Measurements/calculation
Systems on rocket
Launch gear,
Chemical/ energy
Different rockets launched
Procedures (failure)
Stages
Feedbacks / controls

1. abort mode multiple modes in which procedure must take in case of faulure
- source: [@en.wikipedia.org/wiki/Space_Shuttle_abort_modes]
- data: procedure abort modes (dynamic, because procedures needs to take place in failures during different times of liftoff)
- control: procedures in which can be taken in case of a failure
- behavior: starting from countdown of the liftoff, computer monitors for any failure. When detected, procedures dictate what to do depending on time of failure
- role: output because its what needs to be done due to failure
- pattern: structural because it connects to each part of the space system. Behavioral because it needs to work with many of the engines
- concern: model because it manipulates the space systems intentions, (what its supposed to do. View because user has to see and initiate abort mode, and controller taking user's abort mode into action.
- difficulty: hard due to when it happens and what steps that are needed to take.
- risk: high since couples with many parts of the system.
- presentation: red button for abort

2. acceleration change in velocity with respect to time
- source: [@physicsclassroom.com/class/1DKin/Lesson-1/Acceleration]
- data: rate of change in speed(dynamic since it tracks the change in speed)
- control: the change in speed of the space system
- behavior: currently at lift off the acceleration is increasing from back thrust until halfway where it begins to decrease
- role: output because depending on how much the speed changes itll output the acceleration
- pattern: creational because it is defined
- concern: view because we see the acceleration rate of the space system
- difficulty: moderate since we calculate the acceleration by derivative of velocity
- risk: low because its a showing just the acceleration of the space system
- presentation: textbox that shows the number representing acceleration

3. accelerometer measures the acceleration force
- source: [@dimensionengineering.com/info/accelerometers
- data: static like constant force of gravity or dynamic caused by moving or vibrating the accelerometer
- control: measures the acceleration force.
- behavior: user knows what angle the space system is tilted with respect to earth as its

being launched. By sensing the dynamic acceleration, user can analyze the way it is moving

role: processing, takes the information that it senses due to measuring static acceleration

pattern: behavioral, takes the amount of static acceleration due to gravity & measures it

concern: controller pass in it pass in information taken from measurement to calculate

difficulty: moderate. Takes the input of static acceleration. Or change in velocity respect to time

risk: moderate knowing the acceleration can help know what angle the ship is.

presentation: textbox with the acceleration measurement in it.

4. actuator device that takes and send signals by converting it to mechanical motion

source: [@en.wikipedia.org/wiki/Actuator]

data: dynamic because it needs to control the mechanism or system

control: takes control signal and respond by converting energy to mechanical motion

behavior: user sends inputs which sends energy which process the information and respond accordingly to the system / mechanism

role: process from taking inputs and energy and convert it to mechanical motion. Output because it outputs the mechanical motion

pattern: behavioral because it works with mechanic motion of the system

concern: model because it takes input and energy and converts it to the motion
view to see the result of controlling the signals

difficulty: hard due to taking input and doing the logic which would interact with many other component to make the mechanical motion

risk: high since it involves the space system motion. Otherwise you wont have control

presentation: on a plane grid graph type of screen with buttons to send it inputs

5. attitude a position specified by velocity, attitude motion and postion.

source: [@spacealliance.ro/articles/view.aspx?id=200903060613]

data: dynamic the orientation in space of the spacecraft would adjust

control: specified by its position, velocity, attitude motion

behavior: the orientation of the spacecraft determine by xyz axis

role: output because it's the motion of the spacecraft

pattern: behavioral because depending on the ships angle

concern: view because its shows the attitude

difficulty: low because it's a calculation of position velocity and attitude

risk: moderate must make sure the calculation is correct

presentation: on an xyz plane with point of origin

6. attitude control system a control system that manage the position on a 3d space

source: [@] qrg.northwestern.edu/projects/vss/docs/propulsion/2-what-is-attitude-control.html]

data: dynamic attitude is the way the ship is positioned in a 3d space which can be changed

control: position on 3d space has x y and z coordinates

behavior: attitude is monitored and controlled to point the ship in the correct direction

role: output because you take the value to understand the ships position
pattern: behavioral because its in effect the way the ship is pointed
concern: view because it shows the information of the attitude
difficulty: moderate to hard because it has to work with the ship's angle
risk: high. Wrong calculation could cause the ship millions of miles off course
presentation: on a 3d plane visual

7. boost stage a stage where thruster help boost the rocket
source: [@en.wikipedia.org/wiki/Booster_(rocketry)]
data: dynamic first stage of single or multistage rocket launch which rockets are used
control: booster. Sustainer rockets to augment a space vehicle takeoff thrust
behavior: when spacecraft takes off, enters the boost stage which the booster rocket are used
role: output stage in which it uses parts of a space system
pattern: creational, must be define and structural, because it a stage that connects with the space system
concern: model because during that stage, it uses certain parts of the system
difficulty: moderate because we have to know when it enters the boost stage and when it exits the stage
risk: moderate. It is needed to initiate. Without it, the space system cant use the booster
presentation: physical booster that is on the system to be used

8. center of mass A value average mass
source: [@http://hyperphysics.phy-astr.gsu.edu/hbase/cm.html]
data: static systems response to external forces and torques
control: average mass factored by their distance from reference point
behavior: center of mass calculated by engineers for the space system
role: input when user inputs the center mass. Process when user takes information and calculate the center of mass
pattern: behavioral because the distance of reference points into calculation of the system's mass
concern: model since the center of mass can be manipulated
difficulty: high it's a calculation of many parts
risk: high since it must be precise calculation in mechanical parts
presentation: textbox that shows the center mass

9. combustion chamber chamber where combustion happen turn fuel into energy
source: [@en.wikipedia.org/wiki/Combustion_chamber]
data: dynamic parts of the combustion chamber are in used to burn fuel/air
control: part of an internal engine that takes in air and fuel mix is burned
behavior: user turns on space system to activate the combustion chamber
role: process, takes user input that it needs to be activated so it activates and burn
pattern: creational because it needs to be define and structural since it connects to the space system and behavioral because it creates energy with many parts.
concern: model because it manipulate other parts
difficulty: high. Must work with many components to create energy

risk: high. Without this, there would be no fuel and air being burned which creates no energy
presentation: button or switch to turn on and activate the system which then activate the combustion chamber

10. Command Module (Apollo) one of NASA rocket that went to space
source: [@en.wikipedia.org/wiki/Apollo_Command/Service_Module]
data: dynamic, it is an area for the pilot that accommodate to their needs
control: has accommodation, equipment bays, control and display of system
behavior: pilot sits down as he turn on the control to see the display of the course
role: process. Pilot goes in and work the control module and it is processed
pattern: creational must be define, behavioral due to the control systems and structural, must be connected to the space system
concern: model has the logics of the entire space system
difficulty: hard because it's the head of the space system
risk: high. Any failure in here means failure of the entire space system
presentation: a room with many controls for pilot to use as they fly in space

11. control system a system in which user could put input to do what it wants
source: [@m.esa.int/Our_Activities/Space_Engineering_Technology/Control_Systems]
data: dynamic they are focused on precise management and respond accordingly
control: modelling of dynamic system and design of close loop controllers that cause system to behave in a manner that they want
behavior: control engineer monitor and manage the space system's travel
role: output because there are feedbacks that are being received from a close loop design
pattern: behavioral management is according with the space system's mission
concern: view because we need to see it's state
difficulty: high must work separately but dependently on the space system
risk: high, any error on here could mean the space system's travel would be off
presentation: big room with many component systems managing different parts of the system

12. docking an event where one space craft joins another temporarily
source: [@en.wikipedia.org/wiki/Docking_and_berthing_of_spacecraft]
data: dynamic connects one space vehicle to another
control: joining of two separate free flying space vehicle
behavior: one rocket sets up so it could dock onto another rocket
role: process. Because it takes one space system and send it to the 2nd
pattern: structural. Connects two rockets together
concern: controller passes rocket 1 to rocket 2 in order to be able to dock it
difficulty: easy. One is a parent class of another. Such as boxes and connecters
risk: moderate. Must connect correctly in order to ensure safe docking
presentation: platform in which space system of two sort could connect to each other

13. drag a calculation of resistance
source: [@en.wikipedia.org/wiki/Drag_(physics)]
data: dynamic different level of resistance

control: a type of resistance such as air, fluid etc.
behavior: rocket flies with …. Amount of drag from the air (air resistance)
role: input since space craft motion is causing drag
pattern: behavioral since the rocket is moving it causes air resistance otherwise drag
concern: model since drag is based on rockets motion. (velocity acceleration, etc.)
view to see the amount of drag
difficulty: easy input the calculation for it in the equation
risk: moderate since it's a calculation it must be precise
presentation: number on a display to show how much current drag there is

14. engine (rocket) engine of a rocket, creates propellant
source: [@en.wikipedia.org/wiki/Rocket_engine]
data: dynamic. Combustion in engine to create thrust
control: a type of jet engine store rocket propellant mass forming high speed propulsive jet
behavior: rocket engine combust which then thrust the rocket up
role: process. Combustion in side which then also output which is the thrust and propulsion
pattern: creational. Must be defined and structural because it connects to the rocket
concern: model. Th engine is being manipulated into creating energy
difficulty: moderate to hard. Involves knowing how each of the component of engine work
risk: moderate. Because it is needed to power (from a source) the rocket
presentation: cylindrical cone at the bottom of the rocket

15. failsafe (system) a design that responds to failure
source: [@en.wikipedia.org/wiki/Fail-safe]
data: dynamic needs to respond to failures
control: design feature/ practice incase of a failure of some kind
behavior: failsafe features added onto a rocket so if a system fails, other parts wont be harmed
role: output. b/c it incase of a failure, it will be activated to mitigate the failure
pattern: behavioral. Works with other system to help prevent failure
concern: model since it observes and manipulate components
difficulty: hard. Many different things must be watch with different procedures for each
risk: high since it is depended on to help respond that will lessen the harm for equipment's or people
presentation: a monitor that shows system failure and a switch to activate it

16. failure mode different modes that were caused by a failure
source: [@businessdictionary.com/definition/failure-mode.html]
data: dynamic. Is caused due to failures
control: equipment or machine failure has occurred due to premature operation or did not follow directions. Etc.
behavior: pilot failed to operate at correct time which cause ship to fail.
role: process since logic being passed into is what's breaking
pattern: behavioral. Due to working with other parts which it does not like the other parts job in a way that cause this one to fail

concern: model since the system that fails is being manipulated
difficulty: moderate. Must check the different failure mode that it could be catch
risk: high. Failure mode must be caught or else it would be troublesome in the entire process
presentation: screen to show what the error was and where it happened.

17. feedback an output of a result
source: [@en.wikipedia.org/wiki/Feedback]
data: dynamic due to the results of the inputs that being put in
control: outputs of a system is being routed back in as an input
behavior: pilot takes the information and re enters the input using the new information
role: output since it shows the feedback. And input because its being put back in
pattern: structural since it work with the inputs and outputs
concern: controller since it keeps passing in information that effects the other parts
view because we need to see what the feedback is outputing
difficulty: moderate. Takes new output and the input as input to get the new output
risk: moderate. Code has to get new information and updates accordingly then shows the update
presentation: a form to allow inputs and the feedback of the input

18. flight, orbital space travel that stays for at least one orbit
source: [@en.wikipedia.org/wiki/Orbital_spaceflight]
data: static. Space craft is placed in space for at least one orbit
control: spacecraft is placed on a trajectory so it remains in space
behavior: a spacecraft takes off and is now in space for 3 orbits
role: output since the rocket is being placed in space
pattern: creational. It is defined that it will be in space
concern: controller since it is in space it keeps the logic so that it can stay in space
difficulty: easy. Setting of the rocket is flown to space that is far enough
risk: easy. Code to make sure rocket is flown far enough
presentation: a space craft in space and is there for at least one orbit

19. flight, suborbital space travel that is less than 1 orbit
source: [@en.wikipedia.org/wiki/Sub-orbital_spaceflight]
data: static . rocket will be in space but not as far as the preivous
control: spacecraft reaches space but trajectory intersects the surface of gravitating body which it came from
behavior: a rocket was launch in space for a bit as a test run
role: output since the rocket is being place there in space
pattern: creational because it is define that it needs to be in a certain area in space
concern: controller since it is in space it keeps the logic so that it can stay in space
difficulty: easy. Setting of the rocket is flown to space that is far enough
risk: easy. Code to make sure rocket is flown far enough
presentation: a space craft in space and is there for at least one orbit

20. fuel cell device that creates chemical energy and turns it into electricity
source: [@en.wikipedia.org/wiki/Fuel_cell]
data: dynamic because it converts chemical energy from fuel

control: a device that creates chemical energy from the fuel into electricity due to the chemical reaction
behavior: fuel cell is activated and the rocket now has power due to the chemical reaction
role: output. It outputs energy that is being put in
pattern: creational since it needs to be defined and structural since it needs to connect to the rocket
concern: model since chemical energy form fuel is being manipulated
difficulty: moderate. Because it involves working with chemical reaction
risk: high since it powers the rockets from the fuel
presentation: a physical component on a ship

21. gimbal a pivot support
source: [@en.wikipedia.org/wiki/Gimbal]
data: dynamic because it works with rotations
control: a pivoted support that allows rotation of an object about a single axis
behavior: the supports keep the pilot upright while ships upside down
role: process. Changes the axis to keep a specific support upright
pattern: structural since it connects with other parts
concern: model since it keeps the supported upright with respect to the horizon
difficulty: hard due to math it requires and the different cases
risk: high. Without this, the pilot would become disorientated
presentation: physical component on /in a rocket

22. gravity physics value of force
source: [@spaceplace.nasa.gov/what-is-gravity/en/]
data: static gravity equation the same, depends on the mass of planet/moon etc.
control: force by which a planet or other body draws object towards the center
behavior: pilot weighs less on the moon due to less gravity
role: output since it's a math/physics calc
pattern: creational because gravity is defined
concern: controller since gravity have different implementation on different planets view to see the gravity at the moment
difficulty: easy. Calculation
risk: moderate. Should have a precise calculation or else trajectory might be off
presentation: box with the number of gravity

23. guidance guide the rockets with calculations
source: [@en.wikipedia.org/wiki/Guidance_system]
data: dynamic because it controls the spacecraft
control: does the calculation then control the movement of the rocket
behavior: pilot use the guidance system to adjust his velocity
role: process since it use to control movement
pattern: behavioral due to it controlling the movement of the ship which effects other components on the ship
concern: model because ships being manipulated
difficulty: high. Has to work with many other parts in the ship to control the movement
risk: high. If one part doesn't work correctly then the movement control is off

presentation: buttons and switches to increase and decrease and to change the movement variables

24. gyroscope spinning wheel axis

source: [@en.wikipedia.org/wiki/Gyroscope]
data: dynamic due to constant readjustment
control: spinning wheel in which axis of rotation is free to assume any orientation
behavior: gyroscope top was combined with gimbal
role: process. Due to constant rotation across an axis
pattern: model since its being manipulated
concern: controller since gravity have different implementation on different planets
difficulty: easy. Calculation
risk: moderate. Should have a precise calculation or else trajectory might be off
presentation: box with the number of gravity

25. inertial measurement unit measuring unit that measures the angular rate of a body

source: [@en.wikipedia.org/wiki/Inertial_measurement_unit]
data: dynamic since it measures and reports
control: measures and reports a specific force angular rate of a body
behavior: user finds the inertial measurement unit from a device
role: processes due to measuring and output for it reporting a specific force
pattern: creational. Since it must be defined and behavioral because it measures the spacecraft and reports it
concern: model because the measurement is being manipulated
difficulty: moderate. Since it has to know what case to measure
risk: high. Since it needs to be precise about getting the angles for the calculations
presentation: a spreadsheet / data table for the units measurement for each part it measures

26. landing gear gear that is used for landing

source: [@en.wikipedia.org/wiki/Landing_gear]
data: dynamic since its activated and locked
control: can extend out and lock onto the surface
behavior: pilot initiate landing protocols which activates landing gear to land vertically
role: output because it's a mechanical device that that supports rockets landing
pattern: creational because it needs to be defined. Structural since it connects to the rocket
concern: model because its being manipulated
difficulty: moderate. Because it involves activating.
risk: high, without this, rocket can take off but cant land without crashing
presentation: down arrow button to initiate landing protocol

27. launch escape rocket a rocket that is used to escape from the main rocket

source: [@en.wikipedia.org/wiki/Launch_escape_system]
data: dynamic. when it needs to be released
control: crew safety system which connects to a space capsule that detaches itself from the rocket
behavior: pilot escape in the launch escape rocket due to impending explosion
role: output, because it detaches itself from the launch vehicle

pattern: structural because it connects to the rocket, creational because it is defined
concern: model because rockets being manipulated
difficulty: moderate because it involves cloning a similar rocket object
risk: moderate. May not need but it's a backup due to chances of failure
presentation: capsule vehicle that is connected to the rocket physically

28. launch vehicle a spacecraft that is launched into space
source: [@en.wikipedia.org/wiki/Launch_vehicle]
data: dynamic it's a carrier
control: carry a payload from earths surface to outer space
behavior: NASA must send a robot to the moon so it launch a space vehicle to the moon with the robot
role: process , takes the input of whatever it needs to bring and bring it up to space
pattern: creational. The space vehicle must be defined
concern: controller, it passes in the input (payload) and sends it to space (model)
difficulty: hard. Needs to be exact copy of a rocket but with different implementation
risk: moderate involves code that launches the space vehicle correctly
presentation: a physical rocket

29. liftoff (stage) stage where liftoff is taken place
source: [@en.wikipedia.org/wiki/Multistage_rocket]
data: dynamic. lift off stage starts then enter the next stage when its done
control: has its own engines and propellant which is used during specific stage
behavior: rocket initiate lift off stage which the rocket lifts off and when its done the engine and propellant are released
role: outputs the booster so that rockets can take off
pattern: behavioral effects the calculation of the rocket due to it pushing the rocket
concern: model the rockets acceleration is being manipulated as it takes off
difficulty: moderate. Involves motion of the rocket and rocket releasing the booster after the stage
risk: high because it involves motion of the rocket. Without it, there could be failure in rockets liftoff
presentation: a screen with that shows what stage the rocket is in.

30. liquid fuel fuel that creates energy in liquid form for the rocket
source: [@en.wikipedia.org/wiki/Liquid_fuel]
data: dynamic since its able to combust
control: combustible/ energy generating molecules that can be harnessed and produce kinetic energy
behavior: Rocket fuel is being filled in the rocket's fuel tank
role: input. Fuel that is being used must be put in the rockets tank
pattern: behavioral b/c it works with the combustion chamber and other components to produce kinetic energy to push the rocket
concern: model because the fuel is being manipulated into something else
view to see how much fuel is left
difficulty: easy. The entity that when harness outputs energy
risk: moderate. Rocket needs fuel since it is the source of the rockets power/ energy

presentation: a bar where it shows the percentage of the fuel that is left inside the rocket

31. Lunar Module (Apollo) a successful rocket that was sent into space as a mission

source: [@nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1969-059C]
data: dynamic it was a functional rockets that completed a mission
control: two stage vehicle designed for space operation near/ on the moon
behavior: neil Armstrong was the commander that first landed on the moon
role: output b/c it is the result of a functional rocket
pattern: creational. Since the entire rocket was define. Behavioral since all the components worked with each other
concern: model the rocket was manipulated as it was going into space and to the moon
difficulty: hard. Because it is the finish product of a rocket. Which means all parts must work
risk: high since if one part doesn't work that means rocket might not function
presentation: the physical space system that is finished.

32. maneuvering movement of a rocket created by the pilot

source: [@en.wikipedia.org/wiki/Orbital_maneuver]
data: dynamic since its changing the orbit of space craft
control: using propulsion system to change orbit of a spacecraft
behavior: the rocket is maneuvered away from its path due to incoming astroids
role: process. Since its changing a rockets orbit is a process
pattern: behavioral. Maneuvering a rocket requires the different systems to work together
concern: model because the rockets path is being manipulated
difficulty: moderate. Have to change the rocket's orbit by using the propulsion system
risk: high. Since you're changing orbit. Wrong calculation could throw it off
presentation: handles to control and maneuver the rocket

33. oxidizer chemical that is used as a reaction to create energy

source: [@qrg.northwestern.edu/projects/vss/docs/propulsion/2-what-is-an-oxidizer.html]
data: dynamic since it's a reactor that reacts to the liquid fuel
control: oxidizer is a chemical that is brought in space to cause a reaction and burn fuel then which creates energy
behavior: user needs to maneuver so he thrust forwards which cause the oxidizer and fuel to react
role: process. It is used to cause a reaction with the fuel
pattern: behavioral because the oxidizer works with the fuel cell with the liquid fuel to create a reaction
concern: model because the oxidizer molecule is being manipulated view to see how much oxidizer is left
difficulty: easy. It should be define and what happens when it is reactive
risk: moderate. Must incorporate the reaction correctly or else there would be no energy
presentation: a bar that shows the oxidizer level

34. parachute a type of cloth that helps the rockets decelerate when it is trying to land

source: [@solarsystem.nasa.gov/docs/07%20%20Space%20] parachute%20system%20design%20Lingard.pdf
data: dynamic. the parachute is deployed
control: when the spacecraft is landing, parachutes help the deceleration
behavior: pilots about to land on the moon. So pilot activates the parachute to ease the landing and decelerate
role: output because the parachute is deployed out of the space craft
pattern: structural because it connects to the spacecraft and help with the deceleration
concern: model because it manipulated and view because we see that it is happening
difficulty: low. Because the code that is needed is just letting the parachute out
risk: moderate. If there isn't a parachute, craft can still land but space mission might not be as successful due to no deceleration or recovery.
presentation: button with a parachute symbol.

35. payload whats being carried inside of the rocket

source: [@en.wikipedia.org/wiki/Payload]
data: static when the rocket was designed. Payload can not change after it is built
control: payloads carrying compacity that may include cargo, satellite flight crew etc
behavior: rocket has a set amount of payload so only 3 flight crew could enter
role: input. Because the rockets payload is what objects are being put in.
pattern: structural because it connects to a rocket on a certain area
concern: view because it is what the pilots and team interact with and fill up
difficulty: easy. A set compacity which holds data of how much is the rocket holding
risk: moderate. A setter and getter. If it compacity is overboard, issue may arise
presentation: multiple rooms with cargo / flight crew could be and fit in.

36. pitch a value that reflects the up and down angle

source: [@en.wikipedia.org/wiki/Aircraft_principal_axes#Lateral_axis_.28pitch.29]
data: dynamic it changes as the rocket is being maneuver
control: pitch is a lateral axis in which moves the nose of the rocket up or down angle
behavior: pilot raise the rockets pitch as it travels to the moon to stay on course
role: output because it's the value of a position of a rocket
pattern: behavioral because the pilot would maneuver the rocket and as it maneuver, the pitch is what's changing
concern: model because pitch is changing
difficulty: easy. Change the lateral axis of the rocket
risk: easy, if the pitch is off, it could be fixed and maneuver back correctly
presentation: on a 3d plane axis which shows the rocket's pitch movement

37. probe (space)

source: [@URL] en.wikipedia.org/wiki/Space_probe
data: dynamic course and movement is changing to explore more
control: a robotic spacecraft that explores further into outer space
behavior: a rover was sent on mars to explore mars and spend pictures/ videos back
role: process because probe is being sent out to explore more
pattern: creational since a probe has to be defined. And is the functional
concern: controller because it process information while exploring and view so that

headquarters could see the reslts

difficulty: hard probe needs all system to be functionally correct. And is the finished product

risk: moderate. If theres an error, the probe might be off course or unfunctional

presentation: map where the probe is exploring on a screen.

38. propellant chemical used to produce gas

source: [@en.wikipedia.org/wiki/Propellant]

data: dynamic because it is being used to create something

control: propellant is a general name for chemical used to produce gas that is directed thru a nozzle which produce thrust

behavior: the pilot allows the propellant is being passed through the system to generate propulsion

role: input. The crew puts propellant in the correct system so that it could be use to generate thrust

pattern: behavioral because it is being directed and release in turns produce propulsion

concern: controller because the chemical is being directed in a way so that it would create thrust

difficulty: easy. The amount of propellant is an amount

risk: moderate. Code needed to make sure the chemical is directed correctly so that it would create thrust

presentation: a symbol that shows the amount of propellant used with a value

39. reaction control system a system that constantly keeps the rocket on course due to little movments

source: [@en.wikipedia.org/wiki/Reaction_control_system]

data: dynamic constantly adjusting and working with attitude

control: system that used for attitude control, maneuvering, orientation stationkeeping

behavior: the pilot needs to adjust his rotation and maneuver back on track so use RCS to do so

role: output because in situations that requires to use RCS, they produce the desire results

pattern: behavioral because it is a control system that is used thrusters to adjust the space craft

concern: model because it manipulates the space craft

difficulty: moderate. Has to constantly check the arguments if its needed and what to adjust

risk: moderate. It's a readjusting control system. Has to deal with many

presentation: multiple buttons for attitude, maneuvering/docking, orientation adjustment

40. reentry (stage) a stage where pilots re entering the atmosphere

source: [@en.wikipedia.org/wiki/Atmospheric_entry]

data: static. Because the movement isn't being manipulated or change

control: movement of an object in outer space entering thru the gases of an atmosphere of a planet

behavior: pilot renters the earths atmosphere to go back to base.

role: process because it's the act of reentering the earths atmosphere from outer

pattern: behavioral because it works with the environment and drag to reenter

concern: view because the pilot controls the space craft for a proper reentry
difficulty: high code deals with rocket's motion and outside variables
risk: high requires code for the process of reentering or else space craft would not be able to reenter the earth's atmosphere
presentation: 3d plane that shows the rockets trajectory while initiating reentry

41. retrorocket rockets on the option end to balance the rocket when decelerating
source: [@en.wikipedia.org/wiki/Retrorocket]
data: dynamic rocket engine can be turned on or off
control: a rocket engine providing thrust opposing motion causing it to decelerate
behavior: pilot prepares to decelerate so he activates retrorocket
role: output because retrorocket effects the acceleration of the rocket
pattern: structural because it connects to spacecraft, creational because its defined
concern: model because it is being manipulated
difficulty: moderate. Involves code that decelerate the motion of the spacecraft when activated
risk: high. Without this, rocket would most likely have a crash landing
presentation: a stick that acts like a break so when pulled it activates the retrorocket

42. roll a value that is reflected on the longitudinal axis
source: [@en.wikipedia.org/wiki/Aircraft_principal_axes#Longitudinal_.28roll.29]
data: dynamic because the ships positioning is changing
control: passes through the plane from nose to tail. On the longitudinal axis
behavior: pilot initiate maneuver which he has to change is roll
role: output because it's the value of a position of a rocket
pattern: behavioral because the roll is effected by the motion of the spacecraft
concern: model because its being manipulated
difficulty: easy because it will be define as a value
risk: low . must make sure that the value is accurate.
presentation: on a 3d plane with an x y z axis

43. satellite a spacecraft that is in space with multi uses
source: [@en.wikipedia.org/wiki/Satellite]
data: dynamic because satellites have many different purposes
control: satellites can be used for military and civilian observation, communication, navigate weather and space telescope
behavior: person use a satellite to see weather patterns to predict when next the next storm that is coming
role: output because it is there recording data
pattern: creational because it is defined
concern: model because it works to record data. View so we can see what data it has collected
difficulty: high. Lots of components and arguments to consider when sending a satellite up into space to orbit
risk: high due to the potential coupling it has with other satellite that may be there already
presentation: table format that shows the recorded data

44. self-destruct (system) a process that results in destroying itself

source:	[@en.wikipedia.org/wiki/Self-destruct]
data:	dynamic mechanism can be activated
control:	mechanism that cause object to destroy itself when circumstances has occurred
behavior:	headquarter activates self destruct on a robot out of space so it could not be intercepted by others
role:	output because self destruct with cause the mechanism to destroy it self as a result
pattern:	behavioral. When its activated it works with other systems to destroy it
concern:	controller because its passing information and logic to the other components so that it would stop working properly
difficulty:	moderate. Code has to destroy the system to which it should not work anymore
risk:	high. Code must work correctly or else self destruct could cause more harm then it was meant to prevent
presentation:	a red button with an x and something covering it so that could not be so easily access

45. sensor an electronic component that reads inputs and sends information

source:	[@en.wikipedia.org/wiki/Sensor]
data:	static. Its constantly reading information which it could detect changes/ events
control:	electronic component, module that detects events or changes in its environment and sends information to other electronics mainly a compute processor
behavior:	pilot receive information from the sensor and adjust coordinates accordingly
role:	process because it takes in information and pass it to correct system and output when it does pass to correct system
pattern:	behavioral because it interacts with many other system in the space craft
concern:	controller since it passes the data to the system and view so user can see the data
difficulty:	moderate. Involves lots connection to many system on a space craft
risk:	high. if one signal doesn't work to a system, it could mean failure
presentation:	a table with many values output that came from the sensor

46. Service Module (Apollo) another rocket that was sent into space

source:	[@en.wikipedia.org/wiki/Apollo_Command/Service_Module]
data:	dynamic it was a functional spacecraft that can be launched
control:	one of two spacecraft used by US Apollo program to land astronauts on the moon
behavior:	astronauts boarded the service module to travel to the moon
role:	output because the spacecraft was a result of a finished product
pattern:	creational because it was created and defined
concern:	model because the spacecraft could be manipulated
difficulty:	moderate. Would have to code a fully functional rocket. This could be a clone
risk:	moderate. Make sure all parts work on the original if this one is a clone
presentation:	a window of information and values about the space craft as a display

47. solar panel a panel that absorb sunlight and turns it into energy

source: [@en.wikipedia.org/wiki/Solar_panel]

data: static. It doesn't change, a specific job

control: absorb sunlight as a source of energy to generate heat or electricity

behavior: person install solar panel as their main source of energy instead of gas

role: input takes in solar energy outputs heat and electricity

pattern: behavioral because it works with other systems. Lose coupling

concern: controller, takes sunlight as passes it to the system that does the generation

difficulty: easy. Takes input and generate heat or electricity depending the amount of input

risk: low. Loose coupling so have to worry about few parts individually

presentation: a value of how much solar energy was absorb and the output energy

48. solid fuel fuel in solid form

source: [@en.wikipedia.org/wiki/Solid_fuel]

data: dynamic. It can changed its molecular level

control: solid material that can be burnt to release energy, provide heat and light thru combustion.

behavior: NASA launch space craft that have booster that use solid fuel as a solid propellant

role: input because it's a burnable solid material. Output for the energy it produces

pattern: behavioral. Systems work with the fuel which the fuel provide energy to the system

concern: view. Its what user inputs in the space craft

difficulty: moderate. Because its just involves a value for amount of solid fuel and what happens when it is burned to create energy

risk: high. code must pass the correct amount of energy to the system that requires it

presentation: a value/ percentage of how much solid fuel is used or is left.

49. stage, multiple (rocket) a rocket when launch has to go through multiple stages of launch

source: [@en.wikipedia.org/wiki/Multistage_rocket]

data: dynamic. changes stage at different times

control: two or more stage where each contains its own engines and propellant

behavior: the pilot enters the first stage which is the largest, at the bottom

role: output because each stage will output different motion

pattern: creational because each part has to be defined. Structural because each stage has different parts that connects to the rocket

concern: model because the rocket is being manipulated by the stages. View because we need to see and know what stage it is

difficulty: moderate. Code has to know when to enter the next stage

risk: moderate. If code doesn't know when to enter the next stage it could mean too early or too soon

presentation: a data table to show what stage it is on and whats happening

50. stage, single (rocket) a rocket that is launch with only one stage process

source: [@en.wikipedia.org/wiki/Single-stage-to-orbit]

data: static its one single stage to bring the rocket into space
control: vehicle reaches orbit from the surface of a body without jettisoning hardware
behavior: a rocket was launch into space that was single stage
role: process because it is the work name that brings the rocket to space
pattern: creational because the job that is done has to be defined
concern: view because it's a single stage that the user has to see and put the rocket to
difficulty: moderate. If the code for the rocket works, then all we would need is to have it constantly continue launch
risk: risk. Since its only one stage, it must be imperative that the stage doesn't fail for any type of argument. It has to intake all argument and cases
presentation: a data table to show what part the stage is on

51. tank (fuel/oxidizer) external tank of a space vehicle containing fuel and oxidizer
source: [@en.wikipedia.org/wiki/Space_Shuttle_external_tank]
data: dynamic both fuel tank and oxidizer tank need to know how much is in it
control: it supply the rocket with fuel and oxygen
behavior: an engine will request for more fuel when it is needed
role: output because both tanks are supplying fuel or oxidizer
pattern: creational because it is defined, structural because it must connect to the rocket
concern: model because it is manipulated and view because we need to see the result
difficulty: easy. Have code and a visual rep from 0 to 100 and have code that supply
risk: low because it doesn't depend on anything else
presentation: a value with how much fuel is left in the tank

52. telemetry automated communication process which measurements and data is collected
source: [@en.wikipedia.org/wiki/Telemetry]
data: dynamic because it is sending information
control: sends encompass data and sends it wirelessly to the mechanism
behavior: telemetry is sending information to the reaction control system it needs to move to the left a bit
role: process, it takes process input and sends it to the mechanism
pattern: behavioral because it works with the components and systems
concern: controller it takes input and data and sends it wirelessly
difficulty: moderate. Involves code that can encompass data
risk: high. must work with many systems
presentation: a graph with all the inputs that its reading and outputs that it is sending

53. thrust force in which the space craft moves thru the air
source: [@grc.nasa.gov/WWW/K-12/airplane/thrust1.html]
data: dynamic because it's a value that is being change for different speeds
control: as it increase the rocket is moving faster
behavior: pilot increase the thrust which increase his movement speed
role: input because its how we control the shuttle
pattern: behavior because it works with the other system to describe its state
concern: controller because it takes information and react accordingly
difficulty: moderate involves code that works with direction, location and velocity
risk: high because the calculation must be precise when sending it to the systems

presentation: arrow buttons to increase and decrease

54. thrust-to-weight ratio the amount of thrust produced by an engine relative to the weight

source: [@en.wikipedia.org/wiki/Thrust-to-weight_ratio]
data: dynamic because thrust can change. Static weight stays the same
control: display value of thrust divided by weight
behavior: pilot sees the displayed value of thrust divided by weight
role: output because it's a display of value
pattern: creational because it must be defined
concern: view because it is displaying the value raito
difficulty: easy. Code for math formula
risk: low because it depends on how much thrust and weight the rocket weighs
presentation: a value number

55. thrust, deflected use to manipulate the direction of thrust from engine

source: [@en.wikipedia.org/wiki/Thrust_vectoring]
data: dynamic constantly changing the deflection
control: use to manipulate direction
behavior: the thrust deflected puts rocket back on track as its launch by swiveling
role: input because it constantly has to fix it
pattern: creational because its define structural because it connects to the rocket
concern: model because its manipulating the rocket
difficulty: moderate. Involves taking input of travel of the rocket and adjusting it
risk: low because it works with formulas
presentation: on an x y axis and shows rockets motion

56. thrust, gimbaled gimbaled thrust system, rocket swiveled form side to side

source: [@spaceflightsystems.grc.nasa.gov/education/rocket/gimbaled.html]
data: dynamic thrust is changing, static center of gravity stays the same
control: thrust acts upon nozzle of rocket generate the gimbal angle
behavior: the thrust guides the rocket and re adjust it
role: input because it's a guide for the rocket
pattern: behavioral because it guides the rocket
concern: controller because it gets input from other sources
difficulty: hard because it requires input from other sources and then use those inputs
risk: high because it has a high dependency on other inputs
presentation: on a xyz plane that shows the line of angle thrust and torques

57. truss truss is a structure that "consists of two-force members only, where the members are organized so that the assemblage as a whole behaves as a single object".

source: [@en.wikipedia.org/wiki/Truss]
data: static joints where the two ends connect
control: structural frame for a larger object
behavior: structural frame for a larger object
role: output because it's a structural object
pattern: structural because it connects parts of the rocket
concern: view because the structure doesn't require input or manipulation

difficulty: low because it is just simply a connector
risk: low because it doesn't depend on many
presentation:

58. turbopump propellant pump with two main component which produce high pressure fluid for feeding the combustion chamber
source: [@en.wikipedia.org/wiki/Turbopump]
data: static because both rotodynamic pump and driving gas turbine is stationary
control: feed combustion chamber
behavior: feed combustion chamber
role: output because it is a mechanical device that supports the rocket
pattern: structural because it connects to the rocket
concern: model because it manipulates fluid for the combustion chamber
difficulty: hard because it takes in data type and uses the data type for its own
risk: high rocket depends on the pump to feed into the combustion chamber
presentation: a physical box that works with the chamber

59. velocity rate of change in displacement
source: [@en.oxforddictionaries.com/definition/velocity]
data: dynamic because the value is changing
control: describe the value state of our rocket
behavior: pilot checks the velocity of the rocket
role: output because it is the result in change of displacement
pattern: creational because it is defined
concern: view because we see its state and we can change it state
difficulty: low because it's a valued calculation
risk: low because it's a mathematical formula
presentation: a value number

60. vernier thruster rocket engine used on spacecraft for fine adjustment to attitude or velocity
source: [@en.wikipedia.org/wiki/Vernier_thruster]
data: dynamic because it needs to know what their state is to readjust
control: use when heavy spacecraft requires a range of thrust level
behavior: manicuring during docking with other spacecraft
role: process because it needs to know what other thrusters are doing
pattern: structural because it connects to the rocket
concern: controller because it is used to make fine adjustment
difficulty: hard because it involves motion of many thrusters
risk: high because if one thruster is off then the whole rocket is off
presentation:

61. yaw turn by angular motion of vertical axis
source: [@merriam-webster.com/dictionary/yaw]
data: dynamic because its manipulated due to change
control: describes the angle the shuttle is turning
behavior: describes the angle the shuttle is turning
role: processing because it is just used to determine where to point the shuttle
pattern: behavior because it describes the state of the shuttle

concern: view because we need to see the state
difficulty: easy because it's a value
risk: moderate because it depends on the status of the rocket
presentation: xyz plane to show the rockets position

62. watchdog electronic timer that is used to detect malfunction
source: [@en.wikipedia.org/wiki/Watchdog_timer]
data: dynamic. It is used to detect and recover computer malfunctions.
control: watchdog timer is reset so the timer could be used to detect malfunctions
behavior: during normal operation, the watchdog timer has been reset
role: process. It looks for malfunction, if found it recovers it
pattern: structural because its defined, behavioral because it works with many systems
concern: view because it reports in malfunctions
difficulty: high because it constantly has to check and reset to make sure system is fine
risk: high because it works with many systems
presentation: a screen with a status bar that checks each system