Exploration 1 Operations Manual

Contents

Section 1 (Nominal Operations)

Part 1 - Rollout

Once simulation of the mission is complete Flight Controllers will hold a Go/No-go poll T-30 mins prior to launch, if the poll is passed the Flight Controller in charge will roll the vehicle out to the Pad.

Part 2 - Pre-Launch

Once rolled out to pad, the flight controller will access the “Houston UI” of the telemetry at https://iksa-telem.aussie-games.online . Once flight controllers have confirmed the acquisition of Data, they will review all Telemetry to confirm Nominal proceedings, at T-20 mins, a go/no-go poll will be conducted, following a **GO** result the Flight Director will proceed to Fueling operations.

Part 3 - Fueling

After the **GO** result of the T-20mins go/no-go poll, at T-15mins the Flight Director will begin fueling operations of the vehicle from the pad with action group 7. During this process Flight Controllers will monitor their data and EECOM will be the primary communicator whilst monitoring fueling ops. Once the fueling on Stage 1 has completed. A go/no-go poll for Stage 2 prop load will be conducted following a **go** result Flight Director shall enable cross-feed on the Stage1/2 decoupler with action group 8, subsequently Stage 2 Prop load will begin. T-5 mins the cross-feed on the decoupler should be disabled, and all fueling on the vehicle stopped.

Part 4 - Liftoff

At T-3mins the Fueling top off should be disabled with action group 7. At T-1minute the MechJeb2 Ascent Automation System should be Activated. At T-3s the Ascent Controller should stage the Main Engine with the Stage+ Button, at T-2s they should retract the fuel arms with the stage 1 button, T-1s the Vernier Thrusters with the Stage+ Button, T-0s the launch clamps with the Stage+ Button.

Part 5 - Ascent

After Liftoff occurs the ascent controller should callout all major events. Whilst all other controllers should monitor data.

Part 6 - Orbit Insertion

After the initial Stage 1 & 2 burns, the Exploration 1 second stage will coast to apoapsis where a burn to circularise orbit will occur. All callouts will be the responsibility of the Ascent Controller and Navigation controller.

Part 7 - Payload Release

Once the Orbit Insertion is complete, a go/no-go poll for Payload Separation will be conducted. After the **go** result, the ascent controller will check that MechJeb2 Ascent Mode is disabled, and the navigation controller will stage the payload separation decoupler. Following the payload separation, move to section C.

Section 2 (Off-nominal Operations)

Part 1 - General

At any time in the launch countdown if a mission controller finds a major issue with the Launch Vehicle, they will say on the net “Hold, Hold, Hold”, Following the call, the Flight Director will hold the launch countdown, and disable the MechJeb2 Launch Program. Otherwise for non-emergency holds, flight controllers will inform the Flight Director of the issue, and the Flight Director will choose whether or not to hold. To hold countdown and de-tank press 2.

Part 2 - Pre Launch

If any issues are found with accessing vehicle telemetry, or powering of the Launch Vehicle/ Payload. A hold will be conducted for the length of time required to fix the issue. Once resolved Flight Director may choose to scrub the launch for the day, or continue the count.

Part 3 - Fueling

If any issues are found during fueling, mission controllers must announce “hold, hold, hold” regardless of severity. The Flight Directors will stop fueling operations and abort the countdown. If the issue is not severe, a vent of the fuel may occur to allow engineers to fix the issue. If any major issues occur, the fuel should be immediately vented and the auto sequence aborted.

Part 4 - Liftoff

If any issues are found during the terminal count, a “Hold, hold, hold” message must be sent, regardless of severity. If engines fail to ignite all other engines must be shut down and the launch sequence aborted. If any clamps fail to separate but the vehicle is still on the pad, a shutdown of engines will be initiated, if the vehicle has begun flight, the FTS must be activated to destroy the vehicle.

Part 5 - Ascent

If a major issue is found in the Launch Vehicle, such as out of control LV, or rapidly deteriorating LV, the flight termination system should be initiated to destroy the vehicle. If a vernier engine fails during ascent the launch may continue under early-stage sep conditions. If the main engine fails close to stage sep an early stage sep may be initiated. However, if the Main Engine fails before, the FTS must be activated.

Part 6 - Orbital Insertion

If the engine fails to ignite for orbital insertion, the vehicle must be left to re-enter the atmosphere and burn up. If the vehicle will hit land the RCS engines should try to be used to point the vehicle away from land in the event debris survives re-entry.

Part 7 - Payload Release

If the payload fails to separate, the satellite owner must be consulted and the second stage left in orbit, if the sat owner wishes to have the satellite destroyed, stage 2 may de-orbit itself. If the sat Owner wishes to troubleshoot the issue, the second stage should be left in orbit for 30 days, when the stage must be de-orbited.

Part 8 - LOV & RUD

If the launch vehicle and payload is lost, recovery forces should be contacted to trace the vehicle, and the customer informed, subsequently the administrator will make a statement, and an investigation conducted into what caused the launch failure. The customer must be paid compensation. After the investigation is concluded the changes must be made and a report made.

Section 3 (Post Launch)

Part 1 - Re-entry

After payload separation the:

Media Team:

Should cut the feed and give final remarks, then switch to the outro.

Flight Controllers:

Command the second stage to use its rcs quads to move itself a safe distance away from the payload, once at 1km away, the second stage can Orient and ignite for the de-orbit burn.

Part 2 - End of comms

After confirmed loss of data from the second stage Flight controllers should review last recorded telemetry, and inform the Flight Director of nominal proceedings, they may then leave the loop. Media should have the stream ended if not already.

Section 4 (Action Groups)

Part 1 - Action Group 1, De-tank

If operators call for a de-tank of vehicle, the controller in charge should press 1, to activate the vent systems, and the auto stopping of fueling ops. When tank is empty this will automatically shut off.

Part 2 - Action Group 2, Launch Abort from Pad

If an operator calls “hold, hold, hold” on the net, the controller in charge should press 2, to activate the disabling of autopilot, and venting of fuel.

Part 3 - Action Group 3, Toggle fuel arms

If a launch abort is commanded after the detaching of the Fuel Arms as part of the T- Count, flight controllers can use Action Group 3, to re-attach them, this can also be used in off-nominal cases where the arms need to be retracted prior to T-2s.

Part 4 - Action Group 4, Vent Plumes

The 4 key bind will disable the venting plume. Note this is a toggle so to restart the plume press 4 again.

Part 5 - Action Group 5, FTS

If the rocket becomes unstable flight controllers should press action group 5, to demand the rocket Self Destruct.

Part 6 - Action Group 6, Auto Launch Program

At T-1 Minute flight controllers should enable the Auto Launch program with action group 6. Note this is a toggle so to shutdown the program press 6 again.

Part 7 - Action Group 7, Fueling (All)

When Flight Director wishes to begin fueling the vehicle they should press 7, this will begin fueling of the first stage. Once they wish to begin second stage fueling move to section 4.8. Note this is a toggle so to end the fueling press 7 again.

Part 8 - Action Group 8, Fueling (Second Stage)

After 4.7 is complete, and flight controllers wish to start fueling the Second Stage they should press 8, this will enable crossed on the decoupler, allowing for fuel to flow to second stage. Note this is a toggle so to end the fueling press 8 again.

Part 9 - Action Group 9, Next Cam

MEDIA ONLY, press 9 to switch to the next camera.

Part 10 - Action Group 10, Prev Cam

MEDIA ONLY, press 10 to switch to the previous camera.