

Task Analysis for the Troubleforce Expert

Resources

- <https://wiki.robot.car/pages/viewpage.action?spaceKey=TROUBLE&title=Troubleforce+Team+Roles+and+Schedules>
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Administration

Task 1. Prepare for the day

1. Clock in to Calamari.
 - 1.1. Locate a tablet.
 - 1.2. Scan the QR code.
2. If you are the supervisor, conduct a peer review. (This takes about 20 minutes.)
 - 2.1. Review the previous shift's tickets to determine discrepancies.
 - 2.2. Handle any discrepancies.
3. Log in to your laptop.

ProTip: Set up your layout from left to right to maintain efficiency. The apps that you have open will be based on the type of tickets that you take. Generally, night shift takes more behavior tickets because that is when we run operations. Day shift usually handles more technical tickets because that is when we test our AVs.

4. Open Looker (<http://looker.robot.car>) // Might not be necessary. This is being replaced by Hat for most TF Experts.
 - 4.1. This is used for audio files and SVC issues. These are 20 second clips of a behavioral issue.
5. Open Slack.
 - 5.1. Ensure you have access to the needed channels.

- 5.2. ProTip: Set up the double Slack view for two channels.
 - 5.2.1. Right click on the channel..
 - 5.2.2. Select Open in Split View.
 - 5.2.3. Click #delta_field_support.
6. Open Hat. (<http://hat.robot.car>)
 - 6.1. Click Occurrences
 - 6.2. Click Open Tickets or Assigned to Me
7. Open Starfleet. (<http://starfleet.robot.car>)
8. Open Starfleet Issue Triage in a new tab.
 - 8.1. Click the three bars to expand the menu.
 - 8.2. Go to Maintenance > Issue Triage (<http://starfleet.robot.car/issues>)

This displays the live tier of issues. It is recommended that you bookmark this page.
9. Open Starfleet Issue Tracker in a new tab.
 - 9.1. Click the three bars to expand the menu.
 - 9.2. Go to Maintenance > Issue Tracker (<http://starfleet.robot.car/tracker>)

This displays the list of issues that cars encounter along with associated SOPs for mitigating those issues. It is recommended that you bookmark this page.
10. Open these apps for AVBE tickets
 - 10.1. Open the Remote Assistance / Session Viewer.
 - 10.2. Open Raven Occurrences
 - 10.3. Open Cartographer
 - 10.4. Open Google Maps.
11. Launch Raven Queue - Starfleet Issue tracker. They are creating a report of the behaviors, or a specific bag, timeline of events.
 - 11.1. Identify items that need help immediately - Safety critical and avoidance area placement. If VRE, must place an AA within 5 minutes.

Shift Differences

 - Day shift and night shift operate differently.
 - Most VREs happen at night. During the day there are 10 cars, at night over 200 across markets.
12. Observe market specific Slack Channel (#delta_field_support)

Shift Differences

- #troubleforce-behavior-support
- #sfo-behavior-support
- #aus-behavior-support
- #phx-behavior-support

13. VRE Ticket Queue - (30 minutes after the VRE, it is submitted on Jira. // Move to after VRE.

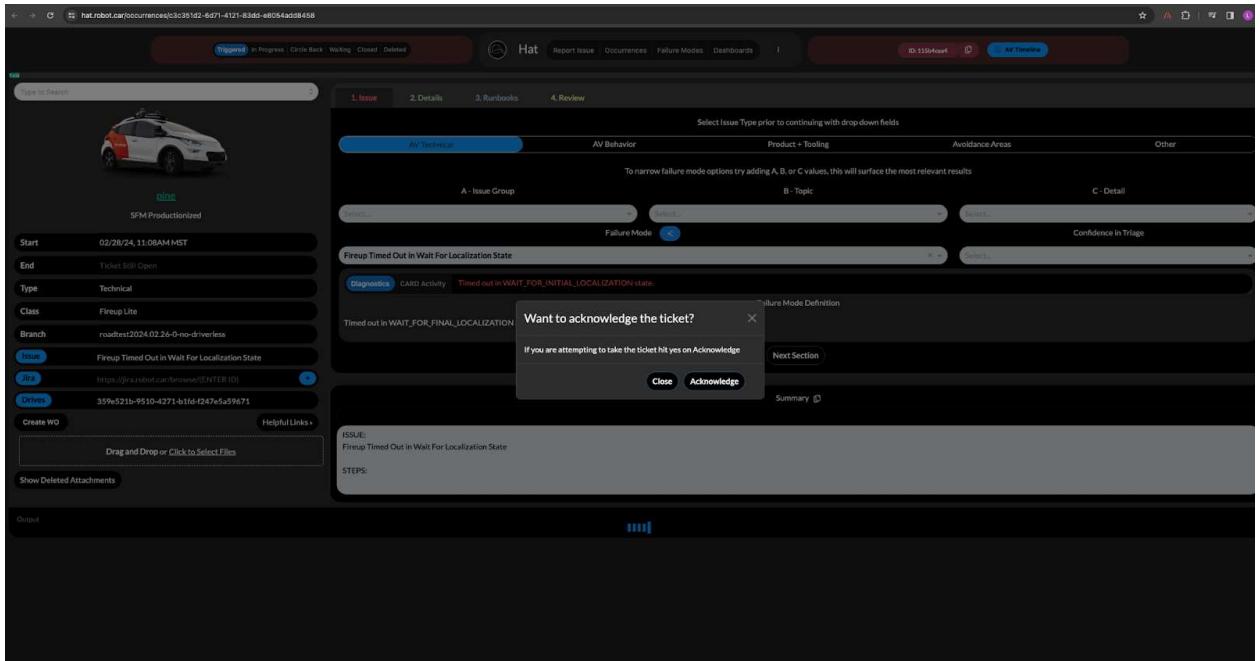
Task 2. End the Day

1. Review all tickets that you resolved for the day.
 - 1.1. Go to Expert Self Review.
 - 1.1.1. Go to the Looker > Home > Expert Self Review.
 - 1.1.2. If you are on day shift, go to day-troubleforce for hyperlinks.
 - 1.2. Ensure that all items are finalized.
2. Slack any incomplete tickets to the team.
3. Report your hours.
 - 3.1. Go to Calamari.
 - 3.2. Enter hours.
 - 3.3. If it is the end of the week, report hours on VNDLY.
4. Clock out using one of the QR codes that are located around the building.

Operations

Task 3. Handle a ticket

1. Go to Hat > Occurrences.
2. Review the Open occurrences.
3. Click Open on the Occurrence that you want to select. A dialogue box will appear: "Want to acknowledge the ticket?"
4. Click Acknowledge.



5. Review the ticket information.
6. Determine if the ticket is related to a technical or behavior issue.
 - 6.1. If the issue is related to how the AV behaves while driving autonomously, it is behavioral.
 - 6.2. If the issue is related to startup, mechanical, or electrical aspect of the vehicle, it is technical.
7. Verify the ticket type.
 - 7.1. Look at the Occurrence Type in Hat.
 - 7.2. If the Occurrence Type is Technical, but should be Behavioral, cancel the ticket and have the reporter submit a new ticket. (How do you cancel a ticket?)
 - 7.3. If the ticket is marked Technical but it is ALSO Behavioral, then have the reporter also file a separate behavioral ticket for the behavior issue, or escalate to a supervisor for guidance
8. If the ticket is technical, go to Task: [Handle a Technical Ticket](#).
9. If the ticket is behavioral, go to Task: [Handle a Behavior \(AVBE\) Ticket](#).)

Task 4. Handle a Technical Ticket

1. Go to the Slack channel **#troubleforce_support**.
2. Look for posts with the Cruise logo. There will be a link to the actual occurrence.

The post may include the following details:

- **AV** - the name of the vehicle.
- **Fleet** - The fleet name that the vehicle is assigned to

- **Location** - Where the vehicle is located.
- **Reported By** - This can be either a person or a fleet operations
- **Status** - This will always be uncategorized. Cruise is working on this being auto triaged.
- **Issue Class** - Where in the phase did the issue occur.
- **Branch** - This lets us know what software is on the car. These are referred to as tags and they have the date commit listed next to the name.
 - **Roadtest** - Created daily with new changes and improvements (Example: roadtest2023.01.05.0-0)
 - **Staging** - hardening and going through further validation of stable code (Example: staging2023.01.05.00-01.00)
 - **Production Supervised** - Hardening and close in nature to driverless to get more insight into expected performance (Example: 2023.01.05.00-01.00)
 - **Delta** - Driverless branch (Example: delta/driverless2023.01.05.00-01.00 and market specific cuts - phx/driverless2023.01.05.00-01.00 and aus/driverless2023.01.05.00-01.00)
- **Drives** - This link takes you to drives.robot.car. This is a site to view the full length of the drive including a live map of where it went and events that occurred.
- **Notes** - This includes clarifying information that others have entered. It is blank by default when it is auto reported.
- **The Thread** - Below is a thread of comments.
 - The thread keeps the comments organized. It lets everyone know who is working on the issue and where they are. To start a thread, click reply to thread. This includes next steps that are required for the AV. A lot of the phrases are acronyms (for example PLS - please, PC - power cycle, RLS - Relaunch Stack).

The general process is

1. Power on the computer.
2. Power on the Stack.
3. Conduct a System Test - either Fire up, Fire Up Lite, or Fire Up Ops.
4. Vehicle Launch - either Driverless or Supervised.
5. Make it a safe stop where it is no longer engaged. You may also see maintenance issues such as windshield wipers, headlights, etc.

3. Check the Slack channel #troubleforce-team for shift hand-off and notes from colleagues and current training items.

#troubleforce_team

The team channel has all team updates and manages downings. Some updates occur automatically. You will also see reminders, post handoffs, and updates from the shift engineers.

AVBE Channels

- #delta_field_support - where HALOs come in
- #troubleforce-behavior-support - used for Raven occurrences

4. View the issue in Slack.
 - 4.1. Go to the Slack channel. Often it is #troubleforce_support.
 - 4.2. Copy and paste the Occurrence ID (Example: Occurrence #0C131d76b) into Slack to find the channel for that incident. The information between Slack and Starfleet will largely be the same; however, Starfleet will update when more information comes in, while Slack will not.
 - 4.3. Acknowledge that you are taking the ticket.
 5. Verify the categorization.
 - 5.1. View the Failure Mode column for the ticket on the Issue Triage page.
 - 5.1.1. It may take 10 or 15 seconds for the failure mode to come in. You may refresh the page to speed this along.
 - 5.2. If the Failure Mode column is auto populated, switch the status to Mitigating. The “Reported by” column will also say “Automated.”
- Fireups and safestops are automatically categorized. It's common to see certain issues appear repeatedly for a few weeks. Often this is a software issue. Therefore, when the software is updated, the issue will not be seen again. Another issue repeated for a while.
- 5.3. If the Failure Mode column is “Uncategorized”, categorize the ticket.

Categorize

6. Categorize the ticket.
 - 6.1. Review the notes in the Slack ticket for keywords that will help you identify the failure mode.
 - 6.2. Get clarification from the AVTO by asking questions or requesting screenshots as needed.
 - 6.3. Go to the Issue Tracker page to find the correct failure mode.

The Issue Tracker page is where all failure modes are housed. It will have some filters applied. Common ones are filter by status = Active, and Filter by type = Technical.

- 6.4. Type in the key words from the Slack ticket into the search bar.
- 6.5. Look for the most closely aligned issue. This may not be exact.

Example

A search for “blinking” may show several items. Some are related to the ADSC while others are not. You may see blinking 1 second or more. You may need to confirm with the operator if the issue is related to the ADSC.

- 6.6. Go to the Starfleet > Occurrence page.
- 6.7. Find the **Edit details** button located on the right side of the screen above the first hard line.
- 6.8. Click the Edit details button.
- 6.9. Update the details as needed:

Failure Mode - This is a very long list. Start typing and the list will display the modes that include the words you entered. If you need more thorough search, go to the Issue Tracker page.

Status - We like to keep the status updated. Here are a following:

Acknowledged - Use acknowledge when it is accepted.

Mitigating - Used when you are ready to take action.

Resolved - Used when it is complete.

Waiting for Customer - This can be used if the customer does not respond for about 5 minutes. This removes the waiting time from the active time to give us a more accurate troubleshooting time.

Deleted - Exclusively used for duplicate tickets. We do not want the issue to be bigger than it is. There should only be one ticket per instance. If there are three distinct issues on a vehicle, there should be three separate tickets.

Backlog -

Diagnosing -

Validating -

Mitigating - The Tech Support

Resolved - the issue has been solved.

Waiting for Customer -

Recovery Type - For driverless cars only

Recovery Location - For driverless cars only.

Troubleforce Degraded State - This field is no longer used.

SOP Adherence - Used for better search criteria. [Followed SOP / Deviated from SOP]

Outcome - Used for better search criteria. [Released AV / Downed AV]

Last Action Result - [Issue Resolved / Issue Unresolved]

Assigned to - Auto generated based on who submitted the issue. You can change this field. There should only be one person assigned.

Component - Automatically populated when you identify the failure mode. This field disappears when a failure mode is assigned.

Occurrence Class - This is a lengthy list. Sometimes it is auto generated if it is an automated issue. Otherwise it is based on the reporter's discretion.

Field Report - This is the URL or ID. It is not always needed. Adding a JIRA ticket to the issue.

Resolution Summary - Notes from the reporter are displayed automatically. This shows a description of the issue and steps taken.

Drive ID - Automatically populated.

Git Branch - Automatically populated.

Location - This is where the issue occurred, not where it was resolved. You may need to change this if it is not accurate.

7. Find the SOP.

- 7.1. Go to Issue Tracker.
- 7.2. Type the Failure Mode into the search bar.
- 7.3. Click the Failure Mode.

Troubleshoot a Fleet Vehicle

8. Troubleshoot a fleet vehicle.

- 8.1. Determine the type of vehicle using the following table.

Type	Conditions
Productionized Supervised	If any of the following apply: <ul style="list-style-type: none">• The fleet name contains the word 'Productionized'• The Branch ends in '-no-driverless'• WOs show productionization completed
None-Productionized Supervised	If the fleet name contains 'Market' or there are no signs of productionized fleet present
Mercury (Walmart) Delivery	This could be productionized, non-productionized, supervised, or driverless
Driverless	If the Fleet name contains 'Driverless' or the Branch contains 'delta' or 'driverless'

- 8.2. If the vehicle is Productionized Supervised:

- 8.2.1. Unable to perform ANY local commands at any time
- 8.2.2. Only able to perform remote actions while AV is connected to facility wifi (.cruiseauto)
- 8.2.3. DO NOT have operators PC in the field (they will be unable to stop stack first, and won't be able to start it again after the PC)

- 8.3. If the vehicle is **Non-Productionized Supervised**:
 - 8.3.1. Able to locally connect to ADSC (for Ciborg, CARD, SSH, etc...)
 - 8.3.2. Able to RLS and PC in the field
- 8.4. If the vehicle is **Mercury (Walmart) Delivery**:
 - 8.4.1. Ask if the AV is on a delivery.
 - 8.4.1.1. If so, postpone mitigation actions (if able) until delivery is done
 - 8.4.1.2. If not, continue regular mitigations according to type of AV
- 8.5. If the vehicle is **Driverless**:
 - 8.5.1. All productionized context applies to Driverless (all driverless cars are productionized)
 - 8.5.2. If the AV is in the garage, then treat it like a regular productionized vehicle.
 - 8.5.3. If the AV is in field and there is nobody to perform instant mitigations:
 - 8.5.3.1. Look to see if the AV has self-recovered from the safe stop and release/close ticket if so.
 - 8.5.3.2. If not, look in the #driverless_drives channel for the VRE thread. Mitigation actions will be taken by FSR or pit crew teams.
 - 8.5.4. In the VRE thread, inform the FSR teams right away whether they can attempt an IFL (in field launch) or if they need to RTB (return to base).

Validation and Mitigation

9. Provide the Validation steps. The purpose of the validation is to ensure that we have the correct failure mode.
 - 9.1. Go to the Validation Step.
 - 9.2. Follow the instructions noted in the SOP depending on if the validation step worked or not. If the validation worked, often this is to provide the mitigation steps..
 - 9.3. Click the hyperlink for the SOP category.
 - 9.4. Review the diagnostic to ensure that the diagnostic message in the ticket is similar to the one on the SOP.
10. Determine if a Minimum Equipment List (MEL) is required.
 - 10.1. Look at the tags.
 - 10.2. If a MEL is required, copy the MEL tag and paste it into the Resolution Summary.
 - 10.3. You will need to submit a queued work order. The WO operates similar to how it does today, Scheduled date can be leveraged though to provide the target dates. Once the WO is closed the MEL is closed with it.
11. Provide the mitigation steps. (See also Task: [Provide Mitigation Steps](#))
 - 11.1. Locate the Mitigation steps on the SOP.
 - 11.2. Copy and paste the Mitigation steps from the SOP into the Slack thread for that ticket.

- 11.2.1. This will become a back and forth conversation with the AVTO as they work to resolve the ticket. Follow other directions noted in the SOP.
- 11.2.2. Write additional details as needed. You may need to update the status in Starfleet as you work with the AVTO.
- 11.2.3. Provide as many mitigation steps as possible by following the SOP.
- 11.3. Confirm with the AVTO that the vehicle is operating to standard.
- 11.4. Determine how to handle the AV.
 - 11.4.1. If the AV is operating to standard, finalize the ticket.
 - 11.4.2. If the AV is not operating to standard, but can continue operating, submit a "queued work order." This is the same as a normal work order but the status is queued. Once a WO is "in progress" that automatically switches the AV to the DOWN status.

The dialog box is titled "Create work order from occurrence". It contains the following fields:

- Work Order Name:** No Avoidance Areas Received From Dos Equis (#9547561cd)
- Description:** Failure Mode: No Avoidance Areas Received From Dos Equis
Failure Mode Class: Full Fireup, Fireup Ops, Fireup Lite
Failure Mode Component: Infrastructure
- Status:** Queued
- Facility:** Milford Proving Grounds
- Jira Ticket ID:** ENG-95025

At the bottom right are two buttons: "Cancel" and "Save".

- 11.4.3. If the AV is not operating to standard, it should be taken out of service. Down the AV. (See [Task: Down an AV](#))

Finalize

- 12. Finalize the ticket.
 - 12.1. Go to the Ticket Details.
 - 12.2. Set the SOP Adherence - [Followed SOP or Deviated SOP].
 - 12.3. Set the Outcome - [Released or Downed AV].
 - 12.4. Set the Last Action Result to Issue Resolved.
 - 12.5. Enter the occurrence class.
 - 12.5.1. For Automated tickets, the occurrence class should be filled out.
 - 12.5.2. If the occurrence class is not filled out:

- 12.5.2.1. Go to the SOP.
 - 12.5.2.2. Find the Issue Class.
 - 12.5.2.3. Copy or type the issue class into the Occurrence Class field.
 - 12.5.2.4. Select it from the drop down menu.
- 12.6. Enter the resolution summary.
- 12.6.1. Document the steps taken using the format below.

ISSUE: Lorem ipsum
Outcome: Lorem ipsum

Example

```
issue:  
stack not launching  
Error mounting disk - Insert report failed  
  
outcome:  
Attempt stack launch with EXT Disks toggled off in ciborg,  
AV failed stack launch for different issue, operator to report new ticket
```

- 12.7. Click the **Save** button on the Edit Details page.
- 12.8. Ensure all items are documented.
- 12.9. Handle the Mitigation Actions.
 - 12.9.1. Scroll down to the Mitigation Actions.
 - 12.9.2. Click each of the mitigation steps. It will say the current value and the updated value. Click Update.
- 12.10. Attach any screenshots or other documentation using the blue Attach file button.

AVBE Tickets

- ⊕ AVBE Discovery Hub - Tags Management
- ⊕ VRE Tier 1.5 Symptom Categories - Study
- ⊖ VRE Process (BF)
- ⊖ Trending AVBE tickets
- ⊖ Issue Escalation PagerDuty

Task 5. Handle a Behavior (AVBE) Ticket

1. Acknowledge the Issue.
 - 1.1. If Raven Queue, type “Acknowledge” on the Slack channel.
 - 1.2. If on Slack Channel (#delta-field_support), it comes in as a HALO notification. It has the AV name and Market that it is in.
 - 1.2.1. Click on the channel.
 - 1.2.2. Manually type “Acknowledge.”
2. Review the issue details.
 - 2.1. AV name
 - 2.2. Model
 - 2.3. Market
 - 2.4. AV Mode
 - 2.5. Scene Context - This tells you what state the AV is in. Provides brief context.
 - 2.6. Coordinates - This helps you know where it will be recovered from.

Common Issues

- VREs are very important and we must be on top of this.
- Raven Occurrences -
 - Avoidance area requests, hard breaking, swerving maneuvers, pedestrian interactions, emergency vehicle interactions, mapping issues,
 - Stuck at railroad, false positive DPV maneuvers (going around false double parked vehicles).

3. Determine the type of issue:
 - 3.1. Customer Feedback.
 - 3.2. RA Feedback

- 3.3. AVTO feedback.
 - 3.4. Non-urgent AA Request
4. Handle Customer Feedback
 - 4.1. Determine if it is a quick close.
 - 4.1.1. This is an item that can be resolved quickly (Bad drop off, bad pickup, Looping around a point, inefficient route).
 - 4.2. If it is a quick close:
 - 4.2.1. Do what is necessary to resolve the issue.
 - 4.2.2. Close the ticket.
 - 4.2.2.1. Enter failure mode
 - 4.2.2.2. Set the status to Resolved.
 - 4.2.2.3. Select Update.
 - 4.3. If it's not a quick close:
 - 4.3.1. Review the drive.
 - 4.3.2. Work with CS personnel to get pickup and drop off details from the person who submitted the ticket. (Time, Date, etc that can help you narrow down where the issue occurred.)
5. Handle RA Feedback
 - 5.1. Look up the session in RA Session Viewer.
 - 5.2. If they submitted a link:
 - 5.2.1. Copy the line from the last backslash.
 - 5.2.2. Paste the copy into the RA session viewer.
 - 5.2.3. Control Click the Session ID link to open it in a new tab.
 - 5.3. If not link submitted:
 - 5.3.1. Look for the AV name in Session Viewer.
 - 5.3.2. Look for the Operator who submitted it
 - 5.3.3. Compare the time that it was submitted..
 - 5.4. Copy the URL for the new tab.
 - 5.5. Paste it into the Raven Support (#troubleforce-behavior-support)
 - 5.6. Review what they are requesting and determine what steps need to be taken.
6. Handle AVTO Feedback
 - 6.1. Find the drive link.
 - 6.1.1. Use filters to find the vehicle.
 - 6.2. Click the drive link.
 - 6.3. Copy the URL and paste it into the Slack thread.
 - 6.4. Acknowledge the ticket and wait for the drive to be uploaded.
 - 6.5. When uploaded, continue to review the issue.

7. Handle Non-urgent AA request.
 - 7.1. Ask the AVTO if an AA is required. It may require an AA if there is an emergency vehicle in the
 - 7.2. Create the AA.
8. Handle VRE.
 - 8.1. See documentation. New hires will not be required to perform VREs for several weeks.
9. Handle a Raven Occurrence.
 - 9.1. Appears as a TARS 3000.
 - 9.2. Manually type on the thread to acknowledge.
 - 9.3. Click on the Raven Occurrence link to go to Starfleet.
 - 9.4. Acknowledge again.
 - 9.5. Evaluate the Issue.
 - 9.5.1. Review the ticket information.
 - 9.5.2. Review the behavior description (ie. the av is looping around the block.)
 - 9.5.3. Look at the time stamp and Drive link.
 - 9.5.4. Look at the Drive link - This is the footage. It may not be accurate time.
 - 9.5.5. Identify if the behavior listed is accurate.
 - 9.6. Use resources to resolve the ticket.
 - 9.6.1. Use Cartographer to route the AV.
 - 9.6.1.1. Look for lane boundary violations.
 - 9.6.2. Contact mapping.
 - 9.6.3. Use WebViz to access the Lidar and Radar.
 - 9.7. Resolve the ticket.
 - 9.7.1. Determine the failure mode.
 - 9.7.2. Go to Starfleet > Edit details.
 - 9.7.3. Create a Resolution Summary using the format.

AVBE Analysis

Summary:

 Lorem ipsum

Tags:

 Lorem ipsum

Outcome:

 Lorem ipsum

- 9.7.4. Attach tags. This is a text note.

Examples

- [VRE]
- [1201-Ingress]
- [Notable] - This deserves something to highlight.

- 9.7.5. Describe the outcome. (ie, “Issue has been triaged.” “No further action.” “Supervisor is aware. Pager duty is...”)
- 9.7.6. Update Status to Resolved. If resolved, it drops off of the queue.
- 9.7.7. Click Save.
- 9.7.8. Go to the next ticket.

RIM (Release and Issue management) - See [RIM Driverless Issue Management](#).

Commercial Logging - help record only when it is needed– near miss,

ORCA - On Road Catch All - These are escalations that are made for Emergency Vehicles (EV) or Law Enforcement Officers (LEO).

Confluence: Expert Resource AVBE

Task 6. Create an Avoidance Area

You should be familiar with the Cartographer layout.

- Icons
 - Lane look - gives all potential photos of that area.
 - Draw Polygon - allows you to draw avoidance areas.
 - Draw Avoidance Area - This is specifically for a planned event (ie, basketball game)
 - Measure - Check the distance between two spots. Useful for determining distance if a vehicle tried to initiate a lane change when a vehicle is too close.
 - Lasso Select - NA
 - 3D View - NA
- Filters -
- Keyboard Shortcuts
- Layers
 - Mainly use
 - Traffic sign - shows traffic sign.
 - Traffic sign link - shows which lane the traffic light is connected to.
 - Traffic Sign 3D - Shows where the real sign is located in the world.
 - Speed Limit Sign - Shows the speed limit traffic sign.

- Avoidance Area Impacted Lanes -

1. Find the AV's location.
 - 1.1. Ask the requestor for the coordinates—often this is the AVTO, RA, or Ops.
 - 1.2. If the coordinates are not known, identify the location manually either by RA, cross streets or adding in the Raven ticket to fill in missing information.
 - 1.2.1. Enter the location in Google maps.
 - 1.2.2. Right click on the map location to copy the coordinates.
 - 1.2.3. Paste the coordinates into the Cartographer search bar.
 - 1.2.4. Press enter.
2. Determine the size and position of the avoidance area.

You'll need to make a judgment call. Small items such as a pothole may only need a PAA.

- 2.1. Determine the size of the AA. The goal with an Avoidance Area is to make it large enough to avoid the issue with minimal impact to AV routing. Check for branching lanes. You may be able to block a turning lane but allow the vehicle to continue forward.
- 2.2. Check the Starfleet map to ensure that there aren't any other vehicles in the area that will be blocked.
 - 2.2.1. Go to Starfleet > Fleet Ops > Vehicles.
 - 2.2.2. Click each car to see if its route will pass through the AA.

Green - AV is autonomous (May or may not be driverless.)

Red - unknown state. It has lost a connection.

Grey - Manual. It will not go into an autonomous state.

If a vehicle is caught in an AA, it will enter recovery mode and may cause a VRE. To avoid that, you can wait until the vehicle is out or put the AA behind the vehicle so that it can route out. Also, if FSCs are involved, they may be able to route it away from the area in time.

- 2.3. Create the Avoidance Area.
 - 2.3.1. Click the Draw Polygon icon.
 - 2.3.2. Draw the points.
 - 2.3.3. Finalize the area by clicking the original polygon.
 - 2.3.4. Click the Place Avoidance Area button (near the bottom left.) The “Place Emergency Avoidance Area” dialogue box appears.
 - 2.3.5. Select the Driverless avoidance area category. (For now always select Temporary Emergency AA.)
 - 2.3.6. Enter the Slack message into the Root cause JIRA ticket.
 - 2.3.6.1. Go to Slack.

- 2.3.6.2. Click the three dots.
 - 2.3.6.3. Click Copy link.
 - 2.3.6.4. Paste into the Root cause
 - 2.3.7. Enter the POC as yael.hernandez@getcruise.com
 - 2.3.8. Unselect “Expires in 6 hours,” for construction that will last through the night.
 - 2.3.9. Set your own expiration date and time. The duration will automatically update.
 - 2.3.10. Ensure Full AA is selected.
 - 2.3.11. Select Submit.
- 2.4. Review the AA.
 - 2.4.1. The AA may not appear immediately. If so, wait for a moment and do a page refresh. You can also force a refresh using the Map Controls and toggle from creation and then back.
 - 2.4.2. If you do not see the AA, turn on the Supervised full AA, Supervised partial AA, and Driverless full AA, and Driverless partial AA, and Scheduled avoidance area.
 - 2.5. Submit a Jira ticket.
 - 2.5.1. Create a ticket.
 - 2.5.2. Select Project: Map Maintenance.
 - 2.5.3. Set Issue type: Avoidance Area.
 - 2.5.4. Enter a Summary
 - 2.5.5. Enter the description in the format:

Location: (Does not need to be specific, just the street location.)

Duration: (Put the time it will expire.)

FEAA ID: (This is the AA in Cartographer. It will appear in the top left..)

- 2.5.6. Click Submit.
- 2.6. Copy the ticket link.
 - 2.6.1. Go to the top of the screen. Find the link (Example, MM264437)
 - 2.6.2. Copy the item.
 - 2.6.3. Paste it in the Slack thread.
 - 2.6.4. Paste the FEAA ID into the Slack thread.
- 2.7. Complete the Raven ticket.
 - 2.7.1. Copy the jira ticket using the whole URL.
 - 2.7.2. Go to Raven > Edit details.
 - 2.7.3. Paste it in the Field Report URL or ID.
 - 2.7.4. Copy the entirety of the ticket description and paste it into the Behavior Description field.
 - 2.7.5. Change the Status from Acknowledged to Resolved.
 - 2.7.6. Change Failure Mode to the specific type of AA.
 - 2.7.7. Click Update. The ticket is finished.

Task 7. Remove an Avoidance Area

1. Determine the type of AA.
 - 1.1. If there are long horizontal lines, it is a PAA (Partial AA).
 - 1.2. If there are criss cross hash marks, it is a FAA (Full AA).
 - 1.3. If there are bright red and cross hatch, it is an SAA (Scheduled AA)
 - 1.4. If mapping AA, inform the requester that it is a mapping AA and they need to reach out to the mapping team.
2. If SAA:
 - 2.1. Click the AA.
 - 2.2. Click the three dots.
 - 2.3. Click Edit Avoidance Area.
 - 2.4. Select Partial Avoidance Area.
 - 2.5. Click Submit.
 - 2.6. Inform the requester of the action.
 - 2.7. Draw a polygon around the AA
 - 2.8. Report the Map Issue.
 - 2.8.1. Click the **Report map issue**.
 - 2.8.2. Set Team Reporting This Issue to :AV Ops
 - 2.8.3. Set On-Road Event Type to No Event.
 - 2.8.4. Set Issue Category: Temporary.
 - 2.8.5. Paste the link to the request (Raven or the thread)
 - 2.8.6. Enter Notes (ie. "please remove SAA ID#xxxxx
 - 2.8.7. Click Submit.
3. If Other AA:
 - 3.1. Click on the AA. The feature dialogue box will appear.
 - 3.2. Click the Remove Avoidance Area link at the bottom.
 - 3.3. Enter the reason for the removal. (ie. "No longer needed, construction is gone.")
 - 3.4. Paste the slack thread link.
 - 3.5. Click **Delete**.
3. Webviz
 - 3.1. Purpose - Shows very specific detailed information, provides multiple views, allows Jack of All Trades.
 - 3.2. Icons
 - 3.2.1. Next traffic light state - red yellow green.
 - 3.2.2. Blinker state
 - 3.2.3. Horn
 - 3.2.4. Drive state
 - 3.2.5. MPH
 - 3.2.6. Steering wheel orientation

- 3.2.7. Breaks/Gas pedal
- 3.2.8.
- 3.3. Priority
- 3.4. Street Views
 - 3.4.1. The color provides a confidence score.
 - 3.4.2. Green is confident.
 - 3.4.3. Pink - not high confidence.
 - 3.4.4. Yellow - 34% confident
 - 3.4.5. Red -
- 4. Drives
 - 4.1. Purpose -
 - 4.2. Manually look for the pickup spot. Observe right front door.
 - If it is an inefficient route, take a screenshot of the route and upload it to Starfleet Raven ticket.

Task 8. Filter and Search Issue Results in Starfleet

1. Go to the filter options located at the top of the screen.

Generic vs Specific failure modes

You may see a note such as "PNFM-Cameras." This is a generic holder so that it can be entered into the system. A specific failure mode will be applied later.

It is more important to focus on the Failure Modes.

2. Select the filters to narrow your search.
 - 2.1. Filter with Failure Mode -
 - 2.2. Filter with Component -
 - 2.3. Filter with Class -
 - 2.4. Filter with Status - Once a status is Inactive, it will be archived and removed from the list.
 - 2.5. Filter with Vehicle -
 - 2.6. Filter with Model - This is the model of the vehicle.
 - 2.7. Filter with Priority - The priority level.
 - 2.8. Filter with Type - This is either Technical or Behavioral
 - 2.9. Filter with Functional -
 - 2.10. Filter with Team -
 - 2.11. Filter with Department -

Task 9. View an Issue in Starfleet

1. Click the issue.
2. Review the details about the issue.
 - 2.1. **Issue Type** -
 - 2.2. **Component** -
 - 2.3. **Issue Case** -
 - 2.4. **Functional Group** -
 - 2.5. **Vehicle Model** -
 - 2.6. **Team** -
 - 2.7. **Department** - The department handling the issue.
 - 2.8. **Diagnostics** - These are typical messages that you will see for the given issue.
 - 2.9. **Affected Versions** -
 - 2.10. **Runbooks** - These are the steps that you will want to take. This can be one of the following:
 - 2.10.1. **Validation** - Ensure that the diagnostics match
 - 2.10.2. **Mitigation** - Provide these instructions to the technicians.
 - 2.10.3. **Investigation** - The results of the investigation.
 - 2.11. **Priority** -
 - 2.12. **Attachments** - Any attachments that would support the issue.

Task 10. Troubleshoot an Issue per Fleet

1. Determine the type of vehicle using the following table.

Type	Conditions
Productionized Supervised	If any of the following apply: <ul style="list-style-type: none">- The fleet name contains the word 'Productionized'- The Branch ends in '-no-driverless'- WOs show productionization completed
None-Productionized Supervised	If the fleet name contains 'Market' or there are no signs of productionized fleet present
Mercury (Walmart) Delivery	This could be productionized, non-productionized, supervised, or driverless
Driverless	If the Fleet name contains 'Driverless' or the Branch contains 'delta' or 'driverless'

2. If the vehicle is Productionized Supervised:
 - 2.1. Unable to perform ANY local commands at any time
 - 2.2. Only able to perform remote actions while AV is connected to facility wifi (.cruiseauto)
 - 2.3. DO NOT have operators PC in the field (they will be unable to stop stack first, and won't be able to start it again after the PC)
3. If the vehicle is Non-Productionized Supervised:
 - 3.1. Able to locally connect to ADSC (for Ciborg, CARD, SSH, etc...)
 - 3.2. Able to RLS and PC in the field
4. If the vehicle is Mercury (Walmart) Delivery:
 - 4.1. Ask if the AV is on a delivery.
 - 4.1.1. If so, postpone mitigation actions (if able) until delivery is done
 - 4.1.2. If not, continue regular mitigations according to type of AV
5. If the vehicle is Driverless:
 - 5.1. All productionized context applies to Driverless (all driverless cars are productionized)
 - 5.2. If the AV is in the garage, treat like regular productionized
 - 5.3. If the AV is in field and there is nobody to perform instant mitigations:
 - 5.3.1. Look to see if the AV has self-recovered from the SafeStop and release/close ticket if so.
 - 5.3.2. If not, look in the #driverless_drives channel for the VRE thread. Mitigation actions will be taken by FSR or pit crew teams.
 - 5.4. Inform the FSR teams right away if they can attempt an IFL (in field launch) or if they need to RTB (return to base) in the VRE thread.

Task 11. Provide a Mitigation Step

The number of mitigation steps is large. This is a list of common options.

1. Refer to the Raven Definitions document.
2. To Relaunch the Stack (RLS).
 - 2.1.
3. PC or Full PC - Power Cycle via the following method (intended for A110, unsure if applies to A100):
 - 3.1. Stop the stack completely.
 - 3.2. Turn off the AV using the main power button on the vehicle itself. The ADSC will shut itself off automatically.
 - 3.3. Wait a given amount of time. The default is 6 minutes. [10 min PC means wait 10 minutes.]
 - 3.4. Turn on the AV using the main power button.
 - 3.5. Wait 2 minutes.
 - 3.6. Turn on the ADSC.
4. To ADSC PC - Power Cycle the ADSC only via the following method:

- 4.1. Stop the stack completely.
- 4.2. Turn off the ADSC only.
- 4.3. Wait until the ADSC power button stops blinking.
- 4.4. Turn on the ADSC.

Task 12. Create a Work Order Using Midas

-  Work Order Guidelines

1. Open the occurrence ticket.
2. Ensure the occurrence ticket is filled out completely.
 - 2.1. Verify the failure mode and review any resolution notes.
 - 2.2. Ensure the ticket status is set to Resolved.
3. Click the “Create Work Order” button (half way down in the Work Order area).
 - 3.1. Scroll down to the Work Order area.
 - 3.2. Click the blue button.
4. Complete the “Create Work Order from occurrence” form.
 - 4.1. **Work Order Name** - This is auto populated.
 - 4.2. **Status** - Enter the status.
 - 4.2.1. The status is something that you will want to change for each issue.
 - 4.2.2. Select Queued if the car will stay up but we still want a vehicle technician to look at it.
 - 4.2.3. Select “In Progress” to down the AV. The vehicle will no longer be able to operate. Ops will need to stop running the car and the car will immediately be passed off to a vehicle technician.
 - 4.3. **Facility** - This is auto-populated.
 - 4.4. **Jira ticket ID** - This is auto-populated from the failure mode.
 - 4.5. Click Save.
 - 4.6. Refresh the page. (The blue button will be replaced by a link.)
 - 4.7. Click the View Work Order link.
5. Verify the information in Midas.
 - 5.1. Ensure that the type has the correct status.
 - 5.1.1. If it is an In Progress Work Order (aka Downing), then set the type to “Unplanned.”
 - 5.1.2. If it is a Queued Work Order, set the Type to “Request.”
 - 5.2. Go to the line item.
 - 5.3. Click the **Line Number** link.
 - 5.4. Click the **Notes** tab.
 - 5.5. Enter a description of the issue or why you are downing the car.
 - 5.5.1. Copy and paste everything from the Resolution Summary into the work order notes as well as any additional context. Maybe this car has failed for this issue

- multiple times in the past several days, anything relevant to the situation, any investigative steps that the technician should take.
- 5.5.2. Click the checkmark to save the notes.
- 5.6. Go to the **Comments and Attachments** tab.
- 5.6.1. Any attachments, images, or tags will go under the Comments and Attachments tab. You can tag people, add images, or anything that will help the technician diagnose the situation.
- 5.7. Share the link on Slack.
- 5.7.1. Right click the work order link.
- 5.7.2. Select Copy.
- 5.7.3. Go to Slack.
- 5.7.4. Paste it into the appropriate channels.

Task 13. Handle a Vehicle Retrieval Event (VRE)

- [OPS-SOP-00024 Troubleforce Driverless and VRE SOP v4](#)
- [OPS-SOP-00009 Driverless Core VRE Response SOP v8](#)

1. Determine if it is a real VRE.
 - 1.1. Determine if the issue is an auto-reported Safestop?
 - 1.2. If it IS a reported Safestop, check the Driverless tab or Vehicles page to determine if the AV is engaged or failed.
 - 1.2.1. If the AV failed:
 - 1.2.1.1. Check if the AV is at a facility by looking at the fleet map. Check both 1201 and 1656.
 - 1.2.2. If the AV did not fail:
 - 1.2.2.1. The AV self-recovered.
 - 1.2.2.2. Fill out a ticket and set the Recovery type to Self Recovery.
 - 1.3. If it is NOT a reported SafeStop, ask the reporter if the AV has failed.
 - 1.3.1. If the AV has failed:
 - 1.3.1.1. Check the FSR channel for a VRE or ask the reporter if it is a VRE.
 - 1.3.1.1.1. If it is a VRE, go to Handle a VRE.
 - 1.3.2. If the AV has not failed:
 - 1.3.2.1. Clear it from the notes. It is not a VRE.
 - 1.3.2.2. Gather he needed details and mitigate as needed.

2. Handle a VRE
 - 2.1. Put [VRE] tag at the start of the occurrence summary.
 - 2.2. If a failure error is given, check the SOP to see if the AV can engage in-field or not.
 - 2.2.1. If the AV reengaged with the first mitigation:
 - 2.2.1.1. Clear for in field launch.
 - 2.2.1.2. Have the team run FUL and attempt an in field launch
 - 2.2.2. If it did not reengage:
 - 2.2.2.1. Return the AV to base to collect screenshots and for mitigation.
 - 2.3. If a failure is not given:
 - 2.3.1. Clear for in field launch.
 - 2.3.2. Have the team run FUL and attempt an in field launch
3. If the failure error is given in the (auto-reported) occurrence ticket, then follow the SOP.
4. If the first steps of the SOP are anything else (such as RLS or PC), then the AV should return to base to gather screenshots of CARD
5. If the failure is hardware related and results in a DS5 safestop, then the AV needs to be down for inspection.
6. Communicate with Ops and the DSS

Safety Item

For Driverless AVs, when a failure happens on the road, Troubleforce is one of the first to see safestops since we get automated occurrence tickets. In these cases, we know of the issue before Ops does and sometimes we may be the only team that is aware that the AV has failed making it our responsibility to ensure that Ops and DSS become aware of the failure. Even if Ops is aware of the AV failure, we need them to acknowledge and follow troubleshooting steps for mitigation, so we need to ensure that we have their attention on the Troubleforce thread. Below are the steps to follow to bring Ops/DSS attention to the Troubleforce thread.

- 6.1. Tag the Ops POC in the occurrence Slack thread if no one has responded to the thread in two minutes.
- 6.2. Copy the link to the occurrence thread in the Troubleforce Support Channel and paste it into the VRE thread in the #<market code>_monitoring_field_support Slack channel once the VRE thread has been posted. VRE threads are posted by VRE Dispatch vToast as follows:



- 6.2.1. Find the post that corresponds to the AV in the occurrence ticket and paste the link in the VRE thread.
- 6.2.2. If there is no VRE thread in the #<market code>_monitoring_field_support Slack channel, verify with Ops whether or not this was in fact a VRE.
- 6.3. If no response has been received from Ops or DSS in the Troubleforce thread within five minutes of the first tag, begin to tag Ops Coordinators or Managers individually and provide some context in the message, such as "@bob.jones Pride had a SafeStop and appears to still be in failed mode. We will need to return this AV to base for troubleshooting."
- 6.3.1. Check the  24/7 Ops Schedule to find which Ops POCs are on shift.
- 6.4. Continue to follow up tagging individual Ops leaders until a response is received. This is especially important in escalations that need mitigations.
- 6.5. If no response is received within five minutes after tagging POCs and the AV is in-field requiring mitigation, then alert the on-shift Troubleforce Engineer. This may require a Pagerduty alert via  Issue Escalation PagerDuty if no Troubleforce Engineer is on shift.
- 6.6. If the SOP allows an in-field launch, then
 - 6.6.1. State, "AV clear for in-field launch" in the Troubleforce Slack thread.
 - 6.6.2. Tag the Ops leaders if no response or emoji reaction is given within two minutes.

7. Mitigate the Occurrence

Safety Item

For Driverless AVs, when a failure happens on the road, Troubleforce is one of the first to see SafeStops since we get automated occurrence tickets. In these cases, we know of the issue before Ops does and sometimes we may be the only team that is aware that the AV has failed making it our responsibility to ensure that Ops and DSS become aware of the failure. Even if Ops is aware of the AV failure, we need them to acknowledge and follow troubleshooting steps for mitigation, so we need to ensure that we have their attention on the Troubleforce thread. Below are the steps to follow to bring Ops/DSS attention to the Troubleforce thread.

8. Once a response from Ops is given, communicate the needed mitigation steps by following the SOP just like any mitigation that would be done. There are a few exceptions as follows:
 - a. When an AV encounters a UPI or collision, damage will usually not be visible by the IE who reports the occurrence.
 - i. Request the DSS to assess the AV in person upon arrival.
 - ii. If the DSS reports no damage, collect photos to confirm and then the AV is clear to continue with in-field launch.

- iii. If the DSS reports minor damage, collect photos and determine if the AV is fit to continue or not. Some ambiguous scenarios are laid out below as a guideline, but always consult with the other on-duty TF experts, OPs, and/or TF engineer if unsure if an AV should be downed.
 - 1. Damage to sensors (scratch, paint, etc) -> down.
 - 2. Obvious damage to body, paint, or branding (can be seen from farther than 10 feet) -> down.
 - 3. Body or trim panels loose, missing, or falling off -> down (tow if panel interferes with wheel).
 - 4. AV defaced with paint, unknown or contaminated fluids, excrement, etc -> down for bio cleaning. Follow [market's urgent cleaning procedure](#).
 - 5. Damage to suspension, tires, wheels that could affect drivability -> down and AV towed to the facility.
 - 6. Leaking fluids -> down and tow AV to the facility.
 - 7. Light scuffs or dings -> clear for in-field launch.
 - 8. Sensor touched, but no signs of scratches, dings, cracks or other damage -> clear for in-field launch.
- iv. AV encounters a DS5 safestop.
 - 1. If there is a failure mode with clear instructions, follow the SOP instructions.
 - 2. If no failure mode yet or instructions are ambiguous, return the AV to facility and collect screenshots of Adim Driver and VHM proxy. Then down the AV.
- v. When downing an AV, wait until the AV has been returned to the facility before setting the WO to “in progress.” Leave as queued until confirmed by Ops it is back at the facility. This ensures DSS does not get booted from the assignment page and/or the AV gets removed from Starfleet map prematurely.

Complete The Occurrence Ticket

1. Fill out the occurrence ticket summary with the issue, steps, and any other details needed.
 - a. In the summary, use the applicable Driverless tags to highlight the issue. The square brackets [] and all caps must be included as noted below:
 - i. [VRE] - Any and every VRE must have a VRE tag. There are specific tags listed in [Occurrences Tags](#) doc, which add greater context in a quick tag. If none fit, fall back to the generic [VRE] tag.
 1. Note that tags are case sensitive and should appear as listed in the doc or in all caps.

2. Tags should be in square brackets and have spacing and dash as shown in the doc.
 - ii. [BLOCKER] - Something that blocks an AV from deploying for driverless, such as unresolved display issues.
 - iii. [DELAY] - Something that delays deployment more than a regular time period, such as needing to PC for terminal latency.
 - iv. [HALO] - Anything reported that is a HALO issue.
 - v. [NOTEABLE] - New issues, safety concerns, or other issues you want to bring to attention.
2. Fill out the drop down fields like any other occurrence.
 3. There are three fields that are specific for VREs: Recovery Type, Recovery Location, and Field Report URL.

Recovery Type

Select...

Recovery Location

Select...

Field Report URL or ID

<https://jira.robot.car/browse/AVBE-3256>

Resolution Summary

[VRE - Vehicle]

Issue:

- a. The Recovery Type indicates how the AV was recovered and includes the following options:
 - i. In facility/no recovery - AV failed in a facility.
 - ii. Self Recovery - AV was able to recover from the safestop and continue.
 - iii. RA recovery - RA/IE was able to maneuver the AV out of the situation.
 - iv. Remote Recovery - AV able to be summoned and issue rectified at base.
 - v. In Person - VRE recovered by DSS team for in field launch.
 - vi. Manual Retrieval - VRE recovered by DSS to facility for troubleshooting.
 - vii. Tow - AV needed to be towed.

- b. The Recovery Location indicates the type of location at the point of failure and includes the following options:
 - i. Conflict area - in intersection, blocking driveways or keeping clear zones.
 - ii. Trafficable lane - In a street, but not blocking alternate traffic.
 - iii. Out of lane - In a non street location like a parking lot.
 - c. The Field Report URL or ID is for the AVBE ticket link.
 - i. Each VRE has a Raven occurrence and a Jira ticket in the AVBE space. A Troubleforce AVBE team member creates the AVBE Jira ticket and pastes the link into the Slack thread for the VRE in the #<market code>_monitoring_field_support Slack channel.
 - ii. Copy the link and paste into the Field Report box above the Resolution Summary box in the edit popup of an occurrence ticket.
1. Resolve the ticket once all troubleshooting is complete and the AV is ready to deploy again or if Ops decides to cancel troubleshooting on the AV for EOS.

Post Mitigation Documentation

After completing the mitigation and filling out the ticket, verify that the VRE ticket is showing up correctly in the [Daily Driverless Troubleforce Summary](#) dashboard either in the Technical Vehicle Retrieval Event section (image below) or in the AVBE Vehicle Recovery Event Section.

Technical Vehicle Recovery Events (VRE)							
	Escalated Time	Vehicle Name	Issue Name	Raven Occurrence	Jira Ticket	Location	Summary
1	2022-06-29 01:37:53	dragonfly	Delta - AV Enters Failed Mode for Unknown Reason	aeb41d14c	AVBE-9627: Dragonfly - AV failed with no callout	In Field	[VRE - Technical Failure] ISSUE: AV failed and did not call out https://jira.infiniti.com/browse/AVBE-9627 ISSUE = VRF - TECHNICAL FAIL [IRFI] VRF - CROWNING AV failed unknown reason and it did not start an

At 7 A.M. each morning, the report is automatically sent to a list of stakeholders giving a recap of the day's driverless operations.

4. Troubleforce Actions for Non-VRE

Driverless AVs encounter non-VRE issues more often than VRE issues. Non-VRE issues can be in the garage such as Stack launch, Fireup, or PDC failures as well as in-field issues such as Safestops that self recover, connection latency, or HALO call issues. Handling these issues is generally the same as handling issues with the supervised fleet, but there are often additions or different issues that are not experienced in supervised AVs. Below outlines the steps to take in these cases.

Communicating with Ops/IE/CS/DSS

For Driverless issues that are not VREs often Ops, IE, CS, or DSS members are reporting the issue manually. In these cases the reporter will usually respond to the thread and mitigation can continue just like any other Troubleforce ticket. However there may still be occasions where no response or

follow up is given and it is our responsibility to ensure that the issue gets proper troubleshooting and documentation as needed. Below are the steps to follow to bring Ops/DSS/CS/IE attention to the Troubleforce thread.

Auto Reported Issues

1. If the issue is auto reported such as Stack launch or Fireup, tag the Ops POC in the occurrence Slack thread if no one has responded to the thread in two minutes.
2. If no response has been received from Ops in the Troubleforce thread within five minutes of the first tag, begin to tag Ops Coordinators or Managers individually and provide some context in the message such as "@bob.jones Pride had a Fireup failure and needs troubleshooting in order to pass."
 - a. Check the  24/7 Ops Schedule to find which Ops POCs are on shift.
3. After tagging at least two separate POCs:
 - a. If there is a response, continue the mitigations lined out in the SOP just like any other occurrence.
 - b. If there is no response, close the ticket and note in the occurrence summary:
STEPS: None, no response from Ops.

Manually Reported Issues

1. If the issue was manually reported and no response has been given in the thread, tag the reporter in the thread asking for follow up such as: "Hello @bob.jones, can I get more details on this escalation please?"
2. If there is still no response, tag another member of that reporting team, such as a coordinator or manager from that team. This is most common with IE and CS who do not frequently use the Troubleforce support channel.
 - a. For IE/RA, check the  24/7 Ops Schedule to find POCs.
 - b. For CS, tag the CS Managers (@cs-ops-mgr) in the Slack thread.
3. Once a response has been given, continue the mitigations lined out in the SOP just like any other occurrence.

Completing the Occurrence Ticket

1. Fill out the occurrence ticket summary with the issue, steps, and any other details needed.
 - a. In the summary, use the applicable Driverless tags to highlight the issue if necessary. The square brackets [] and all caps must be included as noted below:
 - i. [VRE] - Any and every VRE
 - ii. [BLOCKER] - Something that blocks an AV from deploying for driverless. Such as unresolved tablet issue.
 - iii. [DELAY] - Something that delays deployment more than a regular time period, such as needing to PC for terminal latency.
 - iv. [HALO] - Anything reported that is a HALO issue.

- v. [NOTEABLE] - New issues, safety concern or other issue you want to bring attention to.
2. Fill out the drop down fields like any other occurrence.
 3. Resolve the ticket once all troubleshooting is complete or the Issue has been documented depending on the issue type and severity.

Post Mitigation Documentation

After completing the mitigation and filling out the ticket, no further steps are needed unless the occurrence or issue is deemed notable or a blocker. In that case, be sure to add the appropriate tag and then verify the occurrence is showing up correctly in the [Daily Driverless Troubleforce Summary](#) dashboard in the Notable Delta Escalation Occurrences and Blockers section pictured below.

Notable Delta Escalation Occurrences and Blockers							
	Escalated Time	Vehicle Name	Issue Name	Raven Occurrence	Classes	Location	Summary
1	2022-06-28 19:55:33	torta	Tire Pressure Monitoring System (TPMS) Issues, Alerts, or Messages	18285b070	(Maintenance)	In Garage	ISSUE = [NOTABLE] TPMS light is ON, and dashboard reading 19PSI STEPS = 1. manual reading - 2 devices confirmed tire pressure reading is at 39.5 PSI released AV to continue deployment.

At 7 A.M. each morning, the report is automatically sent to a list of stakeholders giving a recap of the day's driverless operations.

5. Troubleforce Actions for DSS AV

DSS AVs are only driven manually in the field. The DSS team uses these AVs to drive to the scene of failed Driverless AVs to recover them in a VRE. The DSS AVs have Stack up during this time to collect the video footage from the cameras for legal and operational reasons. Thus, these DSS AVs may still encounter Stack launch, Fireup, or other vehicle hardware failures, but in some select cases we can release the AV with little to no mitigation. Below are details of what to do in each case.

- Stack launch
 - Handle like all Supervised AVs and follow the steps of the failure mode until resolution with Stack up or to downing when unable to mitigate.
- Fireup
 - If the failure is related to cameras:
 - Follow the steps of the failure mode to resolution. The AV needs proper functioning cameras to be in the field. Down the AV if unable to resolve.
 - If the failure is unrelated to cameras:
 - If the failure mode calls for a rerun as the first mitigation step, rerun Fireup as an attempt to pass. Release the AV whether or not it passes as it will not engage and cameras are working properly. No need to RLS or PC as that would waste time for the DSS team.

- If the failure mode starts with RLS or PC as first mitigation step, release the AV without any mitigation attempts.
- Vehicle Hardware
 - If the AV has damage to vehicle hardware such as a flat tire, broken window, damaged decal, paint scratched, etc., take the steps as provided in the failure mode using best judgment to determine if downing is necessary.
 - Remember, safety is key! If the issue seems like a safety concern, down the AV.
 - The DSS AV is also in the field facing customers so we want to ensure it accurately represents our brand as safe, comfortable, professional, and clean. If the damage looks bad, such as branding damage, faded decals, large scratches, etc., this is good cause for downing as well.

Task 14. Handle an Outage or a Major Issue.

Refer to the TF Playbook > [Outage / Major Issue](#)

Outages and Major Issues occur from time to time, aligning the failure mode and gathering the right information makes it extremely helpful for investigations. Write a quick summary of the issue (with diagnostics if available) and whether mitigation steps are effective. Identify the impacted vehicles based on fleet, branch, WOs completed, etc. and make a compiled list to have more data available for quick reference and post on #troubleforce-team channel tagging TF Engineers, Manager if needed. If the issue takes place when no TF Engineers or managers are on duty please utilize the [Issue Escalation PagerDuty](#) to create an escalation alert.

1. [Example Escalations for reference](#)
2. Identify the outage based on issues reported, provide as much context as possible.
3. While mitigating, place all occurrences related to the outage into “Outage” status in the Raven Status dropdown.
4. Determine the impact of AVs by branch, fleet, WOs, parameters, location, etc.
5. Fill out all the details into at least one occurrence to escalate on #troubleforce-team.
6. Post a message on #troubleforce-support detailing that the issue is being escalated and, if known, which AVs are likely to experience the issue and continue reporting.
7. Keep one AV as is, ideally an AV in the garage that does not have a test associated with it.
8. All the other AVs can attempt mitigation strategies based on component affected (Relogin, Relocate, Reboot, RLS, PC)
9. Tag all TF Engineers and the manager. Outage / Major Issues will be escalated by TF Engineer or Manager, tag all TF Engineers and Manager

Task 15. Down an AV

1. Determine that an AV needs to be downed.
 - 1.1. Ask the Troubleforce team or your peers before you make the work order. This is to ensure we are following guidelines. We do not want to do a downing unnecessarily.
2. Enter a note in the Slack channel #troubleforce-team
 - 2.1. Go to Slack.
 - 2.2. Go to the plus icon. (This is located in the comment area.)
 - 2.3. Select Downing Request (located under Shortcuts and Workflows).
3. Fill out the **Downing Request Form**.
 - 3.1. Enter the AV Name.
 - 3.2. Enter the Raven Occurrence Link,
 - 3.3. Enter the Slack Thread Link.
 - 3.3.1. Add a link to the Slack thread where you are discussing that the vehicle needs to go down.
 - 3.4. Enter the Description.
 - 3.4.1. Add a brief description of why it is going down or the failure mode.
 - 3.5. Click Submit. This will create a post.
4. Review the downing request.
 - 4.1. Verify who requested the order.
 - 4.2. Verify the Slack link.
 - 4.3. Add a note such as "Good to down" in the thread before the work order is created. (If it is busy, it is okay to down the car, and close the work order at a later time.)
 - 4.4. Observe the thread in case additional context or knowledge appears.
5. Create the work order. (See Task: Create a Work Order)
6. Copy the work order link.
7. Determine where the AV is to be transferred to when it is down.
 - 7.1. Go to the Troubleforce Playbook.
 - 7.2. Scroll down to the transfer chart.
 - 7.3. Follow the chart to determine where the AV is to be transferred when it is down.
 - 7.3.1. If the car is in San Francisco, determine its location.
 - 7.3.2. If the car is not in San Francisco, do not transfer the car.

Fleet Location

It is important to note that we are only transferring cars in San Francisco. If you're downing a car that is part of the Phoenix fleet or another fleet, we don't need to transfer the car. Create that post in the team channel, then make the work order is all that is needed.

8. Launch the **Vehicle Transfer Request** form.
 - 8.1. Go to the Slack channel #ab_transfer_sf. (This is the channel that ops uses to communicate with the service technicians to know who is transferring which cars and where they are going.)

- 8.2. Click the plus icon.
 - 8.3. Go to Workflows.
 - 8.4. Select **Vehicle Transfer Manager**.
9. Fill out the **Vehicle Transfer Request** form.
 - 9.1. Enter the **Vehicle Name** (Single AV Name Only).
 - 9.2. Enter the **Origin** (From).
 - 9.2.1. If you do not know where the vehicle is coming from, ask the team who reported the ticket. Otherwise it should be in Starfleet. You should be able to see where the vehicle's home facility is.
 - 9.3. Enter the **Destination**. (This is where we are transferring the vehicle to).
 - 9.3.1. Use the flowchart in the Troubleforce playbook to make the determination.
 - 9.4. Enter the **Fleet**.
 - 9.5. Enter the **Branch/Tag**.
 - 9.5.1. If it is staying at its current branch, set to Current.
 - 9.5.2. If going to another branch, select the branch.
 - 9.6. Enter the **Reason**.
 - 9.6.1. Briefly describe the reason it is being transferred. Anything from AV is down to a flat tire, or multiple safe stops. It should give the text and idea of why that vehicle is being transferred. At the very least they should know that the car is down.
 - 9.7. Enter the **Under Test Request / Work Order Link**
 - 9.7.1. Paste the link from the work order.
 - 9.8. Enter the **AV has field support allocation on Starfleet -**
 - 9.8.1. Enter No, unless it is an FSR car.
 - 9.9. Enter the **Requested ETA**
 - 9.9.1. Leave this blank or write ASAP.
 - 9.10. Enter **AV has California plates, permits, and is driveable**.
 - 9.10.1. Select Yes if it applies.
 - 9.10.2. Select No if it does not.
 - 9.11. Enter the **Notes/Caveates** (optional)
 - 9.11.1. Add additional notes.
 - 9.12. Enter the **Requesters Team**.
 - 9.12.1. Set this to Trouble Force.
 - 9.13. Enter the **AV Ops POC**
 - 9.13.1. Put the person you have been working with on the Troubleforce thread that was helping to mitigate. An ops fleet or coordinator is fine here. They are going to be the ones doing the transfer or at least coordinating it.
 - 9.14. Enter the **2POC** (the second point of contact)
 - 9.14.1. Enter someone from service ops who is on your current shift.
 - 9.15. Enter **For Shift Requested**.
 - 9.15.1. Select the shift that you are working.
 - 9.16. Click Submit.
 - 9.17. // A Slack post will appear with the information. Ops and Service Technicians will coordinate transferring the vehicle.

Task 16. Handle a Minimum Equipment List (MEL)

Source: [MEL Job Aid](#)

1. Go through the Troubleforce Workflow roadmap.
2. Triage and apply MEL.
 - 2.1. Identify the defect.
 - 2.2. Look up the Raven ticket.
3. Follow the existing Troubleshooting SOP.
4. Determine the MEL Criteria and duration.
 - 4.1. If DS0
 - 4.1.1. Criteria
 - 4.1.2. Cue the work order
 - 4.2. If DS1
 - 4.2.1. Criteria
 - 4.2.2. Then, identify the stakeholder and assign the work order.
 - 4.3. If DS2
 - 4.3.1. Criteria,
 - 4.3.2. Complete the current drive and then down the AV for repair.
 - 4.4. DS3
 - 4.4.1. If criteria,
 - 4.4.2. Down the AV for repair
5. Determine the MEL Tracking duration
 - 5.1.1. A - 30 days
 - 5.1.2. B - 10 days
 - 5.1.3. C - 2 days
6. Track the work order
 - 6.1.1. Issue an occurrence tag.
 - 6.1.2. Close the work order.

Ciborg

Task 17. Monitor an AV with Ciborg

1. Open Ciborg.
 - 1.1. In Starfleet, click the vehicle name.
 - 1.2. Click the Deployment tab.
 - 1.3. Click the Ciborg button.
2. Expand the Process window.
3. Ask the AVTO to reattempt the step.
4. Observe any errors.
 - 4.1. Look for red text or message with borders around it.
 - 4.2. Relay the errors to the AVTOs.

Looker

Task 18. View the Looker Dashboard

1. Open Looker.
 - 1.1. Go to looker.robot.car. <https://looker.robot.car/boards/282>
 - 1.2. Click Troubleforce Experts dashboard on the left.
2. Select the needed tile on the dashboard.
 - 2.1. Troubleforce Tech Support HUD -
 - 2.1.1. This is the headsup display.
 - 2.1.2. It contains live updates of what is happening while you are operating. Similar to the triage page, but it updates dynamically.
 - 2.1.3. You can see categorized items, anything that may be open to long, if a car passed FOPM or not.
 - 2.1.4. See if a car has multiple safe stops for the same issue.
 - 2.2. Daily Standup -
 - 2.3. Troubleforce (AVBE) HUD -
 - 2.4. Stack Launch Failure Logs -
 - 2.5. Who Should take the next ticket.-
 - 2.5.1. Displays the minutes that it has taken since the last item.
 - 2.5.2. Does not mandate that it has to be that person. It is only a recommendation.
 - 2.5.3. Automated for those who are on shift. If schedule change, it will be adjusted manually.
 - 2.5.4. It shows a balance of the last 8 hours and the number of discrepancies.
 - 2.5.5. This also has the links.
 - 2.5.6. The discrepancies are automatically evaluated. The results are not always correct. If you have a discrepancy, it does not mean that you are wrong.

Task 19. Identify Who Should Take the Next Ticket

1. Open Looker.
 - 1.1. Go to looker.robot.car. <https://looker.robot.car/boards/282>
 - 1.2. Click Troubleforce Experts dashboard on the left.
 - 1.3. Click the tile: "Who should take the next ticket."

Task 20. Audit a Raven Ticket

1. Open Looker.
 - 1.1. Go to looker.robot.car. <https://looker.robot.car/boards/282>
 - 1.2. Click Troubleforce Experts dashboard on the left.
 - 1.3. View Expert Self Review.
 - 1.4. List out what is expected from a ticket. When it is complete, what should be included?
 - 1.4.1. Status - Resolved.
 - 1.4.2. Resolution time should be accurate.
 - 1.4.3. Should have the correct failure mode.
 - 1.4.4. If Driverless, it should have recovery type and location.
 - 1.4.5. SOP adherence
 - 1.4.6. Last action result filled out.
 - 1.4.7. Occurrence class should be filled out and matched to failure mode.
 - 1.4.8. Resolution summary should contain the issue mitigation steps and outcome.
 - 1.4.9. Location should be correct.
 - 1.4.10. Ensure Mitigation actions are populated correctly.
 - 1.4.11. Any attachments of the failure are included.
 - 1.4.12. // This only checks if the field is populated, not if it is populated correctly. Therefore, this is not a punitive item and is only a tool.
 - 1.5. How to filter the tickets.