

Narrative Description

Baby Bird Mission - FCC Part 5 Special Temporary Authority Application

Applicant: Blackwing Space, Inc.
Filing Type: Special Temporary Authority (STA) under 47 CFR Part 5
Mission: Baby Bird (single spacecraft)

1. Purpose of Operation

Blackwing Space, Inc. (“Blackwing”) requests STA authority under 47 CFR Part 5 to operate a low-power UHF telemetry downlink for the Baby Bird mission, a technology demonstration using a Sparrow 1.5U CubeSat carrying a Manifest Space optical beacon payload that produces no RF emissions. This mission will conduct research on space situational awareness applications using an optical beacon.

This filing seeks authority for the spacecraft telemetry downlink only. The payload experiment itself is optical and produces no intentional RF emissions. Spacecraft commanding is routed through separately licensed third-party earth stations and is described in this narrative only to explain the operational command path and stop-buzzer capability; no Earth-to-Space authority is requested in Blackwing's Form 442.

Requested authorization window is October 1, 2026 through April 1, 2027 (six-month STA window). Blackwing’s integration date is August 1, 2026 and therefore Blackwing respectfully requests a grant of its application by this date.

In this submission, Blackwing also provides:

- Orbital Debris Analysis Report;
- A Stop Buzzer Exhibit;
- An ITU cost recovery letter; and
- An NTIA space data record submission

Blackwing will provide its ITU submission shortly after filing its application.

2. Mission and Spacecraft Summary

2.1 Mission Profile

- Launch vehicle: SpaceX Transporter-18
- Launch site: Vandenberg SFB, SLC-4E
- Integration date: 2026-08-01
- Launch timing: NET 2026-10-01 (+30 days)
- Orbit type: 510 km LEO Sun-Synchronous Orbit (SSO)
- Apogee / perigee basis: 510 km +/- 20 km
- Inclination: 98.0 degrees +/- 0.1 degrees
- Eccentricity: < 0.003
- MLTDN: 10:00 +60 min
- Spacecraft count: 1

2.2 Spacecraft Characteristics

- Satellite name: Baby Bird
- Bus name: Sparrow
- Form factor: 1.5U CubeSat (approx. 17.0 x 12.9 x 11.5 cm external envelope)
- Mass: 2.0 kg
- Power system: body-mounted solar cells plus 78 Wh Li-ion battery
- Solar panel area: 378.5 cm²
- Attitude: tumbling (no active attitude control)
- Propulsion: none

2.3 Communications Subsystem

- Radio: OpenLST UHF radio
- Antenna: PlaneWave PW0404-104
- Spacecraft antenna gain: -6 dBi
- Spacecraft antenna polarization: linear vertical
- Spacecraft TX power: 30 dBm (1 W)
- Spacecraft EIRP: 23.9 dBm (0.25 W)

2.4 Payload Scope

- Payload: Manifest Space Optical Beacon
- RF relevance: none (optical only)
- Experiment duration: approximately 3 months (within STA period)

2.5 Spacecraft Configuration Views

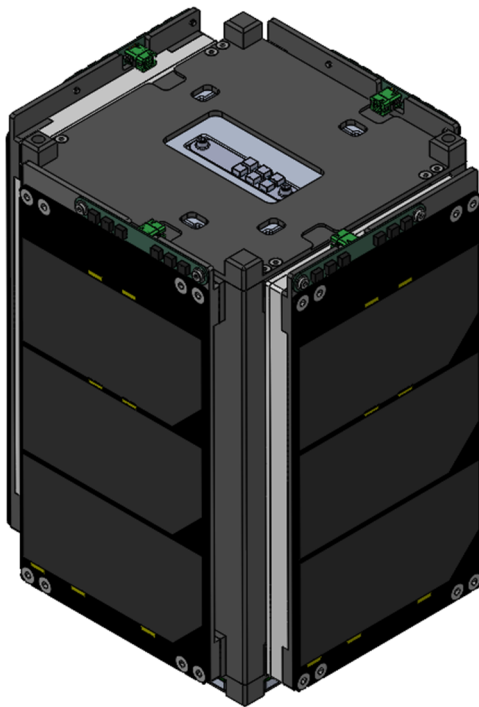


Figure 1: Baby Bird Spacecraft (+X/+Y/+Z View)

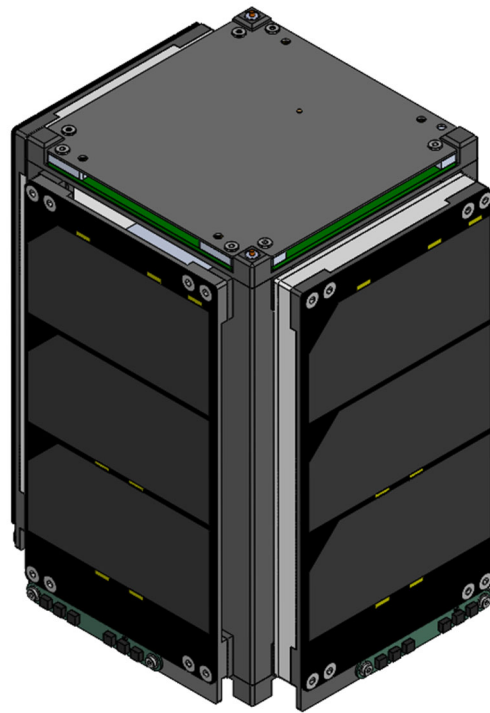


Figure 2: Baby Bird Spacecraft (+X/-Y/-Z View)



Figure 3: Baby Bird Spacecraft (-X/+Y/-Z View)



Figure 4: Baby Bird Spacecraft (-X/-Y/+Z View)

3. Ground Segment and Command Support

Ground services are provided by RBC Signals with current operational support limited to two U.S. stations:

- Deadhorse, Alaska, USA (70 deg 12' 36" N, 148 deg 25' 48" W, 10 m above mean sea level)
- Winston-Salem, North Carolina, USA (36 deg 05' 24" N, 80 deg 15' 00" W, 300 m above mean sea level)

Common ground segment parameters used for the current support plan are:

- Antenna model: 400CP30A
- Antenna type: Yagi-Uda
- Polarization: circular
- G/T: -11.5 dB/K
- EIRP: 33 dBW (63 dBm)
- Ground station antenna gain basis: 16.8 dBi TX/RX for the listed U.S. stations
- Antenna diameter note: not applicable because the 400CP30A is a Yagi-Uda array, not a parabolic dish

These earth stations are operated under separate third-party licensing arrangements and are not part of the requested Blackwing authorization. Their relevance here is operational support only: they provide the command-delivery path Blackwing uses for spacecraft control and for cessation of emissions if harmful interference is reported. Consistent with counsel guidance, the detailed ground-station pattern material is treated as background support for coordination and source validation rather than as a core Blackwing filing attachment.

4. Requested Spectrum and Emissions

4.1 Requested Downlink (Space-to-Earth)

- 401.490-401.510 MHz (center 401.50 MHz)
- Occupied bandwidth: 20 kHz
- Modulation: GFSK
- Emission designator: 20K0F1D
- Data rate: 9600 bps
- Polarization: linear vertical

The requested operation is low-power, narrowband, and intermittent. The combination of 23.9 dBm spacecraft EIRP, 20 kHz occupied bandwidth, 2% duty cycle, and commandable transmitter shutdown capability materially limits interference risk.

Applicant will operate on a non-interference basis under Part 5 and will comply with any coordination conditions imposed by the Commission. Interference Mitigation factors include:

- very low spacecraft EIRP (0.25 W),
- 20 kHz occupied bandwidth,
- 1% duty cycle, and
- commandable transmitter shutdown capability through the separate third-party command path.

4.2 Antenna Beam Projections

This section provides the predicted antenna gain contours for each transmit and receive beam. Contours are depicted on an area map with the beam shown on the surface of the earth with the space stations' peak antenna gain pointed at nadir to a latitude and longitude within the proposed service area. Furthermore, each contour is shown at 2 dB intervals down to 10 dB below the peak gain with additional contours at 15 dB and 20 dB below peak (where applicable). While the regulation states to show intervals of 2 dB down to 10 dB below the peak gain and at 5 dB intervals between 10 - 20 dB below the peak gain, the nature of many of the antennas, and orbital altitude of the spacecraft limit the visibility of the contours in the schematics.

UHF transmit gain contours are provided in Figures 2 over Deadhorse, Alaska and Winston-Salem, North Carolina.

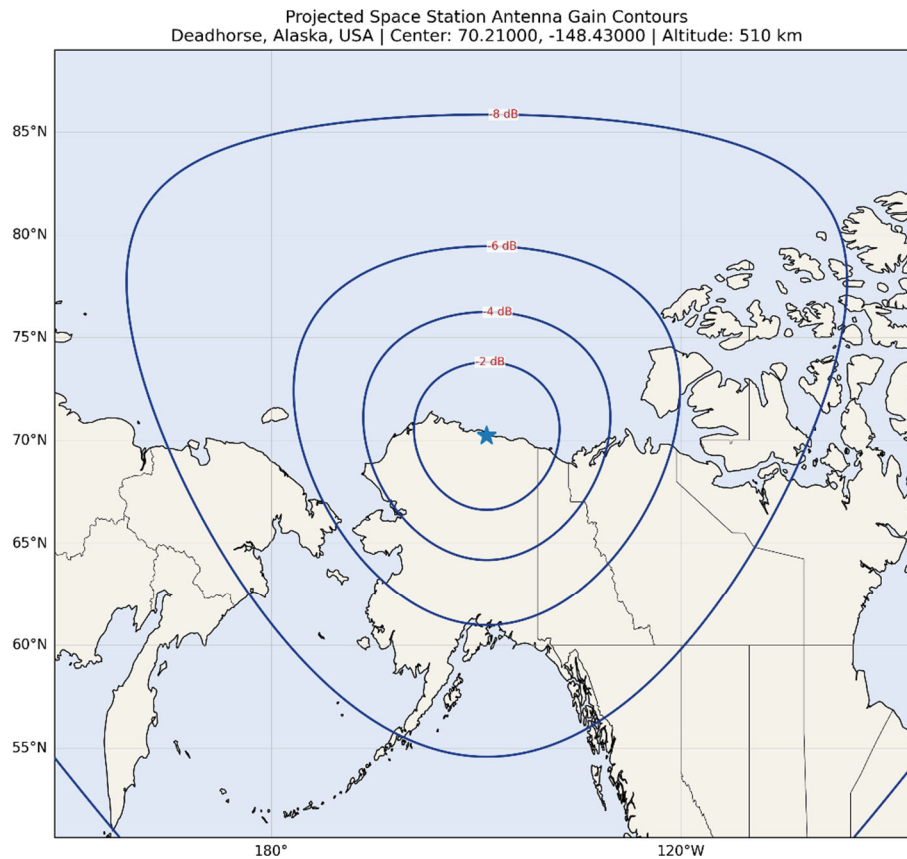


Figure 1 UHF transmit downlink (UTX) gain contours over Deadhorse, Alaska



Figure 1 UHF transmit downlink (UTX) gain contours over Winston-Salem, North Carolina

4.3 Command Path Outside Requested Authorization

Spacecraft commanding and stop-buzzer control are routed through separately licensed RBC Signals earth stations. Blackwing is not requesting Earth-to-Space authority in this filing, but it retains the ability to disable the spacecraft transmitter through that third-party command path if harmful interference is reported.

4.4 Duty Cycle

Spacecraft duty cycle is 1%. Operational rationale:

- Every 10 seconds: one 128-byte downlink frame
- At 9600 bps, each frame is approximately 107 ms
- Total on-air time: 0.107 seconds per 10-second period = 1.07%

5. Coordination and Regulatory Context

Because the requested operations in shared federal/non-federal spectrum, this filing treats NTIA coordination as required. Informal pre-coordination outreach has been prepared, and formal FCC-to-NTIA coordination is expected as part of FCC processing workflow.

Operations are requested on an experimental, non-interference basis under Part 5.

The Manifest Space optical beacon payload does not perform remote sensing of the Earth and is not presented in this package as requiring NOAA remote-sensing authorization.

6. Orbital Debris and End-of-Mission Summary

Baby Bird has no propulsion and no planned debris release. The updated ODAR dated 2026-04-24 uses NASA DAS 3.2.6 and models a retained passive deorbit device that deploys a drag sail at end of mission while remaining attached to the spacecraft. The six-month operational mission is modeled at an area-to-mass ratio of $0.0061 \text{ m}^2/\text{kg}$, and the post mission drag-sail configuration is modeled at $0.0842 \text{ m}^2/\text{kg}$.

Under that updated disposal basis, NASA DAS predicts orbital decay from 510 km x 510 km operational orbit over the six-month operations period to approximately 504 km x 505 km, after which the drag sail is deployed and uncontrolled reentry occurs in 0.53 year, or approximately 6-7 months. The same ODAR reports a tracked-object collision probability of 2.8752×10^{-7} and 0% modeled reentry survivability risk. On that basis, the current debris package presents Baby Bird as satisfying the FCC's 5-year post-mission disposal requirement through prompt passive drag-augmented disposal after the six-month mission.

Blackwing affirms that Baby Bird will be passively tracked once it is released from the launch vehicle. Prior to launch, Blackwing will register Baby Bird with the 18th Space Defense Squadron and in the event of a conjunction warning, Blackwing will take all practical steps to assess and mitigate the collision risk. Because Baby Bird is a propulsion-less spacecraft, Blackwing will provide ephemeris data as needed to support conjunction mitigation.