

# Asteroid Exploration System Command Language

The document provides an example command language for Asteroid Exploration Mission Management.

The document includes commands for:

- defining and updating asteroids
- defining spacecraft
- defining missions
- updating mission control resources
- simulating spacecraft messages

## Asteroid Commands

This section defines commands for creating and updating Asteroid information.

**Identifier:** the given unique identifier for the asteroid (e.g. [1 Ceres](#), [4 Vesta](#), [433 Eros](#), etc),

**Notes:** description and other notes about the asteroid. Notes can be added over time. Notes have a date, author and text.

**Exploration Status:**

**Minerals found, estimated mass, accessibility** (e.g. platinum, 20 metric tons, surface deposit).

**Water found, quantity, state** (e.g. yes, 20 million liters, ice)

**Life** (none, single cell organisms, multi cell, intelligent, friendly)

**Asteroid Type** (C-Type, M-Type, S-Type, Innerbelt comet)

**Size:** width, length, height

**Mass:** approximate mass

**Surface Gravity:** gravitational field at surface

**Aphelion:** furthest distance from Sun in AUs

**Perihelion:** closest distance from Sun in AUs

## Commands

```
# create_asteroid, <asteroid_identifier>, <asteroid_type>, <width>, <length>, <height>,
<mass>, <gravity>, <aphelion>, <perihelion>
```

```
# add_asteroid_note, <asteroid_identifier>, <date>, <author>, <text>
```

```
# add_asteroid_mineral_discovery, <asteroid_identifier>, <mineral>, <estimated_mass>,
<deposit_type>
```

```
# add_asteroid_water_discovery, <asteroid_idenfier>, <water_found>, <amount>,  
<state>
```

```
# add_asteroid_life_discovery, <asteroid_idenfier>, <life_type>, <intelligent>, <friendly>
```

## Examples

```
create_asteroid, 1 Ceres, G_TYPE, 1000, 1000, 1000,  $9.43 \pm 0.07 \times 10^{20}$ , 0.028, 2.9858 ,  
2.5468
```

```
add_asteroid_note, 1 Ceres, 11-27-2013, eric, potential source of water for rocket fuel
```

```
add_asteroid_mineral_discovery, 1 Ceres, titanium, 1000000, surface
```

```
add_asteroid_water_discovery, 1 Ceres, true, 1000000000, ice
```

```
add_asteroid_life_discovery, 1 Ceres, multi_cell, true, true
```

## Spacecraft Commands

This section defines commands for creating and updating Spacecraft information.

Each spacecraft has the following set of attributes:

**Identifier:** *unique spacecraft call sign*

**Launch Date:** *date of launch*

**Mission:** *mission identifier*

**Type** (*Explorer, Miner*)

**Status**

**Fuel** (*% remaining*)

**Systems**

**Guidance** (*OK, Not OK*)

**Communication Link** (*OK, Not OK*)

**State** (*waiting for launch, in route, lost, crashed, landed, exploring, mining, homeward bound, malfunction*)

**Location** (*AUs from Sun*)

**Destination** (*target Asteroid identifier*)

### Command

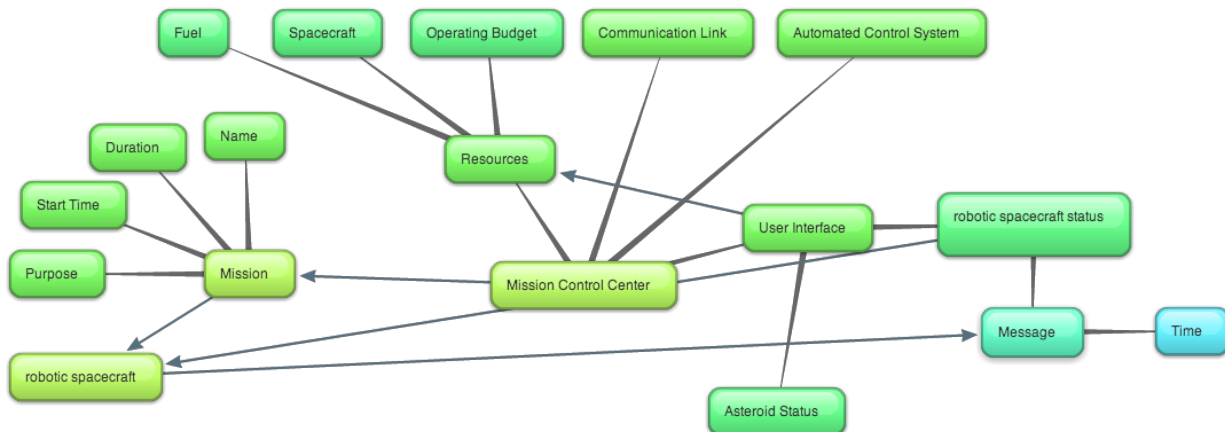
```
# create_spacecraft, <spacecraft_identifier>, <launch_date>, <mission_identifier>,  
<spacecraft_type>, <fuel_level>, <guidance_status>, <communication_status>,  
<state>, <location>, <target_asteroid_identifier>
```

### Example

```
create_spacecraft, Ceres Explorer Spacecraft, 12/1/2015, Ceres Explorer Mission,  
explorer, 100, OK, OK, waiting_for_launch, 1, 1 Ceres
```

## Mission Management Commands

This section defines commands for mission management.



**unique id** for mission

**name** of mission (e.g. "sling shot"),

**purpose** of mission (e.g. search for water)

**spacecraft** id of fully provisioned spacecraft that will perform the mission

**launch date** (start time)

**eta**, estimated time of arrival

**destination**: the destination asteroid for the the Mission

**status**: (waiting for launch, in progress, complete, aborted)

## Commands

```
# create_mission, <mission_identifier>, <mission_name>, <mission_purpose>,
<spacecraft_identifier>, <launch_date>, <eta>, <target_asteroid_identifier>,
<mission_state>
```

```
# increment_fuel_resource <amount>
# increment_spacecraft_resource <amount>
# increment_operating_budge <amount>
# set_communicaiton_link_status <status>
# set_automated_control_system_status <status>
```

## Examples

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# create\_mission, Ceres Explorer Mission 1, Ceres Explorer Mission 1, Explore Ceres  
and locate best location to retrieve water, Ceres Explorer Spacecraft, 12/1/2013,  
12/1/2015, 1 Ceres, waiting for launch

increment\_fuel\_resource -1000

increment\_spacecraft\_resource -1

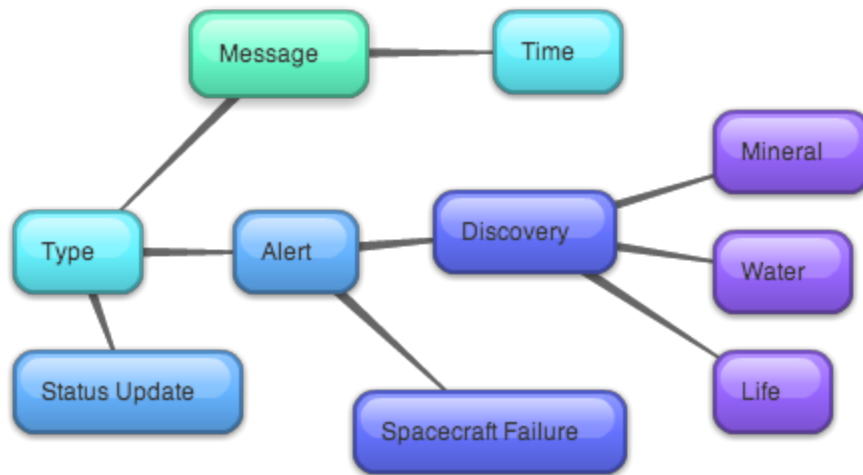
increment\_operating\_budge -1000000

set\_communicaiton\_link\_status OK

set\_automated\_control\_system\_status NOT\_OK

## Simulating Spacecraft Messages

This section defines commands for simulating spacecraft messages.



## Commands

```
# create_spacecraft_status_message, <spacecraft_identifier>, <timestamp>,
<mission_identifier>, <spacecraft_type>, <fuel_level>, <guidance_status>,
<communication_status>, <state>, <location>, <target_asteroid_identifier>
```

```
# create_spacecraft_fault_alert_message, <spacecraft_identifier>, <timestamp>,
<failure_type>
```

```
# create_spacecraft_mineral_discovery_message, <spacecraft_identifier>,
<timestamp>, <asteroid_idenfier>, <mineral>, <estimated_mass>, <deposit_type>
```

```
# create_spacecraft_water_discovery_message, <spacecraft_identifier>, <timestamp>,
<asteroid_idenfier>, <water_found>, <amount>, <state>
```

```
# create_spacecraft_life_discovery_message, <spacecraft_identifier>, <timestamp>,
<asteroid_idenfier>, <life_type>, <intelligent>, <friendly>
```

## Examples

```
create_spacecraft_status_message, Ceres Explorer Spacecraft, 2014:7:1::15:01, Ceres
Explorer Mission 1, explorer, 80%, OK, OK, in_route, 1.4, 1 Ceres
```

create\_spacecraft\_fault\_alert\_message, Ceres Explorer Spacecraft, 2014:7:1::15:01,  
solar\_panel\_damaged

create\_spacecraft\_mineral\_discovery\_message, Ceres Explorer Spacecraft,  
2014:7:1::15:01, 1 Ceres, titanium, 1000000, surface\_deposit

create\_spacecraft\_water\_discovery\_message, Ceres Explorer Spacecraft,  
2014:7:1::15:01, 1 Ceres, true, 1000000, ice

create\_spacecraft\_life\_discovery\_message, Ceres Explorer Spacecraft,  
2014:7:1::15:01, 1 Ceres, multi\_cell, true, true