

UNCLASSIFIED



18th Space Control Squadron



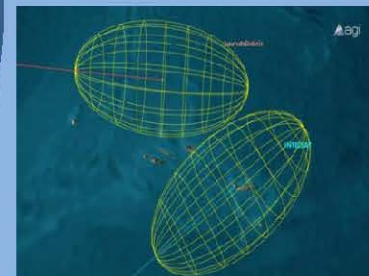
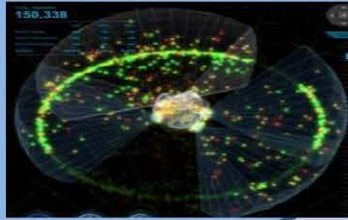
CubeSat Recommendations

This Briefing is: UNCLASSIFIED

This briefing is for information only. No US Government commitment to sell, loan, lease, co-develop or co-produce defense articles or provide defense services is implied or intended.

UNCLASSIFIED

18th Space Control Squadron



*Agreement for Sharing
Space Situational
Awareness Services
Between Department of
Defense...*

Track

- Space Surveillance Network
- 300,000 taskings/day
- 18 sensor sites

Identify

- Catalogue Maintenance (23,000+ objects)
- Reentry Assessment
- Break-up Processing
- SSA Sharing
- Conjunction Assessment
- Human Space Flight Safety
- Advanced Analysis

Detect

- Launch Support
- Launch CA



Master Space Plan
External Mission Support
Data
Space-track.org

Positional Data

Tasking Rqmts

Timely & Accurate
Data

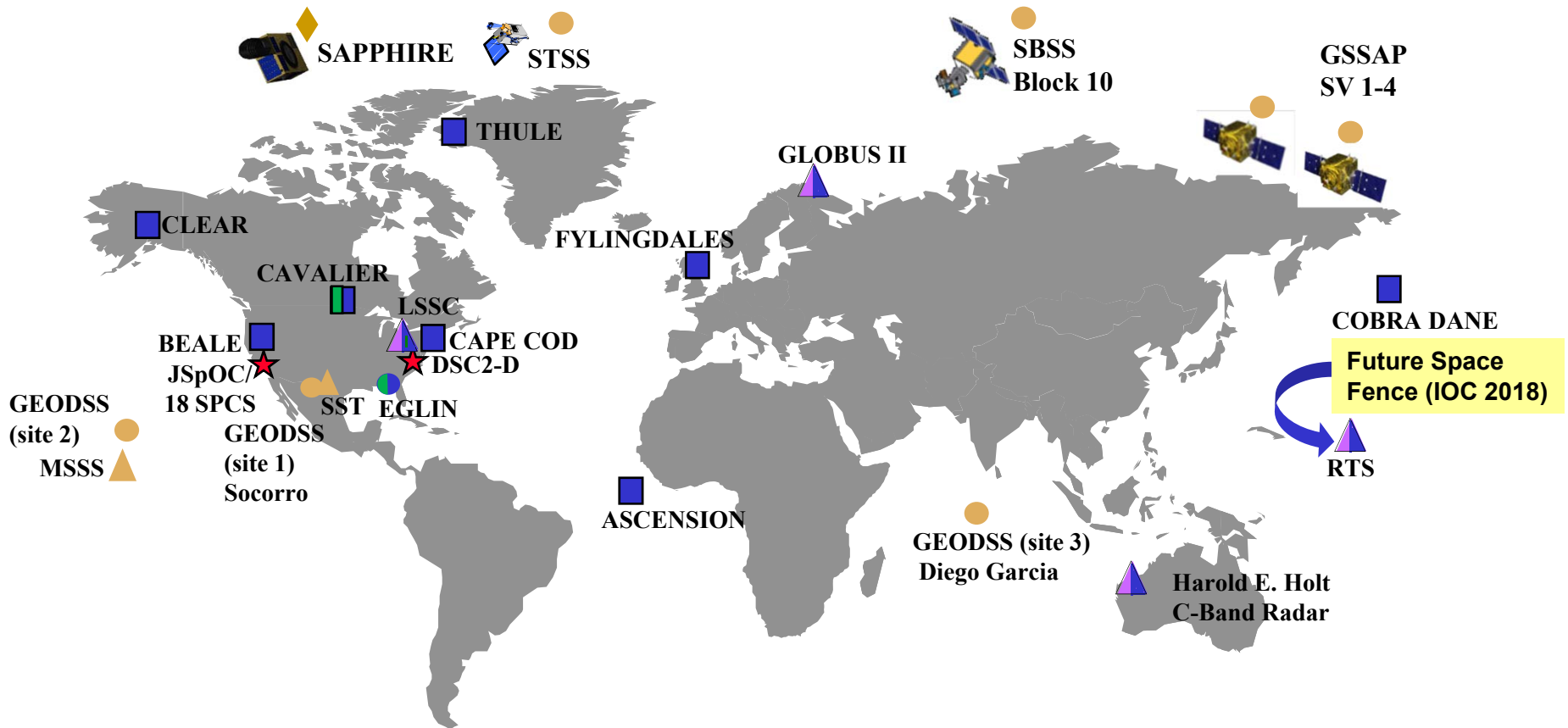


**18 SPCS delivers foundational
Space Situational Awareness
to assure global freedom of
action in space.**



UNCLASSIFIED

U.S. Space Surveillance Network



Tracking Radar

Optical Telescope

● Dedicated

★ SSN C2

Detection Radar

SSN C2

■ Collateral

◆ Dedicated Int'l

UNCLASSIFIED Imaging Radar

▲ Contributing

UNCLASSIFIED



UNCLASSIFIED

Spaceflight Safety

Action taken to prevent:

- Human casualty or damage to property on the surface of the earth or in the air
- Human casualty in outer space
- Mission degradation, failure, or damage to any active on-orbit space asset, or
- Degradation to US national security

UNCLASSIFIED



UNCLASSIFIED

18 SPCS Spaceflight Safety Support

Early Engagement



Launch COLA



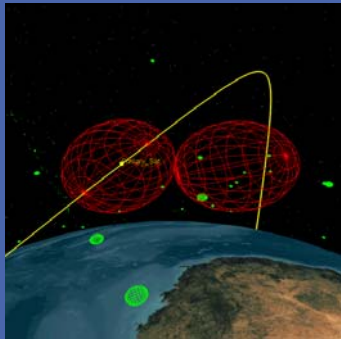
Launch Support



Early Orbit CA



On-Orbit CA & COLA



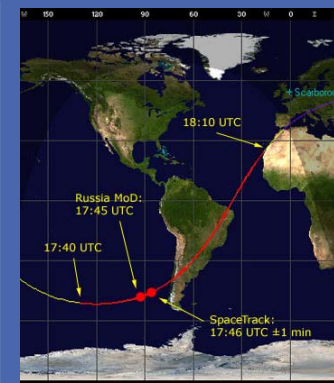
End-of-Life / Disposal



Deorbit



Reentry



UNCLASSIFIED



UNCLASSIFIED

Space-Track.org

HOME OPERATOR FILES HELP

SPACE-TRACK

DIANA.MCKISSOCK

Logged In Successfully

Welcome [Box Score](#) [SATCAT](#) [Decay/Reentry](#) [Query Builder](#) [Favorites](#) [TLE Search](#) [Recent TLEs](#) [SSR](#)

TWO LINE ELEMENT (TLE) DATA

[Retrieve TLE Data by Satellite Catalog Number](#)
[Bulk Catalog Data Downloads](#)
[TLE Format Description](#)

SATELLITE DECAY & REENTRY DATA

[Satellite Decays, Predictions, and TIP Messages](#)
[Search the SATCAT by Satellite Decay Date](#)

SPACE SITUATIONAL AWARENESS (SSA) SHARING

[Register Your Satellite / Payload with the JSpOC](#)
[SSA Services & Orbital Data Requests](#)
[Data Examples & Forms](#)
[CubeSat Recommendations](#)

SATELLITE CATALOG (SATCAT) DATA

[Satellite Box Score \(API\)](#)
[Satellite Search](#)
[Catalog Change Report - now parts 4 & 5 of the SSR](#)
[Geosynchronous Report \(API\)](#)
[Satellite Situation Report](#)

MY ACCOUNT

[My Profile](#)
[Change Password](#)
[My Favorites](#)

There are currently 111,809,762 TLE in the database
Last Update: Sun Aug 06 2017 11:37:57 UTC

Developed by SAIC under contract to JFCC SPACE/J3. [Contact Us](#)



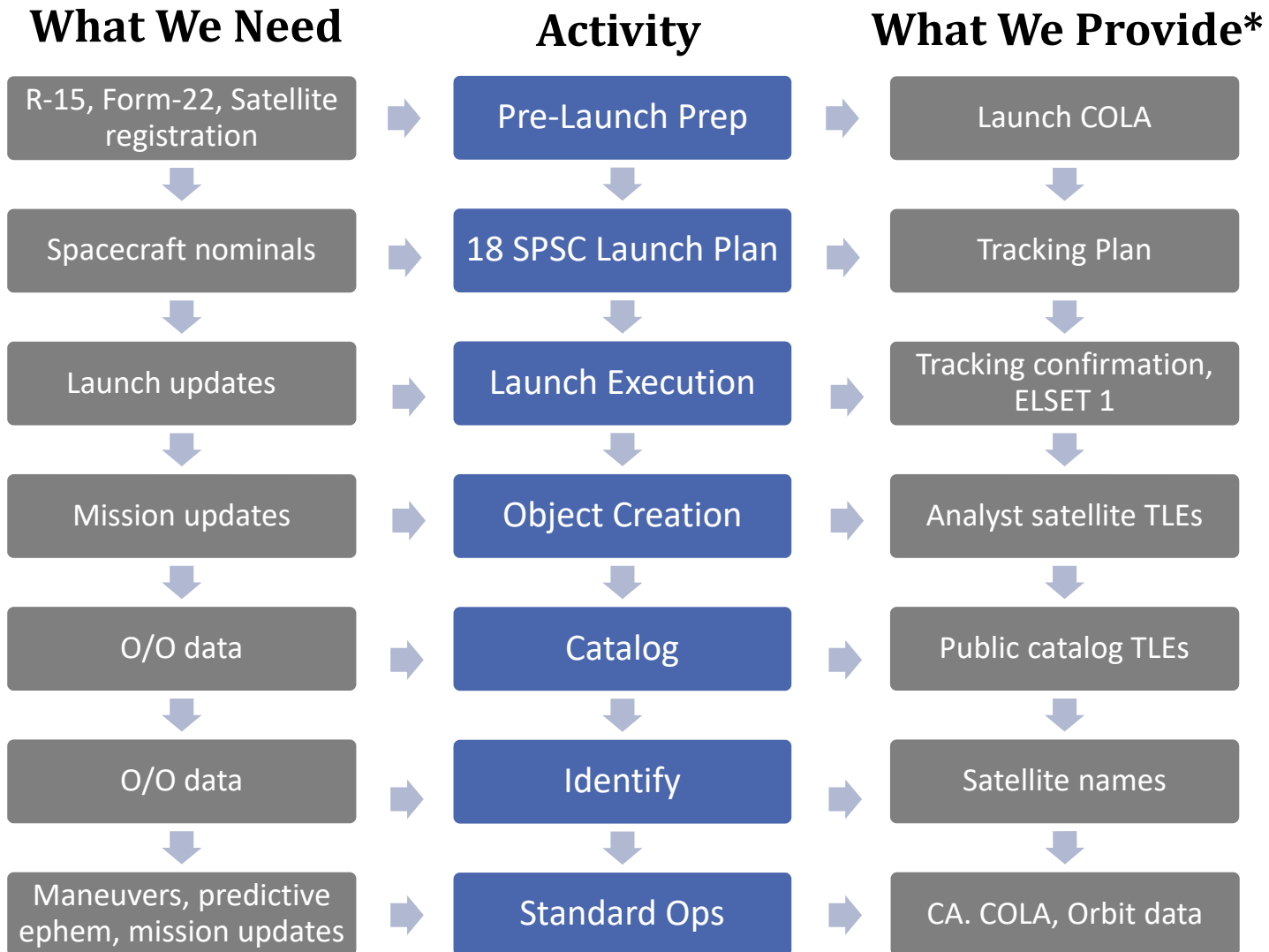
[Back to top](#)

UNCLASSIFIED



UNCLASSIFIED

General Launch Processing



*Dependent on level of agreement with USSTRATCOM for data sharing

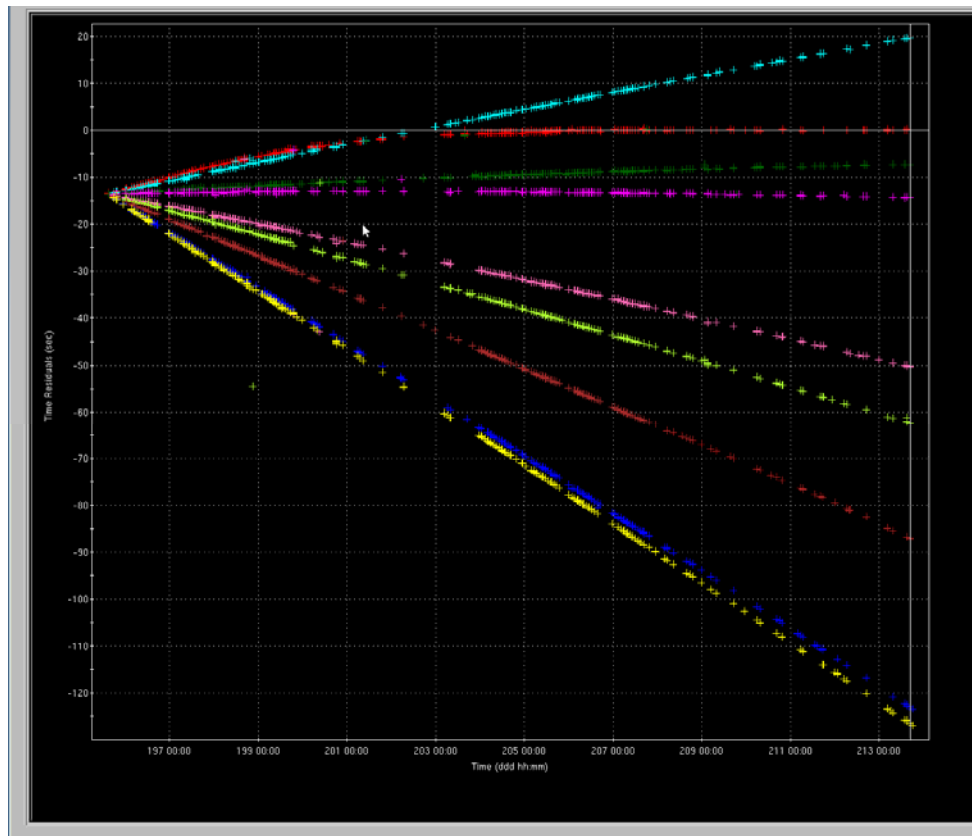
UNCLASSIFIED



UNCLASSIFIED

Cataloging

- Delta-time vs time residuals best for discriminating objects in early stages of launch processing



UNCLASSIFIED



UNCLASSIFIED

Identification

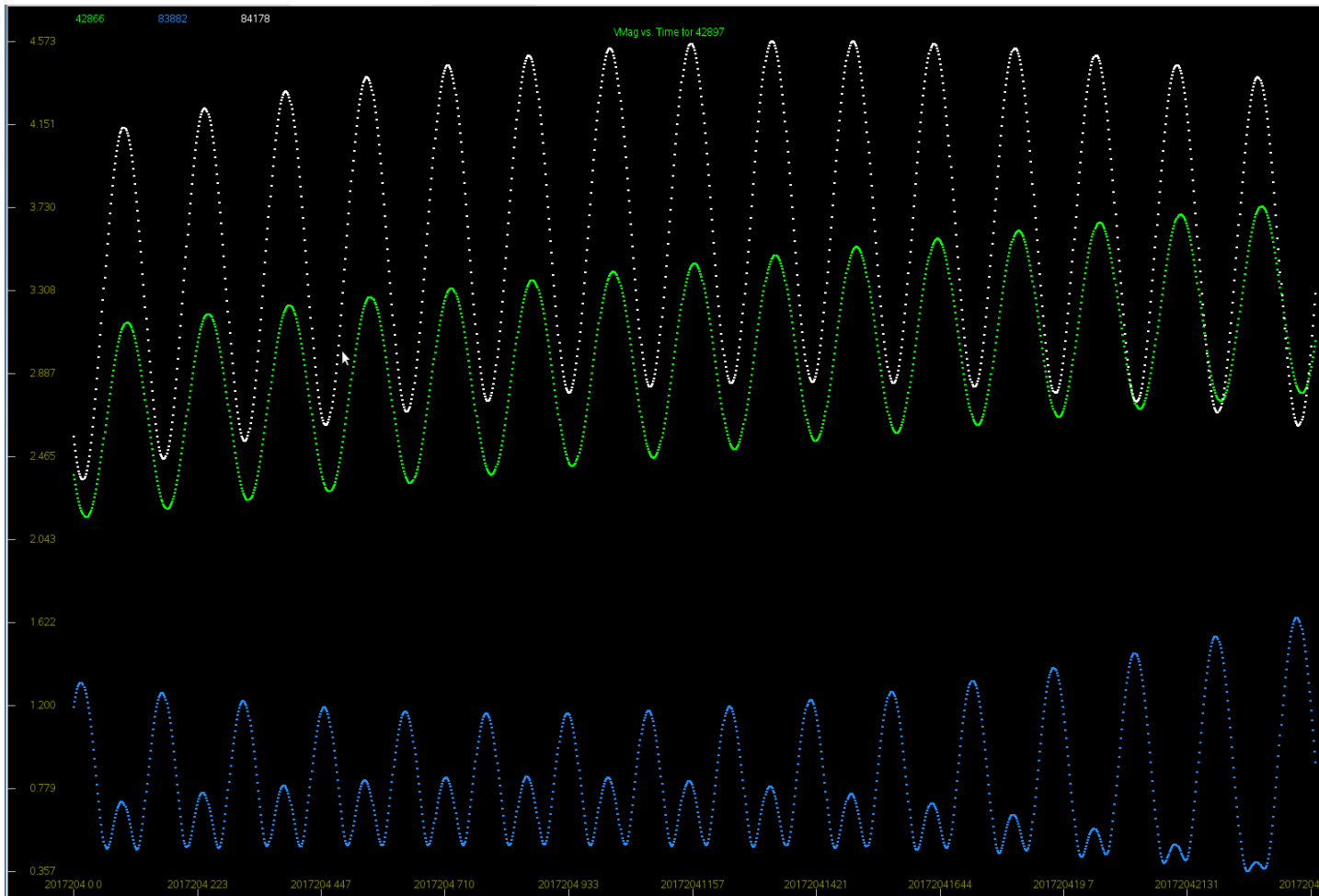
- Most difficult aspect of launch processing
- Methods:
 - Deployment sequence
 - Radar cross section
 - Ballistic coefficient
 - Maneuverability
 - O/O data: TLE or ephemeris in J2000 MEME
 - » 18 SPCS can run conjunction assessment of O/O data vs 18 SPCS data to identify “close approaches”
 - » Helpful when frequent cross-tagging occurs

UNCLASSIFIED



UNCLASSIFIED

Conjunction Assessment Identification



UNCLASSIFIED



UNCLASSIFIED

Recommendations: Design

- Design your satellite to stay in orbit no longer than required by mission life
- Conduct modeling & risk assessment of your deployment sequence
- Utilize tagging and tracking technology
- Register for a user account on www.space-track.org

HOME HELP SPACE-TRACK LOGIN

LOGIN TO SPACE-TRACK.ORG

Username
Password
LOGIN
Forgot password
Forgot username
CREATE ACCOUNT

Space-Track.org promotes space flight safety, protection of the space environment and the peaceful use of space worldwide by sharing space situational awareness services and information with U.S. and international satellite owners/operators, academia and other entities. Please ensure that you understand the [user agreement](#).

If you need help with the website, email admin@space-track.org. For information on data exchange, advanced SSA services, and how to register your satellite/payload with the JSpOC, visit the [SSA Sharing/ODR page](#).

Please visit our social media sites on [facebook](#), [twitter](#), or [google+](#) to read about new features, get information, and interact with the Space-Track team.

Minimum Resolution for this site is 1024x768.
Recommended Resolution is 1920x1200.

UNCLASSIFIED

UNCLASSIFIED



UNCLASSIFIED

Recommendations: Pre-launch

- Register your satellite with 18 SPCS

The screenshot shows a web browser window with the URL <https://www.space-track.org/documentation#/odr>. The page title is "/visited Getting Started". The navigation bar includes links for HOME, OPERATOR, FILES, OPS, ADMIN, HELP, SPACE-TRACK, and DIANA.MCKISSOCK. The main content area is titled "Orbital Data Request" and contains the following information:

- ▶ Launch Early Orbit Determination
- ▶ Early Orbit Conjunction Assessment
- ▶ Advanced Conjunction Assessment (On-Orbit)
- ▶ Advanced Collision Avoidance (On-Orbit)
- ▶ Disposal/End-of-Life Support
- ▶ Deorbit and Reentry Support
- ▶ SSA Sharing Agreement
- ▶ Orbital Data Request
- ▼ **Register Your Satellite/Payload with the JSpOC**
 - Whether you are putting your first satellite on orbit, or adding to an existing constellation, we encourage you to register your asset with the JSpOC so that we can plan for optimal tracking and identification, and provide you with conjunction assessment services as soon as possible. To register, please email jspoc.ssasharing@us.af.mil with the following information:
 - Required:
 - Satellite Common Name
 - Launch date and time window, launch location, and launching agency
 - Owning organization and operating organization (if different than owner)
 - Contact information for operations center (email and phone number)
 - Optional, but highly encouraged:
 - Launch plan and orbital parameters (please complete the [R-15 form](#) – this is necessary to expedite cataloging and identification of you satellite(s))
 - Mission description
 - As soon as you register, a member of the JSpOC will contact you to discuss the details of your mission and coordinate conjunction assessment and other required support.
- ▶ [CubeSat Recommendations](#)
- ▶ [Communicating and Coordinating with the JSpOC](#)
- ▶ [U.S. Government Entities and Contractors](#)
- ▶ [Frequently Asked Questions](#)
- ▶ [Key Contacts](#)

UNCLASSIFIED



UNCLASSIFIED

Recommendations: Pre-launch

- Select cooperative launch provider
- Launch into an orbit ≥ 45 degree inclination
- Deploy over northern hemisphere
- Maximize separation between deployments; deploy with high delta-v in the in-track position
- Send predictive separation TLEs
- File Orbital Data Request and R-15 Form early with 18 SPCS

- Maneuver notification format
- [Example Maneuver Notification - minimum information](#)
- [Example Maneuver Notification - expanded information](#)

Form	Use to:	Format
Orbital Data Request	Request all advanced services	docx pdf
Form 22	Provide detailed parameters on launch collision avoidance requirements	docx
R-15 Form	Provide detailed parameters on an upcoming launch and/or satellites to achieve orbit	docx
Early Orbit Maneuver Plan	List maneuver schedule and screening requirements for satellite(s) as they transfer from spacecraft separation to final orbit	xlsx

https://www.space-track.org/documentation#/odr-examples_forms

UNCLASSIFIED



UNCLASSIFIED

Recommendations: R-15 Info

The R-15 is a comprehensive summary of a launch event:

- Launch site, date, and window
- Orbital parameters of launch, to include sequence of events from liftoff to final injection into operational orbit
- Payloads to achieve orbit, with lifespan, operating positions, physical characteristics, and mission description
- Rocket bodies (booster segments) to achieve orbit, and deorbit plan if applicable
- Description of all other objects achieving orbit, including debris, debris clusters, bolts, etc.

UNCLASSIFIED



UNCLASSIFIED

Recommendations: Post-launch

- Send positional data as soon as possible
- Commit to ongoing engagement with 18 SPCS
 - Provide TLEs for catalog maintenance
 - Provide ephemeris for conjunction assessment
 - Tell us when your mission is over!
- Share your contact info with other operators via Space-Track.org

A Sample Organization Members Satellites **Contact Information** Data Control

Label: Contact Info Entry Name Type: PHONE Value: Phone, EMail, or Fax, etc PUBLIC SAVE

Label	Type	Value	Private	
!Sample Information	TIME_ZONE	Recreated daily	PUBLIC	EDIT DELETE
CEO	PHONE	+1-555-555-5555	PRIVATE	EDIT DELETE
Company Website	WEBSITE	www.aSampleOrg.org	PUBLIC	EDIT DELETE
Conjunction Specialist	CLOSE_APPROACH	HeadsUp@gmail.com	PRIVATE	
Emergency Contact	CLOSE_APPROACH	805-555-1234	PRIVATE	
Front Office	FAX	+1-555-987-6544	PRIVATE	EDIT DELETE
One Center 02	COUNTRY	Australia	PUBLIC	EDIT DELETE

UNCLASSIFIED



UNCLASSIFIED

Promising Technology

- RFID-transmitter
- GPS-transmitter
- Optical emitter tagging
- Colored diode lights
- Corner reflectors
- Radio beacon (GPS)

UNCLASSIFIED



UNCLASSIFIED

Questions?

Contact the 18 SPCS SSA Sharing Team:

jspoc.ssasharing@us.af.mil

Resources:

Spaceflight Safety Handbook for Operators

https://www.space-track.org/documents/JSpOC_Spaceflight_Safety_Handbook_For_Operators.pdf

Space-Track.org SSA Sharing Page

https://www.space-track.org/documentation#/odr-examples_forms

UNCLASSIFIED