

# 2012-2020 Model S Water Intrusion Analysis

Howard C

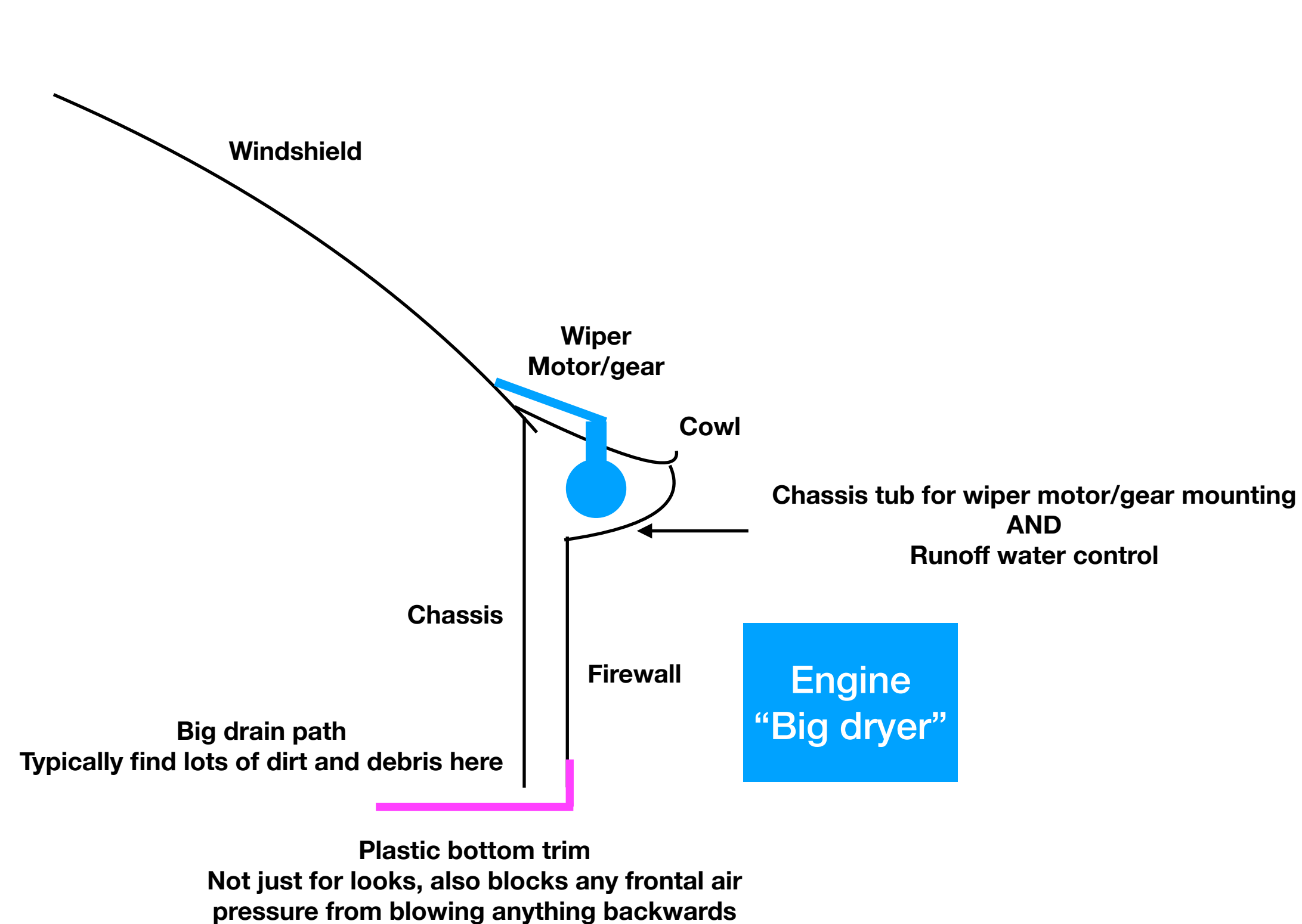
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Version 1.0

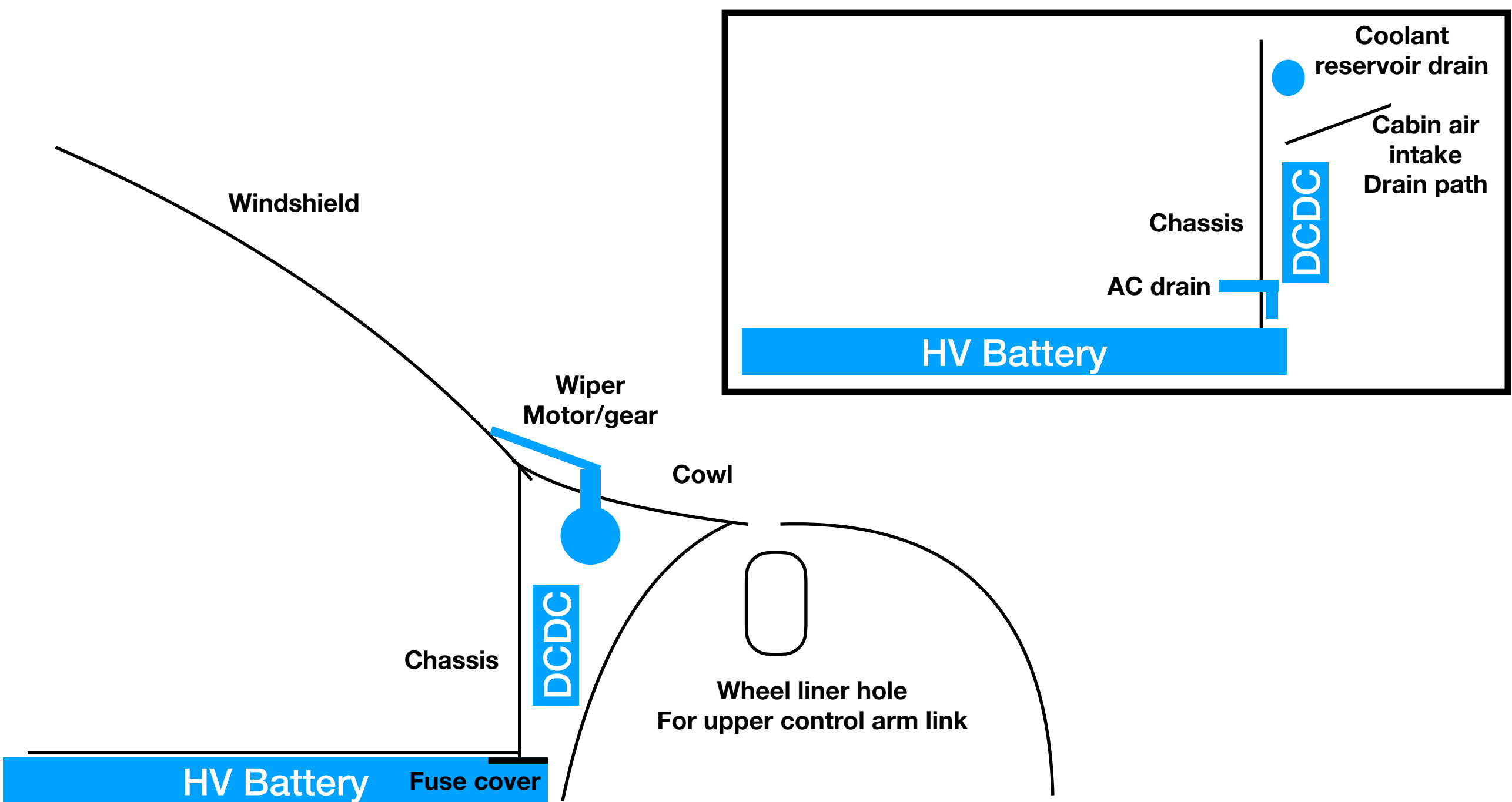
2/14/2023

<https://sites.google.com/view/howards-model-s>

# Front end moisture drain/runoff Comparison



Typical Car



Tesla Model S

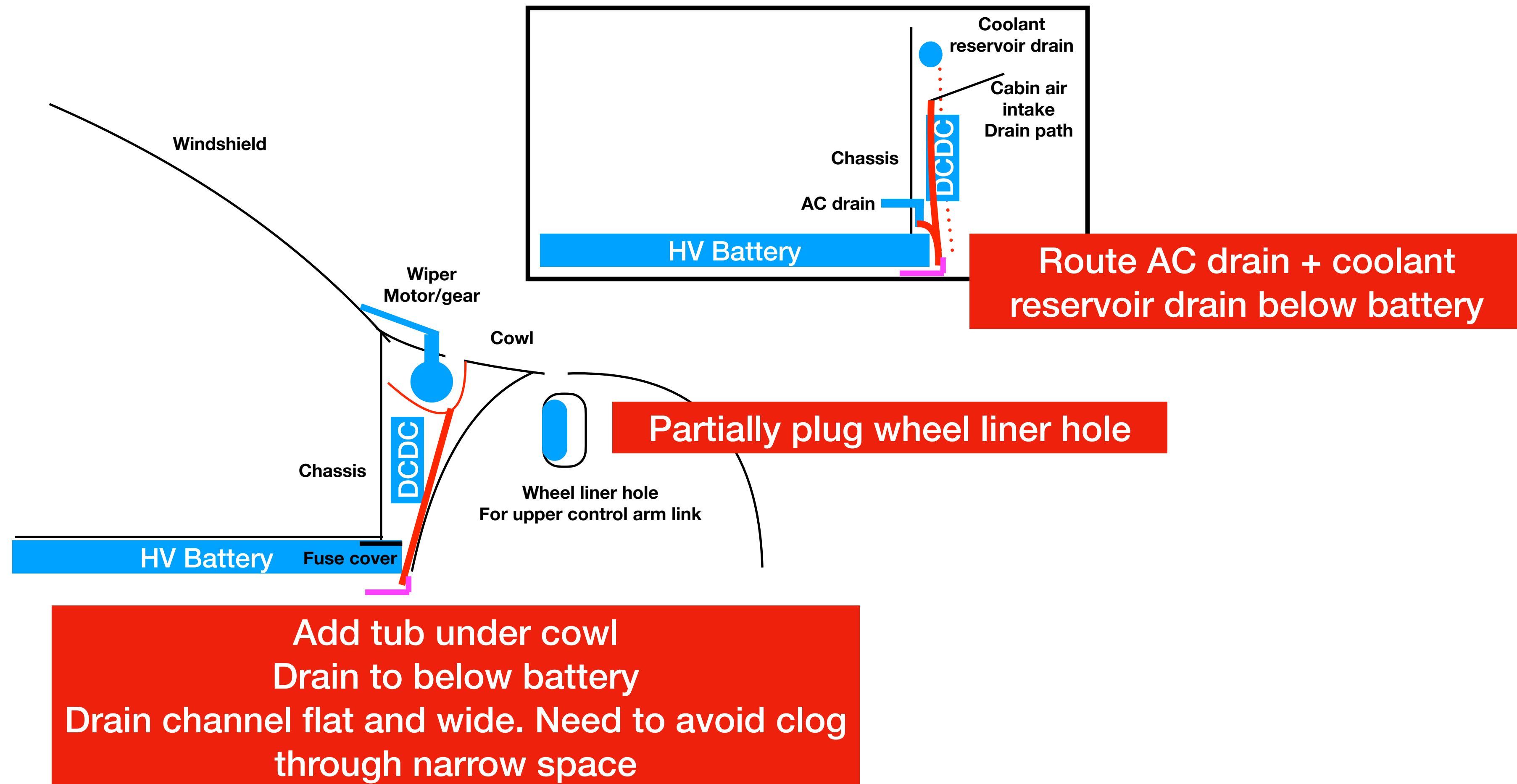
# Major Problems with Model S Windshield Runoff

- Forward driving motion naturally produces many air pressure pathways towards the chassis. Corner of fender is best moisture drain dump.
- Model S
  - Routing cowl drainage forward at very shallow angle is suboptimal against any leaking air channels under the hood when driving forward
  - Cabin air intake has no place to dump water except above HV electronics (gen1 DCDC and its connectors, HV battery)
  - Lacking under cowl tub dumps water onto battery, potentially gen2 DCDC and its connectors?
  - Passenger side wheel liner hole dumps water onto gen1 DCDC and its connectors. Maybe also moisture onto HV battery fuse cover?
  - Driver side wheel liner hole likely dumps moisture onto intermediate steering linkage.
  - AC drain dumps water onto HV battery and the fuse cover
  - Coolant reservoir dumps coolant onto HV battery. Should not be common. Only dumps when over filled. Coolant doesn't dry very easily.
  - <https://teslamotorsclub.com/tmc/posts/7233657/>

# Likely cause for numerous failures

- HV battery frontal moisture intrusion
- DCDC and HV device failures (coolant heater, cabin heater, AC pump)
- Steering intermediate shaft corrosion

# Solutions (A)



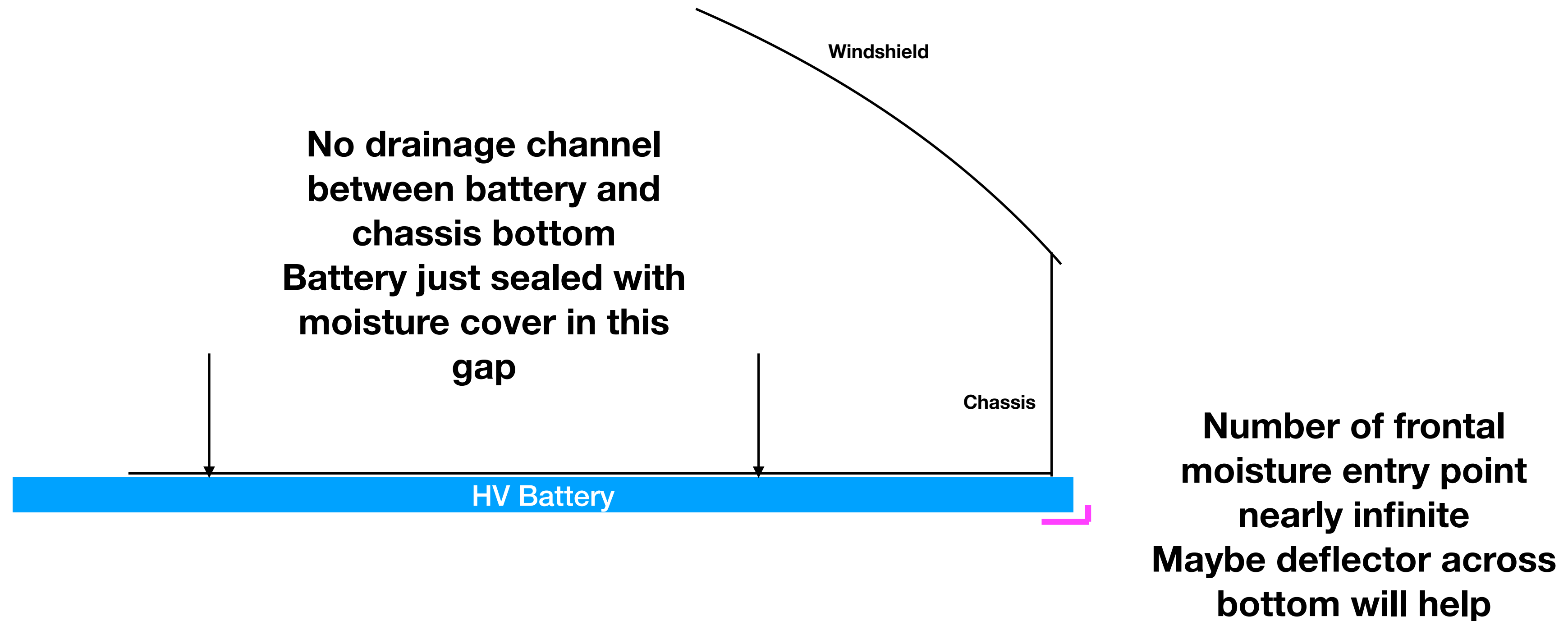
# Solutions (A) Notes

- All drain tips need to consider air pressure hindering drainage when car traveling forward at 80mph on wet roads

# But there are more! High speed frontal water ingress

- Hood to fender and front facia seam during high speed drive in wet conditions
- Hood usually has weather seal inside front (Model S has)
- Fender usually have raised lip routing water backwards towards fender corner drain. (Model S need solution)
- Frunk plastic cover require weather seal underneath as water often runs underneath

# And likely even more! HV battery frontal moisture ingress





# TBD

- Desirable to have additional moisture deflection above HV battery fuse cover. How?
  - Partially opened to inside
  - Partially under frame
  - <https://teslamotorsclub.com/tmc/posts/7364863/>

# Low Likelihood for Solution

- Takes high investment to provide full solution
  - Develop all the add ons
  - Test in wet weather
    - In motion, high forward, faster cornering (freeway on/off ramps) speeds, limited reverse speed. In up and down elevation grades
    - Parked in up and down elevation grades
    - With accumulated snow
  - Drop battery pack for moisture ingress investigation
- Who will purchase?
  - Not Tesla HQ/SC
  - Very few Indys exist
  - Low advanced DIY ownership. These mods require fairly advanced capability along with potential car lift access

# Temporary Solution

- Check weather report before driving. Avoid driving in rain
  - Not great solution but I'm retired. People who need to drive on schedule and park outside have no solution
- Probably need to consider car washing methods. No sure what to do yet.
- Design problem fairly significant without any simple solution in sight.