## ***Risk Analysis***

NG Supersonic Two-stage risk analysis chart

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item #** | **Item** | **Failure** | **Root Cause** | **Likelihood**  1 = least  5 = most | **Severity**  1 = least  5 = most | **Precaution** | **Performance**  1 = least  5 = most | **Schedule**  1 = least  5 = most | **Cost**  1 = least  5 = most |
| 1.1 | Separation System (Staging) | Fails to Separate, buckling, thermal, | Circuit fails to provide voltage to PEM. Mechanical failure | 3 | 5 | Ground Testing before launch to certify system | 1 | 3 | 3 |
| 1.2 | Separation System (Structural) | Failure in flight of sep system, impact, thermal | System detaches mid-flight/ aeroforces exceed limits | 2 | 4 | Ensure system is secured before flight. | 1 | 3 | 3 |
| 1.4 | Body (Structural) | Body bending, cracks, deformities | Forces during flight/temperature | 2 | 5 | Visual/NDT inspections | 2 | 2 | 3 |
| 1.5 | Fins (Structural) | Bending, cracks, deformities | Material deformation, adhesive epoxy failure | 2 | 5 | Visual/ NDT inspections | 2 | 2 | 3 |
| 1.6 | Avionics | Flight computers do not set off energetics | Battery failure, electrical short, ematch failure | 2 | 5 | Ground testing with energetics | 4 | 2 | 3 |
| 1.7 | Payload | Failure to capture data, or run experiment | Improper activation, electrical/mechanical failure | 1 | 1 | Integration/ground testing | 1 | 2 | 1 |
| 1.8 | Rocket Motors | CATO | Propellant/Casing Failure | 1 | 5 | Inspect Propellant grains for cracks or deformities, proper assembly | 5 | 1 | 5 |
| 1.9 | Recovery System (1st Stage) | Drogue/Main Chute do not deploy | Tangled lines, Chute does not release, not fully deployed | 3 | 4 | Proper packing and testing of ejection | 1 | 2 | 4 |
| 2.0 | Recovery System (2nd Stage) | Drogue/Main Chute do not deploy | Tangled lines, Chute does not release, not fully deployed | 3 | 5 | Proper packing and testing of ejection | 1 | 2 | 4 |
| 2.1 | 2nd stage motor ignition | Failure to ignite, excessive delay causing tipover ignition | Delayed ignition/failure to ignite, failed ignitor system. Tipover ignition safety failure. | 4 | 5 | Ground testing, subscale flight testing. | 5 | 2 | 1 |

RISK Analysis Example

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| --- | --- | --- | --- | --- | --- | --- |
| **Item #** | **Item** | **Failure** | **Root Cause** | **Likelihood**  1 = least  5 = most | **Severity**  1 = least  5 = most | **Precaution** |
| 1. | Rocket  body | Recovery failure | Failed parachute deployment | 2 | 5 | Verify recovery systems are properly inspected and installed for flight |
| 1.2 | Body tube | Body tube buckles or tears | High/low stability margin causing the rocket to tip, or the parachute zippers | 2 | 5 | Pack the parachute properly and use Rocksim to make sure the stability margin is acceptable |
| 1.3 | Motor Mount | Motor mount failing and motor coming loose | Bad fillets on the centering rings or too much force on the mounts | 1 | 5 | Inspect motor retainer and centering rings before flight. |
| 1.4 | Fins | Fins breaking resulting in an unstable rocket | Bad fillets or too much drag force | 2 | 5 | Inspect fin fillets and ensure epoxy is cured. |
| 2. | Payload | - | - | - | - | - |
| 2.1 | Avionics System | Short circuit or malfunction | Improper wiring or setup | 3 | 3 | Complete avionics checklist, complete testing on the ground before launch. |
| 2.4 | Motor | Failure to ignite | Igniter improperly attached on launch pad | 2 | 5 | Secure igniter using tape or motor. |