


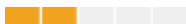
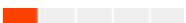


Score Summary

Score	# of Reqs.	Percentage	What should I do?
5 	53	60%	Looking good, move along!
4 	0	0%	Review It! Check the flow and clarity of the requirement.
3 	12	13%	Revise It! Replace negative or ambiguous terms with clear and concise ones.
2 	0	0%	Rewrite It! Focus on what needs to happen and choose clear and unambiguous terminology to re-express the requirement.
1 	23	26%	Rethink It! Consider what the requirement is trying to convey and rewrite it as one concise requirement, or as separate multiple requirements.

Analysis Breakdown

	Percentage	# of Reqs.	Color Highlighting
No Imperatives	25%	22	No Highlight
Vague Words	17%	15	Brown
Optional Words	9%	8	Yellow
Multiple Imperatives	1%	1	Light Blue
Negative Imperatives	1%	1	Blue
Excessive Continuances	1%	1	Purple
No Directives	N/A	N/A	No Highlight

Individual Requirements

Score: 1



No Imperatives

A reusable framework is needed to support a broad class of autonomous ISR missions using unmanned assets — including unmanned aircraft.

Score: 5



The framework must enable distributed, multi-agent cooperative control in a comms-denied environment.

Score: 1



Excessive Continuances

Multiple Imperatives

Vague Words

Universal Quantifiers

The framework must be modular, must be computationally efficient and run on modest hardware, and must allow capabilities such as mission planning, path planning, and surveillance tasks to be efficiently developed and rapidly updated and replaced before the start of each ISR mission.

Score: 5



The framework must optimize tasks for mission-time efficiency.

Score: 5



The framework must ensure safety and security.

Score: 5



The framework must facilitate formal verification and validation.

Score: 5



1-UxAS shall enable cooperative control

Score: 5



2-UxAS shall support multiple agents

Score: 5



3-UxAS shall be distributed

Score: 5



25-UxAS shall operate when there is no comms

Universal Quantifiers

Score: 5



4-UxAS shall operate in the presence of lost comms

Score: 5



5-UxAS shall operate in the presence of denied comms

Score: 5



6-UxAS shall be modular

Score: 3



7-UxAS shall be computationally efficient

Vague Words

Score: 5



8-UxAS will run on modest hardware, e.g., cell-phone sized processor

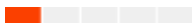
Score: 3



35-UxAS shall allow tasks to be efficiently developed

Vague Words

Score: 1



11-Example tasks include mission planning, path planning, and surveillance

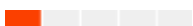
No Imperatives

Score: 5



26-UxAS shall allow configurations to be rapidly modified before the start of a mission

Score: 1

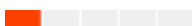


9-Configuration modification includes task update before the start of each mission

No Imperatives

Universal Quantifiers

Score: 1

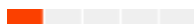


27-update may mean that the component satisfies its contract in a new way

No Imperatives

Optional Words

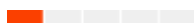
Score: 1



No Imperatives

10-Configuration modification includes task replacement before the start of a mission

Score: 1



No Imperatives

Optional Words

28-replace **may** mean that the contract has been changed and the configuration needs to be re-analyzed

Score: 5



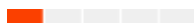
12-Configurations shall optimize tasks for mission-time efficiency

Score: 5



13-Configurations shall ensure the safety of agents

Score: 1



No Imperatives

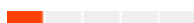
39-Safety includes collision avoidance, health monitoring, contingency planning (safe route home for lost comms)

Score: 5



14-Configurations shall ensure security

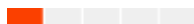
Score: 1



No Imperatives

30-Security includes integrity & confidentiality of comms

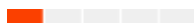
Score: 1



No Imperatives

31-Security includes integrity & confidentiality of onboard data

Score: 1



No Imperatives

32-Security includes availability of computing resources

Score: 5



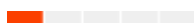
34-UxAS shall facilitate formal verification and validation

Score: 5



15-UxAS shall be employ a service-oriented architecture

Score: 1



No Imperatives

35-The service oriented architecture provides the basis for configurations

Score: 5



16-Configurations shall ensure schedulability of tasks

Score: 5



17-Configurations shall ensure timeliness of task execution

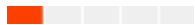
Score: 5



33-Configurations shall ensure timeliness of message delivery within an asset

Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	18-Configurations shall guarantee non-interference amongst services under nominal hardware configurations
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	19-Configurations shall provide time partitioning of services
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	20-Configurations shall provide space partitioning of services
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	21-Configurations shall provide resource partitioning of services
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	22-For example, configurations will schedule direct-memory access
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	23-Configurations shall provide a message-passing interface for inter-service communication
Score: 3 <div><div></div><div></div><div></div><div></div><div></div></div> <div>Vague Words</div>	24-Configurations shall provide a <u>standard</u> interface for <u>all</u> services
Score: 1 <div><div></div><div></div><div></div><div></div><div></div></div> <div>No Imperatives</div> <div>Vague Words</div>	SYS1-For <u>every</u> Unique Automation Request, the system produces a response (which might be an error message).
Score: 1 <div><div></div><div></div><div></div><div></div><div></div></div> <div>No Imperatives</div> <div>Optional Words</div> <div>Vague Words</div>	SYS2- <u>Every</u> task included in a request <u>should</u> be in the response or an error <u>should</u> be produced.
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div>	SYS3-The system shall respect airspace constraints
Score: 5 <div><div></div><div></div><div></div><div></div><div></div></div> <div>Universal Quantifiers</div>	SYS4- <u>No</u> path produced will intersect with a <u>no</u> fly zone.
Score: 1 <div><div></div><div></div><div></div><div></div><div></div></div> <div>No Imperatives</div> <div>Optional Words</div>	SYS5-Vehicles <u>should</u> stay in Keep In Zones
Score: 1 <div><div></div><div></div><div></div><div></div><div></div></div> <div>No Imperatives</div> <div>Optional Words</div> <div>Vague Words</div>	SYS6-If there is a feasible assignment (mission solution), we <u>should</u> find <u>it</u> .
Score: 1 <div><div></div><div></div><div></div><div></div><div></div></div> <div>No Imperatives</div> <div>Optional Words</div> <div>Vague Words</div>	SYS7- If the process algebra relationship is valid (well-formatted), then we <u>should</u> adhere to <u>it</u> .

Score: 1



No Imperatives

SYSA2-Vehicles altitudes are distinct and differ by at least X ft

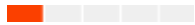
Score: 3



Negative Imperatives

SYS8-Vehicle altitudes shall not be changed during the mission

Score: 1



No Imperatives

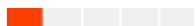
SYS10-The costs of tasks and mission are influenced by vehicle altitude

Score: 5



SYSA1-If a map update is sent by the user, that user will also determine when to force a replan (for the entire system).

Score: 1



No Imperatives

Optional Words

SYS9-Assignment cost matrix coming out of route aggregator service should be $\# \text{vehicles} * \# \text{task options} + \# \text{vehicles} * (\# \text{task options})^2$.

Score: 5



SYS10-Message IDs shall be unique system-wide throughout a mission

Score: 5



SYS11-Route planner shall be configured with vehicle configuration data before a route plan request is sent (or received)?

Score: 5



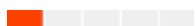
SYS12-Messages shall be received in the order in which they were sent

Score: 5



SYS13-The system shall propagate error messages to the final recipient

Score: 1



No Imperatives

Universal Quantifiers

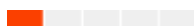
SYS14-For each request sent, a response (possible an error) is received and that response corresponds to that request.

Score: 5



P2-The configuration shall report an error if an automation request is received but the requested resource has not been defined

Score: 1



No Imperatives

P3-Resources include Tasks, Vehicles and Regions

Score: 5



P4-The configuration shall generate a UniqueAutomationRequest message if an AutomationRequest is received and the requested resource has been defined

Score: 5



P5-The configuration shall publish UniqueAutomationRequest messages in the order in which they are generated

Score: 5



P7-The configuration shall publish one UniqueAutomationRequest message and wait for a corresponding UniqueAutomationResponse message to be received

Score: 3



Vague Words

Universal Quantifiers

P8-The configuration shall publish the next UniqueAutomationRequest message immediately if there is no outstanding UniqueAutomationResponse message

Score: 3



Optional Words

P9-Optionally, the configuration shall publish the next UniqueAutomationRequest if the outstanding UniqueAutomationResponse message has not been received within a set time

Score: 5



P10-The configuration shall publish an AutomationResponse message in response to the corresponding AutomationRequest message when a corresponding UniqueAutomationResponse message is received

Score: 5



P11-The configuration shall ensure that only one AutomationRequest is executed at a time

Score: 5



Universal Quantifiers

RA1-The configuration shall create a unique RoutePlanRequest message for each vehicle ID in each RouteRequest message received

Score: 3



Vague Words

Universal Quantifiers

RA2-The configuration shall send each RoutePlanRequest message to the planners that are appropriate for the associated vehicle type

Score: 5



RA3-The configuration shall correlate RoutePlanReponses with RoutePlanRequests

Score: 3



Vague Words

RA4-The configuration shall send a RouteResponse message when all RoutePlanResponses are received for a particular RouteRequest

Score: 5



Universal Quantifiers

RPV1-The configuration shall generate a route for each pair of start and end locations specified in each RoutePlanRequest message received

Score: 3



Vague Words

RPV2-Route generation shall be efficient

Score: 5



RPV3-Route generation shall be responsive

Score: 5



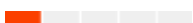
RPV4-Routes shall be approximately distance optional

Score: 5



RPV5-Routes shall respect vehicle limitations

Score: 1



No Imperatives

RPV6-Vehicle limitations include minimum turn radius constraints

Score: 3



Vague Words

RPV7-The configuration shall send a RoutePlanResponse message using return-to-sender addressing when a route has been generated for all pairs of start and end locations specified in the associated RoutePlanRequest message

Score: 3



RPV8-The configuration shall take environment and vehicle constraint information from appropriate inputs

Score: 5



SR1-UxAS shall ensure communication is only between intended services.

Score: 3



SR2-UxAS shall ensure data is only accessible to services with appropriate authority.

Score: 5



SR3-UxAS communication channels shall be always available to intended users.

Score: 5



SR4-UxAS will filter out garbage data from communication channels.

Score: 5



SR5-UxAS shall detect the authenticity of incoming messages.

Score: 5



SR6-UxAS will detect if an attacker resends an old message.

Score: 5



SR7-UxAS will encrypt communications.

Score: 5



SR8-UxAS shall verify received messages are from a source authorized to send the given message type.
