The system shall provide secure user authentication mechanisms.

UC Name	*User Authentication and Authorization* *UC-001*
Summary	*Verifying the identity and the permissions of the users accessing the planning features.*
Dependency	*None*
Actors	Primary Actor:Air Control Department Users Secondary Actor: System
Preconditions	*1.The user's credentials are valid.* *2.The user attempts to access the air control department.*
Description of the Main Sequence	**Step 1**: The user fills in the username and password. **Step 2**: The system verifies the provided credentials with those on the database. **Step 3**: The system checks the user's role and permissions based on credentials. **Step 4**: If the credentials are valid, the system gives access to the user as part of air control department. **Step 5**: If the credentials are invalid, the system denies access and the user has to try again.
Description of the Alternative Sequence	**Step 1**: If the user fails to give the valid credentials after three times, the system deactivates the user's account and notifies the administrator.
Non functional requirements	**Security**: User authentication must have strong encryption methods to protect sensitive information. **Performance**: The authentication process should be completed within … seconds. **Scalability**: The authentication system should be capable of handling a large number of login attempts.
Postconditions	● If authentication and authorisation is successful, user should have access as air control department personnel. ● In case of failure, user access is denied.

The system shall validate user inputs to ensure data integrity and consistency.

UC Name	*Data Validation and Integrity* *UC-002*
Summary	Ensuring the integrity and consistency of data inputs by users.
Dependency	*User Authentication and Authorization (UC-001)*
Actors	**Primary Actor**:Air Control Department Users **Secondary Actor**: System
Preconditions	The user attempts to input or modify flight data into the system.
Description of the Main Sequence	**Step 1**: The user provides input data such as airport coordinates, aircraft details, routes and estimated time of arrival. **Step 2**: The system provides validation checks on the integrity and consistency of the data. **Step 3**: The system checks the user's role and permissions based on credentials. **Step 4**: Verifies if the coordinates are according to the required format. **Step 5**: The system ensures that the provided information aligns with known parameters. **Step 6**: If validation errors are detected,the system notifies the user. **Step 7**: The system provides the user with the correct data. **Step 8**: Once all the validations are passed successfully, the input data is accepted by the system and proceed for further actions.
Description of the Alternative Sequence	If the input data fails any validation check, the system provides a specific error message, indicating the nature of the failure.
Non functional requirements	**Accuracy:** Validation checks should identify errors in user input. **Performance:** Data validation should be performed in real-time. **Flexibility:** Tha validation should be configurable to accommodate changes in flight data.
Postconditions	Validated input data is stored in the system, ensuring integrity and consistency of information about the flight.

The system shall support real-time collaboration features for multiple users.

UC Name	Real-Time collaboration UC-003
Summary	The system should support real-time collaboration, where changes should be immediately visible to other users.
Dependency	*User Authentication and Authorization (UC001)* *Data Validation and Integrity (UC-002)*
Actors	**Primary Actor**:Air Control Department Users **Secondary Actor**: System
Preconditions	● The user is authorized to access the system as part of the air control department. ● The user has initiated the collaboration session within the system.
Description of the Main Sequence	***Step 1****: The system displays the list of all available flight plans.* ***Step 2****: The user selects a specific flight plan.* ***Step 3****: The system gets the flight plan details for the one that is chosen and presents them to the user for viewing and modifying.* ***Step 4****: If another user is editing the same flight at that time the system notifies both parties for the presence.* ***Step 5****: The user can change the plan such as updating route details, modifying aircraft information.* ***Step 6****: When the user makes the changes, the system updates them in real-time.* ***Step 7****: If another user is currently editing the same plan, the system updates their view to reflect the made changes.* ***Step 8****: If conflicts arise, such as modifying the same data field at the same time, the system provides a version control for the differences.*
Description of the Alternative	*If the conflict occurred due to edits by multiple users on the same time, the system prompts the affected users to review*

Sequence	*and resolve the conflict manually.*
Non functional requirements	***Performance** : Real-time updates must happen within a short time.* ***Scalability** : The system should scale to accommodate a large number of users collaborating on multiple flight plans at the same time.* ***Reliability** : Collaborating features should be reliable, ensuring the changes are shown properly at all user's views.*
Postconditions	Collaborative changes to the flight plan are successfully integrated and reflected in the system, maintaining consistency and coherence.

The system shall perform regular backups for flight plan data.

UC Name	*Backup and Recovery* *UC-004*
Summary	The regular backup of flight plan data to prevent loss due to system failures or data corruption.
Dependency	Audit Trail (UC-005)
Actors	Primary actor: Administrator Secondary actor : System
Preconditions	● The system is capable of performing backup operations. ● In the system are existing flight plans data.
Description of the Main Sequence	**Step 1** : The system administrator initiates the backup process. **Step 2** : The system identifies the flight plan data that is going to be backed up. **Step 3** : The system creates a backup of the plan, ensuring data integrity and consistency. **Step 4** : Backup files are stored in a secure location according to data policies and procedures. **Step 5** : Administrator verifies and confirms the successful creation of backup files. **Step 6** : The system maintains a log of backup operations with timestamps and details..

Description of the Alternative Sequence	If the backup process fails, the system notifies the administrator and retires the process automatically.
Non functional requirements	**Reliability** : The backup process should be reliable and resilient, capable of handling large volumes of data without loss or errors. **Security** : Backup files should be encrypted to protect the data. **Scalability** : The backup mechanism should scale to store increasing volume of data.
Postconditions	• Backup files are successfully stored and created in a secure location , mitigating the risk of data loss in the event of system failures or data corruption. • The system is equipped with a robust recovery mechanism to restore the data from backup-s in case of emergencies with minimal downtime.

The system shall maintain an audit trail of all actions performed on flight plans.

UC Name	*Audit Trail* *UC-005*
Summary	*The maintenance of audit trail, documenting all actions performed on flight plans such as creation, modification and deletion. It includes the timestamp and the user responsible for the action.*
Dependency	*User Authentication and Authorization (UC-001)* *Data Validation and Integrity (UC-002)* *Real-time Collaboration (UC-003)*
Actors	***Primary actor****:Administrator* ***Secondary actor****: System*
Preconditions	*The system is operational and capable of tracking user actions.* *Flight plan data exists in the system.*
Description of	***Step 1*** *: The system captures the data associated with each*

the Main Sequence	*action performed on the plans.* ***Step 2** : When the user creates a new flight plan, the system records the timestamp, the user and the details of the created flight plan* ***Step 3** : When the user modifies an existing plan, the system records the timestamp, the name of the user and the specific changes made to the plan.* ***Step 4** : When a user deletes a flight plan, the system logs the timestamp, the responsible user and all the details of the deleted flight.* ***Step 5** : Audit trail events are stored in a secure manner to ensure data integrity.* ***Step 6** : The administrator can access and review the audit trail.* ***Step 7**: The trail is searchable and filterable.* ***Step 8** : The audit trails events are maintained according to data policies and procedures.*
Description of the Alternative Sequence	*If the system encounters errors while logging in into audit trail events, it notifies the administrator and retires to log in.*
Non functional requirements	***Reliability** : The audit trail logging mechanism should be reliable and resilient.* ***Security** : Audit trail events should be securely stored and protected for maintaining integrity and trustworthiness.* ***Performance** : The audit trail logging process should have minimal impact on system performance, allowing the system to operate efficiently under normal and peak load conditions.*
Postconditions	*An audit trail containing details of all actions performed on flight plans is maintained within the system providing accountability and traceability.* *The administrator can review and analyze audit trail events.*

The system shall be capable of integrating with external airline systems.

UC Name	*Integration with External Systems* *UC-006*
Summary	*This use case involves enabling the software to integrate with external systems, aircraft tracking systems or weather services.*
Dependency	*Data Validation and Integrity (UC-002)*
Actors	***Primary Actor**: Administrator* ***Secondary Actor**: Ail Control Department User*
Preconditions	*The system is operational and capable of integrating with external systems.*
Description of the Main Sequence	***Step 1** : Administrator initiates the integration process.* ***Step 2** : Administrator identifies the external systems to integrate with (aircraft tracking systems, weather forecasting services).* ***Step 3** : Administrator configures connection parameters, authentication credentials, data formats.* ***Step 4** : The system establishes connections with external systems verifying the compatibility.* ***Step 5** : The system retrieves relevant data from the external system (real-time aircraft locations from tracking system, weather forecasts for specific routes).* ***Step 6** : The integrated data is processed and incorporated into the flight planning features providing comprehensive information.* ***Step 7**: Air control department users can access the integrated data to make informed decisions and adjustments to flight plans.*
Description of the Alternative Sequence	*If there are connectivity issues or errors in retrieving data, the system notifies the administrator.*
Non functional requirements	***Compatibility** : The integration mechanism should support the interoperability with a wide range of external systems.*

	***Reliability** : Integration with external systems should be reliable and resilient, with error handling mechanisms.* ***Security** : Integration interfaces should be secured using encryption and authentication to protect sensitive data exchange.*
Postconditions	● *The software is successfully integrated with external systems, providing users with real-time data for decision making.* ● *Users can access and utilize integrated data improving operational efficiency and flight management.*

The system shall be designed to handle a large volume of flight plans and user efficiently.

UC Name	*Scalability and Performance* *UC-007*
Summary	*This use case ensures that the software is designed to handle large volumes of flight plans and users efficiently.*
Dependency	*User Authentication and Authorization (UC-001)* *Real-time Collaboration (UC-003)* *Integration with External Systems (UC-006)*
Actors	***Primary actor**: Administrator* ***Secondary actor** : Air control Department User*
Preconditions	*The system is operational and capable of managing flight plans and user interactions.*
Description of the Main Sequence	***Step 1** : Administrator monitors system performance (response time, resource utilization).* ***Step 2** : Based on performance analysis the administrator identifies areas for optimization.* ***Step 3** : The administrator implements performance optimizations.* ***Step 4** : The system does stress testing to test its ability to handle a large volume of concurrent users and flight plans.* ***Step 5** : Performance optimizations are fine-tuned based on*

	results of stress testing and user feedback. ***Step 6*** *: Users interact with the system, performing actions (creating, modifying or accessing flight plans).* ***Step 7*** *: The system efficiently processes user requests and maintains responsive user interface even during peak usage period.* ***Step 8*** *: Air control department users utilize the system for flight planning and management, benefiting from fast response time.*
Description of the Alternative Sequence	*If performance issues are identified during stress testing or user feedback, the administrator applies additional optimizations and re-evaluates system performance.*
Non functional requirements	***Scalability*** *: The system should be capable of scaling horizontally and vertically to accommodate increasing numbers of users without degradation in performance.* ***Responsiveness*** *: User interactions with the system should have minimal delay.* ***Stability*** *: The system should maintain stability and reliability under loading conditions avoiding downtime.*
Postconditions	*The software demonstrates high scalability and performance, efficiently handling a large volume of flight plans and users. Users experience smooth interactions with the system enhancing user satisfaction and productivity.*