking, Astrobee autonomously approaches its berth using visual servoing relative to fiducials mounted to the dock	In DockingMode Astrobee shall eventually satisfy approachberth	MODAL REACTION	[2]
54	When mating is complete, permanent magnets on the berth attract striker plates on the robot, providing a passive retention force	Upon MatingComplete DS shall eventually satisfy StrikeMagnets	TRIGGERED DELAYED REACTION	[2]
55	To enable undocking, linear actuators within the berths pull the magnets away from the striker plates, allowing the propulsion system to easily overcome the reduced magnetic force	In UndockingMode DS shall at the next timepoint satisfy LinearActuators	MODAL PROMPT REACTION	[2]
56	If multiple Astrobees are active, the Control Station displays the positions of all of the Astrobees so that the operators are aware of the other activities and can avoid collisions.	Whenever numberofAtrobees > 1 CS shall immediately satisfy DisplayALL	INSTANT REACTION	[2]
57	Operators use the Plan Editor tab in the Control Station to construct and validate sequences of commands for Astrobee (".fplans"), that include waypoints and actions to perform at the waypoints.	whenever CommandReceived Astrobee shall eventually satisfy PerformCommand	DELAYED REACTION	[2]
58-A	Astrobee can lose signal, when signal is lost Astrobee enters LOS-MOde	whenever LostSignal Astrobee shall immediately satisfy LOSMode	INSTANT REACTION	[2]
58-B	During loss-of-signal (LOS) with the ground, Astrobee continues to hold its position while recording and storing video on its internal file system.	In LOSMode Astrobee shall always satisfy Hold & WorkInternally	MODAL MAINTAIN SAFE SPACE	[2]
58-C	Once ground signal has been reacquired	Whenever !ISSConnection & !Groundsignal Astrobee shall until ISSConnection & Groundsignal satisfy reconnect	RECONNECT	[2]
58-D	Once ground signal has been reacquired, Astrobee resumes downlinking the live video stream to the Control Station.	Whenever ISSConnection & Groundsignal & !Stream Astrobee shall until Stream satisfy downlink	TRANSMIT	[2]
59-A	Astrobee is programmed to stop when it detects an obstacle	Upon ObstacleDetected Astrobee shall immediately satisfy Stop	TRIGGERED INSTANT REACTION	[2]

59-B	we are considering using Astrobee's lights and/or speaker to signal when it enters a hatchway	Whenever EntersHatchway Astrobee shall immediately satisfy EntranceAlarm	INSTANT REACTION	[2]
60-A	White "Vid" LEDs indicate that cameras are in use	In VideoRecordingMode Astrobee shall always satisfy VidLED	MODAL MAINTAIN SAFE SPACE	[2]
60-B	A blue "Aud" light tells the crew that the microphone is on	In AudioRecording Astrobee shall always satisfy BlueAudLED	MODAL MAINTAIN SAFE SPACE	[2]
60-C	"Live" LEDs indicate that cameras are streaming	In StreamingMode Astrobee shall always satisfy LiveLED	MODAL MAINTAIN SAFE SPACE	[2]
61-A	The Control Station warns operators when they create plans that translate through a KOZ.	Whenever KOZPlan ControlStation shall at the next timepoint satisfy Warn	PROMPT REACTION	[2]
61-B	The Control Station prevents operators from sending plans that translate through a KOZ to Astrobee until the violating segments are modified	ControlStation shall until !KOZPlan satisfy !SendPlan + ControlStation shall eventually satisfy satisfy !KOZPlan	WAIT	[2]
62	As a final safeguard, Astrobee itself has an internal list of KOZs that it checks before moving	Whenever moving Astrobee shall immediately satisfy !KOZ1 & !KOZ2	KEEP-OUT-ZONE	[2]
63-A	The robot can periodically update multi-sensor 3D maps of the vehicle. air quality tracking can all help flight controllers understand system status	Whenever TimeForAir Astrobee shall eventually satisfy AirSurvey	DELAYED REACTION	[2]
63-B	The robot can periodically update multi-sensor 3D maps of the vehicle. RFID quality tracking can all help flight controllers understand system status	Whenever TimeForRFID Astrobee shall eventually satisfy RFIDSurvey	DELAYED REACTION	[2]
63-C	The robot can periodically update multi-sensor 3D maps of the vehicle. Visual Imaging tracking can all help flight controllers understand system status	Whenever TimeForVisualImaging Astrobee shall eventually satisfy VisualImagingSurvey	DELAYED REACTION	[2]

63-D	The robot can periodically update multi-sensor 3D maps of the vehicle. Thermal imaging tracking can all help flight controllers understand system status	`Whenever TimeForThermalImaging Astrobee` shall `eventually` satisfy `ThermalImagingSurvey`	DELAYED REACTION	[2]
64	Automated change detection and trending. Once a baseline sensor map is available, changes at the next update can indicate developing problems at an early stage	`Whenever SurveyDone Astrobee` shall `eventually` satisfy `CompareMaps`	DELAYED REACTION	[2]
65	Localizing problems. For example, if a leak produces a whistling sound, acoustic or ultrasonic sensors onboard the robot can be used to pinpoint its location.	`Whenever AnomalyDetected Astrobee` shall `eventually` satisfy `PinpointProblem`	DELAYED REACTION	[2]
66	When flight controllers have a question about something, they can use the robot to get an updated view, filling a role currently played by crew on ISS	`Whenever SpotCheck Astrobee` shall `eventually` satisfy `UpdateMap`	DELAYED REACTION	[2]
67	The first is the observing and planning phase for acquiring motion information of the target satellite and planning when and where the robot will grasp the target satellite	`Upon FirstPhase ServicingSatellite` shall `eventually` satisfy `AcquireMotionInformation & Planning`	PHASES	[5]
68	The second phase is to control the robot to move toward the planned grasping location to make the robot ready for the capturing of the target.	`Upon AcquireMotionInformation & Planning ServicingSatellite` shall `at the next timepoint` satisfy `SecondPhase` + `Upon SecondPhase ServicingSatellite` shall `eventually` satisfy `MoveToPosition`	PHASES	[5]
69	The third phase is the capture (physical interception) phase in which the manipulator physically captures the target satellite	`Upon MoveToPosition ServicingSatellite` shall `at the next timepoint` satisfy `ThirdPhase` + `Upon ThirdPhase RobotManipulator` shall `eventually`satisfy `PhysicalCapture`	PHASES	[5]

70	The fourth phase is the post-capture phase in which captured target satellite is stabilized along with the servicing system	`Upon PhysicalCapture ServicingSatellite` shall `at the next timepoint` satisfy `FourthPhase` + `Upon FourthPhase ServicingSatellite` shall `eventually` satisfy `Stabilization`	PHASES	[5]
71	The maximum rotation speed is restricted within 23,100 rpm to ensure the crew's safety	`IntBall2` shall `always` satisfy `RPM <= 23100`	MAINTAIN SAFE SPACE	[6]
72	Once the variances of the derivatives of acceleration and angular velocity from the IMU exceed predefined upper thresholds, the status shifts to collision mode.	`If (VelocityVariancesc >UpperVelocityThreshold) & (AccelerationVariances >UpperAccelerationThreshold) IntBall2` shall `immediately` satisfy `CollisionMode`	TRIGGERED INSTANT REACTION	[6]
73	If the variances immediately decrease below lower thresholds, the impact cause is presumed to be an impulsive external force, and the Int-Ball2 tries to maintain its current pose	`In CollisionMode if the (VelocityVariances <LowerVelocityThreshold) & (AccelerationVariances <LowerAccelerationThreshold) IntBall2` shall `immediately` satisfy `MaintainCurrentPose`	MODAL TRIGGERED INSTANT REACTION	[6]
74	Otherwise, it is assumed to be held by the astronaut's hands, and maneuver control is turned off	`In CollisonMode if the !(VelocityVariances <LowerVelocityThreshold) | !(AccelerationVariances <LowerAccelerationThreshold) IntBall2` shall `immediately` satisfy `ManeuverControl=0 & AstronautControl`	MODAL TRIGGERED INSTANT REACTION	[6]
75	After the astronaut releases the robot, the control for maintaining the pose at the released point is restarted if the variance falls below the lower threshold	`If AstronautControl=0 & VarianceThreshold <VarianceThreshold IntBall2` shall `immediately` satisfy `MaintainCurrentPose`	TRIGGERED INSTANT REACTION	[6]
76	Additionally, when the navigation camera is blocked by crew interference or positioned too close to a wall so that the feature points for vSLAM cannot be detected, the navigation subsystem shifts to inertial navigation that uses the IMU without relying on the vSLAM output.	`Whenever vSLAMUnavailable IntBall2` shall `at the next timepoint` satisfy `NavigatewithIMU & NavigatevSLAM=0`	PROMPT REACTION	[6]

77-A	However, if the vSLAM output remains unavailable for an extended period, the robot rotates in place until the feature points detected in the current view align with those in the stored map	`whenever vSLAMUnavailable IntBall2` shall `until FeaturePointDetected` satisfy `RotateProtocol` + `whenever vSLAMUnavailable IntBall2` shall `eventually` satisfy `FeaturePointDetected`	CONDITIONAL WAIT	[6]
77-B	if the vSLAM output remains unavailable for an extended period	`Whenever vSLAMOutput=0 & TimePassed <= ExtendedPeriod IntBall2` shall `at the next timepoint` satisfy `vSLAMUnavailable`	PROMPT REACTION	[6]
78	Furthermore, when the Int-Ball2 automatically detects that the remaining battery power is low, it returns to the DS for recharging	`Whenever IntBall2Power <= SafeBattery IntBall2` shall `at the next timepoint` satisfy `RechargeMode`	PROMPT REACTION	[6]

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