

REVIEW OF ARINC SPEC 439A

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[Additional review comments added.](#)

This document contains compiled review comments on ARINC Specification 439A (2016) “Simulated Air Traffic Control Environments in Flight Simulation Training Devices” submitted by a number of previous participants of the FSEMC WG on SATCE.

Please see the **Executive Summary** below for a prioritized list of key subjects, that require further work to improve this valuable industry document.

EXECUTIVE SUMMARY

1. Further input from the training perspective is required, to help reprioritize SATCE features and clarify guidance regarding application across varied training programs and device types.
2. Improve document readiness for contribution to regulatory documents/guidance (for example, EASA CS-FSTD(A), and future revisions to ICAO 9625).
3. Clarify and improve functions and subjective tests - given industry deployments are growing, improvements would support validation of SATCE systems against requirements.
4. In recognition of the potential training benefits from wider adoption of SATCE – extend the guidance to cover all levels of flight training, not just a focus on ab initio / the MPL.
5. Extension of guidance from a focus on SATCE provision for TMAs to include en route flight phases (this will support application for LOFT sessions).
6. Improve guidance on integration of SATCE with TCAS FSTD functionality.
7. Improve guidance on interface requirements concerning SATCE integration and control of FSTD visual systems.
8. Improve guidance on data synchronization between SATCE & FSTD and on SATCE data maintenance.
9. Update guidance for simulating fast-evolving technology areas, including data communications / data link.
10. Editorial improvements to document readability and usability. Removal of some legacy / redundant concepts.

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GENERAL

TRAINING PERSPECTIVE INPUT

- The document goes into much detail when it comes to features, but lacks guidance on how to efficiently make use of those features in everyday training
- There is some information on this topic in Chapter 5 and Appendix C, a consolidation of this might be helpful. Maybe mature a use case / training scenario based approach (Appendix C already points into this direction)
- Attendance of training providers most important for any future SATCE WG meetings
- Also lacking guidance on (automatic) student assessment for training on low fidelity devices without instructor

SATCE BENEFITS

Initial experience with SATCE does not reflect the limited benefits stated in the current guidance regarding application/applicability in advanced pilot training. ARINC 439A currently reflects early thought and emphasis on ab initio training, but it is becoming apparent that SATCE will add value across all training.

Section 2.4

The value added by SATCE during recurrent training for experienced pilots whose first language is English is expected to include the benefits of added realism, enhanced situational awareness, and realistic cockpit workload.

For example, flight crews in LOFT training benefit and derive value from having other traffic and an ATC environment. Early adopters see significant value in having ATC and the radio environment accurately represented during LOFT sessions. In fact, the **lack** of ATC is seen as negatively affecting these training sessions.

READABILITY / USABILITY

FEATURE TABLE (SECTION 3)

SEPARATE TRAINING OUT FROM FIDELITY

SATCE offers potential training benefits across all levels of pilot training - the guidance could be extended to cover all levels of flight training, not just a focus on ab initio / the MPL.

Currently, the MPL levels I-IV are embedded in the SATCE features and fidelity table (Table 1). This gives the impression that SATCE is exclusively applicable for the MPL but not as applicable for other training licenses and types.

Suggestions:

1. Use Table 1 exclusively to define the features mapped to fidelity levels in terms of G, R or S fidelity.
2. Join the feature set and fidelity levels table (Table 1), with the text associated with each row (currently follows the table, and difficult to cross-reference).

3. Separate out training programs / licenses / device types and appropriate SATCE fidelity levels in to an Appendix (or new Chapter).
4. Broaden scope to include more than the MPL – see ‘FSTD Summary Matrix’ tables in ICAO 9625 Ed 4.

SEPARATE REQUIREMENTS

There is a general tendency in the document to group several requirements together, whereas it would be easier for NAAs and all stakeholders using the guidance (particularly for future qualification and assessment of a SATCE system) to have each separate requirement clearly listed in Table 1 (Summary Matrix) and Table 2 (Functions and Subjective Tests).

Each requirement can fall under a category for easy reference, but it’s not helpful to group requirements together (because some systems may comply with one but not all requirements).

Some introductory paragraphs (Section 3.4 onwards in Chapter 3) contain requirements. If so, then move these to the table, or remove, because it is not obvious if they are a requirement or not.

CLARITY ON MANDATORY / OPTIONAL REQUIREMENTS

The document requires more clarity on requirements: those optional (‘where training requires’), and those required. Some “requirements” only contain “may” statements, which seems contradictory.

Many but not all requirements specifically weakened by “where training requires”, “where appropriate to the training” etc. A consolidated, more general treatment of this could be useful (virtually all requirements are arguably dependent on training needs)

FUNCTIONS AND SUBJECTIVE TESTS

Section 4.0 ‘QUALIFICATION AND TRAINING APPROVAL CONSIDERATIONS’ contains Table 2 ‘Functions and Subjective Tests’ – this is a useful table that will be employed as part of the qualification process of devices with SATCE functionality that should be promoted to a top-level, so that it is immediately visible in the document contents.

Table 2 - It would be even better if the “Feature” column would have a “Ref” column which referenced the section number it came from. That way it would be easier for a user to look up the full details/scope on a particular feature/function.

SATCE FUNCTIONALITY

ATC FUNCTIONALITY

SEPARATION

- Document requires other traffic to be separated, but does not state how this separation is achieved (e.g. by simulated ATC instructions to other traffic, where these are via radio, then they need to incorporate appropriate traffic responses).

SATCE TRAINING EVENTS

- ‘SATCE Training Events’ as a concept is currently mentioned in Chapter 5 MPL Implementation (5.6.1). Some of these ‘events’ could be brought in to Chapter 3 – the main features / functions.
- Triggering of runway obstructions is a very specific requirement, a more general requirement could be useful to cover all kinds of manipulations of the SATCE by the instructor (e.g. other traffic stop bar overrun, go around, all kinds of unexpected other traffic behavior, or even unexpected ATC behavior).

OTHER TRAFFIC

INTRODUCTION - SECTION 3.5

- Distinction between intrusive and non-intrusive traffic in Section 3.5 has become meaningless, there are other legacy (inherited) statements that could be removed throughout the document.
- Section 3.5 could be simplified and less prescriptive. Operators seem to want to train in major airports using a wide range of traffic flows.

OTHER TRAFFIC FLOW - SECTION 3.5.3

It would also make it an easier read if the “traffic movements per hour” were not repeated.

Existing text:

3.5.3 Other Traffic Flow

Low: Approx. 10 other traffic movements per hour (local/regional airport).

Medium: Approx. 15 other traffic movements per hour (regional airport).

High: Approx. 30 other traffic movements per hour (major airport).

Updated text:

3.5.3 Other Traffic Flow (movements per hour)

Low: Approx. 1 - 10

Medium: Approx. 10 - 15

High: Approx. 15+

Revisit this section. It might be better not to define appropriate traffic intensity levels, even if it is “a guide” and require that traffic flow intensity should best serve the training need? Discussion and agreement needed.

Comment by NW:

The default behavior for traffic at any given airport should match the “average number of traffic movements per day” for the operational hours as relevant, factored by time of day (traffic at 6AM isn’t going to be as intense as later in the day). The maximum traffic level for any airport should not exceed the real-world average number of movements by more than say 200%.

To emphasize the point here, let's take some local airport, for example Leesburg VA, USA, which has an average traffic load of 316/day, and operates sunrise-sunset, which is approximately 6AM-8PM right now, or 22 movements/hour and, probably has a peak movement load of 30 movements/hour for the hours 8AM-4PM.

At the current levels, Leesburg would be classed as "medium" in terms of traffic load, which is suggested to represent a "regional airport".

Let's look at another example - Washington National (Reagan) reports an average number of operations per day of 1050 over the hours 6AM-10PM, giving an average of 65 movements per hour, which again points to the levels defined in the current document being off, by a significant factor.

I have no problem with allowing the instructor to scale the traffic flow, but 100% should be realistic for the selected airfield and time of day.

AIRPORT & AIRSPACE MODELLING

LACKING INFORMATION ON EN ROUTE-ONLY / DATA COMM-ONLY SATCE

- The document heavily focusses on voice communication and tower services for the terminal area airspace, it is not clear how a SATCE for en route-only or Data Comm-only fits into this
- En route features are mentioned, also that Data Comm can replace voice communication. Elaboration and consolidation of this might be helpful

RUNWAYS

Runways modelled for SATCE should be defined based on the following:

1. Number of runways modelled for use by ownship and/or other traffic in the airport model
2. Runway 'mode of use' simulated

That is, a runway used for different modes, such as take-off only, landing only, or both take-off and landing (mixed mode use) is an important consideration for SATCE.

Suggested fidelity:

- Generic – min 1 runway for ownship use, landing and take-off modes supported only.
- Specific – >1 runway for ownship and/or other traffic use, with landing, take-off and mixed mode use.

AIRPORT LIGHTING

Airport lighting is mentioned, but only in the context of Low Visibility Operations.

The document is not explicit about the fact that SATCE should be able to control (stimulate) the airport lighting visible in the FSTD, and that this lighting should be correlated with ATC clearances concerning the ownship and other traffic.

RADIO SIMULATION

FREQUENCIES

ICAO 9625/4, section 9.8.1 Multi-frequency radio operation, included the following requirements, that are not represented in ARINC 439A:

Each pilot has the ability to select and listen to at least one radio frequency. The system supports multiple radios being operated concurrently. Example: The pilot flying may listen to ATIS on VHF 1 while the pilot monitoring waits for clearance delivery on VHF 2.

Suggest that SATCE specifications are limited to SATCE rather than FSTD radio simulation, but that the second of these features is included as a basic system requirement. For multi-crew simulations, the SATCE system supports multiple radios being operated concurrently, and can simulate more than one ATC frequency concurrently when ownship flight crew radio use demands.

RADIO TRAFFIC (SECTION 3.6)

Introduction - Section 3.6

The criteria include the following:

“4. Reasonable pauses should be provided between communication exchanges to allow the flight crew access to the frequency.”

In the normal course of airport operations, the number of radio transmissions on any given frequencies is a function of the traffic level, and should flow per real world operations. If the flight crew are struggling to get their calls in, then the instructor has the option to reduce the traffic load, which will naturally lessen the amount of radio calls on-frequency.

Section 3.6.2: Errors

The ERRORS section implies that some errors are acceptable. It is imperative that nothing happens which can lead to a distraction or negative training. Revision suggested to emphasize no errors.

Existing:

3.6.2 Errors

*Generic: In order to reduce unintended distractions to the flight crew, and where other traffic is present, ATC and other traffic radio communications should not contain any **significant** erroneous information when simulating normal operations.*

Updated text:

3.6.2 Errors

Generic: In order to reduce unintended distractions to the flight crew, and where other traffic is present, ATC and other traffic radio communications should not contain any erroneous information when simulating normal operations.

Section 3.6.6: Overstepping on frequency seems to go against best RT practices by allowing overstepping without consequence. Based on my (NP) anecdotal evidence, the result will be negative training which must be corrected later. It is best that the proper procedures be built into the skill early on. Thus, I suggest a change in the verbiage which excludes “not required”.

Existing:

3.6.6 Overstepping on Frequency

...In order to best support the flow of training, re-broadcast of other traffic radio transmissions that have been overstepped by the flight crew is not required. Similarly, if the flight crew oversteps on ATC transmissions (other than to the ownship), then re-broadcast of these transmissions is also not required.

Updated text:

...In order to best support the flow of training, re-broadcast of other traffic radio transmissions that have been overstepped by the flight crew should be implemented. Similarly, if the flight crew oversteps on ATC transmissions (other than to the ownship), then re-broadcast of these transmissions should also be implemented.

COMMUNICATIONS BETWEEN ATC AND OWNSHIP (SECTION 3.11)

Simply stating that SATCE is not mandated sounds a bit negative. It would be nice to add that the preferred method of SATCE delivery is indeed the fully automated approach.

Alternatively, delete the highlighted sentence below - the preceding sentence provides all the guidance necessary.

3.11 Communications between ATC and Ownship

The method of delivery of ATC communications to the ownship is not prescribed in this document. This is largely up to the training provider and system suppliers to determine according to technology and budgetary constraints. It should be noted that a fully automated synthetic ATC service implementing Speech Recognition (SR) and Text-to-Speech (TTS) technologies for simulating communications with the ownship is not mandated.

Section 3.11.8: This is an important section which can be enhanced by adding one or two examples (e.g. ownship flight crew request a movement that involves a runway, without stating the runway (number), which is non-compliant with ICAO Standard phraseology, and ATC responds appropriately).

3.11.8 Phraseology and Content Errors

Generic: ATC should be capable of responding to or correcting content errors from the flight crew. For example, ATC should have the capability to correct basic readback and acknowledgement errors.

In order to facilitate training flow, it is desirable that the SATCE system is configurable to support various ATC response options to phraseology and content errors.

VISUAL SYSTEMS

VISUAL SYSTEM AIRPORT MODELS

Section 3.9.1 - there is a need in this section to clarify what is SATCE functionality, and what is visual system functionality.

Section 3.9.1 Generic fidelity refers to the following:

*“Generic: A simple airport model, usually consisting of a single runway (with potentially limited lighting, signage and markings), which may have an associated taxiway and terminal building which are non-specific. A generic airport may be **fictitious and located anywhere.**”*

The idea of a *fictitious airport* seems at odds with experience. Is there any training value? Such a fictitious airport would require far **more work** to implement than using a real airport with published frequencies, approach/departure procedures, etc. Additionally, many FMS systems will not allow such an airport to be used. The idea that suitable navigation aids, etc., could be modelled without conflicting with real world facilities that should already be available on the simulator is also problematic.

Generally, the idea of a “fictitious” airport seems to be far removed from anything we have seen from end users. Furthermore, generating a flight plan to/from such an airport with meaningful hand-off to Center Control (ARTCC) seems entirely implausible.

Note: This is different from a “**generic representation**” of a real airport - in this case the runway/s should be modeled with the correct geographic location, magnetic heading and length, but the remainder of the ‘model’ may be general (representative taxiway/airport building).

Proposal - clarify that Section 3.9.1 refers to SATCE support of a generic representation of a real airport. Specify more carefully the SATCE support for visual system generic airports. Is there need for a requirement above and beyond basic ATC services to the ownship for approach, landing and departure from the modelled runway?

COCKPIT TRAFFIC DISPLAYS

Section 3.13.2: the following requirement concerns the *behavior* of other traffic (not whether it is visible or correlated on cockpit displays), and should not be listed under ‘System Correlation’ (3.13). Better it is moved to Section 3.5.2?

Other traffic is not required to exhibit self-managing actions other than basic navigation along pre-defined routes and behaviors consistent with ATC communications.

The term ‘self-managing actions’ needs clarifying. This term suggests behaviors that would include response during TCAS events. That is, the current behavior doesn’t seem sufficient in the case where a TCAS event occurs. While it may not have been the intended training event, if it should occur, other traffic should undertake the appropriate TCAS resolution behavior. Would this be appropriate through ATC command or self-behavior or a mix of both?

TCAS INTEGRATION

Sections 3.13.2 & 3: Even though it’s stipulated for Generic, in the case of TCAS training, it is very desirable that Other Traffic behave appropriately to a TCAS Resolution so as not to affect any negative training. The way it reads now, it seems that it’s okay for other traffic to collide with the ownship. If that’s the case, then a student will have to un-learn what was seen at the Generic level and re-learn it at the Specific level. Discuss!

GROUND CLAMPING

Add content on ‘ground clamping’ of other traffic. Currently there is no specific mention of ground clamping other traffic supposed to be “on the ground” to match the visual understanding of “on-ground”. This is typically a correlation issue between the visual database and whatever mechanism the SATCE solution is using to determine “on-ground”, and it can be very distracting not to have aircraft visually correlated ‘on the ground’.

Since most SATCE solutions will have to support a significant number of airfields (some of which may be modelled at high fidelity, but not necessarily all), the issue of ensuring on-ground other traffic are ground clamped is important.

Perhaps an additional sentence something like the following could be added:

“Other traffic intended to be represented on the ground should display appropriately on the ground in the visual scene. Aircraft transitioning from ground-to-air and air-to-ground should do so smoothly and without any distracting visual anomalies.”

This issue is also very significant when dealing with sloped or undulating runways and taxiways which are important in many training situations.

INSTRUCTOR INTERFACES / CONTROLS

DISABLE (SECTION 3.14)

(NP) - Pausing the SATCE while the flight sim continues is not necessarily a bad thing. My experience has shown that pausing can be an effective tool based on the instructor’s judgement. Current wording looks prescriptive. Therefore, it would be better to simply remove it.

3.14.4 Disable

Pausing SATCE independent of the simulation is not a recommended feature, as this would create an unrealistic training environment.

TRAINING SCENARIOS

ABNORMAL & EMERGENCY CONDITIONS

ARINC 439A (3.11.4) has a higher fidelity requirement than ICAO 9625/4 in that ‘less complex’ abnormal and emergency conditions are supported with automatic ATC service provision to the ownship, but there is no definition of ‘less complex’ and ‘more complex’ situations. Suggestion that examples are added, and/or definitions are clarified. This could be an important measure of the scope of a SATCE solution, so careful definition would be helpful here.

TCAS INTEGRATION

The scope and extent of SATCE integration with existing TCAS systems, and the exact behavior of other traffic and ATC during TCAS events (TA / RA) should be better clarified. Current requirements should also be separated (in line with general comments above).

DATA SYNC AND MAINTENANCE

- Data synchronization is a very demanding topic and fundamental to good maintainability (airspace data, airport data, update cycles etc.)

- Document requires synchronization but doesn't give much guidance on how this could be achieved
- There was even the idea to not require a specific environment for any SATCE, just a high-fidelity representative one (which could be the snapshot of a specific environment at a given point in time), just to avoid all the synchronization issues

DATA LINK

- Update guidance to stay up-to-date with changes in Data Link implementation, regulations and national/international data communication plans (SESAR / NextGen).
- Improve guidance on support.

INTEGRATION

STANDARDIZED SATCE / FSTD INTERFACE

- The document mentions ICDs / HLA / DIS, but integrators are interested in a standardized interface to connect SATCE / FSTD. We think this is very hard to achieve and outside of the scope of ARINC 439A, but some additional guidance might be helpful.
- This is not only about exchange of entity / audio data (which is pretty straightforward via HLA / DIS), but especially about all the other data and control information (data synchronization, weather information, simulation control, SATCE manipulation etc.).
- The document is not explicit about the communication model between SATCE / FSTD. Unlike other FSTD modules, SATCE influences/affects many FSTD functionalities and is more of a superordinate system (the FSTD could be considered as part of a SATCE, not vice versa).

OTHER ISSUES

IMPLEMENTING SATCE FOR MPL (CHAPTER 5)

Section 5.2.4 Language Use:

For this phase, training will necessitate the student pilot use both ICAO standard phraseology and plain language in some communications with ATC.

Comment for discussion (from HW):

Training may also necessitate the student pilot to use location-specific phraseology also.

Section 5.2.6 Navigation:

Since this phase introduces the student to basic navigation such as the entry and exit to and from the circuit, it would be advantageous to practice communication procedures with the aid of SATCE.

Comment for discussion (from HW):

Consider using a different example as ‘entry and exit to and from the circuit’ does not appear to be listed as an MPL Training Task.

Section 5.4.6 Airport Model Complexity:

For Specific (S) level fidelity simulation, ICAO 9625/4 recommends that the system should include a minimum of 1 specific airport with associated terminal area and 2 additional generic (or higher) fidelity airports.

However, this guidance suggests one specific airport model is needed and one generic airport model. The provision of more than the minimum required should be considered only as a result of training program requirements. Considerable effort might be spared wherever a representative or generic model is used, since it will not need updates to match changes to its real-world counterpart.

Comment for discussion (from NW):

A SATCE solution implemented on any simulator cannot be disconnected from the fidelity of the visual system, when defining requirements for airport complexity. There is absolutely no use in a SATCE solution that isn't implicitly modeling the airfields in use to the same fidelity (at least in terms of runways, taxiways and parking positions) as the visual system.

Section 5.5.2 Airport Model Complexity:

As stated for MPL Phase 3, it may not be practicable or cost effective to simulate the ATC and traffic environment in its entirety at a large hub airport with all departure, approach, and en route communications.

Comment for discussion (from NW):

Certainly, there is more work for a large hub airport, but it is possible. This statement seems to diminish the claims in the prior sections that imply the technology is capable.

GUIDANCE ON TECHNOLOGY (CHAPTER 6)

Section 6.2.1.2 Plain Language Use:

An abnormal or emergency procedure may be introduced in any flight phase during training, and this is likely to necessitate the use of plain language in communications.

Comment for discussion (from HW):

Fully automated SATCE systems may support structured non-standard phraseology to support abnormal or emergency procedures as an alternative to plain language. Therefore, the following amendment is suggested:

An abnormal or emergency procedure may be introduced in any flight phase during training, and this may necessitate the use of plain language in communications.

REPEATED REQUIREMENT

The following requirement is repeated: “The same ATC voices should be used for transmissions to the ownship as for ATC transmissions to other traffic” in both Voice Assignment (table and 3.8.1) and Continuity of Communications (Table 1 & 3.11.1). Suggest delete the requirement in voice allocation, because duplication is unnecessary.

DUPLICATED CONTENT

The content of section 7.2.2 ‘Interface Control Documents’ is a subset of the content of section 6.2.2.1 ‘Interface Control Document (ICD)’. One of the sections should be removed.

FORMATTING / EDITORIAL

- Missing full stops (periods) in Table 2: ATC Ownship Radio Communications (test guidance bullets).
- Consistency - make the term ‘other traffic’ either singular (other traffic is...) or plural (other traffic are...) throughout the document. Note: This may not be 100% achievable as in some instances, other traffic is not the subject associated with the verb, for example ‘Routes traveled by other traffic are...’ and ‘ATC service provision to other traffic is...’ should not be changed.
- The first bold word ‘Generic’ is an error in Section 3.9.1, which is describing visual system fidelity, not SATCE fidelity levels.
- Appendix A ‘Acronyms’ and Appendix B ‘Glossary’ are missing some definitions. The following additions are suggested:
 - a) Add ‘PDC’ (Pre Departure Clearance) to Appendix A.
 - b) Add ‘Satcom’ to Appendix A or B
 - c) Add ‘Flight Service Station’ to Appendix B (or remove from FIS definition in Appendix A)
- Appendix C, section C-2, final paragraph:
Requirements for SATCE are likely to be broadly similar where a training task involves managing abnormal or emergency situations.
Suggested clarification: ‘For all training tasks that involve managing abnormal or emergency situations, the requirements for SATCE are likely to be similar.’
- Appendix C, Table 5, Flight Phase 4, Training Task ‘Perform Standard Instrument Departure (SID)/en-route navigation’:
SID, en route or self-navigation tasks are unlikely to involve direct communications between the flight crew and ATC during normal operations.
To aid readability, suggest above sentence is cut and pasted following ‘... routing and altitude.’
- Appendix C, Table 5, Flight Phase 6, Training Task ‘Perform holding’:
On occasion, flight crews may request a holding clearance if necessary.
Suggest replacing by the following:
‘Communications may be initiated by the flight crew during abnormal situations.’
- Appendix C, Table 5, Flight Phase 6, Training Task ‘Perform holding’:
Plain language would normally be used during a request initiated by the flight crew.
Suggest that an example is included.
- Typographical errors:

Page(s)	Section	Current Text	Proposal
<u>2</u>	<u>2.1</u>	<u>‘an SATCE’</u>	<u>‘a SATCE’</u>
<u>29</u>	<u>3.15.2</u>	<u>‘and available’</u>	<u>‘and be available’</u>
<u>30</u>	<u>3.15.6.1</u>	<u>‘SATCE support’</u>	<u>‘SATCE supports’</u>
<u>31</u>	<u>3.15.7.1</u>	<u>‘would should’</u>	<u>‘should’</u>
<u>36</u>	<u>5.2.1</u>	<u>‘of Fidelity Level’</u>	<u>‘on Fidelity Level’</u>

Page(s)	Section	Current Text	Proposal
<u>60</u>	<u>Appendix C, Table 4</u>	<u>'Upset prevention'</u>	<u>'9.6 Upset prevention'</u>
<u>61</u>	<u>Appendix C, Table 5</u>	<u>'9625/3'</u>	<u>'9625/4' (or '9625/5')</u>
<u>63</u>	<u>Appendix C, Table 5</u>	<u>'has not be given'</u>	<u>'has not been given'</u>
<u>65, 67</u>	<u>Appendix C, Table 5</u>	<u>'climb FL xxx'</u>	<u>'climb to FL xxx'</u>
<u>68, 77</u>	<u>Appendix C, Table 5</u>	<u>'descend FL xxx'</u>	<u>'descend to FL xxx'</u>
<u>84</u>	<u>Appendix D-4.9</u>	<u>'Data Link Service Providers'</u>	<u>'Data Service Providers'</u>

GENERAL

SCENARIO REPEATABILITY

- Determine if 'guidance' on scenario repeatability would be useful. The following describes the issue / benefits:

The question of the system determinism has come up several times. Essentially the issue is what will happen if I restart a "flight" (call it a scenario/mission) at exactly the same time/date/etc.? Will the ATC environment present the exact same behavior each time? - the answer is most probably "yes, but..." for the majority of SATCE solutions. As in the real world, the flow of traffic and exact sequence of actions around the ownship is determined to an extent by the behavior of the ownship and timing of actions

For example, as it moves through the environment - if the ownship blocks a runway, for some reason, the flow of traffic will end up being different, compared to another crew that expedites a departure for example.

Equally, an ownship crew that misses or overshoots a turn while being vectored to an approach, may receive additional ATC vectors to correct the situation, and hence experience different approach pattern traffic.

This mirrors real world. While the overall scenario "plan" is predetermined, small changes in timing can lead to large changes in the outcome. While this isn't addressed in the document generally, it is something that anyone contemplating a SATCE should be aware of. Not sure where this belongs, or how best to present it, but this is exactly why a properly implemented SATCE system is a meaningful addition to a simulator, since immersion comes from the dynamics of the moment, which cannot be represented in any system utilizing scripted behaviors or similar.

GENERALIZATION?

- In general, a lot of feature requirements are very specific, maybe some generalization could be helpful (specifics will be always based on training requirements and negotiated between vendor and customer).

REFERENCES

- Are all the references to external document necessary and up-to-date?