U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Driver's Enhanced Vision System (DEVS)	**Date:** Draft **Initiated By:** AAS-100	**AC No:** 150/5210-19B **Change:**

1 Purpose.

This advisory circular (AC) contains performance standards, specifications, and recommendations for Driver's Enhanced Vision System (DEVS).

2 Cancellation.

This AC cancels 150/5210-19A, *Driver's Enhanced Vision System (DEVS)*, dated June 12, 2009.

3 Applicability.

The Federal Aviation Administration recommends the guidance in this publication for installation of DEVS equipment on Aircraft Rescue and Fire Fighting (ARFF) vehicles. This AC does not constitute a regulation, is not mandatory and is not legally binding in its own right. It will not be relied upon as a separate basis by the FAA for affirmative enforcement action or other administrative penalty. Conformity with this AC is voluntary, and nonconformity will not affect rights and obligations under existing statutes and regulations, except for the projects described in subparagraphs 2, 3 and 4 below:

1. The standards and guidelines contained in this AC are practices the FAA recommends in establishing an acceptable level of safety, performance and operation of DEVS equipment.
2. This AC provides one, but not the only, acceptable means of meeting the requirements of 14 CFR part 139, *Certification of Airports*.
3. Use of these standards and guidelines is mandatory for projects funded under Federal grant assistance programs, including the Airport Improvement Program (AIP). See Grant Assurance #34.
4. This AC is mandatory, as required by regulation, for projects funded by the Passenger Facility Charge program. See PFC Assurance #9.

4 Related Documents.

1. DOT/FAA/CT-94/99, *Driver's Enhanced Vision System (DEVS)*, final report, dated January 1995. This report is available online at http://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications.
2. DOT-FAA-TC-17/27, *Thermal Imaging for Aircraft Rescue and Fire Fighting Applications*, final report, dated May 2017. This report is available online at http://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications.

5 Principal Changes.

The AC incorporates the following principal changes:

3. Updated Forward Looking InfraRed (FLIR) requirements per 2019 National Fire Protection Association (NFPA) 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles*, language.
4. Incorporated DOT/FAA/TC-17/27, *Thermal Imaging for Aircraft Rescue and Fire Fighting Applications*, language regarding the performance of higher resolution and high contrast filter thermal imaging cameras.
5. Updated the format of the document in this version and made minor editorial changes throughout.

Hyperlinks (allowing the reader to access documents located on the internet and to maneuver within this document) are provided throughout this document and are identified with underlined text. When navigating within this document, return to the previously viewed page by pressing the "ALT" and " ←" keys simultaneously.

6 Use of Metrics.

Throughout this AC, U.S. customary units are used followed with "soft" (rounded) conversion to metric units. The U.S. customary units govern.

7 Where to Find this AC.

You can view a list of all ACs at http://www.faa.gov/regulations_policies/advisory_circulars/. You can view the Federal Aviation Regulations at http://www.faa.gov/regulations_policies/faa_regulations/.

8 Feedback on this AC.

If you have suggestions for improving this AC, you may use the Advisory Circular Feedback form at the end of this AC.

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CONTENTS

Paragraph **Page**

CONTENTS

Paragraph **Page**

TABLES

CHAPTER 1. INTRODUCTION

1.1 Background.

For airport operating certificate purposes, design Aircraft Rescue and Fire Fighting (ARFF) vehicles to yield an emergency response time of three minutes to a simulated accident on an airport runway, with the goal to get to the accident site in as little time as possible. During periods of poor visibility, ARFF vehicles are susceptible to increased emergency response times. The Driver's Enhanced Vision System (DEVS) program is aimed at four difficult aspects of poor visibility and response time:

1. navigating to the accident site,
2. locating the accident,
3. avoiding obstacles, and
4. locating humans on the way to the accident site.

Earlier research conducted by the FAA Technical Center as well as subsequent operational experiences at airports have demonstrated that DEVS can improve a driver's ability in these areas. More recent full-scale testing performed by the FAA Technical Center showed that all the thermal cameras evaluated were capable of identifying hot spots on the aircraft exterior resulting from a radiant heat source in the aircraft. These hot spots were shown to directly correlate with damage to the aircraft insulation from the radiant source. During the DEVS evaluations, the cameras with higher resolutions and high contrast filters outperformed the other cameras. Where DEVS is installed, drivers are required to receive training on DEVS operation.

1.2 DEVS Subsystems.

1.2.1 System.

DEVS is an integrated system consisting of three subsystems: low-visibility vision enhancement, navigation, and tracking. Depending upon their configurations and operational requirements, individual airports may be able to show safety benefits at a lower cost by utilizing a subset of the complete DEVS.

1.2.2 DEVS Components.

1.2.2.1 Low-Visibility Enhanced Vision.

Use a Forward Looking InfraRed (FLIR) device or other comparable state-of-the-art low-visibility enhanced vision technology for the Low-Visibility Enhanced Vision subsystem. The low-visibility enhanced vision capability will improve visual acuity and situational awareness in smoke, fog, or dark environments by utilizing thermal radiation instead of visible light. FLIR cameras can be configured to be sensitive to specific IR ranges, such as the shortwave IR range and the longwave IR range.

Thermal cameras convert IR (infrared radiation) into a false color (including grayscale) visual image. The image is representative of the temperature of the objects in the image. One noteworthy feature of thermal cameras is that smoke does not affect their operations the same way that color cameras are affected because smoke particles absorb IR and visible light. Smoke particles strongly absorb visible light, but only partially absorb IR radiation. This allows the IR radiation to pass through smoke and be captured by thermal cameras. Testing showed that heat or hot spots may not be visible on a thermal camera on the outside of a fuselage until the interior of the fuselage has reached a dangerous condition (i.e., presence of a large fire and the fuselage is about to be breached).

1.2.2.2 **Navigation.**

The purpose of the navigation subsystem is used to enhance the ARFF vehicle driver's awareness of the vehicle's location and to serve as an aid in locating the incident site. A minimum 12 channel Wide Area Augmentation System (WAAS) enabled or a Beacon Differential Global Positioning System (DGPS) will meet the specifications of this AC.

1.2.2.3 **Tracking.**

The purpose of the tracking subsystem is to transmit the vehicle position to the Emergency Command Center. The tracking subsystem may be integrated with the navigation subsystem through a data link. A tracking capability will reduce driver communications work load and improve the situational awareness of the driver and command and or dispatch personnel. This system also allows the operator to see and interact with other DEVS equipped vehicles.

CHAPTER 2. DEVS PERFORMANCE REQUIREMENTS

2.1 General.

The characteristics outlined in the following paragraphs are intended to serve as a set of minimal performance requirements for DEVS equipment used at airports. Navigation and tracking subsystems historically have been presented as individual subsystems. It is recommended that manufacturers that offer both of these functions, offer them as one integrated navigation/tracking subsystem for sponsors purchasing both of these subsystems.

2.2 Overall Requirements.

Design the DEVS system to operational without increasing driver workload or mandating an additional driver during an emergency response. Arrange the equipment installation so that the driver's view is not obstructed or it hampers the operation of any other ARFF vehicle system.

2.2.1 Vehicle Modifications.

Ensure installation of the DEVS system can be accomplished without requiring extensive modifications to the ARFF vehicle body, cab, or electrical system.

2.2.2 Power Requirements.

Ensure DEVS power is operational from the vehicle battery power bus for a minimum of one hour without adversely affecting other systems. Ensure vehicle-mounted DEVS equipment includes a dedicated power source that enables uninterrupted operation of the navigation system for one hour minimum without any external power source (i.e., external vehicle shore connection to conditioner/charger or vehicle alternator power). Design the ARFF vehicle battery power bus protecting installed equipment to withstand up to ±20 percent voltage variations from the nominal power bus voltage, alternator load dumps, voltage spikes/transients/noise and be protected from reverse polarity. Design the DEVS equipment installed at the Emergency Command Center (ECC) or other designated site to operate from a nominal 115 volts alternating current (VAC) power source and accommodate voltage variations up to ±20 percent of the nominal source voltage.

2.2.3 Equipment Environmental Protection.

Use exposed DEVS equipment capable of withstanding the same environmental conditions (weather, chemical, and otherwise) as that of the ARFF vehicle.

2.2.4 Equipment Repair.

Ensure the manufacturer maintains an inventory of spare parts/components so that any failure can be repaired within a maximum of 10 calendar days.

2.2.5 Video Recording.

The manufacturer may offer an optional (specified by the airport) video recording device and/or additional FLIR camera(s) to aid with accident investigation as well as training and evaluation of the system if specified by the airport. The manufacturer may offer an optional (specified by the airport) video recording device and/or an additional FLIR camera(s) to aid with accident investigation as well as training and evaluation of the system if specified by the airport.

2.3 **Quality Assurance.**

Follow best industry standards and practices to ensure the quality and workmanship of an installation. These practices generally include the following:

- secure all electrical connections by locking pin type plugs,
- ensure all wiring is loomed,
- equip all penetrations in the vehicle body with grommets or other guard to protect against wire chafing,
- seal all penetrations from the weather,
- seal all firewall penetrations,
- solder and then seal all splices with heat-shrinkable tubing (crimp connections are permitted if the proper crimping tool and connection terminals are used),
- color code and identify all wiring from end to end,
- label and illuminate all controls, and
- include complete “as built” wiring diagrams with each installation.

CHAPTER 3. LOW-VISIBILITY ENHANCED VISION SUBSYSTEM

3.1 Overall Requirements.

Ensure the low-visibility enhanced vision subsystem is operational within 30 seconds (or an alternate time that may be specified by the user based on operational considerations) and useful in 0-ceiling/0-mile visibility.

Provide a means for the subsystem to detect people, debris, wreckage, and equipment for the distances and conditions per Table 3-1 and Table 3-2.

Table 3-1. The DEVS Camera Requirements for Human Detection Distances

Distance (ft)	Ambient Temperature *	Humidity (%)	Camera Dynamics	Weather
500	-20 to 115°F	0 to 100	Moving 55 mph	Clear
500	-20 to 115°F	0 to 100	Moving 50 mph	Light Fog
400	-20 to 115°F	0 to 100	Moving 40 mph	Heavy Fog
400	-20 to 115°F	0 to 100	Moving 40 mph	Smoke
300	-20 to 115°F	0 to 100	Moving 35 mph	Rain/Snow

Note: * If winterization is necessary, extend the temperature performance range to at least -40°F (-40°C).

Table 3-2. The DEVS Camera Requirements for Aircraft Detection Distances

Distance (ft)	Ambient Temperature *	Humidity (%)	Camera Dynamics	Weather
2500	-20 to 115°F	0 to 100	Moving 55 mph	Clear
1000	-20 to 115°F	0 to 100	Moving 50 mph	Light Fog
500	-20 to 115°F	0 to 100	Moving 40 mph	Heavy Fog
500	-20 to 115°F	0 to 100	Moving 40 mph	Smoke
500	-20 to 115°F	0 to 100	Moving 35 mph	Rain/Snow

Note: * If winterization is necessary, extend the temperature performance range to at least -40°F (-40°C).

3.2 FLIR.

Confirm that the FLIR sensor can detect long wave (8 µm -12 µm) infrared (IR) energy. Design the sensor array to have a minimum resolution of 640 horizontal pixels by 480

vertical pixels. Ensure the camera has a high-contrast filter that will show low-contrast objects in a dynamic thermal scene and has an industry standard composite (with automatic gain and level control) or digital video output. The camera's minimum Horizontal Field of View (HFOV) and Vertical Field of View (VFOV) will be 27° (±4°) and 18° (±4°), respectively.

3.2.1 Mounting.

Mount the FLIR device with remote controlled pan and tilt capabilities so that the picture is clear and stable while the ARFF vehicle is in motion. Align the sensor line of sight with that of the driver. Do not compromise operation of the ARFF vehicle roof turret with the sensor mounting location.

3.2.2 Exposure Considerations.

Ensure the FLIR device and its housing is capable of withstanding the same outdoor environment as the ARFF vehicle (exposure to fire extingusihing agents, water, and dense smoke included). Design the FLIR device and housing with a means of clearing accumulated water and/or dust/debris from exposed optical surfaces without degrading the transmission quality.

3.3 **Display.**

If the display is not integrated with a DEVS computer, design the display with a 10-inch to 12-inch (254 mm to 305 mm) diagonal viewable image screen with a minimum resolution of 640 horizontal x 480 vertical pixels and capable of displaying industry standard composite video. A thin film transistor (TFT) liquid crystal display (LCD) is recommended because of its low power requirements and immunity to shock and vibration. Select a display with adjustable brightness and contrast controls accessible on the front panel.

CHAPTER 4. NAVIGATION SUBSYSTEM

4.1 Overall Requirements.

Ensure the navigation subsystem is capable of computing a vehicle position solution within 30 seconds (or an alternate time that may be separately specified by the user based on operational considerations). Confirm the ECC equipment is capable of generating Global Positioning System (GPS) correction messages continuously (24 hours/day, 7 days/week). Design the navigation subsystem to be accurate to at least 16 ft (5 m) 2D-RMS (Two-Dimensional Root Mean Square) - 95 percent of the time. Vehicle position updates via GPS are to be at least once per second. Ensure the equipment automatically initializes upon start-up is capable of withstanding vehicle shock and vibration. Ensure the system provides an integrity requirement that it is either working properly or down altogether, allowing no possibility of wrong/misleading information.

4.2 Vehicle Navigation Device.

4.2.1 GPS Receiver.

Ensure the vehicle GPS receiver:

1. accepts differential correction messages (internal WAAS capability or a Differential Service Provider)
2. is accurate within 6.6 ft (2 m)
3. uses these messages to compute a differentially corrected GPS position solution once per second
4. has a minimum 12 channel parallel type with all in view tracking capability
5. has accuracy within 16 ft (5 m) horizontal 2D-RMS-95 percent of the time.

4.2.2 Antenna.

Essential to the antenna are weatherproofing and a mounting position high in the center of the vehicle with a clear view of the sky.

4.3 Vehicle Computer.

Select a vehicle computer that:

1. provides reliable operation in an automotive type of environment
2. withstands exposure to shock, vibration, dust ingress, moisture, and periods of heat and cold that would adversely affect the operation of commercially available laptop portable personal computers
3. is capable of executing DEVS navigation software, interface GPS data from the GPS receiver, interface to the data link for transmit/receive to/from the ECC,

keyboard, mouse, and graphics interface for driving a display while maintaining a 50 percent throughput capacity reserve

4. is small and lightweight as possible
5. has a monitor that is touch screen capable.

If the computer is not panel or floor mounted, mount it on a full-motion bracket that allows it to be stowed.

4.3.1 Computer Ambient Environment Specification.

The following specification applies to the computer, keyboard, and display:

Operating temperature range:	-4°Fahrenheit (F) to 140°F (-20°Celsius (C) to 60°C)
Storage Temperature Range	-40°F to 167°F (-40°C to 75°C)
Dust resistance:	Protected against the ingress of dust that could adversely affect keyboard, data communications ports, and mechanical functions.
Humidity:	Operating: 95% relative humidity at 140°F (60°C).
Water resistance:	Resistant to dripping water arising from condensation and spills.
Vibration resistance:	Resistant to damage caused by ARFF vehicle vibration while in operation over rough terrain and firefighting activities (4.5g rms 5-500 Hz Sine).

4.3.2 Portable Computer.

The DEVS manufacturer may elect to use a laptop computer with an integrated display that mounts on a full motion bracket and meets all the requirements applicable to a panel or floor mounted computer. Route all cables required for interfacing the laptop computer to external equipment so that they will not interfere with the safe operation of the vehicle or limit the driver's vision through the vehicle windshield.

4.4 Vehicle Navigation/Mapping Software.

Ensure the information displayed on the map includes primary and secondary roadways, all surfaces of the airport movement area, fences, significant buildings, landmarks, and bodies of water. Provide software that allows the ARFF vehicle crew to store and accesses user-defined critical documents (for example: aircraft crash charts or hazardous material references). Other user defined information may be made available and displayed by providing the ability to turn on/off the information as required. Use mapping software display that is legible. Use system software that supports zooming, panning, and selecting a variable-sized area for full screen display.

4.4.1 Map Detail and Orientation.

4.4.1.1 **Level 1.**

This is the driving area (approximately one-half mile in front of the vehicle in the heading-up orientation). If the map is zoomed in or beyond this level, the vehicle icon remains fixed and the map is capable of translating and rotating to maintain this position with a heading-up orientation.

4.4.1.2 **Level 2.**

This level corresponds to the Airport Operational Area (AOA). The map translates and rotates to maintain a heading-up orientation.

4.4.1.3 **Level 3.**

This is the entire airport property, including unimproved access roadways, plus the area surrounding the airport up to the ARFF department's response radius. The map translates and rotates to maintain a heading-up orientation. As an option specified by the airport, the airport's grid map may be integrated at this level.

4.4.2 Visual Cues.

Display visual cues for proper map/vehicle orientation on the vehicle display. The following options are recommended and may be specified by the airport:

4.4.2.1 **Incident Location.**

Locates the incident via menu or radio button on the touch screen monitor.

4.4.2.2 **Routing.**

Determines a route from his/her location to the incident location by one of the following:

4.4.2.2.1 Pre-Loaded Route.

Allows the operator to create and store pre-defined routes (for example, fire hall to terminal #1).

4.4.2.2.2 Automatically Created Route.

Determines the quickest hard surface route from the vehicle location to the incident location.

4.4.2.2.3 Manually Created Route.

Provide system capability allowing the operator to touch the points between his/her location and the incident location to determine the route he/she will use.

4.4.2.3 **Navigation Support.**

Provide both visual and audible indications on the system to help the operator stay on course towards the incident.

1. Provide a system capable of providing an expected time of arrival (ETA), based on GPS, for both the next point/turn in the route and the final destination.
2. Provide a system capable of supporting the provision of audible voice commands to indicate the relative progress and instructions against the defined route. The voice may be male/female and may be turned off/on as required. Volume may also be altered as required.

4.4.2.4 **Staging Areas/Scenario Planning.**

Provide a system that allows the operator to preset and save scenarios such as staging areas for various scenarios/configurations. This will allow the operator to quickly set up the incident operation if the feature is selected.

4.4.2.5 **Drawing Tools.**

Ensure the system is capable of creating zones on the map and is able to attribute logic to these zones as required.

4.4.2.5.1 Incursion Areas.

Provide a system that supports the operator in setting up a zone as an alert for entry to airport movement areas (active runways, taxiways, and ramps) where an incursion could create a safety hazard.

4.4.2.5.2 Other Hazards.

Ensure the system supports the operator in creating areas via menus and the touch screen that are identified with obstacles and or obstructions (for example: hazards identified in Notices to Airmen (NOTAMs), foreign object damage (FOD), construction areas, snow and ice, standing water).

4.4.2.6 Only use a system that supports the configuration of any of the zones, routes, and areas to warn the operator if a route will cross these areas. With this option, the operator will be able to choose whether or not to accept/reject a warning via a radio button or menu on the touch screen display.

4.4.2.7 **CAD Layers.**

Ensure the system is capable of importing, storing, and displaying airport computer aided design (CAD) layers from the Airports Geographic Information System (GIS) located at https://airports-gis.faa.gov/public/index.html and uses the Airports GIS information as the basis to improve the operator's ability to display information critical to the accident location (for example: fire hydrants and underground power distribution).

4.5 Vehicle Radio Frequency (RF) Data Link.

If specified, integrate the vehicle data link control function within the vehicle computer (RF MODEM excluded). Use RF data link equipment capable of:

- receiving accident location and text messages data from the ECC.
- transmitting vehicle track data to the ECC.
- Transmitting asset request messages to the ECC.
- Receiving/transmitting informational text messages from/to the ECC that should display automatically on screen and be cleared and acknowledged (to the ECC) with the touch of a button.

For the radio data link, use frequencies that are approved for use on the airport by the Regional FAA Spectrum Management Office. Additionally, provide equipment that meets all applicable Federal Communications Commission (FCC) requirements per Title 47, Telecommunications, Part 15, Radio Frequency Devices, and any additional requirements imposed by the FAA Spectrum Management Office. Mount antennas on the vehicle where they do not interfere with or are shadowed by any external equipment.

4.6 Vehicle Display/System Control.

Provide a display:

1. with at least 256 colors and adjustable brightness and contrast controls on the front panel
2. with a 10-15 inch (25-37 cm) diagonal viewable image screen with a minimum of 640 horizontal x 480 vertical pixels
3. that is easily readable in bright daylight since its location is likely to be near the vehicle windshield
4. with an adjustable brightness range to prevent visual impairment of the driver at night.

The manufacturer may shield the display from ambient light to ensure maximum readability. A cathode ray tube (CRT) type of display is not permitted for the ARFF vehicle. Supply a display that is resistant to the effects of vehicle operation (shock, vibration, humidity, dripping water, and dust/smoke) per the computer requirements in paragraph 4.3. A Transparent Window Display System (TWDS), a Head Up Display (HUD), or an industry standard head down display (if mounted near natural line of sight) may be used. Ensure the display can be seen easily by the driver while not obstructing the view from the vehicle windshield and require minimal operator intervention to control (a touch screen display is highly recommended). Use a display with an industry standard digital format and interface with the vehicle computer.

4.7 Optional DGPS Base Station GPS Receiver.

Use a DGPS base station GPS receiver with an all-in view tracking receiver and a minimum of twelve parallel channels. Supply a differential corrections receiver (if not integrated with the GPS receiver) that output differential correction messages via an industry standard serial data link to the ECC computer. Ensure the DGPS position accuracy is within 16 feet (5 m) 2D-RMS-95 percent of the time and computes a position solution at least once per second. Mount the GPS and DGPS antenna with a clear view of the sky on a survey monument or a surveyed position with an accuracy of ±3 feet (0.9 meters).

Note: WAAS based GPS receivers do not require a separate antenna.

4.8 ECC Computer.

The ECC computer and application software/hardware provides interaction with all DEVS equipped vehicles during an incident. The ECC computer may be designed for either fixed or mobile operation (specified by the airport).

4.8.1 Mobile ECC.

If the ECC is mobile, the computer requirements in paragraph 4.3 are applicable.

4.8.2 Fixed ECC.

If the ECC is at a fixed location within a climate-controlled building, a commercially available personal computer (PC) will be adequate. Ensure the PC:

1. is capable of supporting the tracking software requirements and any log, temporary, or scratch files required during program execution
2. is capable of seamlessly enabling program execution and general computer housekeeping functions
3. is expandable to support future requirements
4. supports connector jacks (example: universal serial bus (USB or EIA-232)) available to enable connection and operation of the GPS receiver, differential receiver (if not integrated with the GPS), and any external data required for wireless data vehicle tracking data or other communications.

Supply a graphics processor circuit card capable of supporting vehicle tracking functions. A portable computer may be used for this application if the display and data port configurations are adequate.

4.9 ECC DGPS Software.

The software controls the flow and timing of DGPS correction messages from the base station receiver to the data link equipment. This control software is not required at the ECC if the DGPS function is integrated into the vehicle GPS receiver/computer.

4.10 **ECC Radio Data Link.**

Provide a radio data link that is capable of transmitting DGPS (not applicable to WAAS enabled GPS receivers or equipment with integrated differential receivers) correction messages and any other command center data messages with built-in error checking or correcting codes. Provide a radio that is capable of transmitting RF output power to broadcast correction messages and other data to the extremes of the normal expected response area which may vary with the airport topography. Consult with Regional FAA Spectrum Management and FCC rules regarding available frequencies and maximum transmit power levels prior to operation of any radio data link on the airport. In addition, supply equipment that meets all applicable FCC requirements per Title 47, *Telecommunications*, Part 15, Radio Frequency Devices, and any additional requirements imposed by the FAA Spectrum Management Office. Mount antennas on the vehicle where they will not interfere with or be shadowed by any external equipment.

4.11 **ECC Display/Control.**

These requirements pertain to the display/control equipment if the ECC computer is not an integral part of the DGPS base station GPS receiver.

4.11.1 Mobile ECC.

If not integrated with the ECC computer, locate the display a minimum of 14 diagonal inches (356 mm). A CRT display is not permitted for mobile use. Select a display that is resistant to the effects of vehicle operation (vibration and shock) per the environmental requirements in paragraph 4.6.

4.11.2 Fixed ECC.

If not integrated with the ECC computer, the display may be a commercially available type to the latest industry standard display resolution.

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CHAPTER 5. TRACKING SUBSYSTEM

5.1 General.

Provide a tracking subsystem that is capable of obtaining the vehicle position data from the navigation subsystem and reporting the vehicle position to, and exchange messages with, the ECC within 30 seconds (or an alternate time that may be specified by the user based on operational considerations) after system initialization. Select one that is able to track a minimum of 50 vehicles simultaneously with 3 second maximum position updates to the ECC/base station and that is automatically initialized upon start-up while requiring minimal operator actions or intervention.

5.2 Vehicle Tracking Software.

Ensure the vehicle tracking software:

1. computes and formats its vehicle track data position
2. reports to the vehicle computer a minimum of once every 3 seconds
3. is capable of transmitting airport definable asset request messages (police, fire, ambulance), position markers, and special messages to the ECC by touching a single button
4. indicates current vehicle location and track with an icon on the vehicle map display
5. displays vehicle track history with icons that is included and selectable by the vehicle driver or DEVS operator.

5.2.1 Accident Site Location.

Provide vehicle tracking software (or a related software module) that generates an icon (either manual or automatic) and provides for automatic generation in conjunction with other data sources such as ground based radar and aircraft emergency locators (if available) that indicates accident site, or direction and distance to the accident site (if site is off map) should be displayed.

5.2.2 Text Message.

Ensure informational text messages from the ECC displays automatically on screen and is cleared and acknowledged (to the ECC) with the touch of a button.

5.3 ECC Tracking Software.

Provide ECC tracking software that displays the locations of DEVS equipped ARFF vehicles and other equipped vehicles on a digital map of the airport surrounding area, including information on the map that identifies primary and secondary roadways, all surfaces of the airport movement area, fences, and significant buildings, landmarks, and bodies of water or any other obstacles. Other information may be displayed, but consideration should be given so that the map is easy to interpret. Ensure the mapping

software has the capability of zooming, panning, and also selecting an area for full screen display.

5.3.1 Map Detail:

5.3.1.1 **Level 1.**
This is an area approximately one-half mile around the vehicle.

5.3.1.2 **Level 2.**
This level corresponds to the AOA.

5.3.1.3 **Level 3.**
This is the entire airport property, including unimproved access roadways, plus the area surrounding the airport up to the ARFF department's response radius. As an option, the airport grid map may be integrated at this level and specified by the airport.

5.3.2 Map Icons.
Icons indicate vehicle positions and have an identification tag. They also update with changing vehicle track data to indicate locations or show a track history and the last position and direction of the vehicle (if outside the map boundary).

5.3.3 Visual Cues.
Display visual cues on screen for proper map/vehicle orientation.

5.3.4 Incident Location.
Provide the operator with the ability to view the incident location via a radio button or menu on the touch screen monitor.

5.3.5 Routing.
Provide the operator with the ability to determine a route from his/her location to the incident location via one of three means:

1. Pre-loaded route: provide the capability of allowing the operator to create and store pre-defined routes (i.e., fire station to terminal #1).
2. Automatically created route: provide the capability to determine the fastest hard surface route from the vehicle location to the incident location.
3. Manually created route: provide the capability to allow the operator to touch the points between his/her location and the incident location to determine the route to be taken.

5.3.6 Staging Areas/Scenario Planning.
Ensure the system allows the operator to preset and save scenarios such as staging areas for various scenarios/configurations. This will allow the operator to quickly set up the incident operation should he/she choose to use this feature.

5.3.7 Drawing Tools.

Ensure the system allows an operator to create zones on the map and the ability to attribute logic to these zones as required.

5.3.7.1 **Incursion Areas.**

Provide the operator with the ability to set up a zone to remind him/her of a dangerous area such as the approach from the non-active side of a stop bar, when his/her vehicle enters the pre-defined zone or EMAS systems located at the end of runways.

5.3.7.2 **Hazards.**

Be sure the system identifies areas with obstacles and or obstructions such as but not limited to FOD, NOTAMs, snow and ice, standing water, etc., that are easily located using the touch screen.

5.3.7.3 Ensure the system has the ability to setup any of the above zones and areas to warn the operator if a route, per the descriptions above, will cross through one of these zones/areas. Provide the operator with the choice on what to do with this warning (i.e., accept and be re-routed around or continue through).

5.3.8 CAD Layers.

Ensure the system is be capable of storing and displaying airport CAD layers for the purpose of improving the operator's ability to see critical information such as but not limited to fire hydrants, underground utilities, topography etc.

5.4 **ECC Data Link.**

Provide the capability of receiving ECC tracking data link position reports, position marks, and asset request messages from vehicles; transmit accident location and text messages to vehicles; and transmit power to reach to the extremes of the normal expected response area which may vary with the airport. Use FAA Regional Spectrum Management and FCC approved communications frequencies, interface with the ECC computer, and employ industry standard error checking algorithms (check sums, parity checks) to ensure correct message receipt and transmission as well as a message transmission handshake.

Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) mailing this form to Manager, Airport Engineering Division, Federal Aviation Administration ATTN: AAS-100, 800 Independence Avenue SW, Washington DC 20591 or (2) faxing it to the attention of the Office of Airport Safety and Standards at (202) 267-5383.

Subject: AC 150/5210-19B Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

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☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____
_____
_____

☐ Other comments:

_____
_____
_____

☐ I would like to discuss the above. Please contact me at (phone number, email address).

_____
_____
_____

Submitted by: _____ Date: _____