MEETING MINUTES
MEETING OF SPECIAL COMMITTEE 231

Terrain Awareness Warning System (TAWS)

RTCA Paper No. 275-19/SC231-032

Date: Dec 4-5, 2019

Time: 0900 to 1700 Alaska Standard Time

Place: University of Alaska-Anchorage, Anchorage, AK

Co-Chairs: Yasuo Ishihara Rick Ridenour

Government Authorized Representative: Charisse Green

Attendees:

Name	Company/Agency	Attendance Day 1	Attendance Day 2
Adler, Richard	Federal Aviation Administration (FAA)	**Attended in person**	**Attended in person**
Baker, James (Kirk)	Federal Aviation Administration (FAA)		
Bleakley, Timothy	General Atomics Aeronautical Systems, Inc.	**Attended via phone**	**Attended via phone**
Blom, Stefan	Saab Group		
Bradley, Capt. Mark	Delta Air Lines, Inc.		
Bulger, Chip	Federal Aviation Administration (FAA)		
Burgeles, Mr. Brett	The Boeing Company		
Bykov, Vladimir	International Aeronavigation Systems (IANS Inc.)		
Caruhel, Mrs. Camille	Airbus		
Chism, Linda	Alaska Airlines	**Attended in person**	**Attended in person**
Dean, Mr. Garfield	EUROCONTROL		
Dhulipudi, Mr. Durga	Honeywell International, Inc.		
Duke, Rune	Aircraft Owners and Pilots Association		
Dunagan, Mr. Joseph	Raytheon		
Fisch, Wayne	Universal Avionics Systems Corp.		
Fleury, Stephane	Thales Group		
Forrest, Joseph	Collins Aerospace		

Name	Company/Agency	Attendance Day 1	Attendance Day 2
Franzen, Mr. Paal	Astronautics Corporation of America		
Geoghagan, William L	National Air Traffic Controllers Association (NATCA)		
Goddard, David	Garmin Ltd.		
Gosselin, Eustis	Jacobs Technology		
Green, Charisse	Federal Aviation Administration (FAA)	**Attended in person**	**Attended in person**
Hogestad, Marie	Federal Aviation Administration (FAA)		
Ishihara, Yasuo	Honeywell International, Inc.	**Attended in person**	**Attended in person**
Jacky, Tom	NTSB	**Attended in person**	**Attended in person**
Jain, Ravi	FAA - AIR		
Johnson, Steve	Honeywell International, Inc.		
Judge, John	Sikorsky		
Kapytov, Vasily	International Aeronavigation Systems (IANS Inc.)		
Kirtz, Jon	Collins Aerospace	**Attended via phone**	
Koffink, Michael	Intertek Testing Services NA		
Korns, Peter	National Business Aviation Association	**Attended in person**	**Attended in person**
Labay, Mr. Marcus	Federal Aviation Administration (FAA)		
Lawrence, Mr. Tom	Universal Avionics Systems Corp.	**Attended via phone**	**Attended via phone**
Lokatt, Mikaela	Saab Group		
Lorey, Janiece	Gulfstream Aerospace Corporation	**Attended in person**	**Attended in person**
Morrison, Rebecca	RTCA, Inc.	**Attended in person**	**Attended in person**
Mulkins, Jim	Honeywell International, Inc.		
Ostrom, Gary	Honeywell International, Inc.		
Parikh, Mr. Ajay	Ligado Networks		
Philbin, Mr. John	Northrop Grumman Corporation		
Pippard, Mr. Nigel	Saab Group		
Prosser, Kevin	Gulfstream Aerospace Corporation		

Name	Company/Agency	Attendance Day 1	Attendance Day 2
Resnick, Mr. Boris	International Aeronavigation Systems (IANS Inc.)		
Reynolds, Zach	L3 Harris Technologies	**Attended in person**	**Attended in person**
Ridenour, Rick	L3 Harris Technologies	**Attended in person**	**Attended in person**
Ringnes, Mr. Erik	Honeywell International, Inc.		
Rossi, Mr. Angelo	The MITRE Corporation	**Attended on phone**	
Sadilov, Mr. Vsevolod	International Aeronavigation Systems (IANS Inc.)		
Sauter, Michael	Lufthansa		
Sheng, Randy	Honeywell International, Inc.		
Stevens, Aubrey	Delta Air Lines, Inc.		
Stone, Capt. Rocky	United Airlines, Inc.		
Sun, Hui	Honeywell International, Inc.		
Tubb, Nick	The Boeing Company		
Vafiades, Monica	U.S. Air Force		
Williams, Shaun	NTSB	**Attended on phone**	
Wilson, Garry	Gulfstream Aerospace Corporation		
Zapoluch, Steve	Garmin Ltd.	**Attended via phone**	**Attended via phone**
Unique Attendees for Anchorage conference:			
Asay, August	FAA Anchorage ACO Branch	**Attended in person**	**Attended in person**
Corson, Dan	Wings of Alaska/Wings Airway	**Attended via phone**	
Dale, Jane	Alaska Air Carriers		
Flack, Andy	Department of Interior	**Attended in person**	**Attended in person**
Gambucci, Ryan	RAVN Air	**Attended in person, AM only**	
George, Tom	Aircraft Owner's Pilots Association	**Attended in person**	**Attended in person**
Johnson, Clint	NTSB	**Attended in person**	
Kieling, Harry	Alaskan Aviation Safety Foundation;	**Attended in person**	

Name	Company/Agency	Attendance Day 1	Attendance Day 2
Long, Kerry	Federal Aviation Administration (FAA), Alaska	**Attended in person**	
Phillips, Mark	Alaska Airmen's Association	**Attended in person**	
Veal, Evan	RAVN Air Connect	**Attended in person, AM only**	
White, Adam	Alaska Airmen's Association	**Attended in person**	**Attended in person**

Plenary Discussion:

Wednesday, Dec 4:

A slide presentation was made to the group based on the below agenda. These slides are found at the below location:

https://workspace.rtca.org/apps/org/workgroup/sc-231_taws/download.php/40300/Plenary%2016%20Presentation%20-%20final%202019-12-04.pptx

1. Welcome
2. Administrative remarks, RTCA Process Announcements
3. Agenda Review
4. Introductions
5. Presentation of recommendations to participating operators
6. Discussions with participating operators
7. Revisions to recommendations based on discussions
8. Re-prioritizing recommendations
9. Begin writing recommendation document
10. Other business
11. Date and place of next meeting
12. Adjourn

Rebecca Morrison walked through 3 RTCA policies:

- Anti-trust policy
- Proprietary policy
- Committee participation membership policy

Rick Ridenour and Yasuo Ishihara (co-chair) led the remainder of the slides.

As a first step, the Terms Of Reference (TOR) were introduced. Then Tom Jacky provided the NTSB baseline and recommendations in a slide presentation.

https://workspace.rtca.org/apps/org/workgroup/sc-231_taws/download.php/40294/NTSB%20Investigations%20and%20Safety%20Recs%20DEC%203.pdf

Among the CFIT cases over the last ten years, a common theme in the two accidents (Ketchikan/Promech and Togiak/Hageland) and other similar cases is the practice of inhibiting the TAWS to avoid the continuous alerting condition that can occur during low altitude operations.

Linda asked Evan from Ravnair if the inhibit mode is aural only or visual and aural. Evan answered that only aural is inhibited. He cited that several areas produces aural alerts where keeping the terrain display is desired. One example included Barter Island (PABA), right at minimums, which systematically has TAWS aural alerts. At PABA, Evan believes that the airport location appears to be incorrect in the Terrain Database, causing this nuisance alert. Even when inhibited, the display shows visual indication of red alert areas. However, the continued display may not be desirable in all cases. Yasuo pointed out that some TAWS versions inhibit both display and aural information. The display information might be potentially misleading given that the flight crew has already decided to inhibit what they believe is less-than-reliable information.

Adam mentioned that off airport operations cause many of these alerts. He mentioned that there are several places where the airport database is wrong – missing one of two parallel Fairbanks runways for example. Linda agrees and felt that regardless of supplier, the database can be crude just due to the number of rural airports or changes to airports in Alaska. It is recognized that terrain resolution is much improved due to satellite mapping and that the TAWS systems now have better memory capabilities – at the very least, improving the resolution of TAWS system appears to be an improvement path.

Potential solutions were then discussed per the slides. Note that the solution number does not represent a priority or preference.

The **potential solution #1 (slide 14)** of applying Class C to Class B operators was discussed. Evan mentioned that the Class C 250 feet terrain clearance appeared to be too low, but where a 400 foot threshold seemed reasonable for the lower altitude operations in this area. The NTSB has made the recommendation of allowing Class C operations for Part 135 operators in Alaska as far back as four years ago. Alaska Air Carriers Association had the exemption requests ready to go in November 2018. This exemption is working its way through the FAA process (Flight Standards) for the specific carriers who applied. FAA-2018-0049 is the exemption documentation. The exemption could have restrictions, but as proposed today the only restriction is to Alaska operators. The exemption application currently being reviewed by the FAA covers nine operators. Evan indicated that IFR operations should still maintain Class B thresholds of 700 feet, so blanket adoption is not advised. The current exemption application would only apply to VFR operations.

Although we emphasize the lower vertical threshold, the lateral boundaries are reduced also in a Class C implementation typically, though the lateral envelope varies by manufacturer.

Category changes are done today via configuration settings. But among the discussions is consideration of dynamic changes from one Class to another in midflight. Rich mentioned that this has some precedent, where two noise classes have been switched with a placard change, where the lower Class allows additional flap settings. Rick and Yasuo suggested that instead of seeing this as a switch between Classes, the operator could change their clearance level dynamically (solution #6 below), analogous to the Reduced Protection Mode as present in HTAWS system which is the more applicable precedent.

In general, the Class C allowance shows a marginal improvement that is worth pursuing, but is not the silver bullet solution that is needed. During a later priority exercise, this has been given a high priority, but this is not the preferred solution. A preferred solution would be adding a switch from Class B to Class C, corresponding to IFR vs. VFR operations.

The **potential solution #2 (slide 15)** presented a change to uninhibit terrain after either a period of time or a condition change. This is probably easier to implement, where a mechanical switch could be installed for 3 of the 4 uninhibit conditions presented.

Evan offered an opinion that the time based uninhibit or threat change uninhibit would be desirable. Operators have regions of known alerting and this solution matches this problem.

Interdependency: Adam indicated that there are regions where threats would be nearly continuous, so another change (envelope change for example – solution #7, slide 20) may be needed along with this change. August had an alternate suggestion that a transition from amber to red (caution to warning) alert would constitute a new threat rather than the caution alert where too many uninhibits would take place. Evan expressed an opinion that due to the prevailing false warnings, this idea has a major drawback due to how frequently the re-inhibiting would take place. If inhibit is used every day, this is not effective. This timed inhibit ***would be*** beneficial if there were lesser alerting (reduced envelope for example). So, in effect, this concept is good if combined with other solutions.

Mark felt that there was still a training angle corresponding to this idea, but requiring no hardware changes. He felt that reinforcing to the flight crew the need for an uninhibit response after pressing the inhibit was a potential improvement. He cited taking off routinely with inhibit applied and out of habit, uninhibiting after passing through a particular altitude.

The **potential solution #3 (slide 16)** is transitioning from a current mechanical switch to a lighted annunciator. This addresses the inadvertent inhibition that the flight crew may not be aware of. However, with 90 % of flight operations being inhibited by some Alaska operators, the lack of awareness may not be the problem and this idea was considered less worthwhile.

The **potential solution #4 (slide 17)** addresses an earlier discussion of tying the inhibition to both display and aural. However, this is already the case for the Alaska operators - this linking of both appears to be only related to Part 121 operators. Therefore, this solution already appears to be present and may be expressed as a best practice in the eventual White Paper. A later

suggestion was made to make this a standalone requirement in the MOPS, requiring a separation of the aural inhibition from an optional display inhibition.

This topic also was associated with a complaint that some system's terrain alert display depiction goes to a smaller range (5 Nm). The commenter stated that the smaller range could lead to a loss of overall situational awareness. In fact, the range should be kept the same even as the alert intensity is changing. So if this concept is adopted, this side feature should be considered rather than autoranging.

The **potential solution #5 (slide 18)** had the concept of inhibiting only the caution and not the warning alerting and therefore only alerting at the last moment. We recognize that the warning alert may still be a nuisance alert for cases such as off airport operations. This concept has a disadvantage of being a longer lead item to get through FAA regulation.

Interdependency: Later committee discussions noted that the display of terrain (potential solution #4, slide 17) to allow situational awareness is a prerequisite to having this "last moment" alert. In this way, these last moment alerts will include situational awareness.

Interdependency: The ability for the pilot to enter a pilot-defined landing area is a prerequisite to having this "last moment" alert. Otherwise, every off-airport landing would have an alert issued during a high-workload phase of flight.

The **potential solution #6 (slide 19)** would offer a pilot selectable alert height. This one also has a disadvantage of being a longer lead item to get through FAA regulation. Mark Phillips expressed that switching between Class B and Class C based on aircraft operations may be beneficial. In general, regulators would have a difficult time approving such dynamic control. Rich felt that this could be acceptable, if this is allowed to be set higher than 250 feet.

Adam introduced the concept of a pilot entered runway or waypoint which would be the cause for a dynamic inhibition zone. This would be frozen lake, tundra or other known landing strip. This would theoretically remain set for future operations, so this would not need to be entered each time. August suggested that the pilot entered waypoint could also include runway heading as another option. However, from one year to the next, this waypoint may change.

Rich suggested that a drawback exists if on a different day, the crew intends to overfly a pilot entered runway. A cross check of the pilot entered waypoint for this particular flight compared to the pilot entered runway could address this, but would be difficult to implement. Rick mentioned that the potential to inadvertently get close to an unintentional landing location is unlikely and may be more of a corner case.

For the most common runways, Rick felt that the operator could always contact the manufacturer to simply add this runway to the TAWS DB. Rich felt that the current MOPS would involve more work to allow non-airport locations to be inhibited.

A question was raised on what type of inhibition switches are present. When polled, operators indicate that the aural inhibition occurs via:

- Toggle switches are common
- Latching Pushbutton switches are also common

Terrain display selection and deselection typically occurs via the display menu item and not through a physical switch.

The **potential solution #7 (slide 20)** is the change in the TAWS envelope. Because current envelopes are well established for Classes A through C, this could introduce a Class D, not just for Alaska operators but for other aircraft where a smaller protection envelope exists both laterally and vertically. Another option brought up by Rich Adler would be to modify the Class C MOPS to have some additional clearance, configurable between 250 and 700 feet. This discussion overlapped with potential solution #1, where the discussion is found above.

This change in threshold would be greatly preferred to be a new Class D tailored to this new envelope rather than modifying the existing Class B.

A question was raised on whether passengers can hear the terrain alerting aurals. Both August and Evan mentioned that passengers are briefed ahead of time for the potential that TAWS alerting can occur and that this situation is not unusual. Including this in the passenger briefing is a relatively new practice. The FAA introduced this practice when they learned from operators that one reason for inhibiting TAWS was to prevent TAWS alerts from upsetting the passengers.

The **potential solution #8 (slide 21)** was expressed where a lateral maneuver alert could be provided. Here the risk is that if a lateral position error or terrain database error is present, the lateral maneuver may actually be incorrect and hazardously misleading. Heritage TAWS alerting advising a pull up are by definition moving away from hazards and this suggestion backtracks from that standard. The changes in the algorithm would require more design and certification risks.

Evan expressed some preferences initially, where he can cite several cases where the annunciated aural Pull Up would not be or was not successful but where a lateral maneuver was still possible. This added capability would be appreciated, though it's recognized that there is some risk present of incorrect alerts unique to lateral threats. This system would also need to include performance capabilities of the aircraft and could be enhanced with weight, temperature and other factors.

Ryan expressed concern that a lateral aural might lead to a tendency to follow the aural and decrease the crew's situational awareness. Although the alert does not dictate an action, navigating to the alert could begin to take place. Synthetic vision concepts have led to a similar reliance to the system rather than situational awareness outside the aircraft. While the images are compelling, Adam and others mentioned seeing significant inaccuracies while VFR.

The **potential solution #9 (slide 22)** described a limitation to a single aural alert rather than continuous alerts. This matches the TCAS alerting processing with a single aural. This may drive less inhibition. Evan mentioned Donlin Creek as an area where a continuous alert for 10 minutes may occur. Training to continue to monitor the terrain situation is not intuitive.

Therefore, the training effort might be small but the risk may be large of the flight crew not responding promptly to what would be a single alert. Also, it is not apparent when the threat is past with this concept.

Andy felt that some intermediate alerting mode (lower volume, lower cadence) could achieve the same goal as this potential solution. This idea could be tweaked to address the risk of the unresponded alert.

Interdependency: This concept is probably best implemented along with a reduced alerting envelope (solution #7) that would reduce the frequency of nuisance alerts.

Adam talked about Enhanced Vision systems and asked if they were under consideration. There are some systems currently being used by Part 91. However, August and others felt that there were still enough anomalies with these systems and that these would not yet be under consideration.

A presentation of the GCAS system was made in conjunction with the **potential solution #10 (slide 23)**, Viable Escape Maneuver Display on PED. This presentation had been made original in SC-231 of September. This presentation can be found here: https://workspace.rtca.org/apps/org/workgroup/sc-231_taws/download.php/39493/TAWS%20SC-231%20FtF%20%2019-09-24_Mark_Scoggs.pdf

Adam expressed an industry concern from Part 135 operators. He felt that too much information has been a concern, citing Caravan operators who have declined ADS-B In applications because the information can be distracting. However, for Part 91 operators, if this were wrapped into an existing App running on a PED, this would be useful for directional information. Rich added that the number of nuisances would drop with this system, because alerts are suppressed until the point where all 3 directions are alerting or indicating no path. A figure below shows the context of this remark:

August felt that while Part 135 operators are not using a phone App, the PED app is currently in use and would be a possible application. However, one drawback he expresses is the lack of situational awareness of the terrain around them. One can see this maneuver but does not allow

planning beyond the immediate maneuver. Adam wonders if this can be superimposed onto a larger terrain map.

Andy sees a drawback also of needing to run successive maneuvers because each one is discrete and then re-analyzed, where the next situation could be worse. Rick answered that to his best recall, the NASA design is set up for the more last minute case and not designed for medium term planning.

Adam felt that rather than waiting for the last second, some threat assessment level should be provided to the flight crew. Rich feels that this is in place and showed a progression of separate indicators of the Left, Right and Center display.

Harry had a concern that the text "Right" can be misconstrued by the flight crew into the "correct" action.

Harry felt that, given the capabilities of a lookahead system, the next several steps should be taken into consideration. For Part 135, the tool should be able to get the pilot back to situational awareness rather than just executing a series of turns based on the algorithm. To address this, Rich felt we should ask Mark Skoog what the lookahead time is, to better understand the potential for sequential turns.

Questions occurred during the video presentation of the GCAS:

- We are not sure what the difference is between the acknowledge symbol and speaker symbol
- Terrain Near could be misleading where one might think the terrain is alongside aircraft
- Terrain Near occurred while all 3 paths looked clear
- Terrain Clear sounds quite a bit like Terrain Near
- The rising terrain symbology could be misleading

Discussions were held over how accurate the climb gradient needed to be in these systems. Some existing systems use real-time weight and temperature. However, a low cost system would not provide these signals and therefore conservative estimates would be applied which moves in the direction of more nuisance alerting.

While the details of the concept are not known, the Alaskan operators feel there is strong merit to this concept for an PED app. Linda has asked that the SC-231 stay in tune with what the development timeframe is for the NASA program. Rebecca indicated that she can stay in touch and include the latest snapshot for the white paper release of this committee.

Adam mentioned that with an Airmen Association Great Alaska Aviation Gathering 2020 show coming up in Anchorage in May 2-3, a simulator presentation of this concept could ideally be made then. Another aspect is the March 4-5 Alaskan Air Carriers convention. At a later point, Linda discussed what next steps could take place to get this concept in front of Alaskan operators. August indicated such demos are available at Langley and Edwards, if folks are able to travel.

Training was then discussed. August indicated that Part 135 safety training now includes the toolset available through handheld devices. He said that around 2 hours per training session is written around the portable device.

Linda expressed that given the regulatory concerns, Part 91 operators may be more willing to take this on. Both Adam and Harry felt that there was promise in this design and a willingness to Beta test in the Part 91 community. However, this design would have a drawback of yet another display, introducing further pilot loading. Putting the escape cue onto to the same PED screen would be best.

It's recognized that driving industry to a regulated design may take time. Adam felt that in the meantime, the handheld application will be useful and perhaps eventually integrated into the certified electronics.

Another aspect of any of these systems is the reliability of the GPS position solution in this environment. Right now, NOTAMs are issued often for what might be a small scale interference and jamming. Nonetheless, there have been increasing concerns with GPS jamming and these systems rely on an accurate GPS position. There might be too much reliance on GPS for these systems.

We briefly discussed **potential solution #11 (slide 24),** Viable Escape Maneuver Display in panel mounted avionics. This seemed to all as a logical extension of the PED based system. So, this has high merit but the same concerns as the PED based system.

Other ideas were solicited with the Alaskan operators. Mark mentioned that having some indicators that the "zone of danger" was being entered beyond the current 500 foot callout. A dynamic setting of this level to include other levels would be of interest for lower altitude operations.

Questions were raised on what the GAJSC activity is in regards to these Alaskan cases. A reference was made by Peter Korns to this site:
https://www.gajsc.org/
Then, Peter noted that the CFIT recommendations have been completed recently:
https://www.gajsc.org/2019/04/controlled-flight-into-terrain-working-group-completes-drafting-safety-recommendations-in-daytona-beach-fl/

Next steps are discussed. PMC will meet in June or September. Depending on when we complete the white paper will determine when the PMC review takes place. For example, if the White Paper is completed on May 31, this would go to PMC in September. The PMC may go ahead or wait for the government to move forward.

Thursday, Dec 5:

Thursday's meeting began with a discussion of an on-line GPS spoofing issue brought up by Eurocae representative Garfield Dean. The question raised by Garfield is: "Could TAWS

manufacturers use multiple navigation sources (beyond GPS) wherever reasonably possible in their TAWS calculations, rather than just single source GNSS, to partially mitigate this kind of operational disruption?"

A response was discussed and is shown below which will then be sent to Mr. Dean on behalf of the committee as proposed below between the dashes.

The committee discussed this on 5 December 2019 as summarized below:

First, the existing MOPS DO-367 indirectly says a TAWS has to use a position source and altitude source accurate enough to perform its intended function. Paragraph 2.1.1.1 describes:

> *Note: Continuous self-test includes monitoring input signals for sufficient accuracy to allow the TAWS to perform its intended function. Note that some system inputs such as horizontal and vertical position may have readily available accuracy information where others of less system criticality such as flap angle or glideslope deviation have no real-time accuracy information. The degree to which this accuracy monitoring is performed is left to the manufacturer, who can assess which information is available on a given installation.*

This issue is in the realm of a manufacturers' implementation detail and not to be prescriptive in a MOPS. It may be in the manufacturer's interest for a product improvement but is not a MOPS matter.

Secondly, this issue is not part of the TOR nor a subtopic of the two NTSB cases brought up related to the TOR. It is acknowledged that GPS spoofing is a current industry concern. This issue affects systems beyond TAWS and also draws in navigation systems. A dual frequency MOPS is being developed currently within RTCA SC-157, with an initial publication in 2021 with a TSO beyond this.

So, while the committee agrees that GPS spoofing is a valid concern, the committee feels that the issue is not specific to TAWS and is already being addressed by industry.

A continuation of the previous day's topics took place. One concept of allowing a switch between Class B and Class C protection levels was discussed. Ideally, a 400 foot clearance could be dialed in, however past experience suggests that the certifiability of a pilot entered parameter used for the eventual Forward Looking Sensor is doubtful. But given that Class B and C are each already certifiable, these are the apparent best choices. Pilot training would then reinforce that Class B is selected when IFR and Class C when VFR.

We envisioned two different regulation effects on DO-367 for this Class B/Class C switching concept:

- Redefine Class B to include a switch to a lower level, which just happens to be Class C. This would be an optional function. The drawback here is that for operators who already are in Class B with no particular nuisance concern, this switch negatively affects this class.

- Introduce a Class D, which as a class includes the switch to allow either Class B or Class C. This method doesn't negatively affect Class B.

A question was raised on whether the terrain database includes trees or not. The answer is that sometimes it does. Yasuo indicated that, for example, the National Elevation Dataset (NED) is a bare earth model but by contrast, the Shuttle Radar Topography Mission (SRTM) data does include canopy height particular to the time of the scan.

Adam brainstormed an idea that the transponder squawk code already dictates that the aircraft is VFR (1200) which could be fed to the TAWS system and prompt the switch to Class C. August pointed out that some floatplanes are not equipped with transponders. Also, changing weather conditions bringing on sudden IFR conditions can precede in time the change in squawk code.

Another aspect that was discussed on Wednesday was the means to enter an off-airport location. The ability to enter a user defined runway appears to be needed, where the waypoint with heading supplied on the display dictates to the TAWS system to add this runway. This concept would not affect the currently worded regulations, but may need further analysis where some parties would want only charted runways. Therefore, we would anticipate this being part of the White Paper only.

The committee then began to construct a matrix of the current concepts. Columns were created for whether or not (a) MOPS/TSO changes are implied or (b) Regulatory changes are implied (Part 91, Part 135, etc.). The time to release these changes can each be longer duration. However, MOPS/TSO changes can precede the regulatory effect. This had been the case for the HTAWS for example.

The group of three remaining Alaskan operator representatives (Tom, Andy and Adam) were then polled with results shown under Operator in this matrix. The Priority of Concepts 2019-12-05 matrix is then attached at the SC-231 workspace.

Within this meeting, we are learning that the GCAS concept is a (TBD) licensed technology that may not be available to all suppliers and therefore may not be applicable as a recommendation. This is different than the original presentation where some recalled that NASA indicated that although the concepts are patented, this would be made available to all suppliers. To address this point, the concept of "Lateral Escape Option", slide 21 should be left as a placeholder to cover the concept of lateral maneuvers and kept separate from Viable Escape Maneuver (slides 23-24).

A sidebar took place on whether a FRAC is needed for this committee. The committee felt that while a review of the eventual paper would be desired, this need not be a formal Final Review And Comment (FRAC).

The group then discussed upcoming plans. The White Paper is due in May 2020. It's desirable to have a Plenary before this date. We are also planning to have some subset of attendees in Anchorage on March 4-5, for the 2020 AACA convention.

A target for the draft White Paper is end of January 2020. To ensure that the White Paper is being completed, we would plan a biweekly cycle on January 29, February 12, February 26, etc….at 1000 Eastern Time.

The recommendation is to have comments accumulated via a Review And Comment (RAC) process based on these telecons. Then, the plenary would walk through these comments. A proposed Plenary date of May 12-13 is then resulting.

The June PMC will then review this White Paper. The tentative date of PMC is June 25, 2020 with a potential to move to June 11, 2020.

Plenary section closed with this remark.