**Table 1. define\_edl\_system.m**

edl\_system

*Field Name Type Value Description*

parachute struct Parachute structure

heat\_shield struct Heat shield structure

rocket struct Rocket structure

speed\_control struct Speed control structure

position\_control struct Position control structure

sky\_crane struct Sky crane structure

marvin struct Marvin structure

altitude scalar NaN [m] Altitude of system

velocity scalar NaN [m/s] Velocity of system

num\_rockets scalar 8 Number of rockets in our system

volume scalar 150 [m^3] Volume of air displaced by EDL system

parachute

*Field Name Type Value Description*

deployed bool true True means it has been deployed but not ejected

ejected bool false True means parachute no longer is attached to system

diameter scalar 16.25 [m] (MSL is about 16 m)

Cd scalar 0.615 [-] (0.615 is nominal for subsonic)

mass scalar 185.0 [kg] (This is a wild guess--no data found

rocket

*Field Name Type Value Description*

on bool false Indicates whether rockets are on

structure\_mass scalar 8.0 [kg] Everything not fuel (guestimate)

initial\_fuel\_mass scalar 230.0 [kg] Initial mass of fuel

fuel\_mass scalar 230.0 [kg] Current fuel mass (<= initial)

effective\_exhaust\_velocity scalar 4500.0 [m/s] (Ballpark correct; lacking a good source)

max\_thrust scalar 3100.0 [N] (MSL is 3100 according to wikipedia)

min\_thrust scalar 40.0 [N] (MSL is 400 according to wikipedia)

speed\_control

*Field Name Type Value Description*

on bool false Indicates whether this control mode is active

Kp scalar 2000 [-] Proportional gain term

Kd scalar 20 [-] Derivative gain term

Ki scalar 2500 [-] Integral gain term

target\_velocity scalar -3.0 [m/s] Desired descent speed

position\_control

*Field Name Type Value Description*

on bool false Indicates whether this control mode is active

Kp scalar 2000 [-] Proportional gain term

Kd scalar 1000 [-] Derivative gain term

Ki scalar 50 [-] Integral gain term

target\_velocity scalar 7.6 [m] This needs to reflect the sky crane cable length

sky\_crane

*Field Name Type Value Description*

on bool true True means lowering rover mode

danger\_altitude scalar 4.5 [m] Altitude at which considered too low for safe rover

touch down

danger\_speed scalar -1.0 [m/s] Speed at which rover would impact too hard on

surface

mass scalar 35.0 [kg] (Guesstimate)

area scalar 16.0 [m^2] Frontal area for drag calculations (guestimate)

Cd scalar 0.9 [-] Coefficient of drag (guestimate; should be relatively

high)

max\_cable scalar 7.6 [m] Max length of cable for lowering rover

velocity scalar -0.1 [m] Speed at which sky crane lowers rover

heat\_shield

*Field Name Type Value Description*

ejected bool false True means heat shield has been ejected from system

mass scalar 225.0 [kg] Mass of heat shield (total guess)

diameter scalar 4.5 [m] (MSL heat shield was 4.5m in diam)

Cd scalar 0.35 [-] Total guess

**Table 2. define\_mission\_events.m**

mission\_events

*Field Name Type Value Description*

alt\_heatshield\_eject scalar 8000 [m] Altitude where heat shield is ejected

alt\_parachute\_eject scalar 900 [m] Altitude where parachute is ejected

alt\_rockets\_on scalar 1800 [m] Altitude where rockets turned on

alt\_skycrane\_on scalar 7.6 [m] Altitude where the sky cranes is turned on

**Table 3. define\_planet.m**

mars

*Field Name Type Value Description*

g scalar -3.72 [m/s^2] Gravity on Mars

altitude\_threshold scalar 7000 [m] Altitude at threshold

low\_altitude struct Low altitude structure

high\_altitude struct High altitude structure

density scalar vary\* [kg/m^3] Density based on altitude data

low\_altitude

*Field Name Type Value Description*

temperature scalar vary\* [C] Temperature at altitude

pressure scalar vary\* [Kpa] Pressure at altitude

high\_altitude

*Field Name Type Value Description*

temperature scalar vary\* [C] Temperature at altitude

pressure scalar vary\* [KPa] Pressure at altitude

\*: Value is dependent on other values within the structure.

**Table 4. define\_rover.m**

marvin

*Field Name Type Value Description*

on\_ground bool false True means rover is on ground and ready to drive

wheel\_assembly struct Wheel assembly structure

chassis struct Chassis structure

science\_payload struct Science payload structure

power\_subsys struct Power subsystem strucuture

wheel\_assembly

*Field Name Type Value Description*

wheel struct Wheel structure

speed\_reducer struct Speed reducer structure

motor struct Motor structure

wheel

*Field Name Type Value Description*

radius scalar 0.2 [m] Radius of the wheels

mass scalar 1.0 [kg] Mass of one wheel

speed\_reducer

*Field Name Type Value Description*

type string reverted String of text defining the type of speed reducer

diam\_pinion scalar 0.04 [m] Diameter of pinion

diam\_gear scalar 0.06 [m] Diameter of gear

mass scalar 1.5 [kg] Mass of speed reducer assembly

motor

*Field Name Type Value Description*

torque\_stall scalar 165 [N-m] Motor stall torque

torque\_noload scalar 0 [N-m] Motor no-load torque

speed\_noload scalar 3.85 [rad/s] Motor no-load speed

mass scalar 5.0 [kg] Motor mass

chassis

*Field Name Type Value Description*

mass scalar 674 [kg] Mass of chassis

science\_payload

*Field Name Type Value Description*

mass scalar 80 [m] Mass of science payload

power\_subsys

*Field Name Type Value Description*

mass scalar 100 [m] Mass of power subsystem