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***Risk Management and Root Cause Analysis
regarding a Manufacturing Defect in the
Automotive Manufacturing Sector***

**Engineering Applications and Study Skills
(ACMA 4039)**

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1 Abstract

Aston Martin is an iconic luxury British sports car manufacturer that prides itself on its dedication to being a great example in Health and Safety across the industry. This is because any Health and Safety matters that are not complied with, can have a detrimental effect on the brands image; “The Company manages its business in a way that is designed to ensure maintenance of the highest standards of health and safety.” (Senior Manager, 2015).

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3 Introduction

This report intends to identify a variety of risks within the manufacturing sector at Aston Martin (AML). The report will also discuss the effect that these risks can have on the business and its employees. The report will take a more in-depth look into the safety precautions surrounding sound engineering, specifically, an ongoing issue that has been raised, regarding scuff damage that has been found continuously on the rear of a vehicle part called the 'squab' on the production line. A squab is the rear seat backrests in the vehicle.

4 Literature Review

4.1 Code of Conduct

When conducting a Root Cause Analysis (RCA), or any form of engineering activity within a professional environment, it is best practice for the individual to follow the rules, regulations and responsibilities of both internal and external guidelines. Internal guidelines can include Aston Martin's own Code of Conduct, or external guidelines such as IMechE. IMechE's Code of Conduct covers multiple realms of discipline for members to follow, including "They shall quantify, balance and limit risk in all aspects of professional work, including with those who are working under their authority" (IMECHE, 2021). This guidance does not just apply to members of IMechE, it should apply to all Engineers, Technicians and Management as they act to prevent risk, as well as safety concerns in the Workplace. Aston Martin's own Code of Conduct covers aspects such as values, code of conduct, and how we work together, which specifies the insurance of Health and Safety. "We promote a strong safety culture through health and safety training and risk assessments." (Aston Martin, 2023). This code applies to everyone working for and with Aston Martin, to keep everyone on and off site, safe and free from harm.

4.2 Aston Martin's Root Cause Analysis (RCA)

Within the company, there are many practical methods to sourcing the root cause of an issue or problem. The first of which is a Process Failure Mode and Effects Analysis (PFMEA). This version of RCA is used within Aston Martin as a measure of increasing safety for employees and customers, by reducing failures. Aston Martin's PFMEA measures Severity, Occurrence and Detection, resulting in an overall PFMEA ranking. Another effective method that Engineers and Technicians within AML use as a Root Cause Analysis technique, is the '5 Why's?'. The purpose of this method is to prevent an engineer from assuming that their first idea could be the cause of the issue. By brainstorming five different potential causes to an issue, it allows an engineer to be more open minded regarding the root cause.

4.3 Process of Installing the Rear Squab

When the technician is installing the rear squab to the vehicle, they have a process to follow, which is a list of instructions that outlines the part required to be fitted, how to fit the part, any fixings needed, and torque requirements. The technicians have a process to follow, to ensure that the same task is completed in the same order on every occasion. The process also involves the technician pressing a “Checks Complete” button at the end of their process, this is the technician confirming that they have followed the process, whilst acknowledging the company’s internal policies and standards regarding health and safety. This process enables technicians to follow a section of the ‘Health and Safety at Work Act 1974’. It states, “It shall be the duty of every employee to take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at work” (legislation.gov.uk, 2011).

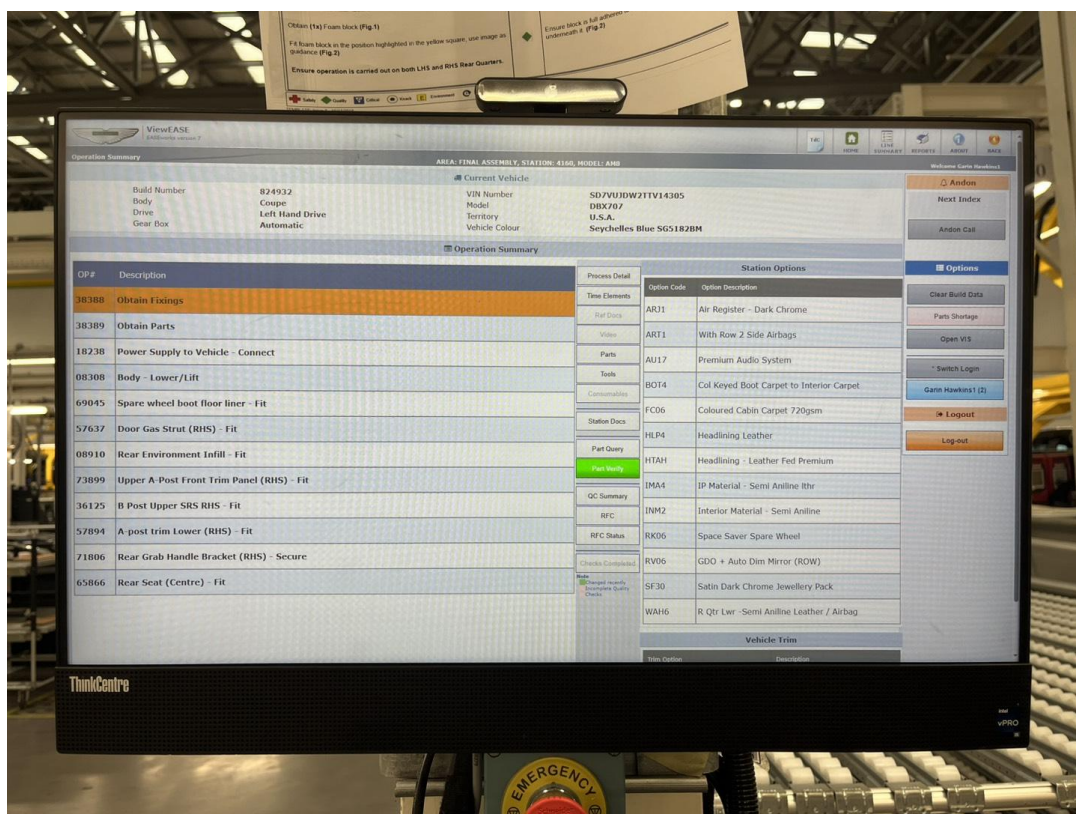


Figure 1 - Ease Screen showing 'Checks Complete' button (Author, 2025)

5 Issue at Hand

Aston Martin uses a system called ‘FLAGS’ to report damage to vehicle parts. From examining the Flags data, it is apparent that the issue is called at End of Line (EOL). EOL is the final quality checks within the Trim department, before the vehicle enters the next segment of production.

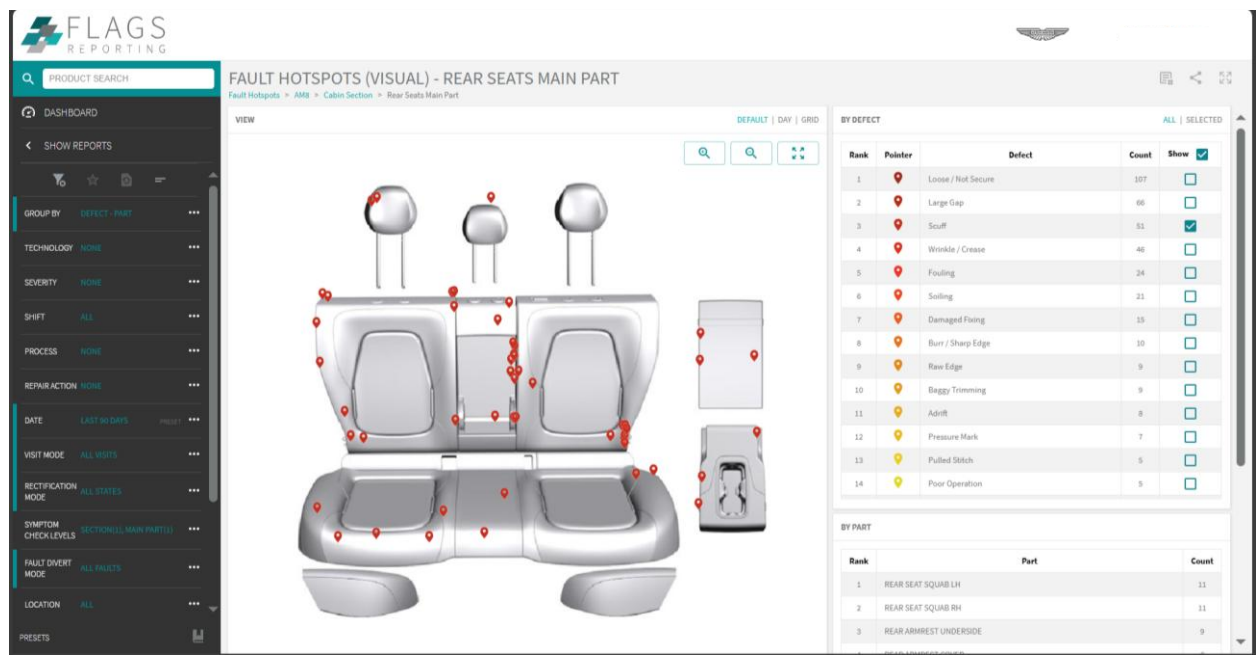


Figure 2 - Flags Reporting System (Flags Aston Martin, 2025)

Within the last 30 days exclusively, the concentration of scuffs in this area has reached 9 in the 104 vehicles inspected during this time. That is 9% of vehicles produced in this time frame with this exact damage. It has been established that the average rework time for a scuff of this caliber is 40 minutes, equating to £150 in both labor and material. Therefore, a total of 360 minutes and £1,350 in costs just for these 9 established scuffs within 30 days. This issue is going to be rectified as soon as possible.



Figure 3 - Flags Image of Squab Damage (Cerys Halford, 2025)

However, whilst investigating the issue, another issue was raised by technicians. The issue is that they are having trouble with the trolley that these parts are loaded on to. The technicians informed that bending over to obtain the part and lift it out of the trolley is causing repetitive strain on their backs due to the parts weighing approximately 20kg each, and being a difficult shape to carry.



Figure 4 - Example of lifting part from Trolley (Author, 2025)



Figure 5 - Example of lifting part from Trolley (Author, 2025)

The Health and Safety Executive state “Ergonomics can also reduce the potential for ill health at work, such as aches, pains and damage to the back. Consider the layout of equipment – Place those used most often where they are easy to reach without the need to stretch.” (Health and Safety Executive, 2013). This emphasizes the need for improvement on this station, where technicians are having difficulty regarding safely lifting and carrying the parts.

6 Root Cause Analysis

6.1 Form Fill-out

As displayed in the RCA below, the root cause, as well as corrective actions were established. The severity, occurrence, and detection scores are all based on feedback from the technicians on the defined station both before, and after the corrective action was put in place. Due to the original RPN being so high, actions had to be taken immediately to reduce this number. This not only reduces the ergonomic instabilities experienced by technicians, but it will also reduce the number of defects found on these particular interior components.

Root Cause Analysis (RCA)																
Item: Rear Seat Fit		Responsibility: Interior Trim		RCA number:												
Model: DBX 707 / DBX 707 S		Prepared by: Ben Cole		Page :												
Core Team: Damage Investigation / Ergonomics				FMEA Date (Orig): 23/10/2025 Rev:												
Process / Function	Identified Issue	Potential Effect(s) of Failure	Severity	C I S	Potential Cause(s) / Mechanism(s) of Failure	Occ	Current Controls	Det	R P N	Recommended Action(s)	Responsibility and Target Completion Date	Action Results				
												Actions Taken	Severity	Occ	Det	R P N
Process / Function	Describe the issue		Rate the severity from 1-10	Ex: Operational Failure	List potential causes of the issue	Rate the occurrence likelihood from 1-10	List current controls in place to detect/prevent the issue	Rate the detection capability from 1-10	Multiply severity, occurrence, and detection	Actions recommended to mitigate the issue	Person responsible and target date for action completion	Results after implementing actions			0	
OP65866 - Rear Seat (Centre) - Fit	Technicians having ergonomic issues lifting/carrying part	Damage to technicians backs, resulting in absenteeism	6	LO	Trolley shelving does not extend outwards (Like a drawer)	6	N/A	9	324	Provide technicians with a refresher on manual handling techniques from HSE	B. Cole (Completed)	Refresher course provided to technicians	3	2	36	
OP57848 - Rear Seat (RHS) - Fit	Technicians having ergonomic issues lifting/carrying part	Damage to technicians backs, resulting in absenteeism	6	LO	Trolley shelving does not extend outwards (Like a drawer)	6	N/A	9	324	Provide Lead Technicians with a refresher on manual handling techniques from HSE	B. Cole (Completed)	Refresher course provided to Lead Technicians	3	2	36	
OP57877 - Rear Seat (LHS) - Fit	Technicians having ergonomic issues lifting/carrying part	Damage to technicians backs, resulting in absenteeism	6	LO	Trolley shelving does not extend outwards (Like a drawer)	6	N/A	9	324	Provide Group Leaders with a refresher on manual handling techniques from HSE	B. Cole (Completed)	Refresher course provided to Group Leaders	3	2	36	

Figure 6 - RCA for Rear Seat Fit Issue (UWTSD, 2025)

6.2 Justification

A severity score of 6 has been decided. This is because a repetitive strain for an employee can result in time spent on sick leave. Repetitive strain is a form of Musculoskeletal Disease (MSD), “MSDs are the leading cause of sick days due to work-related ill health in the UK.” (Arco, 2019). Therefore this is a negative effect for both the employee, and Aston Martin as a company, however it is not rated higher than a 6 due to it not being a broken bone, damaged organ, or life-threatening injury for example.

The occurrence rating was given a score of 6. The 6 out of 10 demonstrates that it is a reoccurring issue that is experienced by the technicians that needs to be investigated further, however, the issue occurrence is not every vehicle or every other vehicle for example, therefore it has not been given a higher rating. Secondly, this risk shows the potential teams accessing the RCA that the issue is not severe, but it should not be downgraded to a lower priority issue such as a score of 4-5 could.

The detection figure was given a 9. This is due to the primary source of detection being when the technician experiences the pain firsthand. This is because there is no other way to measure an individual's resistance to pain/strain other than themselves. Therefore, there are not many actions that can be placed to reduce or increase the detection rating.

7 Solutions

7.1 Temporary Solution

To reduce the risk of technicians developing MSD from repetitive strain, immediate action must be taken. Firstly, the technicians are going to receive refresher training on safe manual handling techniques, following the Health and Safety Executive guidance;

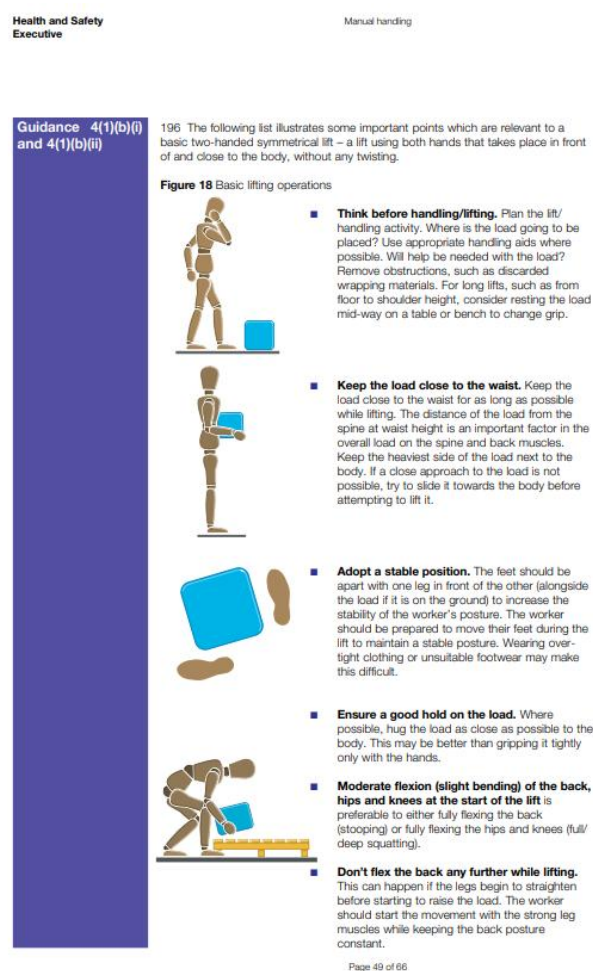


Figure 7 - Safe Manual Handling Techniques (HSE, 2016)

This advice will help to reduce the number of incidents regarding muscle strain due to awkward lifting. Technicians will have been trained on manual handling at the start of their time with Aston Martin, however, some technicians could have forgotten vital steps in the process to reduce potential injury as much as reasonably practicable. Since the temporary solution has been implemented, a recent verbal check in with technicians has shown that there has been a “clear improvement” in ability to lift, carry

and maneuver the rear squabs safely and efficiently. However, the technicians have also reported that straining does continue due to the positioning of the part being awkward to pick up from the shelving. This ongoing issue now must be escalated from a Level 0 to a Level 1. This means that the author has completed everything reasonably practicable within their capabilities, and following safety guidelines, to try and reduce the issue, the issue now has to be escalated to the Engineers.

DRAFT	DRAFT	DRAFT
Level 0 Problem Solving / Initial Investigation		
Problem Statement: <u>Squab Damage</u> Date / Time: <u>23/10/25</u> Originator: <u>End of Line</u> Point of Detection: <u>End of Line</u> Point of Fit: <u>4150</u> Full Part Number(s): <u>Centre Rear Squab</u> Vehicle(s) affected: <u>MULTIPLE</u> Technician on Process: <u>Garin Hawkins</u> Operation Number: <u>65866</u>		
Process Is EASE process present? ☐ Y ☒ N Is process clear and understandable? ☐ Y ☒ N Are quality standards accessible? ☐ Y ☒ N Are process knacks documented? ☐ Y ☒ N Date EASE/PSS released: <u>8/11/23</u> Is technician trained? ☐ Y ☒ N Date technician trained: <u>15/05/24</u> Does technician follow process? ☐ Y ☒ N Is the regular technician on process? ☐ Y ☒ N Does technician have sufficient time to complete process? ☐ Y ☒ N	Tooling Are tools listed on EASE? ☐ Y ☒ N Are tools used correct to EASE? ☐ Y ☒ N Are the tools referenced in the PSS? ☐ Y ☒ N Is tooling in good working condition? ☐ Y ☒ N Are tools calibrated and within date? ☐ Y ☒ N Are fixtures listed on EASE? ☐ Y ☒ N Are fixtures used correct to EASE? ☐ Y ☒ N Are fixtures referenced in the PSS? ☐ Y ☒ N Is there a fixture TPM record present? ☐ Y ☒ N Are all FLMs completed? ☐ Y ☒ N Is error proofing present and working? ☒ Y ☐ N	
Parts Are parts listed on EASE? ☐ Y ☒ N Is full part number correct (inc. suffix)? ☐ Y ☒ N Is the part number correct on materials rack / kit list? ☐ Y ☒ N Is barcode/QRcode scanning operational? ☒ Y ☐ N Does barcode/QRcode scan show correct part number? ☒ Y ☐ N Are there any obvious defects present? ☐ Y ☒ N Does defect occur after fitment? ☒ Y ☐ N	Problem Resolution / Next Steps Issues identified in Level 0? ☒ Y ☐ N PCMs raised: <u>N/A</u> _____ _____ Have all PCMs been rectified? ☒ Y ☐ N Does problem still exist after level 0? ☐ Y ☒ N If no, root cause: _____	
Problem Definition (to be completed for further investigation) What is the specific concern? _____ Where is the problem found? _____ How many defects have been found? _____ Over what time period has that quantity of defects been found? _____ Is this a new problem or just a new priority? _____ Is the defect visible at point of fit? _____		
Escalation to Level 1 Owner: _____ Signature: _____		
DRAFT	DRAFT	DRAFT

Figure 8 - Conducted Level 0 (Author, 2025)

7.2 Permanent Solution

To resolve this issue permanently, a complete redesign of the trolley holding the parts is necessary. This is an ongoing discussion amongst engineers within the factory. The redesign would require drawer runners to be implemented to the shelves of the trolley, allowing the shelves to extend and retract. Therefore, reducing the technicians muscle strain, and reducing the damage found on the back of the rear squab's, due to the easier accessibility to the parts, not having to lift and pull from an awkward to reach angle. Once the design has been finalized by the team, the trolley redesign will take place.

The screenshot shows the Amazon.co.uk product page for AOLISHENG Heavy Duty Drawer Runners. The product is described as having a 200kg load capacity, locking mechanism, ball bearing slides, full extension, and side mount. The price is £104.90. A table of size options is provided below the product description.

Size Name	Price
18 inch (450mm)	£72.90
20 inch (500mm)	£77.90
22 inch (550mm)	£82.90
24 inch (600mm)	£87.90
26 inch (650mm)	
28 inch (700mm)	
30 inch (750mm)	
32 inch (800mm)	

Figure 9 - Drawer Runners in Discussion with Engineering (Amazon.co.uk, 2025)

8 Conclusion

In conclusion, the RCA that was conducted, was a streamlined and essential method for finding a solution to the established issue. All potential contributors were considered during the investigation. After the RCA was complete, it was found that not only was the trolley the cause of damage to the rear of the squabs, but it was causing significant ergonomic stress on the technicians, causing strain on the back, resulting in an increased potential of absenteeism. In future, the technicians should report the issue to their Lead Technician as soon as the problem arises, and should not wait for a team to look at another issue on the item before raising the issue. Therefore, the RCA can be completed at an earlier stage, before harm is caused. RCA is an effective method of communicating an issue within different departments in the business. It ensures that every potential contributor is considered when a problem presents itself.

9 References

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10 Appendices & Personal Development Plan

T&F PFMEA - SEVERITY RANKING						
Effect on Product/Customer	Rank	Effect on Process/Manufacturing		AML Statement		
SAFETY and/or REGULATORY REQ not met - NO Warning [CPA '300' Safety no Warning]	10	May ENDANGER OPERATOR (machine or assembly) - NO Warning				Without warning.
SAFETY and/or REGULATORY REQ not met - WITH Warning [CPA '300' Safety With Warning]	9	May ENDANGER OPERATOR (machine or assembly) - WITH Warning		Hazardous	Extremely severe failure that affects the safe vehicle operation of the vehicle / non-compliance with legal requirements. May endanger machine / operator. High risk to company's production capability long term, which will affect financial stability. CPA 300 call due to V/S spec or performance failure	With warning.
LOSS of PRIMARY Function - vehicle inoperable, does not affect safe vehicle operation [CPA '70' Walk Home no Warning]	8	MAJOR DISRUPTION - scrap 100% of product, line shut down, or stop shipping. - Yard Hold/Ship Hold - 4 hours or more - Scrap Vehicle - Mainline / Shop Hold - Excessive down time greater than 4 hours		Very High	Vehicle is inoperable. Loss of primary function. Unscheduled dealer visit. Major disruption to the production line / extended line stop / stop vehicle shipment. 100% of the process related product needs to be scrapped. CPA 70 Customer extremely dissatisfied. Damage, incorrect or missing part. Complaint expected by >70% of customers due to V/S spec or performance failure. Tool wear / damage is high.	
DEGRADATION of PRIMARY Function - vehicle operable, but at reduced level of performance [CPA '70' Walk Home with Warning]	7	SIGNIFICANT DISRUPTION - scrap some product, deviation from primary process (decreased line speed or added manpower) - Added manpower Outside Station/Group Team Lead: example 100% Contain, Mark, etc for a shift - Loss of Trace - Scrap Major Component/Assembly -Example: Frame, Engine, Trans, etc - Mainline stopped for (3) Hours - Repair likely to cause collateral damage to nearby KCSS/PQC/Electrical parts.		High	Vehicle is operable, but at a reduced level of performance. Degraded primary function or loss of secondary function. Unscheduled dealer visit. Deviation from many processes with significant disruption to the production line. Delayed delivery or Tool wear. Decreased line speed or added manpower. Product may have to be scrapped and a portion scrapped (100%). CPA 70 Customer extremely dissatisfied. Damage, incorrect or missing part. Complaint expected by >70% of customers due to V/S spec or performance failure.	
LOSS of SECONDARY Function - vehicle operable, but comfort / convenience functions inoperable	6	MODERATE DISRUPTION - 100% of product reworked off-line - Standard / Procedure is offline repair - Mainline Stopped for (60) Minutes or More - Repair likely to cause collateral damage to nearby parts - Primary process followed.		Moderate	Vehicle is operable, but comfort / convenience features are inoperable. Degraded secondary function. Constant squeaks & rattles. Unscheduled dealer visit. Moderate disruption to the production line which delays delivery. A portion (<100%) may have to be scrapped. CPA 70 Customer extremely dissatisfied. Damage, incorrect or missing part. Complaint expected by >30% of customers due to V/S spec or performance failure.	
DEGRADATION of Secondary Function - vehicle operable, but comfort / convenience functions at reduced level of performance	5	MODERATE DISRUPTION - some product reworked off-line - Standard Repair done online and downstream - Mainline Stopped for more than (30) Minutes		Low	Vehicle is operable, but comfort / convenience features operate at a reduced level of performance. Intermittent squeaks & rattles. Repaired at scheduled dealer visit. Moderate disruption to the production line whereby 100% of the product may have to be re-worked off line. CPA 70 Customer extremely dissatisfied. Damage, incorrect or missing part. Complaint expected by >30% of customers / V/S spec, performance or cosmetic defect.	
ANNOYANCE (vehicle is still operable) - appearance or audible noise - noticed by >75% of customers	4	MODERATE DISRUPTION - 100% of product reworked in-station - Line Stop Repair (In Station) - Andon Pull; Less than "two cycles" (30) Minutes		Very Low	Minor disruption to the production line. The product may have to be sorted and a portion (<100%) and re-worked on line after the station / operation. CPA 30 Defect noticed by average customer. Major cosmetic item / Poor appearance. Repaired at scheduled dealer visit. Complaint expected by >30% of customer / V/S cosmetic defect.	
ANNOYANCE (vehicle is still operable) - appearance or audible noise - noticed by 50% of customers	3	MODERATE DISRUPTION - some product reworked in-station - Line Stop Repair (In Station) - Andon Pull; Less Than "one cycle" / (15) Minutes		Minor	Minor disruption to the production line. The product may have to be sorted and a portion (<100%) has to be re-worked prior to station / operation. CPA 30 Defect noticed by average customer. Major cosmetic item / Poor appearance. Scheduled or unscheduled dealer visit. Product repaired at 50% of customer's V/S.	
ANNOYANCE (vehicle is still operable) - appearance or audible noise - noticed by <25% of customers	2	MINOR DISRUPTION - slight inconvenience to process, operation, or operator - Repair (in station) - No Line Stop		Very Minor	Very minor disruption to the production line. The product may have to be sorted and a portion (<100%) can be reworked within station / operation TACT. Slight inconvenience to process or operator. CPA 10 Defect noticed by discriminating customer / V/S cosmetic defect	
NO EFFECT	1	NO EFFECT		None	No discernable effect	

Figure 10 - PFMEA Severity Ranking (Aston Martin, 2019)

PFMEA - OCCURRENCE RANKING							
Probability of Failure	Rank	Failure Rate		Production of 5 Per DAY	AML Statement		
VERY HIGH	10	≥ 100 per thousand > 1 in 10	10%	2.5 Failures / WEEK	Very High	New process / technology without any existing preventive controls. Approximately 100% NOK. Process failure is inevitable.	
	9	50 per thousand 1 in 20	5%	1.25 Failures / WEEK		New process / technology with unproven preventive controls. Approximately 50% NOK. Process is likely to fail.	
	8	20 per thousand 1 in 50	2%	2.2 Failures / MONTH	High	Process with problematic history. Approximately 25% NOK. Process inconsistency.	
MODERATE	7	10 per thousand 1 in 100	1%	1.1 Failures / MONTH		Current process / technology applied to new commodity with uncertainty about effectiveness of preventive controls. Approximately 15% NOK. Generally	
	6	2 per thousand 1 in 500	0.2%	2.61 Failures / 1 YEAR	Moderate	New process / technology using proven preventive controls. Approximately 5% NOK. Generally associated with similar processes that have experienced occasional	
	5	.5 per thousand 1 in 2,000	0.05%	1.305 Failures / 2 YEARS		Current process applied to existing commodities with unproven preventive controls. Approximately 1% NOK. Associated with similar processes that have New process / technology using proven preventive controls. Less than 1% per model. Associated with similar processes that have experienced isolated failures.	
LOW	4	.1 per thousand 1 in 10,000	0.01%	< 1 Failures / 5 YEARS	Low	Minor changes to current processes with positive production experience under comparable conditions. Isolated failures associated with almost identical processes.	
	3	.01 per thousand 1 in 100,000	0.001%	< 1 Failures / 5 YEARS	Very Low	Minor changes to current processes with positive production experience under comparable conditions. Isolated failures associated with identical processes.	
	2	≤ 0.001 per thousand 1 in 1,000,000	0.0001%	< 1 Failures / 5 YEARS		No failures associated with identical processes. Failure is eliminated through preventive controls i.e. Poke yoke process / assembly.	
VERY LOW	1	Failure is eliminated through preventive control.			Remote		

Figure 11 - PFMEA Occurrence Ranking (Aston Martin, 2019)

T&F PFMEA - DETECTION RANKING									
Opportunity for Detection	Rank	Detection Control	Line Stop	In Station	Subsequent Operation	100%	Sampling	AML Statement	
NO DETECTION OPPORTUNITY	10	NO DETECTION - There is no detection method or the defect cannot be detected in the assembly plant						Abandon the assembly	Control will not and/or cannot discover the potential failure cause or subsequent failure mode (in-house), the current detection method is proven
NOT LIKELY TO DETECT AT ANY STAGE	9	SINGLE SENSORY CHECK - PERIODIC Example: C/P, drive audit, random audit, random torque checks, random wheel inspection	MANUAL		X		X	Very Remote	Very remote likelihood of the defect being detected will detect the potential failure cause or subsequent failure mode (in-house). Very low detection probability (e.g. Random audit)
PROBLEM DETECTION POST PROCESSING	8	ATTRIBUTE GAUGING - PERIODIC Example: Oil leak & valve leak, C/P, water test inspection	MANUAL		X		X	Remote Discovery	Remote likelihood of the defect in control will detect the potential failure cause or subsequent failure mode (in-house). Unproven detection method
PROBLEM DETECTION AT SOURCE	7	SINGLE SENSORY CHECK - 100% SUBSEQUENT OPERATION Example: visual check OR touch, C/P, New, late final test (without proper, not automatic), verification station	MANUAL		X	X		Very Low	Unlikely in the ability of the detection measures. No previous experience with the defect procedure. Detection of the failure cause post process. Failure in detection in detection using existing test methods in new design process (e.g. New gas, manual torque check)
		ATTRIBUTE GAUGING - SUBSEQUENT OPERATION Example: gas gas, manual torque check, length of wheel, click wrench, functional test (pneumatic, not automatic), torque & valve leak, water test, inspection (100%)	MANUAL		X	X			
		VARIABLE GAUGING - PERIODIC Example: torque audit, downward, body leak test (SLT)	MANUAL	X			X		
		SINGLE SENSORY CHECK - 100% INSTALLATION Example: visual check OR touch	MANUAL	X		X			
PROBLEM DETECTION POST PROCESSING	6	MULTIPLE VISUAL INSPECTIONS - first checks in installation	MANUAL	X	X	X		Low	Detection of the failure cause post process or failure in detection in detection (e.g. New gas, manual torque check). In-house and for procedures from comparable gas are used under real conditions (production, not trials)
		DOUBLE SENSORY CHECK - 100% SUBSEQUENT OPERATION Example: (visual AND tactile) visual with paint mark or visual with pull test	MANUAL		X	X			
		DATA RECORDING first catches the operator or a downstream part (gas leak) without line lock-out	MANUAL		X	X			
		ATTRIBUTE GAUGING - IN STATION Example: gas gas, manual torque check, length of wheel, click wrench	MANUAL	X		X			
PROBLEM DETECTION AT SOURCE	5	VARIABLE GAUGING - SUBSEQUENT OPERATION Example: gas gas, manual torque check, length of wheel, click wrench	MANUAL		X	X		Moderate	No failure test procedures in new design process or under new conditions (production, not trials). Possible detection of the failure cause in detection by operator using automated controls that will detect downstream part and verify the operation (light, buzzer, etc.). Gasping performance on set-up or shakedown in first-in-first-out
		DOUBLE SENSORY CHECK - 100% INSTALLATION Example: (visual AND tactile) visual with paint mark or visual with pull test	MANUAL	X		X			
		RITING or Sequencing using positional pick, and marking each line on the run wheel	MANUAL	X		X			
		CANNOT COMPLETE SUBSEQUENT OPERATION	MANUAL		X	X			
PROBLEM DETECTION POST PROCESSING	4	NOTIFICATION ONLY - IN STATION Example: pick type (first pick) without line lock-out, forcing or locking, head locking, line code reader, torque controlled (code with light, buzzer, away code, very low) but not the operator or a downstream part without line lock-out	MANUAL	X		X		Moderately High	Moderately high likelihood of the detection measures will detect the failure cause. Detection of the failure cause in detection using automatic controls that will detect the downstream part and prevent it from being processed further. The required new design equipment has been confirmed
		VARIABLE GAUGING - IN STATION Example: head test before and after discharge	MANUAL	X		X			
		AUTO LINE STOP - SUBSEQUENT OPERATION Example: (warning (line code reader), vision system, sensor providing feed to the vehicle (first pick) such as pressure mats, limit switches, forcing or locking, constant P/C constant or torque (code with torque, light torque, no torque, single monitoring for cross-feeding), garage doors	AUTO		X	X			
		PART PICK WITH FEEDBACK - IN STATION (or in downstream) without line lock-out	AUTO	X		X			
PROBLEM DETECTION AT SOURCE	3	CANNOT COMPLETE CURRENT OPERATION Example: (warning (line code reader), vision system, sensor providing feed to the vehicle (first pick) such as pressure mats, limit switches, forcing or locking, constant P/C constant or torque (code with torque, light torque, no torque, single monitoring for cross-feeding), garage doors	MANUAL	X		X		High	High likelihood of the defect detection measures will detect the failure cause. High detection of the failure cause in detection using automatic controls that will detect the downstream part and prevent it from being processed further. The required new design equipment has been confirmed
		AUTO LINE STOP - IN STATION Example: (warning (line code reader), vision system, sensor providing feed to the vehicle (first pick) such as pressure mats, limit switches, forcing or locking, constant P/C constant or torque (code with torque, light torque, no torque, single monitoring for cross-feeding), garage doors	AUTO	X		X			
		DEFECT PREVENTION - IN STATION (control also visible with defect)	AUTO	X		X			
		Example: warning with part lock prior to assembly (control continues to assemble) vision system without lock prior to assembly	AUTO	X		X			
ERROR DETECTION AND/OR PROBLEM PREVENTION DETECTION NOT APPLICABLE; ERROR PREVENTION	1	ERROR PROOFED - the defect cannot happen	AUTO	X		X		Almost Certain	Failure cause will not and/or not be detected using no failure controls. Changing part to correct the failure cause has been confirmed. Design of the failure cause has been confirmed. Design of the failure cause has been confirmed. Design of the failure cause has been confirmed.

Figure 12 - PFMEA Detection Ranking (Aston Martin, 2019)




POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
PROCESS FMEA

FMEA Number: _____

Page _____ of _____

Prepared By: _____

FMEA Date: (Orig) _____ (Rev.) _____

Item: _____

Model Year(s)/Program(s): _____

Core Team: _____

Process Responsibility: _____

Key Date: _____

Process Function	Potential Failure Mode	Potential Effect(s) of Failure	S e v e r i t y	C a u s e	O c c u r r e n c e	Current Control		D e t e c t i o n	R e c o m m e n d e d a c t i o n	Responsibility & Target Completion Date	Action Results			
						Prevention	Detection				S	O	C	R
Requirements														

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APPENDIX A - 5

Figure 13 - Ford PFMEA Process Form (Ford Motor Company, 2004)

Personal Development Plan

Name – Ben Cole

Degree – Manufacturing and Mechanical Engineering

Previous Qualifications – Level 3 Ext Dip Engineering Technical Support, Level 3

Performing Engineering

Previous Experience – Customer Assistant (Tesco), Temporary Cover (Local Gardening Business)

Long Term Goals (5 to 10 years)

- Become a qualified Engineer at Aston Martin.

Short Term Goals (0 to 5 years)

- Develop technical writing skills through the creation of this report.
- Develop understanding of what a root cause analysis is, and where they are used throughout Aston Martin.
- Develop research skills, ensuring that the correct material, from reliable, relevant and up to date sources, is used.

Goal	Objective	Resources Required	Measurement	Target Date
Redesign of a parts delivery trolley for interior squabs.	Create an ergonomically safe method for technicians to obtain relevant part from the parts delivery trolley.	4x drawer runners that can safely withstand the required load. 3D modelling with use of computer aided technology.	Regular meetings and conversation with management and engineers regarding project progression.	January 2 nd , 2026 (Within the next company shut down).
Provide technicians with safe manual handling information.	To be able to provide technicians with safe manual handling information from the Health and Safety Executive website, in an attempt to reduce reported pains.	Company Health and Safety standards. Health and Safety Executive safe manual handling documents.	Delivery of toolbox talk to technicians regarding safe lifting techniques. Name and signed document from technicians on completion.	October 31 st , 2025 (As soon as possible).