1. Create a science plan

Use Case Name: Create a science plan	ID: 1		Importance Level: High
Primary Actor: Astronomer			Use Case Type: Detail, Essential
Stakeholders and Interests: • Astronomer - wants to create a science plan			
Brief Description: The use case describes the process of an astronomer creating a science plan			
Trigger: An astronomer wants to create a science plan **Type:** External			
Preconditions: The astronomer must successfully log in to the system.			

Relationships:
 	
     Association: Astronomer
 	
     Include: -
 	
     Extend: -
 	
     Generalization: -			

Normal Flow of Events: 1. The system displays the Create a Science Plan page. 2. The astronomer fills in the details including Creator, Submitter, Funding, and Objective. 3. The astronomer fills the type of the star system. 4. The astronomer selects the Schedule (e.g. start date, end date, and time) and Telescope location. 5. The astronomer selects the Data processing requirements including File type, File quality, and Image processing (e.g. color type, contrast, brightness, saturation). 6. The astronomer creates the science plan by clicking the "Save Science Plan" button.			

7. The system records the created science plan.

Subflows:

Alternate/Exceptional Flow:
- Exception for event 4: If the selected Schedule has a start date after an end date, the system alerts with a "Start date cannot be after the end date."
- Exception for event 6: If the input is incomplete or invalid input format.
    If the input is incomplete, the system alerts with a "Please fill in all required fields." message.
    If the input is invalidated, the system alerts with a "Please enter a valid {the input areas that are invalid input format}" message.
    - If the value of funding is not number.
        The system alerts with a "Please enter a valid funding amount.

    a. If the astronomer selected the color type of Color mode.
        - If the value of contrast is not a number.
        the system alerts with a "Please enter a valid Contrast amount.".
        - If the value of brightness is not a number.
        The system alerts with a "Please enter a valid Brightness amount.".
        - If the value of saturation is not number.
        The system alerts with a "Please enter a valid Saturation amount.".
        - If the value of exposure is not a number.
        The system alerts with a "Please enter a valid Exposure amount.".
        - If the value of luminance is not a number.
        The system alerts with a "Please enter a valid Luminance amount.".
        - If the value of hue is not a number.
        The system alerts with a "Please enter a valid Hue amount.".
    b. If the astronomer selected the color type of B&W mode.
        - If the value of contrast is not a number.
        the system alerts with a "Please enter a valid Contrast amount.".
        - If the value of highlights is not a number.
        the system alerts with a "Please enter a valid Highlights amount.".
        - If the value of exposure is not a number.
        the system alerts with a "Please enter a valid Exposure amount".
        - If the value of shadows is not a number.
        the system alerts with a "Please enter a valid Shadows amount.".
        - If the value of whites is not a number.
        the system alerts with a "Please enter a valid Whites amount..".
        - If the value of blacks is not a number.
        the system alerts with a "Please enter a valid Blacks amount.".
        - If the value of Luminance is not a number.

the system alerts with a "Please enter a valid Luminance amount.". - If the value of Hue is not a number. the system alerts with a "Please enter a valid Hue amount.".	

2. Validate a science plan

Use Case Name: Validate a science plan	**ID:** 2	**Importance Level:** High
Primary Actor: Science Observer		**Use Case Type:** Detail, Essential
Stakeholders and Interests: ● Science Observer - wants to validate a science plan.		
Brief Description: This use case describes how the science observer validates a science plan.		
Trigger: The astronomer submits a science plan and the science observer receives the science plan to validate it. **Type:** External		
Preconditions: The science observer must successfully log in to the system.		

Relationships:
 	
    Association: Science Observer
 	
    Include:
 	
    Extend:
 	
    Generalization:		

Normal Flow of Events: 1. The system presents a list of 'SUBMITTED' science plans. 2. The science observer selects a 'SUBMITTED' science plan he or she wants to validate. 3. The science observer validates the integrity of the details including the Creator, Submitter, Funding, and Objective, type of the Stars system, the availability of the Schedule, the availability of the Telescope location, Data processing requirements		

including File type, File quality, and Image processing (e.g. color type, contrast, brightness, saturation).

4. The science observer validates the science plan.
5. The science plan's status changed to "VALIDATED".

Subflows:

Alternate/Exceptional Flow:
- Exception for event 1: If the system cannot find any science plan data.
    The system displays "There are currently no submitted science plans."
- Exception for event 3: If the integrity of the details is corrupted
    The science observer invalidates the science plan.
    The science plan is rejected.
    The science plan's status changed to "INVALIDATED".

3. Create an observing program

Use Case Name: Create an observing program	**ID:** 3	**Importance Level:** High
Primary Actor: Science Observer		**Use Case Type:** Detail, Essential

Stakeholders and Interests:
• Science Observer – wants to create an observing program.

Brief Description: This use case describes the process of how the science observer transforms a science plan into an observing program.

Trigger: After the science observer validates a science plan, a science observer will transform a science plan into an observing program. **Type:** External

Preconditions:
    1. The science observer must log in to the system first.
    2. The science observer must have validated the science plans.

Relationships:
 	
    Association: Science observer
 	
    Include: -
 	
    Extend: -
 	
    Generalization: -

Normal Flow of Events:
    1. The science observer goes to the "Create an observing program" page.
    2. The system presents a list of validated science plans.
    3. The science observer selects a validated science plan he or she wants to create.
    4. The science observer creates an observing program from the validated science plan
    5. The science observer fills in the details including Optics Primary, F-stop, Optics Secondary RMS, Science Fold Mirror Degree, Science Fold Mirror Type, Module Content, Calibration Unit, Light type, and Telescope Position Pair.
    6. The science observer creates the observing program by clicking the "Create Observing Program" button.

7. The system records the created observing program.

Subflows:

Alternate/Exceptional Flow:
- Exception for event 2: If the system cannot find any validated science plan data.
    The system displays "There are currently no validated science plans."
- Exception for event 5: If the input is incomplete or invalid input format.
    If the science plan is not selected, the system will alert a "Please select a science plan" message.
    If the inputs are invalid input formats, the system will alert a "Please enter a valid {the input areas that are invalid input format}" message.
    - If the value range of f-stop for GNZ filled by the science observer is not as required.
        The system alerts with a "Value range of f-stop for GNZ is 1.8-8.1. Please enter a valid value for F-Stop".
    - If the value range of f-stop for GSZ filled by the science observer is not as required.
        The system alerts with a "Value range of f-stop for GSZ is 2.9-18. Please enter a valid value for F-Stop".
    - If the value range for the South telescope RMS filled by the science observer is not as required.
        The system alerts with a "Value range for South telescope RMS is 5-13 nm. Please enter a valid value for Optics Secondary RMS".
    - If the value range for the North telescope RMS filled by the science observer is not as required.
        The system alerts with a "Value range for North telescope RMS is 5-17 nm. Please enter a valid value for Optics Secondary RMS".
    - If the Science Fold Mirror Degree range filled by the science observer is not as required.
        The system alerts with a "Value range for science fold mirror degree is 30-45. Please enter a valid value".