True Anomaly Demo-1 Mission Description

True Anomaly, Inc., a start-up founded in 2022 and based in Colorado Springs, is on a mission to deliver security and sustainability solutions for space. In this application, True Anomaly seeks an experimental license for its Demo 1 mission, for which it aims to launch two Jackal spacecraft to demonstrate space-to-space rendezvous proximity operations (RPO). This mission serves as a means of testing the defense of critical space infrastructure to support future US DoD missions through the Space Force, Air Force and other agencies tasked with national security directives to secure and sustain the space domain for the U.S. and its allies.

The mission will demonstrate national security capabilities necessary for anticipated U.S. DoD contracts related to RPO and NEI designed to secure and sustain the space domain for the U.S. and its allies. Additionally, The U.S. Government will benefit from the mission through advancement of the technology readiness level (TRL) maturation of space-based Intelligence, Surveillance, and Reconnaissance (ISR), Space Domain Awareness (SDA) technologies, and CONOPS. The commercial space market will benefit from this mission establishing improved capabilities for close-up inspection for anomaly resolution and monitoring of high-risk spacecraft structure deployments.

True Anomaly's Demo 1 mission is scheduled to launch in October 2023, on-board SpaceX's Transporter 9 Launch Vehicle out of Cape Canaveral, Florida. The Jackal space vehicles (~300 kg in mass) will be deployed from the launch vehicle into a sun synchronous orbit at 550 km, and will maneuver to within 1 km of each other to demonstrate their payload suite capability. For successful operations, including de-orbit, each Jackal spacecraft will be equipped with a hydrazine thruster system, which consists of twelve, 1 N thrusters, along with an attitude control system of four reaction wheels and three torque rods.

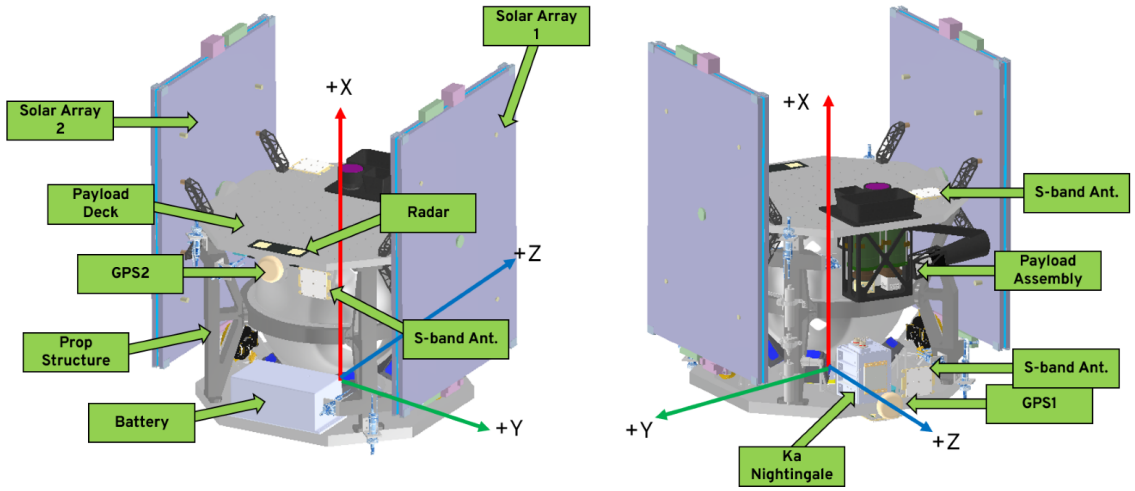

Figure 1. Schematic of a True Anomaly Jackal Space Vehicle (in a stowed configuration)

There are two solar array wings, each with two, equally sized panels that are stowed during launch. For communications, the two Jackal spacecraft will each have a Cesium Astro Nightingale Radio onboard. The Nightingale will come with two S-band patch antennas that are used for TT&C functions, up and downlink, as well as S-band crosslink for intersatellite communication, and one Ka-band phased array that will be used for mission data downlink. There will additionally be a radar that will operate in the 15.4 - 16.6 GHz band. The purpose of the radar is to ensure spacecraft safety during RPO operations. The Jackal spacecraft will use the radar to ensure accurate relative range to the other Jackal spacecraft as the distance approaches 1 km or less. This is the only situation where the radar will be used. If the range measurements do not meet expectations, RPO missions will be aborted.

Table 1 summarizes the frequency bands and spectrum usage for each of the two Jackal spacecraft. All transmissions will be polarized in right hand circular polarization (RHCP).

Table 1. Jackal Spacecraft Frequency Summary

Band and Direction	**Frequency Range**	**Bandwidth (MHz)**	**Usage**
S-band Uplink	2025 - 2100 MHz	5	Command
S-band Downlink	2200 - 2290 MHz	5	Telemetry – Used outside of the U.S.
S-band Crosslink	2200 - 2290 MHz	5	Payload Data
Ka-band Downlink	25.5 - 27.0 GHz	120	Payload Data, Telemetry
Radar	15.4 - 16.6 GHz	180	For Radiolocation

Ka-band downlinks will be received at a 7.3 m Viasat Ka-band Earth Station located in Alaska, and S-band uplink-s will be transmitted from a 5.4 m Viasat Dish in Georgia. *S-band downlinks will be supported outside of the U.S using the Viasat ES network.* A full list of ES locations and relevant performance information is provided in the Earth Station Exhibit attached to this application.

The planned RPO includes non-earth imaging (NEI) limited to the spacecraft themselves, captured on-demand and for a specific time-limited duration to demonstrate mission assurance of non-earth imaging functionality for monitoring spacecraft health, solar array integrity, attitude control, payload deployments, and navigation. True Anomaly has already engaged with NOAA, submitted the Initial Contact Form, and now NOAA is in the process of formal NOAA license application review. True Anomaly is also in the process of pre-coordination with other government entities.