CTAAS System Requirements Document

1. Introduction
   1.1. Purpose – This document addresses the high-level requirements that describe the operational capabilities necessary to achieve the aircraft arrival sequencing goals to be achieved by the Federal Aviation Administration's (FAA) future airspace control system. These requirements are grouped under the functional component of the Controlled Time of Arrival for Airports System (CTAAS) within which the requirements will be met.

2. Function Descriptions
   2.1. Accept Aircraft/Airlines Request & Acknowledge – This high-level function will be responsible for handling all requests from the Airlines/Aircraft, will route the request to the appropriate functional component of the CTAAS, and will provide an acknowledgement message to the system user of receipt of the request.
      2.1.1. Support Aircraft Requests – This component will receive and route any requests from the Aircraft to the appropriate component of the CTAAS.
      2.1.2. Support Airlines Requests - This component will receive and route any requests from the Airlines to the appropriate component of the CTAAS.
      2.1.3. Support Aircraft/Airline Entities Requests in Emergency – This component will receive and process all requests from the Airlines or Aircraft related to a current emergency situation. These requests will be given priority over other routine, non-emergency requests.

   2.2. Provide Aircraft Flight Guidance – This high-level function will be responsible for providing all flight guidance for inbound flights. This direction will come from the *Generate Aircraft Arrival Sequencing* component of the CTAAS system and the flight guidance will be provided to the Aircraft and Airlines as appropriate.
      2.2.1. Receive Sequence Requirements – This component will receive the inbound-aircraft sequencing data, and compare this information to the inbound-aircraft's current flight characteristics. From this comparison, any modifications to the inbound-aircraft's flight characteristics will be calculated, and provided to the *Provide Aircraft Flight Guidance* Component.
      2.2.2. Provide Aircraft Flight Guidance – This component will take the inbound-aircraft's flight characteristic modifications and provide them to the Aircraft and/or Airlines entities as appropriate.

   2.3. Generate Aircraft Arrival Sequencing – This high-level function will be responsible for requesting inbound flight status from both the inbound-aircraft and from the airlines, receiving and processing these messages, generating a queued sequence of arrival for all inbound aircraft, and will provide emergency support for any sequence changes as a result of an emergency situation.
      2.3.1. Request Inbound Flight Status – This component will poll aircraft and airlines to provide up-to-date flight status (location, speed, heading, etc) for all inbound-aircraft.

2.3.2. Receive and Process Messages – This component will receive the inbound-flight status messages from the aircraft and airlines. The data from these messages will be passed to the *Enqueue Aircraft* component as a basis upon which the arrival sequence will be based. If an emergency situation is reported, it will routed to the *Emergency Support* component of this high level function.

2.3.3. Send Acknowledgement Messages – This function will generate an acknowledgement message to the Aircraft and Airlines from which the navigation data was received. The message will be routed to the *Accept Airline/Aircraft Request and Acknowledge* component to be returned to the user.

2.3.4. Enqueue Aircraft – This component will take all flight creation requests, inbound-flight modification requests, flight emergency requests, and all inbound-flight status datum, and generate or modify the inbound arrival sequence as appropriate. After the sequence has been updated or modified, any flight guidance would be routed to the *Provide Aircraft Flight Guidance* high-level function for eventual dissemination to the aircraft or airlines as appropriate.

2.3.5. Emergency Support – This component will receive all emergency requests from the *Accept Airline/Aircraft Request and Acknowledge* component, and will provide priority input to the *Enqueue Aircraft* component as appropriate in order to provide best support/solution to the emergency situation.

2.4. Provide Emergency Support – This high-level function will be responsible for receiving and processing the emergency-related messages. It will generate an internal acknowledgement message to eventually be routed to the aircraft or airlines that reported the emergency situation. Finally, it will generate a best course of action plan to deal with the emergency situation, and where appropriate, will contact and inform ground based emergency support organizations to inform them of the emergency situation.

2.4.1. Receive and Process Emergency Message – This component will receive the Emergency messages routed from the *Accept Airline/Aircraft Request and Acknowledge* component and will send the data to the *Send Emergency Action-Related Message & Direction* component.

2.4.2. Send Acknowledgement of Emergency Message – This component will generate an acknowledgement message that will be routed to the *Airline/Aircraft Request and Acknowledge* component to be returned to the user.

2.4.3. Send Emergency Action-related Message and Direction – This component will analyze the Emergency Situation and will provide a best course of action for the situation. This course of action may include placing all inbound-flight into a holding pattern upon arrival at the airport corner post to speed the landing process for the aircraft experiencing the emergency. This course of action may also include diverting the aircraft in emergency to another airport that is closer to the aircraft's current location. Additionally, if necessary this component will contact the appropriate ground-based

emergency support entities and advise them of the emergency situation, and required emergency support.

2.5. Enable System Maintenance and Servicing – This high-level function is responsible for the service and maintenance of the system. This includes handling service/maintenance requests, analyzing the system for any system problems or failures, conducting maintenance as appropriate, and for reporting the system diagnostic and status messages to both internal and external users.

2.5.1. Receive Service/Maintenance Request – This component will receive any requests for service to the system. The requests can originate from both internal and external sources.

2.5.2. System Analysis – This component will analyze the system for any operational issues, and could include the execution of internal built-in-tests or other test of the system's functionality.

2.5.3. Conduct Maintenance – This component will execute fixes and other maintenance required on the system.

2.5.4. Report System Diagnostic and Status Messages – This component will report system diagnostic message and system status messages back to the appropriate users. This includes direction to servicing personnel of operational issues detected during system functionality analysis.

3. Functional Requirements

3.1. Accept Aircraft/Airlines Request & Acknowledge

3.1.1. Support Aircraft Requests

3.1.1.1. The CTAAS shall notify the originator of any problems with flight plan amendments.

3.1.1.2. The CTAAS shall retrieve flight plan data upon receipt of users' request.

3.1.1.3. The CTAAS shall accept requests from users to retrieve flight plans.

3.1.1.4. The CTAAS shall accept requests to close flight plans.A11

3.1.1.5. The CTAAS shall close flight plans.A11

3.1.1.6. The CTAAS shall accept requests for assistance from pilots.

3.1.2. Support Airlines Requests

3.1.2.1. The CTAAS shall accept flight plans from users.

3.1.2.2. The CTAAS shall accept proposed flight plan information.

3.1.2.3. The CTAAS shall format proposed flight plan information.

3.1.2.4. The CTAAS shall notify the originator when a flight plan has been accepted.

3.1.2.5. The CTAAS shall accept flight plan amendments.

3.1.2.6. The CTAAS shall accept amendments to proposed flight plans.

3.1.2.7. The CTAAS shall accept amendments to active flight plans from users.

3.1.2.8. The CTAAS shall notify users when an amendment has been accepted.

3.1.2.9. The CTAAS shall accept corrections to proposed flight plans.
3.1.2.10. The CTAAS shall accept requests to cancel flight plans.
3.1.2.11. The CTAAS shall cancel flight plans.
3.1.2.12. The CTAAS shall notify the originator of any problems with flight plan amendments.
3.1.2.13. The CTAAS shall retrieve flight plan data upon receipt of users' request.
3.1.2.14. The CTAAS shall accept requests from users to retrieve flight plans.

3.1.3. Support Aircraft/Airline Entities Requests in Emergency
3.1.3.1. The CTAAS shall monitor the status of aircraft. A31
3.1.3.2. The CTAAS shall acquire flight information for each controlled aircraft inbound towards destination airport A31
3.1.3.3. The CTAAS shall acquire flight information for each controlled inbound aircraft to destination airport. A31
3.1.3.4. The CTAAS shall retrieve flight information for each controlled inbound aircraft to destination airport. A31
3.1.3.5. The CTAAS shall detect overdue aircraft. A31
3.1.3.6. The CTAAS shall retrieve essential information on overdue aircraft. A31
3.1.3.7. The CTAAS shall retrieve essential information on missing aircraft. A31
3.1.3.8. The CTAAS shall determine the location of an aircraft in an emergency situation. A31
3.1.3.9. The CTAAS shall disseminate Emergency Alerts. A31

3.2. Provide Aircraft Flight Guidance
3.2.1. Receive Sequence Requirements
3.2.1.1. The CTAAS shall disseminate flight plan information to users.
3.2.1.2. The CTAAS shall determine the velocity of aircraft in en route airspace.A32
3.2.1.3. The CTAAS shall determine aircraft trajectories. A32
3.2.1.4. The CTAAS shall up The CTAAS shall transmit conflict-free flight path recommendations to expedite resolution of emergency situations.A22 date flight path projections. A32
3.2.1.5. The CTAAS shall detect deviations from the active flight plan. A32
3.2.1.6. The CTAAS shall disseminate landing area outlines to users.A22
3.2.1.7. The CTAAS shall disseminate runway area outlines to users. A22
3.2.1.8. The CTAAS shall generate aircraft maneuvers to avoid separation standards violations.A22
3.2.1.9. The CTAAS shall generate resolution advisories for aircraft in violation of separation standards.A22
3.2.1.10. The CTAAS shall disseminate alerts for separation standards violations.A22

3.2.1.11. The CTAAS shall alert users to predicted aircraft separation standards violations.A22

3.2.1.12. The CTAAS shall disseminate aircraft maneuvers to avoid predicted separation standards violations.A22

3.2.1.13. The CTAAS shall disseminate control directivesA22

3.2.2. Provide Aircraft Flight Control Direction

3.3. Generate Aircraft Arrival Sequencing

3.3.1. Request Inbound Flight Status

3.3.1.1. The CTAAS shall acquire position reports from properly equipped aircraft in en route airspace.

3.3.1.2. The CTAAS shall acquire position reports from properly equipped aircraft in selected volumes of en route airspace.

3.3.2. Receive and Process Messages

3.3.2.1. The CTAAS shall detect errors in flight plans.

3.3.2.2.

3.3.2.3. The CTAAS shall validate user amendments to proposed flight plans.

3.3.2.4. The CTAAS shall process position reports from aircraft.

3.3.2.5. The CTAAS shall correlate actual flight information to flight plan information for each controlled aircraft.

3.3.2.6. The CTAAS shall update flight plans based on current position.

3.3.2.7. The CTAAS shall disseminate aircraft position.

3.3.2.8. The CTAAS shall identify aircraft in the en route environment.

3.3.2.9. The CTAAS shall disseminate weather information covering the US delegated airspace for flight planning. A32

3.3.2.10. The CTAAS shall disseminate weather information aloft for all U.S. delegated airspace for flight planning. A32

3.3.2.11. The CTAAS shall disseminate surface aviation weather information for flight planning. A32

3.3.2.12. The CTAAS shall disseminate en route weather information for flight planning. A32

3.3.2.13. The CTAAS shall disseminate hazardous weather information for flight planning A32

3.3.2.14. The CTAAS shall disseminate the predicted movement of thunderstorms for flight planning. A32

3.3.2.15. The CTAAS shall disseminate weather information to users for flight planning. A32

3.3.2.16. The CTAAS shall disseminate weather information to users. A32

3.3.2.17. The CTAAS shall disseminate route-oriented weather information for flight planning. A32

3.3.2.18. The CTAAS shall disseminate visibility information for flight planning. A32

3.3.2.19. The CTAAS shall disseminate special weather observations for flight planning. A32

3.3.2.20. The CTAAS shall disseminate wind information for hazardous weather avoidance. A32
3.3.2.21. The CTAAS shall disseminate hazardous weather information to users. A32
3.3.2.22. The CTAAS shall disseminate weather advisories information upon users request. A32
3.3.2.23. The CTAAS shall disseminate weather advisories to users. A32
3.3.2.24. The CTAAS shall support navigation for all phases of flight. A32
3.3.2.25.
3.3.2.26. The CTAAS shall monitor the status of operational systems. A32
3.3.2.27. The CTAAS shall disseminate weather information covering the US delegated airspace for flight planning. A32
3.3.2.28. The CTAAS shall disseminate weather information aloft for all U.S. delegated airspace for flight planning. A32
3.3.2.29. The CTAAS shall disseminate surface aviation weather information for flight planning. A32
3.3.2.30. The CTAAS shall disseminate en route weather information for flight planning. A32
3.3.2.31. The CTAAS shall disseminate hazardous weather information for flight planning A32
3.3.2.32. The CTAAS shall disseminate the predicted movement of thunderstorms for flight planning. A32
3.3.2.33. The CTAAS shall disseminate weather information to users for flight planning. A32
3.3.2.34. The CTAAS shall disseminate weather information to users. A32
3.3.2.35. The CTAAS shall disseminate route-oriented weather information for flight planning. A32
3.3.2.36. The CTAAS shall disseminate visibility information for flight planning. A32
3.3.2.37. The CTAAS shall disseminate special weather observations for flight planning. A32
3.3.2.38. The CTAAS shall disseminate wind information for hazardous weather avoidance. A32
3.3.2.39. The CTAAS shall disseminate hazardous weather information to users. A32
3.3.2.40. The CTAAS shall disseminate weather advisories information upon users request. A32
3.3.2.41. The CTAAS shall disseminate weather advisories to users. A32
3.3.2.42. The CTAAS shall support navigation for all phases of flight. A32
3.3.2.43.
3.3.2.44. The CTAAS shall monitor the status of operational systems. A32
3.3.2.45. The CTAAS shall disseminate the performance of all CTAAS sub-systems. A32
3.3.2.46. The CTAAS shall disseminate systems parameters. A32
3.3.2.47. The CTAAS shall disseminate safety advisories to aircraft.A32

3.3.2.48. The CTAAS shall disseminate traffic advisories upon user request. A32
3.3.2.49. The CTAAS shall disseminate delay advisories in effect along the users proposed flight path. A32
3.3.2.50. The CTAAS shall disseminate flight restrictions to users. A32
3.3.2.51. The CTAAS shall disseminate safety critical information. A32
3.3.2.52. The CTAAS shall disseminate recommendations for hazardous weather avoidance.A22
3.3.2.53. The CTAAS shall disseminate CTAAS status information to users. A32
3.3.2.54. The CTAAS shall detect aircraft violations of separation standards. A32
3.3.2.55. The CTAAS shall detect the position of aircraft in selected volumes of en route airspace, independent of aircraft equipage.
3.3.2.56. The CTAAS shall detect each inbound aircraft to local destination airport.
3.3.2.57. The CTAAS shall determine the current altitude for each participating aircraft (in controlled airspace).
3.3.2.58. The CTAAS shall alert the user when a controlled aircraft's track position is outside of its clearance-based trajectory.A22
3.3.2.59. The CTAAS shall notify users when their aircraft deviates from its flight plan clearance by a prescribed amount.A22
3.3.2.60. The CTAAS shall transmit recommended airport locations to expedite resolution of emergency situations.A35

3.3.3. Send Acknowledgement Messages
3.3.3.1.

3.3.4. Enqueue Aircraft
3.3.4.1. The CTAAS shall analyze conditions that affect traffic synchronization.A34
3.3.4.2. The CTAAS shall analyze arrival sequences. A34
3.3.4.3. The CTAAS shall evaluate alternate trajectories for sequencing. A34
3.3.4.4. The CTAAS shall establish arrival sequences. A34
3.3.4.5. The CTAAS shall sequence VFR aircraft in the arrival phase of flight. A34
3.3.4.6. The CTAAS shall establish minimum separation standards based on the operational environment. A34
3.3.4.7. The CTAAS shall recommend courses of action to any user declaring an emergency. A34
3.3.4.8. The CTAAS shall acquire weather information aloft for all U.S. delegated airspace for flight planning.A34
3.3.4.9. The CTAAS shall acquire forecast winds aloft information. A34
3.3.4.10. The CTAAS shall acquire current surface weather information for flight planning. A34

3.3.4.11. The CTAAS shall acquire en route weather information for flight planning. A34
3.3.4.12. The CTAAS shall acquire area forecast weather information for flight planning. A34
3.3.4.13. The CTAAS shall acquire special forecast weather information for flight planning. A34

3.3.5. Emergency Support

3.4. Provide Emergency Support
3.4.1. Receive and Process Emergency Message
3.4.1.1. The CTAAS shall accept an emergency transmission from any user declaring an emergency. A35

3.4.2. Send Acknowledgement of Emergency Message
3.4.2.1. The CTAAS shall respond to requests for assistance from in-flight users.A42

3.4.3. Send Emergency Action-related Message and Direction
3.4.3.1. The CTAAS shall alert appropriate emergency services of an emergency alert.A35
3.4.3.2. The CTAAS shall alert ATC facilities to the existence of an emergency. A35
3.4.3.3. The CTAAS shall disseminate information to agencies involved in search and rescue activities. A43
3.4.3.4. The CTAAS shall transmit conflict-free flight path recommendations to expedite resolution of emergency situations.A22

3.5. Enable System Maintenance and Servicing
3.5.1. Receive Service/Maintenance Request

3.5.2. System Analysis

3.5.2.1. The CTAAS shall perform physical inspections of facilities. A52
3.5.2.2. The CTAAS shall acquire data on completed equipment maintenance. A52
3.5.2.3. The CTAAS shall certify restoration of services following the completion of maintenance actions. A52
3.5.2.4. The CTAAS shall certify equipment performance of designated systems from designated remote locations. A52
3.5.2.5. The CTAAS shall verify operation of repaired operational systems. A52
3.5.2.6. The CTAAS shall determine the cause of system failures.A52
3.5.2.7. The CTAAS shall determine preventive maintenance intervals for all CTAAS equipment.A52

3.5.2.8.

3.5.3. Conduct Maintenance
3.5.3.1. The CTAAS shall perform corrective maintenance on operational systems. A53
3.5.3.2. The CTAAS shall perform on-site maintenance of facilities. A53
3.5.3.3. The CTAAS shall perform preventative maintenance on operational systems. A53

3.5.4. Report System Diagnostic and Status Messages
3.5.4.1. The CTAAS shall disseminate an alert when a CTAAS system fails. A54

4. Support Requirements
4.1. Infrastructure Requirements
4.1.1. The CTAAS shall exchange data between FAA and DoD air traffic control facilities.4.1
4.1.2. The CTAAS shall provide air-ground communications within the CTAAS.4.1
4.1.3. The CTAAS shall provide VHF channels for air-ground communications. 4.1
4.1.4. The CTAAS shall provide UHF channels for air-ground communications. 4.1
4.1.5. The CTAAS shall provide HF channels for air-ground communications. 4.1
4.1.6. The CTAAS shall provide ground-to-ground communications. 4.1
4.1.7. The CTAAS shall control equipment remotely.4.1
4.1.8.

4.2. Security Requirements
4.2.1. The CTAAS shall establish emergency communications.4.2
4.2.2. All CTAAS systems shall provide recovery measures from security incidents.4.2
4.2.3. The CTAAS shall prevent disclosure of sensitive information to unauthorized persons.4.2
4.2.4.
4.2.5. The CTAAS shall control physical access to equipment and facilities.4.2
4.2.6. The CTAAS shall provide security measures at facilities for protection of CTAAS systems.4.2
4.2.7.
4.2.8. The CTAAS shall protect CTAAS assets.4.2
4.2.9. The CTAAS shall protect assets from unauthorized modification4.2
4.2.10. The CTAAS shall protect assets from unauthorized deletion4.2
4.2.11. The CTAAS shall protect assets from unauthorized creation4.2
4.2.12. The CTAAS shall protect assets against false or misleading data4.2

4.2.13. The CTAAS shall protect assets from denial of service4.2
4.2.14. The CTAAS shall protect assets from unacceptable degradation of service. 4.2

4.2.15. The CTAAS shall alert specialists when malicious activity is detected. 4.2
4.2.16. The CTAAS shall detect malicious activity. 4.2
4.2.17. The CTAAS shall deter malicious activity. 4.2
4.2.18. The CTAAS shall record the security audit log during all operational states. 4.2
4.2.19. The CTAAS shall control access to information. 4.2
4.2.20.

4.3. Performance Requirements
4.3.1. The CTAAS shall monitor status of equipment without degrading equipment availability.
4.4. Reliability, Maintainability, and Availability
4.4.1. The CTAAS shall train system operators.
4.4.2. The CTAAS shall train maintenance specialists.
4.4.3. The CTAAS shall provide contingency plans for ARTCC's in the event of catastrophic failure4.5
4.4.4. The CTAAS shall comply with all Occupational Safety and Health Administration
4.4.5. (OSHA), FAA, and local safety and sanitary regulations.4.5

CTAAS Response Times (seconds)			
Function	**Mean**	**99%**	**Maximum**
Validating Proposed Flight Plans and Amendments	4.0	6.0	12.0
Validating Active Flight Plan Amendments	.6	1.2	3.0
Validating Flight Plan Actions	1.5	3.0	6.0
Monitor Flights			
Current Aircraft Position, Altitude, Speed and Trajectory Request	3.0	5.0	10.0
Future Aircraft Position, Altitude, Speed and Trajectory Request	3.0	5.0	10.0
Alerts for Aircraft not Associated with Flight Plan	.6	1.2	3.0
Control Traffic			
Sequencing and Spacing Advisory Request	.6	1.2	3.0
Amended Flight Plan Conflict Detection	1.5	3.0	6.0
Predicted Imminent Collision Notification	.6	1.2	3.0
Recommended Avoidance Maneuver Display	.6	1.2	3.0
Support Flight Operations			
Weather Information Request	3.0	5.0	10.0
Hazardous Weather Information for 100 NM Area Request	1.5	3.0	6.0
Hazardous Weather Information for Continental US Request	3.0	5.0	10.0
Monitor CTAAS Operations			
Capacity and Demand Projections Request	3.0	5.0	10.0
Aeronautical Information Request	3.0	5.0	10.0
Plan CTAAS Usage			
Flow Control and Delay Advisory Information Request	3.0	5.0	10.0