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NOTICE

The material in Plane Talk® is meant only as general information. In all cases no maintenance action published in Plane Talk should be taken that is not in consonance with your particular company's operating and maintenance procedures, your approved maintenance manuals, or your certification agency's directives.

www.aviation-ia.com/activities/amc

2022 AMC Aviation Maintenance Conference

Hello all:

ARINC Industry Activities invites you to the 2022 AMC Conference in Memphis, Tennessee. The 73rd annual AMC Conference will be the center of the aviation world for 3 days. The Conference will be hosted by FedEx and HEICO. In addition to the open forum discussion, the conference will have a joint symposium with the AEEC on Tuesday, May 10th on Cyber Security for Older Aircraft.

The AMC will be held May 10-12, 2022. Make your plans now to attend, participate, exhibit, and problem-solve.



[Register online Today!](#)

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AMC Follow-Up Items

The responses to most AMC discussion items result in a solution being accepted and the discussion item being closed. The following list identifies those discussion items still unresolved at the time of publication of this AMC Report. Airlines and suppliers are requested to contact the AMC Executive Secretary if an open item has been satisfactorily closed.

| | ITEM | SECTION | SUBMITTER | SUPPLIER | ACTION |
|----|------------------|---------------------------------|-----------|-------------------|---|
| 1 | 21-005 | Management & Philo | ETD | Boeing | Extraction of SB |
| 2 | 21-012 | Management & Philo | AFR | Safran | Non-Procurement parts |
| 3 | 21-016 20-030 | Test System | AFR/KLM | Safran | Safran to supply TSDP |
| 4 | 21-022 | Electrical Power | ETD | Airbus/Collins | GPCU with Lighting Protection |
| 5 | 19-073 | Electrical Power | VIR | Collins Aerospace | Boeing and Collins Aerospace to report on update to VFSG. |
| 6 | 21-32 | Autoflight/Flight Control | AFR/KLM | LORD/Airbus | Lord to provide complete CMM |
| 7 | 20-122 | Communication | ANA | Thales | ANA request Thales to resolve radio interference. |
| 8 | 21-046 | Communication | AAL | Boeing | Gatelink WI-FI Connectivity |
| 9 | 21-071 | Lighting | DLH | Collins/Boeing | Repairability of Attendant Switch Panel. |
| 10 | 21-072 | Lighting | AFR/KLM | Collins Aerospace | Quotation for Attendant Switch Panel Spare Parts |
| 11 | 20-133 | Air Conditioning System | ANA | Collins/Boeing | Large Galley Control Unit Fan |
| 12 | 21-058 | Air Conditioning System | AFR/KLM | Collins Aerospace | Ram Air Fan FOD |
| 13 | 21-073 | Fuel | AAL | Collins Aerospace | Fuel quantity probe premature failure |
| 14 | 21-077 | Fuel | AFR/KLM | Onitic | Fuel quantity indicator poor reliability |
| 15 | 21-078 | Landing Gear | UAL | Meggitt | Parking brake reliability |
| 16 | 21-079 | Landing Gear | AFR/KLM | Esterline/Boeing | IPL Mistake |
| 17 | 21-080 | Landing Gear | AFR/KLM | Safran | Piece parts are not procurable |
| 18 | 21-088 | Equipment Furnishing | AFR/KLM | Collins/Boeing | Repair of PDU |
| 19 | 21-092 | Nacelles and Thruster Reversers | UAL | Collins Aerospace | Fan Cowl Repair |
| 20 | 21-106 | Water and Waste | AFR/KLM | Safran | Safran to provide TSDP for vacuum generator |

Matrix Reloaded

By: Marijan Jozic and Kevin Kramer

How much return does an airline get from the investment of sending representatives to the AMC Conference? A fair question! In the past, there were attempts to numerically express the benefits of the AMC conference. We asked attendees to provide the USD value for each question. Those USD values were added, multiplied by 10%, and then multiplied by the number of airlines and quantity of their aircraft. After some adjustments, the result would show the benefit of AMC, which was close to a hundred million USD. The results obtained that way were not considered reasonable. Therefore, discussions continued within the AMC Steering Committee on how to provide a sounder approach to realizing the benefits of the AMC.

If you try to improve the calculations, you will soon realize that it is extremely difficult to get numbers which are reliable, acceptable, and simple enough to be trusted. You must realize that the individuals who are financing your trip to AMC would exercise every number to challenge you to show what the benefit is for your company. They want to see the proven savings.

It might be easier to say that your attendance to the AMC would prevent spending too much money for your company. It is difficult to document preventative costs in a way that can be articulated to financial teams. To say it succinctly, preventative costs are intangible and difficult for standard financial practice.

Perhaps your return on investment is found through a casual conversation with a fellow industry engineer. Your explanation may sound a bit like, "I went to the AMC, acquired an idea to change a procedure and prevented spending \$50K USD to purchase new parts by repairing something instead". Again, this is thanks to a tip by an engineer in the lobby of the AMC hotel. They may not see the benefit of the AMC because you did not spend money in the first place.

You can show that your organization has spent millions on the maintenance of an LRU. Now with the new approach discovered at the AMC. There is a more cost-efficient Service Bulletin (SB) to address your problem. By tracking costs, the next year you can show the cost of maintaining your LRU dropped by 70%. The airline is not spending \$200,000 USD per year but \$60,000 USD. They will be satisfied. Next year, you may be asked to find another 70% of cost reduction. But that is a different story.

Well, after years of those discussions, the AMC Steering Committee has come up with a matrix that shows where to look for savings or spending prevention. The matrix is expandable in all directions based on your own experience and imagination, but basically, this is it:

Benefits of Attending and Contributing to AMC

| INPUT | OUTCOME | | | | |
|-----------------------------|----------|-----------|----------------------------|---|---------------|
| Saving at AMC Based on: | SB/SIL | Contracts | Maintenance Concept Change | Operational Impacts (Delay Cancellations) | Flight Safety |
| Operator Collaboration | X | X | X | X | X |
| Other Operator Experiences | X | | X | X | X |
| Submitted Discussion Item | X | X | X | X | X |
| New Repair Discovered | | X | X | | |
| Industry Wide Problem | | X | X | X | X |
| New Parts Source Tip | | X | | | |
| New Service Discovered | | X | | | X |
| Historical Discussion Items | X | X | X | X | X |

Here is the explanation!

The left column provides the basis of savings. It can be as simple as others' experiences or the outcome of your discussion items. You may attend AMC with just one target: to see if there is a new repair available for something flying on your aircraft. Also, you could come to the realization that you are not the only one with the problem and many operators are complaining about the same issue. You might accidentally run into another operator's engineer who shares with you a new source of parts which were declared obsolete. Other engineers might tell you about a shop (MRO) that is able to repair components not normally repairable. Do not underestimate the possibility that you might find the solution to your problem in one of the old AMC reports.

The left column is clear. It is not limited to those 8 listed items. Use your experience and imagination to define more items. It would be interesting to know what new items you might define.

There are 5 columns with the outcome of your efforts to save cash or prevent costs. Those columns are SB/SIL, Contract, Maintenance Concept Change, and Flight Safety. Some AMC discussion items can have the outcome that a new SB or SIL is issued. Besides the Success Story, this is the item that can be exactly expressed in cash. If you accomplish an SB, it will cost some money, but you will earn much more. This is an example of the saying: You must first spend money to earn money. It is up to your sound engineering judgment to figure out if you are going to do that and if the promised SB is beneficial.

The column labeled Contract means that the outcome of collaboration at AMC could lead you to sign a contract for a service or hardware which should create a financial benefit for your company. A contract can be the result of different activities and again, it is up to your sound engineering judgment to figure out if you are going to do that or not.



The next topic is called Maintenance Concept Change. This topic might provide huge benefits just by changing the procedure or interval of maintenance. It could be that your people are doing something so stupid that nobody even dreamed about. You might discover it during a conversation at AMC. Again, low impact within your organization, but gigantic savings! That is exactly what you are looking for. That is exactly why you went to the AMC.

The last column is called Flight Safety. You should ask yourself: does this issue affect the folks up in the cockpit? Could this component issue create a safety issue while in flight? Your Flight Ops department may be able to share with you some additional cost savings that you never thought of before (e.g., air turn-backs) that you can add to your AMC justification.

It is very possible that you can add columns with some additional outcomes or that you can express in numbers for your own savings. The matrix is designed to help you to justify the benefits of AMC. Do not hesitate to share your data. The whole purpose of AMC is to educate and share data to make commercial aviation safer, more efficient, and cost effective.

An airline recently shared an example of how attending the AMC benefitted their company. At the 2015 AMC, another operator brought up a Weather Radar issue they were experiencing in their fleet. After the AMC, this airline reviewed their own reliability data and determined they too were affected by this issue. The related costs involved with this issue started to increase when they started looking at component repair costs and operational delays. The engineer brought this issue to his or her Flight Ops department and expressed concern about how this affected the Flight Crews and their use of the Weather Radar system in flight. None of this would have been discovered if the airline did not attend AMC.

Please feel free to share any justification ideas with the AMC Steering Committee so we can build a comprehensive matrix that will benefit all our members. We hope that these ideas will assist you in justifying the costs of your trip to AMC and show your superiors and fellow engineers that AMC is the place to go if you want to make a big impact in terms of Avionics for your company.

Radio Altimeter and 5G Network or 5G Immune Radio Altimeter

By: Marijan Jozic

This is the just the reminder to follow the story about radio altimeter and 5G network. As we all know a reliable radio altimeter signal is one of the most important parameters in an aircraft. Radio altitude is used in the most critical phase of flight: Landing. Additionally, other systems are using radio altitude data (TCAS, TAWS, Windshear). During Auto Land operation, all radio altimeters must be in synch. Regarding Auto Land: we know that there are 3 categories CAT 1, CAT 2, and CAT 3. Whereas CAT 3B is most critical and needs perfect accuracy of all sensors to automatically land and roll-out an aircraft with almost zero visibility.

The official definition of CAT 3 is:

A category III A approach is a precision instrument approach and landing with no decision height or a decision height lower than 100ft (30m) and a runway visual range less than 700ft (200m).



For such a critical situation, everything must work perfectly. If during Auto Land anything goes wrong, the pilot flying would just say “go around” and engage TOGA switch and perform go around maneuver. No discussion whatsoever because there is no time for troubleshooting.

Therefore, I guess we are convinced about importance of a good working radio altimeters.



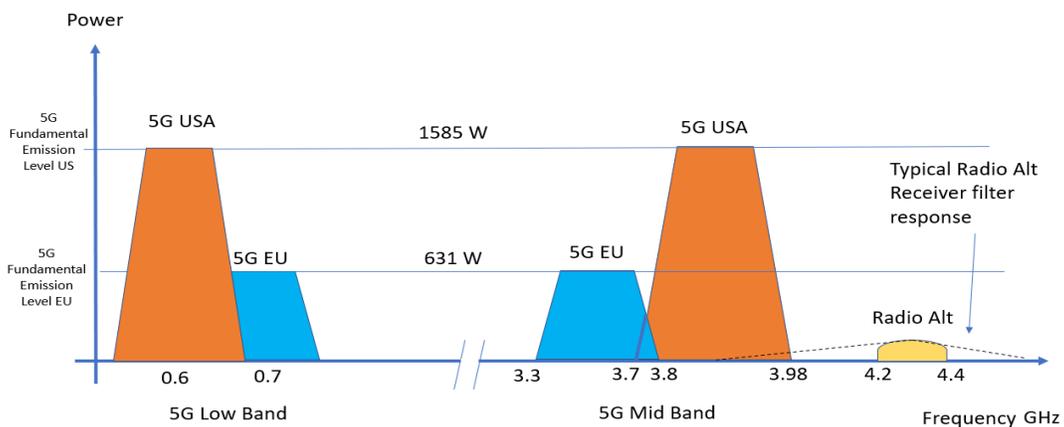
But there are some external factors in this context. It is the rollout of the 5G network. We all know that we need 5G network to have fast wireless internet. In the 5G network, there are hundreds of transmission towers transmitting 5G signal for high-speed internet. Many of those towers are installed in the vicinity of the airports. So here is the problem:

5G Band vs. Radio Altimeter Band:

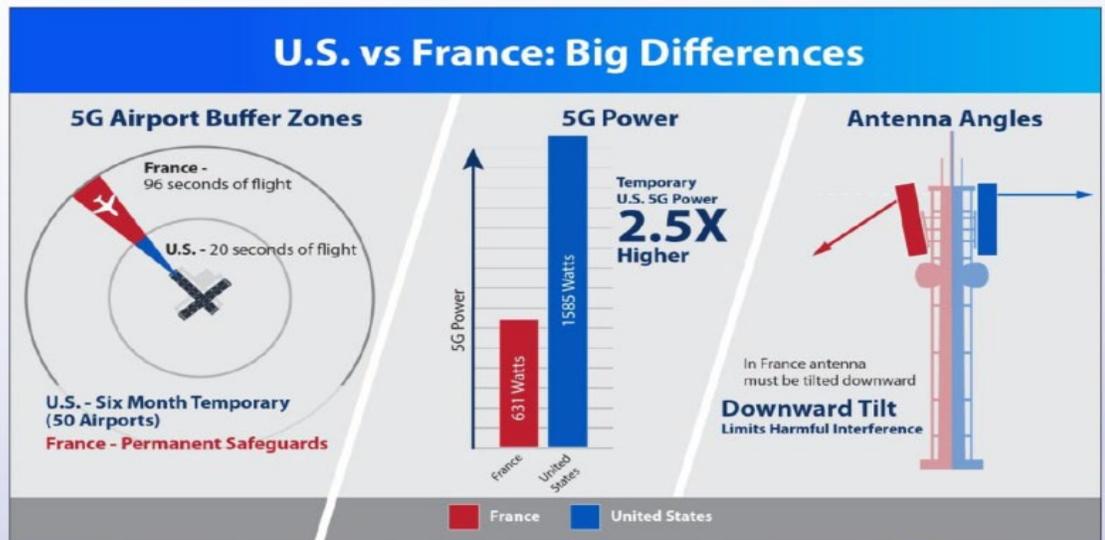
Note: The 5G EU transmitters are transmitting with 65% lower power than US.

| 5G | EU | US |
|-----------|-------------|--------------|
| Low-band | 700 MHz | 600 MHz |
| Mid-band | 3.3-3.8 GHz | 3.7-3.98 GHz |
| High-band | 26 GHz | 28 GHz |
| | | |
| Radio Alt | | |
| Frequency | 4.2-4.4 GHz | 4.2-4.4 GHz |

Here is the visual presentation of the current situation for lower and mid band comparing it with a radio altimeter:



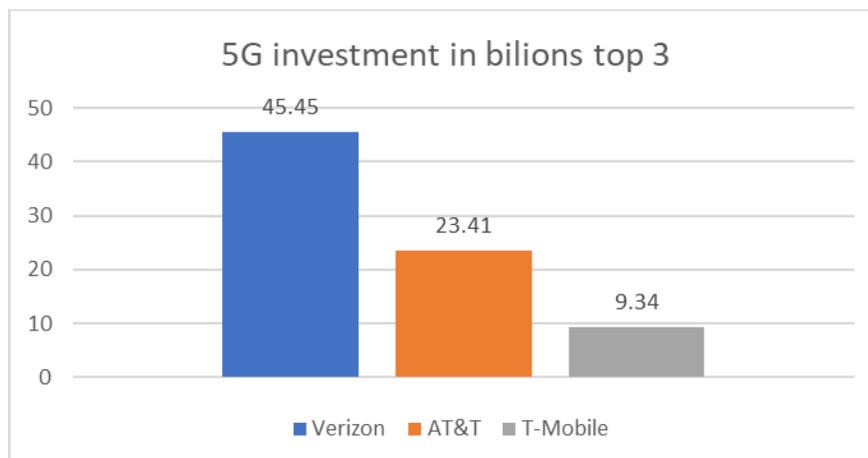
In the US, the antenna angle is pointed 12 degrees above the horizon.



Source: FAA

At the end of March 2021, 5G commercial services had been deployed in 24 EU-27 countries. The most used frequency bands are 700 MHz and 3.3 – 3.8 GHz with the latter established as the global workhorse band for 5G. The US led the world in making the 28 GHz band (short distance, home-applications) available for 5G. Several other countries, particularly Japan and South Korea, quickly followed. However, in the last couple of years, interest in either 26 GHz or 28 GHz has waned.

If you follow the money, you will see that big telecom companies are paying astronomical amounts of money to get licensees for the most wanted C-Band frequencies. That is billions of dollars involved.



US mobile operators paid a lot of money for the 3.7 – 3.98 GHz band at an auction that concluded in early 2021. In total, Telecom operators paid \$81 billion for the spectrum, plus \$9.7 billion in incentive payments for incumbent satellite operators to vacate the band. It is fair to expect more

activity in 3.7-4.2 MHz band.

The frequencies are filed by FCC (Federal Communications Commission). So, there are many parties involved in radio altimeter anomaly issue: FCC, 5G telecom industry, RTCA, ARINC IA, Authorities (FAA; EASA, CAA), aircraft operators, Airframers and OEM's.

Radio altimeters were designed decades ago and in all those years nobody was having any complaints with interference of external signals. But now, signals from the 5G network are penetrating into the radio altimeter band and disrupting the accurate altitude measurement, which is not surprising.

Landing in the blind, knowing that the radio altimeter might be unreliable, is a serious problem. You can run into the situation that both or all three radio altimeters are in sync but providing wrong data. There is a potential loss of pilots' trust (confidence) into aircraft Auto Land function because of that. And that is exactly what we don't want in aviation. We do not want our pilots to lose the confidence in Auto Land function of the autopilot.

On Auto Land, the autopilot is using localizer to detect the center of the runway and glideslope to detect the vertical angle of approach. The radio altimeter simultaneously provides the height of the aircraft above the ground. This is, however, applicable for air transport, business, and helicopters aircraft. Bottom line is that all altimeters (two or three dependable of aircraft type) must be serviceable during Auto Land operation. If your radio altimeters are receiving the wrong signal, they might not report it as wrong. Therefore, it means that radio altimeter is not performing the intended function. This is not good. Especially in critical phase of flight, like Auto Land.

RTCA is a nonprofit organization which recently published RTCA Paper No. 274-20/PMC-2073: *Assessment of C-band Telecommunication Interference Impact on Low Range Radar Altimeter Operation* noting that there are potential problems on interference between 5G network and radio altimeter. The 5G telecom industry eventually rejected the report saying that there is no hard evidence of a problem. RTCA reproduced the interference in the lab.

Nevertheless, FAA issued the AD note: AD 2021-23-12 imposing flight restrictions. Meaning that if the weather is less than CAT 1, the aircraft is not going to move. No operation until weather improves. That has a potential to cost millions of dollars of revenue for airlines because it is affecting at least 80 US airports.

Europe is using frequencies: 700 MHz, 3,5 GHz and 26 GHz which is in a different portion of the spectrum. As a result, the Europeans are claiming that they have no problem with 5G. But they are forgetting that aviation is a global operation and that European operators are also flying to US airports. Meaning that restrictions at 80 US airports will affect their operation too.

How to fix this is difficult to say at this moment. Because there is a tremendous amount of money involved it would be difficult to force 5G telecom companies to stop their activities and stop installing 5G transmitters in the vicinity of the airports, or to change the 5G frequencies. They will also oppose the idea to pay for modifications of the world fleet of aircraft.

Aviation was first in using airports and present systems; therefore, aviation should not suffer. The government would not like the idea to use some of those billions of dollars which are paid for frequencies and pay for aircraft upgrades. Money talks in this situation, and the outcome of that discussion is unknown.

Many years ago, aviation had problems in the frequency spectrum. The anomaly was known as FM Immunity. It was about interference with commercial radio stations. ICAO Annex 10 was issued and shortly after that all FM radios in the aircraft had to be modified to prevent interference on ILS, VOR and VHF-Comm). On some occasions, it was not possible to modify the LRU and airline was forced to replace it with a new FM Immune LRU (certification costs; LRU costs). This might be the case again but with radio altimeters. The new radio altimeter will then be 5G Immune. Let us call that modification 5G Immunity. After implementation of the Service Bulletin the 5G Immune radio altimeter will be used.

At least, we have a name for this new beast.

Scan

By Marijan Jozic



AEEC|AMC this time is in the city of Elvis Presley: Memphis. Just to make sure that you are not associating Memphis with Pharaohs and Egypt; we are talking about Memphis, Tennessee and not that old Memphis in Egypt. This article, before the Aviation Maintenance Conference (AMC), is to expound on various items which are currently occupying this engineer's mind.

Recently, I have attended several conferences, as part of my new role within SAE ITC. For your edification, SAE ITC has 14 consortia one of which is ARINC Industry Activities. For 20 plus years, this engineer has been attending the AEEC|AMC Conference. I concluded that there is no better conference. In attending and observing these other various conferences, it is evident that AEEC|AMC is one of the premier conferences to attend and learn.

The average conference is a mix between tradeshow and seminars. Tradeshows are booths in a conference hall. The manufacturers show up with their promotion materials, and a group of sales representatives are there to talk and provide the information about their products. Nothing wrong with that. The AEEC|AMC also has booths in the vicinity of the ballroom which are there during the conference but are only manned during the breaks and lunch.

One special aspect to the AEEC|AMC is the Tuesday Showcase. The Showcase is an opportunity for small and large vendors to have a tabletop in the evening between 6:00pm and 8:00pm. This is an excellent time to gather, talk, and learn new information.

Second aspect is symposiums, other conferences organize seminars the whole day and have the exhibit floor open the whole day you split the crowd, and everybody is unhappy. People in booths are not happy because they expect a crowd, but the crowd is in the ballroom listening to the presenters at the seminar. The presenters in the ballroom are not happy because they expect the whole ballroom full of engineers, but a lot of engineers are on the floor visiting booths. Engineers are also not happy because they would like to be at the seminar and visiting booths. There is nothing more awful than to do the comprehensive preparation for a seminar and make sure that you will shine when presenting and find that you are presenting for a half empty room.

That is, fortunately, different at AMC|AEEC. We managed to get the full attention of seminars and open forum discussions during the day and visit booths and hospitality suites in the evening. Not at the same time. That makes it more efficient. Our engineers are also more focused on the subjects. Therefore, I proudly call the AEEC|AMC Conference the North Star of all conferences.

There is one more topic in aviation which is gaining popularity and that is sustainability. When you say “sustainability” various individuals are associating it with food. That is because immediately after sustainability somebody says greener environment. But it is not only about food. It is much more.

Just to mention that I am not part of the current millennials’ movement. Those youngsters are involved in Bitcoins and smartphones not knowing (or just don’t want to know) that Bitcoins and smartphones are huge contributors to carbon emission. All their information is in the cloud, and the cloud is a network of servers using a significant amount of energy. All that liking, sharing, and subscribing require fossil fuels. It would be impossible to take a smartphone out of the hands of anyone under 30. Therefore, they should stop saying the older generation ruined the planet and start to contribute into getting it fixed.

Therefore, here are some facts which are made possible by the older generation. 35 years ago, flying from Amsterdam to Los Angeles on a 747-100, 120 tons of fuel was burned in those 10 hours of flight. These days 787s burn 56 tons of fuel in the same 10 hours with the same number of passengers and suitcases. That is 47.28% less fuel burn. Isn’t that wonderful? Aviation is not getting credit for that; although, it was hard work to get so far.

Of course, we are doing more, and we are not stopping here. We are monitoring the following subjects and will be involved in doing much more. Look at our list:

- o Flying in full electrical airplanes
- o Additive manufacturing
- o Software development
- o Cybersecurity
- o Databases (Aerudition, Materials database)
- o Noise pollution
- o CO2 Emissions
- o Policies, procedures, and guidelines
- o Training and training requirements
- o New standards and revisions of present standards
- o SAF (Sustainable Aviation Fuel)

We have chosen to do it all, not because it is easy but because it is hard. We cannot do it in one big step. We will do it in numerous small steps because we know that small steps will lead to the biggest results.



There is, however, one important challenge which needs to be solved. We cannot solve it today but many of us will be able to see it happen. That is perhaps the biggest challenge in aviation so far. It's about energy.

There are 4 sources of energy for the new aircrafts in the future. You can be sure that in 2050 (which is approximately 28 years from now) perhaps 70% of flying fleet today will be retired. We don't know which energy will be used in the next generation of aircraft. Would it be the present-day jet fuel (Kerosene) with new and more efficient engine? Will the aircraft use SAF (Sustainable Aviation Fuel)? Perhaps full electrical aircraft will be a solution. Hydrogen might be the new energy source (Fuel Cells). We know that now days the highest energy concentration is in fossil fuel, by far. Yes, we are talking about energy concentration. Every one of those sources has advantages and disadvantages. What will be the future? We don't know. For now, we should concentrate on small steps.

The third part of my story is data sharing. I attended a meeting for the Data Sharing Coalition in Amsterdam. In my opinion, Amsterdam is the capital of the internet. All internet highways are crossing in Amsterdam and there are at least 100 big server warehouses around the city. The magic word is data sharing. At this moment we are discussing how to do it in aviation. Can you imagine that we put the data in a secure place and make an agreement on how to share it in a safe and secure way. In that case many smart software engineers can use artificial intelligence to develop algorithms for predictive maintenance based on data sets. With a lot of data, you can train the software to do analyses and predict the failure. It would be like the Stanley Kubrick movie: *Space Odyssey 2001*. In one scene, the computer HAL said: *"Dave High gain antenna will fail in 48 hours"* and Dave Bowman had to go out to the roof of the space craft and replace the antenna. Wouldn't that be wonderful if the onboard computer would announce to the pilot: Your radio altimeter will fail in 24 hours. The pilot would then push the ACARS button and send the notice to the ground base. After the aircraft is parked, the technician would already be there with a serviceable radio altimeter. Nice!



Memphis will soon be the hottest place in the universe. We all will be there for our beloved AEEC|AMC Conference, the North Star of all conferences. Be there and ask us about Aerudition Database, Materials Working Group, Future Computer-Based Training, Data Sharing, Cyber Security, and many more items. Make your reservation and sign up for the AEEC|AMC Conference. Be there or be square!

Commentary:

Be There or Be Square Meaning

Definition: *If one does not attend a certain event, one is not “cool.”*

The expression be there or be square means that if one declines to attend an event, one is considered “uncool.” It implies that the event will be exciting. Someone who doesn’t attend is boring.

AMC Steering Committee

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United Airlines

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Delta Air Lines

Sharon Gradwohl
United Airlines

**Each airline organization on the AMC Steering Committee receives one vote.*

ARINC IA PARTIAL CALENDAR

| | | |
|----------------------|-----------------------|---------------------|
| AEEC AMC | May 9-12, 2022 | Memphis, TN |
| EFB USERS Forum 2022 | June 1-3, 2022 | Annapolis, MD |
| FSEMC | September 26-29, 2022 | Dallas (Irving), TX |



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"Another Success Story!"

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