# QCE CO-OP STUDENT TBP REPORT

| | |
|---|---|
| MODEL CODE: | 641W |
| MODULE: | FRONT MASK |
| QUALITY CATEGORY: | SAFETY |
| GROUP CODE: | 5310 |
| GROUP NAME: | RADIATOR GRILLE |
| STAGE: | Current |
| CONFIDENTIAL: | No |
| NEXT PROJECT REFLECTION: | Yes |
| SUPPORTING DOCUMENTS: | No |

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**QCE APPROVALS**

| ASST. GEN'L. MGR. | MANAGER | SR. PROJECT MGR. | ASST. MANAGER | LEADER | SPECIALIST |
|---|---|---|---|---|---|
| | | | | | |


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**DEPARTMENT:** QCE
**LEAD:** Johanna Friend


## Student Background

**Academic:** Completed 1B year Mechanical Engineering, University of Waterloo, Class of 2022
**Work History:** Stores / Assistant Machinist, E3 Machine Shop (University of Waterloo)
**Personal Experience:** Vehicle maintenance & repair

## Personal Objectives

1) Understand how the TBP problem solving process is used by QCE and apply it to successfullly investigate quality defects
2) Learn the complete vehicle manufacturing flow, how anomalies in Man, Method, Machine, Material cause defects
3) Understand how different QC groups work together to ensure vehicle quality

Planned / Actual

| Projects | Sept 6 | 13 | 20 | 27 | Oct 4 | 11 | 18 | 25 | Nov 1 | 8 | 15 | 22 | 29 | Dec 6 | 13 | 20 | Eval | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project 1 Seat Label Change | | | | | | | | | | | | | | | | | Ó | |
| Project 2 Spoiler Levelness Trials | | | | | | | | | | | | | | | | | Ó | |
| Project 3 TBP 1 - RR A/M x Bmpr IA | | | | | | | | | | | | | | | | | Ó | |
| Highlight Project TBP 2 MWR Aim NG | | | | | | | | | | | | | | | | | Ó | |

## 1. Clarify the Problem

**ULTIMATE GOAL**
Ensure customer safety by exceeding requirements for GSP functionality

**IDEAL CONDITION**
**0 vehicles** with initial MWR (Millimetre Wave Radar) vertical correction angle outside of Control Limits

**GAP**
**31 vehicles** with MWR vertical correction angle outside of Control Limits

**CURRENT SITUATION**
In October 2018, **31 vehicles** with MWR vertical correction angle outside of Control Limits

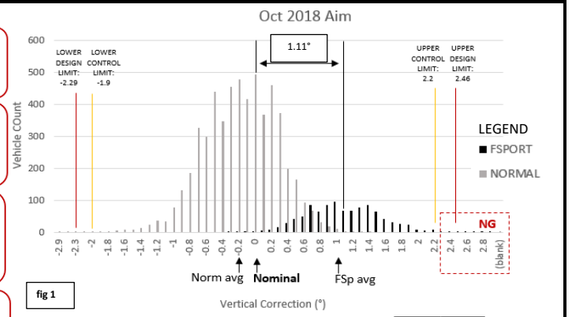



fig 1

Same gap condition has been trending since SOP

| | Norm | FSp |
|---|---|---|
| Avg (°) | -0.2 | 1.11 |
| Std dev (°) | 0.46 | 0.47 |

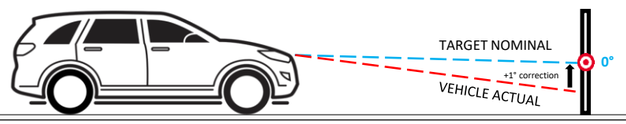



fig 2

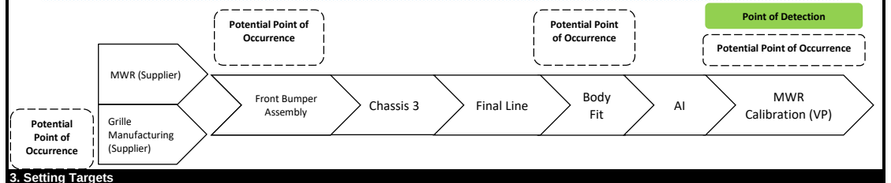
**AIM VALUE**
The correction angle is fed to a computer, which modifies the car's MWR software to account for the MWR's deviation from nomi nal (0°) when performing radar functions (fig 2)

## 2. Break Down The Problem

In October 2018, 31 vehicles have MWR vertical correction outside of Control Limits
- 20 > UCL (MWR angled too far downward) → 20 - F-Sport
- 11 < LCL (MWR angled too far upward) → 0 - Normal

**PRIORITIZED PROBLEM:** MWR intial aim vertical correction above UCL on F-Sport vehicles

**PROCESS FLOW**

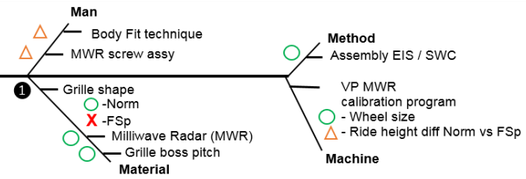



## 3. Setting Targets

**TARGET:** 0 F-Sport vehicles with MWR aim exceeding Upper Control Limit by Jan, 2019

## 4. Root Cause Analysis

MWR intial aim vertical correction above UCL on F-Sport vehicles




1

Avg aim 1.2° lower on QIS+ for FSp vs. Norm (fig 1) — WHY?

Grille type (not vehicle) causes a change in MWR aim (fig 3) — WHY?

FSp and Norm grilles hold MWR unit in different tilt positions (fig 4) — WHY?..

Lower grille curvature is more extreme for FSp grille (fig 5) — WHY?..

**Neccessary manufacturing processes (heat + paint / pressure) affect FSp grille differently (thinner plastic)**

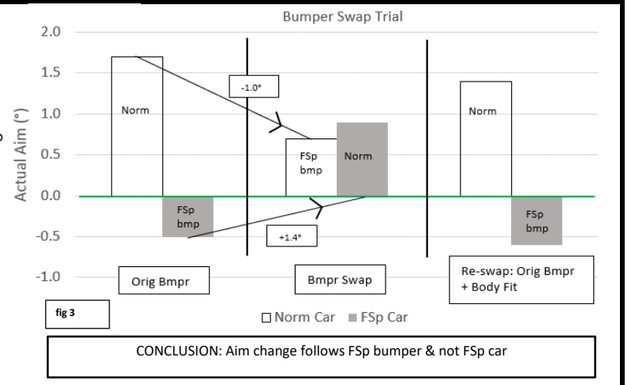



fig 3

CONCLUSION: Aim change follows FSp bumper & not FSp car

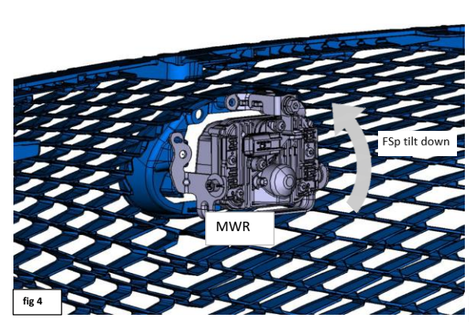
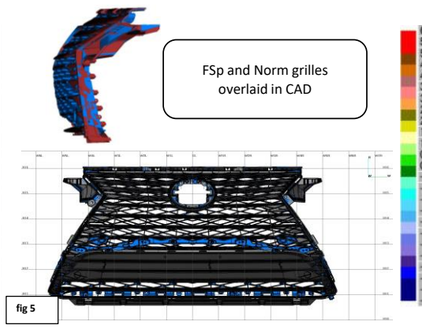
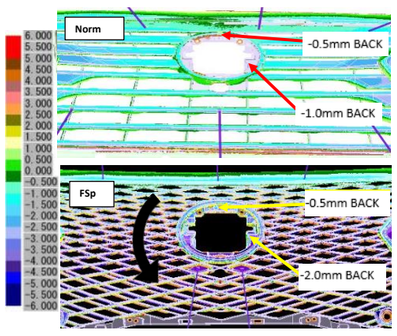



fig 4



FSp and Norm grilles overlaid in CAD

fig 5




## 5. Develop Countermeasures & 6. See Countermeasures Through

| CM # | | Cost | Quality | Timing | Effectiveness | Feasibility | Overall |
|---|---|---|---|---|---|---|---|
| 1 | Change Manufacturing conditions (heat / pressure) | △ | X | △ | X | △ | X |
| 2 | QTR: FSp grille upper boss length | △ | ○ | △ | ○ | ○ | ○ |
| 3 | VP: MWR calibration programming change | ○ | X | ○ | △ | △ | X |

**C/M 2: FSp Grille Upper Boss Height Tuning (fig 6)**
- Tuning: 0.847mm increase in upr boss height
- Tuning boss will have no negative effect on good Hd x Grl fitting

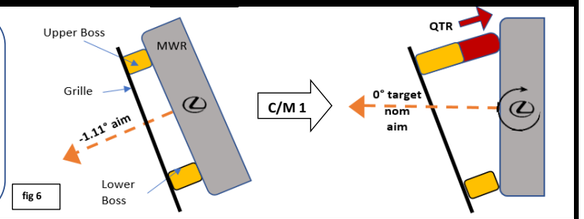
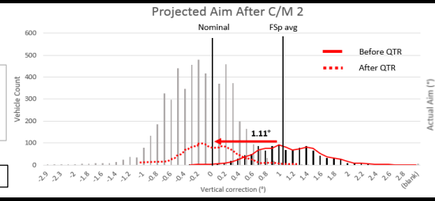



fig 6

## 7. Results and Process Evaluation & TBP Step 8. Standardization and Yokoten

**NEXT STEPS:**
Recommend QCE to use C/M 2 as QTR



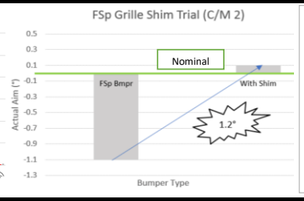




fig 7

**STANDARDIZATION / RECOMMENDATIONS**
To ensure quality in future vehicles:
- Include evaluation of general curvature of grille in Inspection Standard
- Curvature should be re-evaluated during manufacturing process changes
- Recommend that curvature be a critical point for 685B

## Analysis of Personal Objectives

| Objective | Eval | Status |
|---|---|---|
| 1) Gained understanding of how TBP is used to organize thought process and provides framework to investigate quality defects | Ó | |
| 2) Developed knowledge of manufacturing flow and how problems in 4 Ms can combine to produce defects | Ó | |
| 3) Learned how different QC groups use varied methods and approaches to work together in creating a high quality vehicle | Ó | |

## Reflections for Co-op Program

**Reflection:** I have gained experience with functional components of Front Mask, and been able to understand how contributions from different processes can combine to produce a defect. I have also gained cross-functional experience with various vehicle modules. Aside from main projects, I recommend that students seek opportunities to assist in project management roles during their work term.