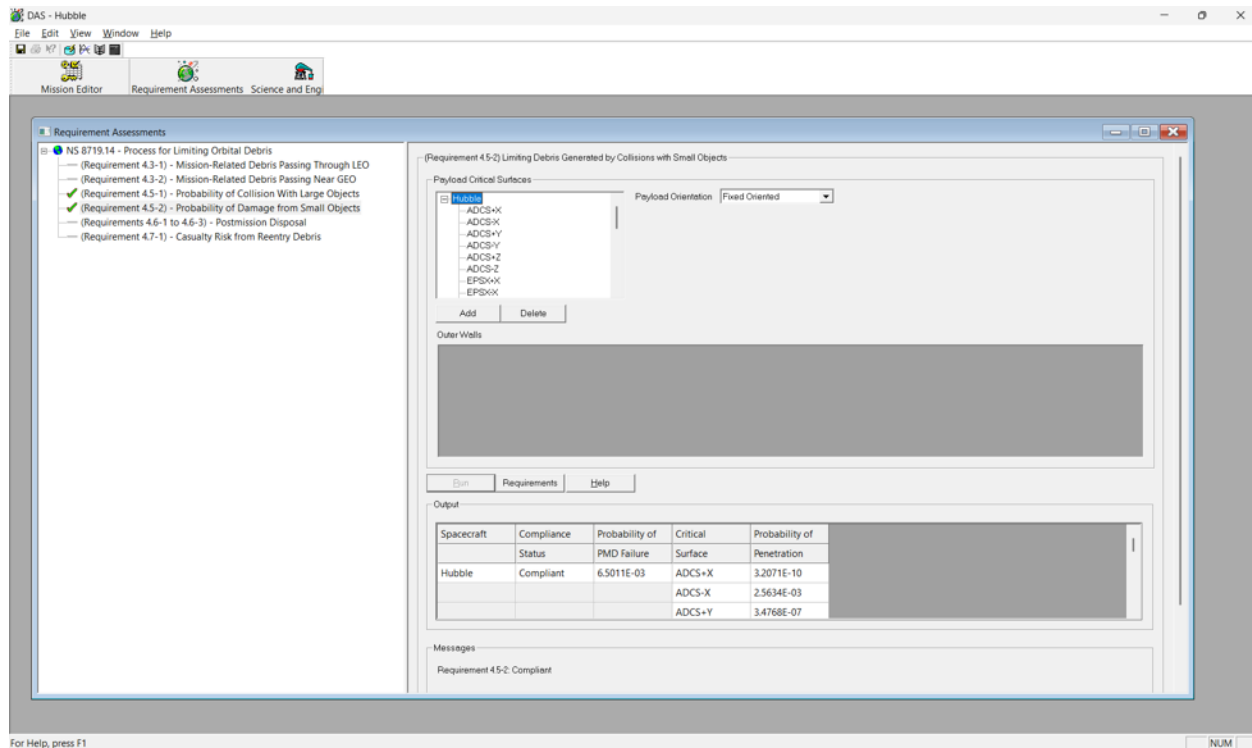


**ORBITAL DEBRIS MITIGATION PLAN ACTIVITY LOGS
(HUBBLE-8 AND HUBBLE-9)**

I.	Small Object Collision Risk.....	1
II.	Large Object Collision Risk.....	23
III.	Orbital Lifetime	23
IV.	Human Casualty Risk	24

I. SMALL OBJECT COLLISION RISK



Spacecraft = Hubble
Critical Surface = ADCS+X

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0095 (m²)

Vector = (0.000000 (u), -1.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 2.380 (g/cm²) Separation: 8.000 (cm)
Outer Wall 2 Density: 2.380 (g/cm²) Separation: 60.900 (cm)
Outer Wall 3 Density: 1.250 (g/cm²) Separation: 90.700 (cm)

****OUTPUT****

Probability of Penetration = 2.7672E-10 (2.7672E-10)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = ADCS-X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0095 (m²)
Vector = (0.000000 (u), 1.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.250 (g/cm²) Separation: 8.600 (cm)

****OUTPUT****

Probability of Penetration = 2.3766E-03 (2.3795E-03)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble

Critical Surface = ADCS+Y

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0055 (m²)
Vector = (0.000000 (u), 0.000000 (v), -1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.410 (g/cm²) Separation: 8.400 (cm)
Outer Wall 2 Density: 1.350 (g/cm²) Separation: 20.200 (cm)
Outer Wall 3 Density: 0.830 (g/cm²) Separation: 33.200 (cm)

****OUTPUT****

Probability of Penetration = 3.0181E-07 (3.0181E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

Spacecraft = Hubble

Critical Surface = ADCS-Y

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)

Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0055 (m²)
 Vector = (0.000000 (u), 0.000000 (v), 1.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.410 (g/cm²) Separation: 8.400 (cm)
 Outer Wall 2 Density: 1.350 (g/cm²) Separation: 20.200 (cm)
 Outer Wall 3 Density: 0.830 (g/cm²) Separation: 33.200 (cm)

****OUTPUT****

Probability of Penetration = 3.0181E-07 (3.0181E-07)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
 Critical Surface = ADCS+Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0317 (m²)
 Vector = (1.000000 (u), 0.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 0.410 (g/cm²) Separation: 13.400 (cm)

****OUTPUT****

Probability of Penetration = 3.7269E-07 (3.7269E-07)

Returned Error Message: Normal Processing

Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble

Critical Surface = ADCS-Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)

Perigee Altitude = 590.000 (km)

Orbital Inclination = 97.700 (deg)

RAAN = 0.000 (deg)

Argument of Perigee = 0.000 (deg)

Mean Anomaly = 0.000 (deg)

Final Area-To-Mass = 0.0185 (m²/kg)

Initial Mass = 570.000 (kg)

Final Mass = 570.000 (kg)

Station Kept = Yes

Start Year = 2027.090 (yr)

Duration = 7.000 (yr)

Orientation = Fixed Oriented

CS Areal Density = 0.541 (g/cm²)

CS Surface Area = 0.0317 (m²)

Vector = (-1.000000 (u), 0.000000 (v), 0.000000 (w))

CS Pressurized = No

Outer Wall 1 Density: 0.541 (g/cm²) Separation: 0.200 (cm)

Outer Wall 2 Density: 0.541 (g/cm²) Separation: 4.200 (cm)

Outer Wall 3 Density: 0.410 (g/cm²) Separation: 9.300 (cm)

****OUTPUT****

Probability of Penetration = 4.6149E-08 (4.6149E-08)

Returned Error Message: Normal Processing

Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble

Critical Surface = EPSX+X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0036 (m²)
 Vector = (0.000000 (u), -1.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.220 (g/cm²) Separation: 3.500 (cm)
 Outer Wall 2 Density: 0.430 (g/cm²) Separation: 33.600 (cm)

****OUTPUT****

Probability of Penetration = 1.1945E-09 (1.1945E-09)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====
 Spacecraft = Hubble
 Critical Surface = EPSX-X
 =====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)

Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0036 (m²)
Vector = (0.000000 (u), 1.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.220 (g/cm²) Separation: 3.500 (cm)
Outer Wall 2 Density: 0.430 (g/cm²) Separation: 33.600 (cm)

****OUTPUT****

Probability of Penetration = 1.4346E-04 (1.4347E-04)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = EPSX+Y

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0675 (m²)
Vector = (0.000000 (u), 0.000000 (v), -1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.700 (g/cm²) Separation: 20.800 (cm)

****OUTPUT****

Probability of Penetration = 1.5662E-03 (1.5674E-03)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

```
=====
Spacecraft = Hubble
Critical Surface = EPSX-Y
=====
```

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0675 (m²)
Vector = (0.000000 (u), 0.000000 (v), 1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 3.550 (g/cm²) Separation: 2.200 (cm)
Outer Wall 2 Density: 3.550 (g/cm²) Separation: 40.300 (cm)
Outer Wall 3 Density: 0.700 (g/cm²) Separation: 64.400 (cm)

****OUTPUT****

Probability of Penetration = 1.4519E-06 (1.4519E-06)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

```
=====
Spacecraft = Hubble
Critical Surface = EPSX+Z
=====
```

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)

Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0108 (m²)
Vector = (1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 5.600 (cm)

****OUTPUT****

Probability of Penetration = 1.2880E-07 (1.2880E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = EPSX-Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0108 (m²)
Vector = (-1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 5.300 (cm)

****OUTPUT****

Probability of Penetration = 1.2927E-07 (1.2927E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = EPS+X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0077 (m²)
Vector = (0.000000 (u), -1.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.220 (g/cm²) Separation: 8.500 (cm)
Outer Wall 2 Density: 0.430 (g/cm²) Separation: 38.600 (cm)

****OUTPUT****

Probability of Penetration = 1.4874E-09 (1.4874E-09)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = EPS-X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0077 (m²)
 Vector = (0.000000 (u), 1.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.220 (g/cm²) Separation: 8.500 (cm)
 Outer Wall 2 Density: 0.430 (g/cm²) Separation: 38.600 (cm)

****OUTPUT****

Probability of Penetration = 3.0779E-04 (3.0784E-04)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====
 Spacecraft = Hubble
 Critical Surface = EPS+Y
 =====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented

CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0630 (m²)
Vector = (0.000000 (u), 0.000000 (v), -1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 3.550 (g/cm²) Separation: 2.200 (cm)
Outer Wall 2 Density: 3.550 (g/cm²) Separation: 40.300 (cm)
Outer Wall 3 Density: 0.700 (g/cm²) Separation: 64.400 (cm)

****OUTPUT****

Probability of Penetration = 1.3551E-06 (1.3551E-06)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = EPS-Y

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0630 (m²)
Vector = (0.000000 (u), 0.000000 (v), 1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.700 (g/cm²) Separation: 20.700 (cm)

****OUTPUT****

Probability of Penetration = 1.4618E-03 (1.4629E-03)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

```
=====
Spacecraft = Hubble
Critical Surface = EPS+Z
=====
```

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0150 (m²)
Vector = (1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 4.100 (cm)

****OUTPUT****

Probability of Penetration = 1.8471E-07 (1.8471E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

```
=====
Spacecraft = Hubble
Critical Surface = EPS-Z
=====
```

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)

Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0150 (m²)
 Vector = (-1.000000 (u), 0.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 0.410 (g/cm²) Separation: 3.800 (cm)

****OUTPUT****

Probability of Penetration = 1.8664E-07 (1.8664E-07)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
 Critical Surface = MFC+X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0135 (m²)
 Vector = (0.000000 (u), -1.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.250 (g/cm²) Separation: 8.600 (cm)

****OUTPUT****

Probability of Penetration = 3.2210E-09 (3.2210E-09)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

Spacecraft = Hubble
Critical Surface = MFC-X

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0135 (m²)
Vector = (0.000000 (u), 1.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 2.380 (g/cm²) Separation: 8.900 (cm)
Outer Wall 2 Density: 2.380 (g/cm²) Separation: 61.800 (cm)
Outer Wall 3 Density: 1.250 (g/cm²) Separation: 91.600 (cm)

****OUTPUT****

Probability of Penetration = 2.9211E-06 (2.9211E-06)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

Spacecraft = Hubble
Critical Surface = MFC+Y

****INPUT****

Apogee Altitude = 590.000 (km)

Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0060 (m²)
 Vector = (0.000000 (u), 0.000000 (v), -1.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.410 (g/cm²) Separation: 2.800 (cm)
 Outer Wall 2 Density: 1.350 (g/cm²) Separation: 14.400 (cm)
 Outer Wall 3 Density: 0.830 (g/cm²) Separation: 27.500 (cm)

****OUTPUT****

Probability of Penetration = 3.7184E-07 (3.7184E-07)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====
 Spacecraft = Hubble
 Critical Surface = MFC-Y
 =====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented

CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0060 (m²)
Vector = (0.000000 (u), 0.000000 (v), 1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.410 (g/cm²) Separation: 2.800 (cm)
Outer Wall 2 Density: 1.350 (g/cm²) Separation: 14.400 (cm)
Outer Wall 3 Density: 0.830 (g/cm²) Separation: 27.500 (cm)

****OUTPUT****

Probability of Penetration = 3.7184E-07 (3.7184E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = MFC+Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0167 (m²)
Vector = (1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 17.600 (cm)

****OUTPUT****

Probability of Penetration = 1.9639E-07 (1.9639E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = MFC-Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0505 (m²)
Vector = (-1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 5.100 (cm)

****OUTPUT****

Probability of Penetration = 6.0683E-07 (6.0683E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = TTCFE+X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)

Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0045 (m²)
 Vector = (0.000000 (u), -1.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 1.250 (g/cm²) Separation: 8.600 (cm)

****OUTPUT****

Probability of Penetration = 1.0800E-09 (1.0800E-09)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
 Critical Surface = TTCFE-X

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0045 (m²)
 Vector = (0.000000 (u), 1.000000 (v), 0.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 2.380 (g/cm²) Separation: 8.900 (cm)
 Outer Wall 2 Density: 2.380 (g/cm²) Separation: 61.800 (cm)
 Outer Wall 3 Density: 1.250 (g/cm²) Separation: 91.600 (cm)

****OUTPUT****

Probability of Penetration = 9.7947E-07 (9.7947E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = TTCFE+Y

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0060 (m²)
Vector = (0.000000 (u), 0.000000 (v), -1.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 1.410 (g/cm²) Separation: 14.100 (cm)
Outer Wall 2 Density: 1.350 (g/cm²) Separation: 25.900 (cm)
Outer Wall 3 Density: 0.830 (g/cm²) Separation: 38.900 (cm)

****OUTPUT****

Probability of Penetration = 3.0971E-07 (3.0971E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = TTCFE-Y

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)
 Station Kept = Yes
 Start Year = 2027.090 (yr)
 Duration = 7.000 (yr)
 Orientation = Fixed Oriented
 CS Areal Density = 0.541 (g/cm²)
 CS Surface Area = 0.0060 (m²)
 Vector = (0.000000 (u), 0.000000 (v), 1.000000 (w))
 CS Pressurized = No
 Outer Wall 1 Density: 0.541 (g/cm²) Separation: 0.200 (cm)
 Outer Wall 2 Density: 0.541 (g/cm²) Separation: 1.100 (cm)
 Outer Wall 3 Density: 1.410 (g/cm²) Separation: 14.100 (cm)
 Outer Wall 4 Density: 1.350 (g/cm²) Separation: 25.900 (cm)
 Outer Wall 5 Density: 0.830 (g/cm²) Separation: 38.900 (cm)

****OUTPUT****

Probability of Penetration = 2.3116E-07 (2.3116E-07)
 Returned Error Message: Normal Processing
 Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
 Critical Surface = TTCFE+Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
 Perigee Altitude = 590.000 (km)
 Orbital Inclination = 97.700 (deg)
 RAAN = 0.000 (deg)
 Argument of Perigee = 0.000 (deg)
 Mean Anomaly = 0.000 (deg)
 Final Area-To-Mass = 0.0185 (m²/kg)
 Initial Mass = 570.000 (kg)
 Final Mass = 570.000 (kg)

Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0169 (m²)
Vector = (1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.410 (g/cm²) Separation: 13.400 (cm)

****OUTPUT****

Probability of Penetration = 1.9912E-07 (1.9912E-07)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

=====

Spacecraft = Hubble
Critical Surface = TTCFE-Z

=====

****INPUT****

Apogee Altitude = 590.000 (km)
Perigee Altitude = 590.000 (km)
Orbital Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass = 0.0185 (m²/kg)
Initial Mass = 570.000 (kg)
Final Mass = 570.000 (kg)
Station Kept = Yes
Start Year = 2027.090 (yr)
Duration = 7.000 (yr)
Orientation = Fixed Oriented
CS Areal Density = 0.541 (g/cm²)
CS Surface Area = 0.0169 (m²)
Vector = (-1.000000 (u), 0.000000 (v), 0.000000 (w))
CS Pressurized = No
Outer Wall 1 Density: 0.541 (g/cm²) Separation: 0.200 (cm)
Outer Wall 2 Density: 0.541 (g/cm²) Separation: 4.000 (cm)
Outer Wall 3 Density: 0.410 (g/cm²) Separation: 9.300 (cm)

****OUTPUT****

Probability of Penetration = 2.5472E-08 (2.5472E-08)
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range

II. LARGE OBJECT COLLISION RISK

****INPUT****

Space Structure Name = Hubble
Space Structure Type = Payload
Perigee Altitude = 620.000 (km)
Apogee Altitude = 620.000 (km)
Inclination = 97.700 (deg)
RAAN = 0.000 (deg)
Argument of Perigee = 0.000 (deg)
Mean Anomaly = 0.000 (deg)
Final Area-To-Mass Ratio = 0.0185 (m²/kg)
Start Year = 2027.090 (yr)
Initial Mass = 590.000 (kg)
Final Mass = 570.000 (kg)
Duration = 7.000 (yr)
Station-Kept = True
PMD Perigee Altitude = 380.000 (km)
PMD Apogee Altitude = 380.000 (km)
PMD Inclination = 97.700 (deg)
PMD RAAN = 0.000 (deg)
PMD Argument of Perigee = 0.000 (deg)
PMD Mean Anomaly = 0.000 (deg)
Long-Term Reentry = False

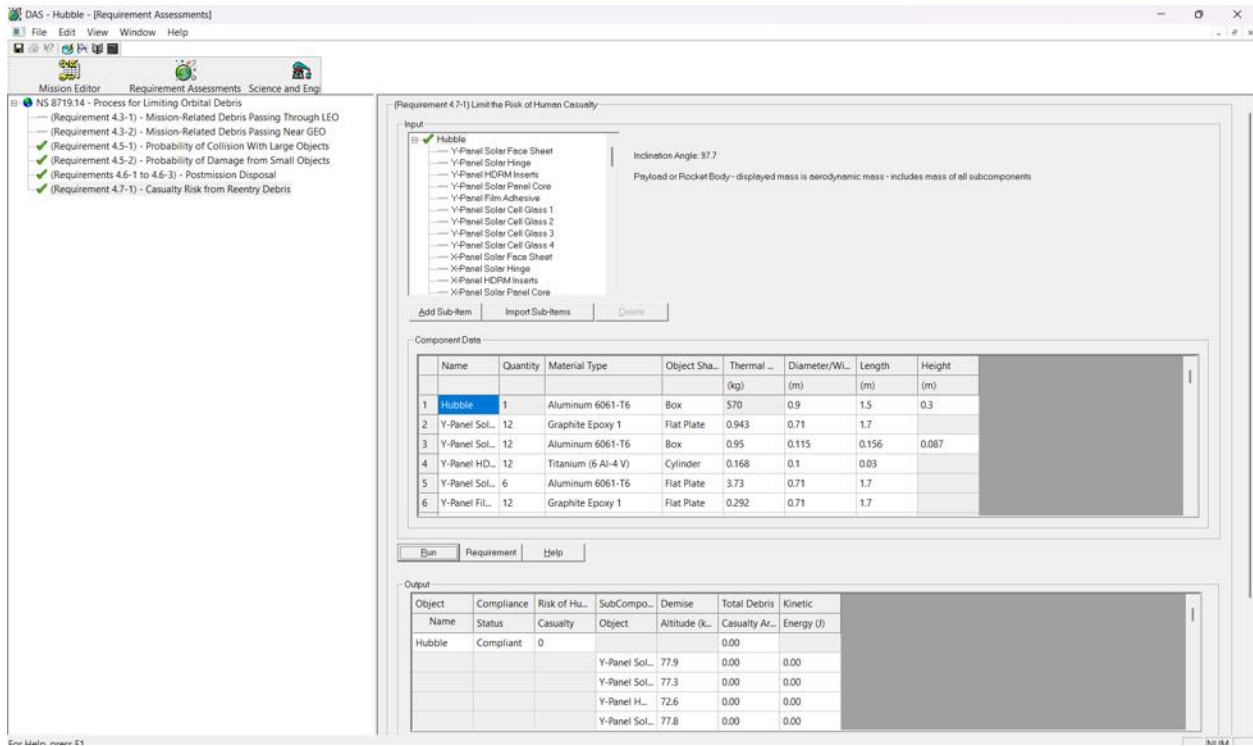
****OUTPUT****

Collision Probability = 5.0360E-04
Returned Message: Normal Processing
Date Range Message: Normal Date Range
Status = Pass

III. Orbital Lifetime

The relevant input and output plots appear in the Narrative, Attachment A (Technical Annex).

IV. HUMAN CASUALTY RISK



****INPUT****

Item Number = 1

name = Hubble

quantity = 1

parent = 0

materialID = 8

type = Box

Aero Mass = 570.000000

Thermal Mass = 570.000000

Diameter/Width = 0.900000

Length = 1.500000

Height = 0.300000

name = Y-Panel Solar Face Sheet

quantity = 12

parent = 1

materialID = 27

type = Flat Plate

Aero Mass = 0.943000

Thermal Mass = 0.943000

Diameter/Width = 0.710000

Length = 1.700000

name = Y-Panel Solar Hinge
quantity = 12
parent = 1
materialID = 8
type = Box
Aero Mass = 0.950000
Thermal Mass = 0.950000
Diameter/Width = 0.115000
Length = 0.156000
Height = 0.087000

name = Y-Panel HDRM Inserts
quantity = 12
parent = 1
materialID = 65
type = Cylinder
Aero Mass = 0.168000
Thermal Mass = 0.168000
Diameter/Width = 0.100000
Length = 0.030000

name = Y-Panel Solar Panel Core
quantity = 6
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 3.730000
Thermal Mass = 3.730000
Diameter/Width = 0.710000
Length = 1.700000

name = Y-Panel Film Adhesive
quantity = 12
parent = 1
materialID = 27
type = Flat Plate
Aero Mass = 0.292000
Thermal Mass = 0.292000
Diameter/Width = 0.710000
Length = 1.700000

name = Y-Panel Solar Cell Glass 1
quantity = 12
parent = 1
materialID = -1

type = Flat Plate
Aero Mass = 0.376000
Thermal Mass = 0.376000
Diameter/Width = 0.410000
Length = 0.480000

name = Y-Panel Solar Cell Glass 2
quantity = 12
parent = 1
materialID = -1
type = Flat Plate
Aero Mass = 0.180000
Thermal Mass = 0.180000
Diameter/Width = 0.230000
Length = 0.410000

name = Y-Panel Solar Cell Glass 3
quantity = 12
parent = 1
materialID = -1
type = Flat Plate
Aero Mass = 0.141000
Thermal Mass = 0.141000
Diameter/Width = 0.160000
Length = 0.460000

name = Y-Panel Solar Cell Glass 4
quantity = 6
parent = 1
materialID = -1
type = Flat Plate
Aero Mass = 0.236000
Thermal Mass = 0.236000
Diameter/Width = 0.280000
Length = 0.440000

name = X-Panel Solar Face Sheet
quantity = 12
parent = 1
materialID = 27
type = Flat Plate
Aero Mass = 0.472000
Thermal Mass = 0.472000
Diameter/Width = 0.820000
Length = 1.120000

name = X-Panel Solar Hinge
quantity = 12
parent = 1
materialID = 8
type = Box
Aero Mass = 0.950000
Thermal Mass = 0.950000
Diameter/Width = 0.115000
Length = 0.156000
Height = 0.087000

name = X-Panel HDRM Inserts
quantity = 12
parent = 1
materialID = 65
type = Cylinder
Aero Mass = 0.168000
Thermal Mass = 0.168000
Diameter/Width = 0.100000
Length = 0.030000

name = X-Panel Solar Panel Core
quantity = 6
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 3.400000
Thermal Mass = 3.400000
Diameter/Width = 0.820000
Length = 1.120000

name = X-Panel Film Adhesive
quantity = 12
parent = 1
materialID = 27
type = Flat Plate
Aero Mass = 0.193000
Thermal Mass = 0.193000
Diameter/Width = 0.820000
Length = 1.120000

name = X-Panel Solar Cell Glass
quantity = 24
parent = 1
materialID = -1
type = Flat Plate

Aero Mass = 0.370000
Thermal Mass = 0.370000
Diameter/Width = 0.360000
Length = 0.540000

name = Reaction Wheel
quantity = 4
parent = 1
materialID = 8
type = Cylinder
Aero Mass = 4.800000
Thermal Mass = 4.800000
Diameter/Width = 0.260000
Length = 0.100000

name = Reaction Wheel Pyramid Bracket
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 3.400000
Thermal Mass = 3.400000
Diameter/Width = 0.340000
Length = 0.370000
Height = 0.240000

name = Torque Rod
quantity = 3
parent = 1
materialID = 38
type = Cylinder
Aero Mass = 0.540000
Thermal Mass = 0.540000
Diameter/Width = 0.040000
Length = 0.370000

name = ADCS
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.900000
Thermal Mass = 0.900000
Diameter/Width = 0.148000
Length = 0.224000
Height = 0.041000

name = MFC
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 1.300000
Thermal Mass = 1.300000
Diameter/Width = 0.150000
Length = 0.337000
Height = 0.040000

name = TTCFE
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 0.480000
Thermal Mass = 0.480000
Diameter/Width = 0.113000
Length = 0.150000
Height = 0.040000

name = EPS
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 1.500000
Thermal Mass = 1.500000
Diameter/Width = 0.180000
Length = 0.350000
Height = 0.043000

name = EPS-X
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 1.640000
Thermal Mass = 1.640000
Diameter/Width = 0.150000
Length = 0.450000
Height = 0.024000

name = Battery XL

quantity = 6
parent = 1
materialID = 8
type = Box
Aero Mass = 6.880000
Thermal Mass = 6.880000
Diameter/Width = 0.211000
Length = 0.285000
Height = 0.087000

name = MPPT
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 1.450000
Thermal Mass = 1.450000
Diameter/Width = 0.180000
Length = 0.330000
Height = 0.030000

name = Zenith TTC Antenna
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 0.070000
Thermal Mass = 0.070000
Diameter/Width = 0.070000
Length = 0.080000
Height = 0.070000

name = GNSS Antenna
quantity = 1
parent = 1
materialID = 50
type = Flat Plate
Aero Mass = 0.050000
Thermal Mass = 0.050000
Diameter/Width = 0.050000
Length = 0.100000

name = MuMSS
quantity = 1
parent = 1
materialID = 8

type = Flat Plate
Aero Mass = 0.050000
Thermal Mass = 0.050000
Diameter/Width = 0.040000
Length = 0.080000

name = RadioCore
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 1.440000
Thermal Mass = 1.440000
Diameter/Width = 0.170000
Length = 0.250000
Height = 0.023000

name = HSRFE
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.480000
Thermal Mass = 0.480000
Diameter/Width = 0.111000
Length = 0.150000
Height = 0.040000

name = PayloadCore
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 1.000000
Thermal Mass = 1.000000
Diameter/Width = 0.150000
Length = 0.224000
Height = 0.041000

name = Nadir Panel
quantity = 1
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 22.420000
Thermal Mass = 22.420000

Diameter/Width = 0.860000
Length = 1.460000

name = Zenith Panel
quantity = 1
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 25.410000
Thermal Mass = 25.410000
Diameter/Width = 0.860000
Length = 1.170000

name = Y Panel
quantity = 2
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 2.340000
Thermal Mass = 2.340000
Diameter/Width = 0.180000
Length = 1.390000

name = X Panel
quantity = 2
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 3.070000
Thermal Mass = 3.070000
Diameter/Width = 0.420000
Length = 0.860000

name = Hashtag Y Rib
quantity = 2
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 3.670000
Thermal Mass = 3.670000
Diameter/Width = 0.180000
Length = 0.860000

name = Hastag X Outer Rib
quantity = 4
parent = 1

materialID = 8
type = Flat Plate
Aero Mass = 1.510000
Thermal Mass = 1.510000
Diameter/Width = 0.180000
Length = 0.300000

name = Hastag X Inner Rib
quantity = 2
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 4.000000
Thermal Mass = 4.000000
Diameter/Width = 0.180000
Length = 0.530000

name = Battery Mounting Plate
quantity = 4
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 1.340000
Thermal Mass = 1.340000
Diameter/Width = 0.220000
Length = 0.300000

name = Generic Fastener
quantity = 500
parent = 1
materialID = 57
type = Cylinder
Aero Mass = 0.007000
Thermal Mass = 0.007000
Diameter/Width = 0.007000
Length = 0.025000

name = Harness Wires
quantity = 4500
parent = 1
materialID = 19
type = Cylinder
Aero Mass = 0.001000
Thermal Mass = 0.001000
Diameter/Width = 0.001000
Length = 0.250000

name = Payload Support Structure
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 61.500001
Thermal Mass = 34.000000
Diameter/Width = 0.810000
Length = 0.822000
Height = 0.728000

name = Payload PSPU
quantity = 1
parent = 43
materialID = 8
type = Box
Aero Mass = 14.000000
Thermal Mass = 14.000000
Diameter/Width = 0.420000
Length = 0.666000
Height = 0.045000

name = Payload Harness
quantity = 10000
parent = 43
materialID = 19
type = Cylinder
Aero Mass = 0.001000
Thermal Mass = 0.001000
Diameter/Width = 0.001000
Length = 0.250000

name = Payload Fasteners
quantity = 500
parent = 43
materialID = 57
type = Cylinder
Aero Mass = 0.007000
Thermal Mass = 0.007000
Diameter/Width = 0.007000
Length = 0.025000

name = Comms & Tracking Tray
quantity = 1
parent = 1

materialID = 8
type = Flat Plate
Aero Mass = 3.680000
Thermal Mass = 3.680000
Diameter/Width = 0.325000
Length = 0.728000

name = BCT Star Tracker
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 0.850000
Thermal Mass = 0.850000
Diameter/Width = 0.100000
Length = 0.231000
Height = 0.100000

name = Nadir TTC Antenna
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 0.070000
Thermal Mass = 0.070000
Diameter/Width = 0.070000
Length = 0.080000
Height = 0.070000

name = HSR Uplink Antenna
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.070000
Thermal Mass = 0.070000
Diameter/Width = 0.070000
Length = 0.080000
Height = 0.070000

name = HSR Downlink Antenna
quantity = 1
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 0.080000

Thermal Mass = 0.080000
Diameter/Width = 0.110000
Length = 0.110000

name = Mini Plaser
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 18.500000
Thermal Mass = 18.500000
Diameter/Width = 0.444000
Length = 0.548000
Height = 0.427000

name = Solar HDRM Support
quantity = 4
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 6.340000
Thermal Mass = 6.340000
Diameter/Width = 0.380000
Length = 0.630000

name = HDRM
quantity = 8
parent = 1
materialID = 8
type = Cylinder
Aero Mass = 0.870000
Thermal Mass = 0.870000
Diameter/Width = 0.070000
Length = 0.090000

name = MA Cam
quantity = 1
parent = 1
materialID = 5
type = Box
Aero Mass = 0.100000
Thermal Mass = 0.100000
Diameter/Width = 0.040000
Length = 0.040000
Height = 0.040000

name = PPU Base Plate
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.500000
Thermal Mass = 0.500000
Diameter/Width = 0.160000
Length = 0.260000
Height = 0.006500

name = PPU Cover
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.413000
Thermal Mass = 0.413000
Diameter/Width = 0.160000
Length = 0.260000
Height = 0.030000

name = PPU Xformer
quantity = 2
parent = 1
materialID = -12
type = Box
Aero Mass = 0.251000
Thermal Mass = 0.251000
Diameter/Width = 0.038000
Length = 0.051000
Height = 0.030000

name = Feeder Stepper Motor
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.273000
Thermal Mass = 0.273000
Diameter/Width = 0.050000
Length = 0.050000
Height = 0.040000

name = Feeder Top Cap
quantity = 2

parent = 1
materialID = 5
type = Box
Aero Mass = 0.035800
Thermal Mass = 0.035800
Diameter/Width = 0.062000
Length = 0.113000
Height = 0.015000

name = Feeder Outer Housing
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.074000
Thermal Mass = 0.074000
Diameter/Width = 0.081000
Length = 0.113700
Height = 0.031000

name = Feeder Housing Motor Side
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.074000
Thermal Mass = 0.074000
Diameter/Width = 0.082000
Length = 0.114000
Height = 0.034000

name = Feeder Motor Mount
quantity = 2
parent = 1
materialID = 5
type = Box
Aero Mass = 0.038000
Thermal Mass = 0.038000
Diameter/Width = 0.064000
Length = 0.092000
Height = 0.020000

name = Thruster Outer Screen
quantity = 2
parent = 1
materialID = -8

type = Cylinder
Aero Mass = 1.065510
Thermal Mass = 0.209740
Diameter/Width = 0.083000
Length = 0.034000

name = Inner Screen
quantity = 2
parent = 64
materialID = -9
type = Cylinder
Aero Mass = 0.091570
Thermal Mass = 0.091570
Diameter/Width = 0.041000
Length = 0.030000

name = Inner Mag
quantity = 2
parent = 64
materialID = -10
type = Cylinder
Aero Mass = 0.764200
Thermal Mass = 0.764200
Diameter/Width = 0.360000
Length = 0.200000

name = Thruster Inner Pole
quantity = 2
parent = 1
materialID = -8
type = Cylinder
Aero Mass = 0.012660
Thermal Mass = 0.012660
Diameter/Width = 0.039000
Length = 0.020000

name = Thruster Outer Pole
quantity = 2
parent = 1
materialID = -8
type = Cylinder
Aero Mass = 0.035070
Thermal Mass = 0.035070
Diameter/Width = 0.084000
Length = 0.030000

name = Thruster Frame Connector Half
quantity = 2
parent = 1
materialID = 59
type = Flat Plate
Aero Mass = 0.135440
Thermal Mass = 0.135440
Diameter/Width = 0.070000
Length = 0.090000

name = Thruster Frame Bare Half
quantity = 2
parent = 1
materialID = 59
type = Flat Plate
Aero Mass = 0.443000
Thermal Mass = 0.135020
Diameter/Width = 0.070000
Length = 0.090000

name = Cathode Body Clamp
quantity = 2
parent = 70
materialID = 59
type = Cylinder
Aero Mass = 0.066980
Thermal Mass = 0.066980
Diameter/Width = 0.038000
Length = 0.014000

name = Anode
quantity = 2
parent = 70
materialID = 59
type = Cylinder
Aero Mass = 0.062560
Thermal Mass = 0.062560
Diameter/Width = 0.059000
Length = 0.021000

name = Cathode Mount Adapter
quantity = 4
parent = 70
materialID = 59
type = Box
Aero Mass = 0.010470

Thermal Mass = 0.010470
Diameter/Width = 0.017000
Length = 0.017000
Height = 0.010000

name = Gas Distributor
quantity = 2
parent = 70
materialID = -8
type = Cylinder
Aero Mass = 0.088830
Thermal Mass = 0.088830
Diameter/Width = 0.058000
Length = 0.026000

name = Heat Cover
quantity = 2
parent = 70
materialID = -8
type = Cylinder
Aero Mass = 0.038350
Thermal Mass = 0.038350
Diameter/Width = 0.035000
Length = 0.016000

name = Cathode Cap
quantity = 2
parent = 70
materialID = -8
type = Cylinder
Aero Mass = 0.019320
Thermal Mass = 0.019320
Diameter/Width = 0.038000
Length = 0.025000

name = Ceramic Anode
quantity = 2
parent = 70
materialID = -11
type = Cylinder
Aero Mass = 0.011000
Thermal Mass = 0.011000
Diameter/Width = 0.061000
Length = 0.020000

name = Thruster Outer Pole Clamp

quantity = 2
parent = 1
materialID = 59
type = Cylinder
Aero Mass = 0.028630
Thermal Mass = 0.028630
Diameter/Width = 0.036000
Length = 0.020000

name = Outer Mag
quantity = 2
parent = 1
materialID = -10
type = Cylinder
Aero Mass = 0.707200
Thermal Mass = 0.707200
Diameter/Width = 0.072000
Length = 0.030000

name = Outer Mag Align
quantity = 2
parent = 1
materialID = 8
type = Cylinder
Aero Mass = 0.031220
Thermal Mass = 0.031220
Diameter/Width = 0.085000
Length = 0.030000

name = Inner Mag Align
quantity = 2
parent = 1
materialID = 66
type = Cylinder
Aero Mass = 0.021680
Thermal Mass = 0.021680
Diameter/Width = 0.025000
Length = 0.035000

name = Thruster Bottom Cover
quantity = 2
parent = 1
materialID = 8
type = Cylinder
Aero Mass = 0.018360
Thermal Mass = 0.018360

Diameter/Width = 0.085000
Length = 0.030000

name = Harness Strain Relief
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 0.010530
Thermal Mass = 0.010530
Diameter/Width = 0.029000
Length = 0.029000
Height = 0.016000

name = Thruster Wedge Mount
quantity = 2
parent = 1
materialID = 5
type = Cylinder
Aero Mass = 0.070000
Thermal Mass = 0.070000
Diameter/Width = 0.080000
Length = 0.130000

name = Anode Propellant Reservoir
quantity = 2
parent = 1
materialID = 8
type = Cylinder
Aero Mass = 15.450000
Thermal Mass = 11.450000
Diameter/Width = 0.200000
Length = 0.170000

name = Zinc Propellant
quantity = 2
parent = 85
materialID = 70
type = Cylinder
Aero Mass = 4.000000
Thermal Mass = 4.000000
Diameter/Width = 0.100000
Length = 0.070000

name = Cathode Propellant Reservoir
quantity = 2

parent = 1
materialID = 8
type = Cylinder
Aero Mass = 1.450000
Thermal Mass = 1.450000
Diameter/Width = 0.100000
Length = 0.120000

name = Propulsion Panel
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 6.185000
Thermal Mass = 6.185000
Diameter/Width = 0.550000
Length = 0.550000
Height = 0.060000

name = Payload Antenna Core
quantity = 16
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 6.660000
Thermal Mass = 6.660000
Diameter/Width = 0.580000
Length = 0.937000

name = Payload Antenna Face Sheets
quantity = 16
parent = 1
materialID = 27
type = Flat Plate
Aero Mass = 0.250000
Thermal Mass = 0.250000
Diameter/Width = 0.580000
Length = 0.937000

*****OUTPUT*****

Item Number = 1

name = Hubble
Demise Altitude = 77.997995
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel Solar Face Sheet
Demise Altitude = 77.928504
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel Solar Hinge
Demise Altitude = 77.250484
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel HDRM Inserts
Demise Altitude = 72.645333
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel Solar Panel Core
Demise Altitude = 77.751389
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel Film Adhesive
Demise Altitude = 77.976776
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y-Panel Solar Cell Glass 1
Demise Altitude = 0.000000
Debris Casualty Area = 13.089849
Impact Kinetic Energy = 6.436463

name = Y-Panel Solar Cell Glass 2
Demise Altitude = 0.000000
Debris Casualty Area = 9.582880
Impact Kinetic Energy = 3.078428

name = Y-Panel Solar Cell Glass 3
Demise Altitude = 0.000000

Debris Casualty Area = 8.737634
Impact Kinetic Energy = 2.420228

name = Y-Panel Solar Cell Glass 4
Demise Altitude = 0.000000
Debris Casualty Area = 5.331016
Impact Kinetic Energy = 4.050512

name = X-Panel Solar Face Sheet
Demise Altitude = 77.953525
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X-Panel Solar Hinge
Demise Altitude = 77.250484
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X-Panel HDRM Inserts
Demise Altitude = 72.645333
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X-Panel Solar Panel Core
Demise Altitude = 77.704254
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X-Panel Film Adhesive
Demise Altitude = 77.980398
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X-Panel Solar Cell Glass
Demise Altitude = 0.000000
Debris Casualty Area = 26.031602
Impact Kinetic Energy = 6.309629

name = Reaction Wheel
Demise Altitude = 74.978503
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Reaction Wheel Pyramid Bracket
Demise Altitude = 77.354543
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Torque Rod
Demise Altitude = 73.861251
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = ADCS
Demise Altitude = 77.369589
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = MFC
Demise Altitude = 77.345239
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = TTCFE
Demise Altitude = 77.458572
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = EPS
Demise Altitude = 77.341416
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = EPS-X
Demise Altitude = 77.263727
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Battery XL
Demise Altitude = 75.280127
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = MPPT
Demise Altitude = 77.284232
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Zenith TTC Antenna
Demise Altitude = 77.872816
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = GNSS Antenna
Demise Altitude = 77.707985
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = MuMSS
Demise Altitude = 77.695129
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = RadioCore
Demise Altitude = 77.035889
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = HSRFE
Demise Altitude = 77.458527
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = PayloadCore
Demise Altitude = 77.304288

Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Nadir Panel
Demise Altitude = 76.471087
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Zenith Panel
Demise Altitude = 75.873103
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Y Panel
Demise Altitude = 77.537988
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = X Panel
Demise Altitude = 77.518658
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Hashtag Y Rib
Demise Altitude = 76.859080
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Hastag X Outer Rib
Demise Altitude = 77.027686
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Hastag X Inner Rib
Demise Altitude = 76.362500
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Battery Mounting Plate
Demise Altitude = 77.227246
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Generic Fastener
Demise Altitude = 76.994948
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Harness Wires
Demise Altitude = 77.947369
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload Support Structure
Demise Altitude = 76.298018
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload PSPU
Demise Altitude = 73.486848
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload Harness
Demise Altitude = 76.255059
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload Fasteners
Demise Altitude = 75.240997
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Comms & Tracking Tray
Demise Altitude = 77.224196
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = BCT Star Tracker
Demise Altitude = 77.526540
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Nadir TTC Antenna
Demise Altitude = 77.872816
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = HSR Uplink Antenna
Demise Altitude = 77.872816
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = HSR Downlink Antenna
Demise Altitude = 77.818184
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Mini Plaser
Demise Altitude = 76.179594
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Solar HDRM Support
Demise Altitude = 76.635284
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = HDRM
Demise Altitude = 75.741294
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = MA Cam
Demise Altitude = 76.682892

Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = PPU Base Plate
Demise Altitude = 77.008717
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = PPU Cover
Demise Altitude = 77.309500
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = PPU Xformer
Demise Altitude = 75.807473
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Feeder Stepper Motor
Demise Altitude = 75.270161
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Feeder Top Cap
Demise Altitude = 77.769143
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Feeder Outer Housing
Demise Altitude = 77.662595
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Feeder Housing Motor Side
Demise Altitude = 77.674477
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Feeder Motor Mount
Demise Altitude = 77.733637
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Outer Screen
Demise Altitude = 75.635001
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Inner Screen
Demise Altitude = 74.263626
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Inner Mag
Demise Altitude = 75.326520
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Inner Pole
Demise Altitude = 77.509050
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Outer Pole
Demise Altitude = 77.470768
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Frame Connector Half
Demise Altitude = 76.039317
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Frame Bare Half
Demise Altitude = 76.401803
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Cathode Body Clamp
Demise Altitude = 73.428808
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Anode
Demise Altitude = 74.899723
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Cathode Mount Adapter
Demise Altitude = 75.400609
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Gas Distributor
Demise Altitude = 74.361778
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Heat Cover
Demise Altitude = 74.556097
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Cathode Cap
Demise Altitude = 75.674226
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Ceramic Anode
Demise Altitude = 0.000000
Debris Casualty Area = 0.654560
Impact Kinetic Energy = 0.659972

name = Thruster Outer Pole Clamp
Demise Altitude = 76.845631

Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Outer Mag
Demise Altitude = 73.377289
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Outer Mag Align
Demise Altitude = 77.869210
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Inner Mag Align
Demise Altitude = 76.623644
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Bottom Cover
Demise Altitude = 77.923987
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Harness Strain Relief
Demise Altitude = 77.872803
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Thruster Wedge Mount
Demise Altitude = 77.671827
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Anode Propellant Reservoir
Demise Altitude = 71.613778
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Zinc Propellant
Demise Altitude = 67.095814
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Cathode Propellant Reservoir
Demise Altitude = 75.757532
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Propulsion Panel
Demise Altitude = 76.884547
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload Antenna Core
Demise Altitude = 77.192462
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

name = Payload Antenna Face Sheets
Demise Altitude = 77.970043
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
