

Spacecraft Emergency Cross Support Service Overview

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- The IOAG established the Spacecraft Emergency Cross Support Working Group (SECSWG) in 2014 in response to an IOP-3 recommendation
- Spacecraft Emergency Cross Support (SECS) services are:
 - Inter-agency cross support services provided during a spacecraft emergency
 - Minimal-to-zero emergency support coordination between the user mission and the service provider conducted prior to emergency
 - Include basic engineering and standard TT&C services, when possible, on a best effort basis
- SECSWG Goals:
 - Establish a process and guidelines to make emergency support a permanent cross-support capability between space agencies.
 - Implement and maintain SECS services with minimal investment from the participating agencies
- Participating Agencies: ASI, CNES, DLR, ESA, JAXA, KARI, NASA

“Emergency” Definition

- Spacecraft emergency mode is the anomalous state of the spacecraft in which its persistence will result in the loss of the spacecraft entirely or the loss of any of the spacecraft’s essential faculties (payload excluded).
- For human space flight missions, any external or internal conditions that could negatively affect the health and safety of the crewmembers are causes for spacecraft emergency mode.
- Any ground station failure by itself is not a direct cause for declaring the spacecraft in emergency mode.
- SECS is only related to establishing a Telemetry, Tracking and Command (TT&C) link to the spacecraft for recovery operations as well as engineering services. It does not apply to science or mission data acquisition.

Services Available for Emergency Cross Support

Engineering Services

- ❑ Provided as 'a best effort approach' to determine the status of the spacecraft and/or to recover from the anomaly condition
- ❑ Services include:
 - Spacecraft Search Service
 - Downlink signal analysis service
 - Uplink Adjustment Service

IOAG Standard TT&C Services

- ❑ These core services, as listed in the IOAG Service Catalog, can be provided during an emergency if the missions meets the pre-conditions specified in the IOAG SECS SOP
- ❑ Services include:
 - Forward Data Delivery Services
 - Return Data Delivery Services
 - Radiometric Services

SECS Standard Operating Processes and Procedures (SOP)

- Describes recommended actions for service providers and missions that simplifies the real-time coordination process and reduces the response time during an emergency
 - Ex. Early coordination on procedures and Points of Contact (POC), RF licensing, creating configuration files at the station, maintaining current trajectory files
- Describes services available and frequently used during emergency cross support
- Lists Service Provider POCs and available ground stations; provides a template for exchanging spacecraft specification data
- SECS SOP draft is currently under review by the IOAG

Implementations Options

Support Scenarios As Described in Standard Operating Procedure

COMMITTED

The provider agrees to:

1. Maintain RF licenses for nominated Spacecraft
2. Maintain a functioning TT&C configuration on the desired ground station
3. Maintain a functioning Comms infrastructure between the agencies involved
4. Maintain a functioning FD infrastructure for processing Orbital Predicts and Radiometric Data
5. Perform periodic validation tracks (6 -12 monthly) on nominated Spacecraft

ACKNOWLEDGED

The provider agrees to:

1. Maintain a TT&C configuration on the desired ground station (untested, no periodic validation)
2. Maintain a functioning FD infrastructure for processing Orbital Predicts and Radiometric Data

NON-REGISTERED

The provider agrees, on a best effort basis, to:

1. Real Time preparation of Ground Station Configuration

Notes: In each of the three cases the services provided will depend on the emergency situation. At a minimum, 'engineering services' may be available. If the emergency state permits, also full TM/TC and radiometric services. Also, terms of support scenarios may vary between service providers.



Potential Opportunities for Industry

- IOAG believes that these services present an industry engagement opportunity.
 - The basic concepts documented in the SOP can be leveraged by industry to serve as candidate emergency cross support providers.
- Potential Benefits
 - Requires minimal industry investment, presenting a possible business case
 - Positive publicity for saving a spacecraft in distress
 - Creates a standardized process capability between agencies as well as industry
 - Reduces confusion during an emergency
 - Simplifies the interface to other agencies
 - Identifies appropriate points of contact
 - Creates a centralized location listing available ground stations and points of contact

- Backup

Implementations Options

Support Scenarios As Described in Standard Operating Procedure

Service Provider Preparation Prior to Emergency	Committed	Acknowledged	Non-Registered
Concurrence of Agency Service Provider to provide best-effort SECS to Mission	Yes	Yes	No
Ground Station Configuration for User TT&C	Yes	Yes	No
Periodic Validation & Testing for Ground Station Configuration (6-12 months)	Yes	No	No
Maintain functioning FD infrastructure for processing orbital predicts and radiometric data	Yes	Yes	No
Maintain function communications infrastructure	Yes	As Agreed	No
Obtain RF Licenses	Yes	As Agreed	No
<i>Response Time for Engineering Services</i>	ASAP	ASAP	Up to x day(s); not guaranteed
<i>Response Time for Return Data Delivery</i>	ASAP	Up to x day(s); not guaranteed	Up to x week(s); not guaranteed
<i>Response Time for Forward Data Delivery</i>	ASAP	Up to x day(s); not guaranteed	Up to x week(s); not guaranteed
Point of Contact Prior to Emergency	IPOC	IPOC	N/A
Point of Contact During Emergency	OPOC	OPOC	IPOC then OPOC
Associated Costs to Mission for Services	Agency-Specific	Agency-Specific	Agency-Specific

Note: Initial Point of Contact (IPOC) information will be provided in the SOP. The Operational Point of Contact (OPOC) information is provided to the user by the IPOC.