MAE 508
System's Engineering

Spring 2018

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Customer Requirements	System Requirements	Design Requirements
CR1. The helmet must fit an average adult male.	SR1. The helmet shall be sized to fit 90% of adult males in general US population.	DR1. The helmet shall be manufactured in three different sizes (small, medium, large) to fit 90% of adult males in general US population.
CR2. The helmet must protect user from all weather conditions.	SR 2. The helmet shall be designed for all weather conditions in the continental United States.	DR2. The helmet shall be operational in temperature ranges of -30 ˚F to 150 ˚F.
		DR3. The helmet shall be constructed such that there is 0.5% water absorption at outer layer.
CR3. The helmet must allow user to see surrounding traffic.	SR3. Helmet shall have an opening at face to provide peripheral vision clearance of a minimum of 120 deg vision angle.	DR 4. Face opening shall provide peripheral vision clearance of a minimum of 60 deg from the helmet midline.
CR4. Helmet must be comfortable.	SR4. Helmet weight shall not exceed 1800 grams +/- 200 grams.	DR5. The total weight of helmet system after manufacture shall not exceed 1800 grams +/- 200 grams.
	SR5. Helmet shall allow for a ventilation rate of 0.025 m^3/s.	DR6. Helmet design shall include vent holes that shall allow for a ventilation rate of 0.025 m^3/s.
CR5. Helmet must be able to be secured and retained on head during use including during impact.	SR6. Helmet shall allow for an angular rotation of 0.1 degrees or less between user and helmet.	DR7. The helmet shall be constructed with an inner layer of foam that is flush with user's head such that there is an angular rotation of 0.1 degrees or less between user and helmet.
	SR7. Helmet shall be retained on head with a 200 mph windspeed.	DR8. The helmet shall be constructed to be retained on head with a 200 mph windspeed.
	SR8. Helmet shall withstand a 12,500 psi.	DR9. The helmet's rigid outer layer material shall withstand 12,500 psi without cracking.

Requirements Traceability Matrix

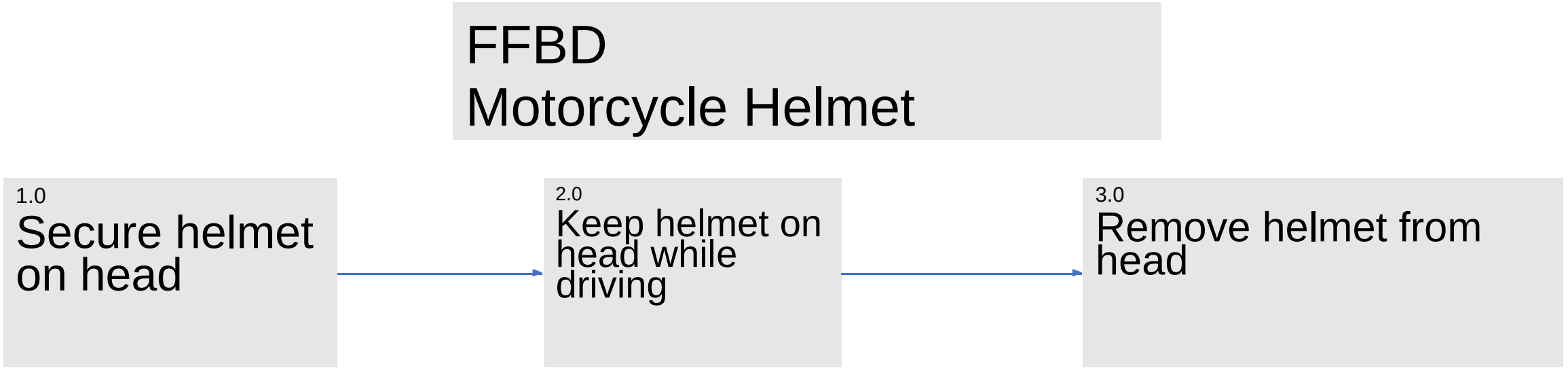
Customer Requirements	System Requirements	Design Requirements
CR1	**SR1**	**DR1**
CR2	**SR2**	**DR2, DR3**
CR3	**SR3**	**DR4**
CR4	**SR4**	**DR5**
	SR5	**DR6**
CR5	**SR6**	**DR7**
	SR7	**DR8**
	SR8	**DR9**

Requirements Allocation Sheet (RAS)

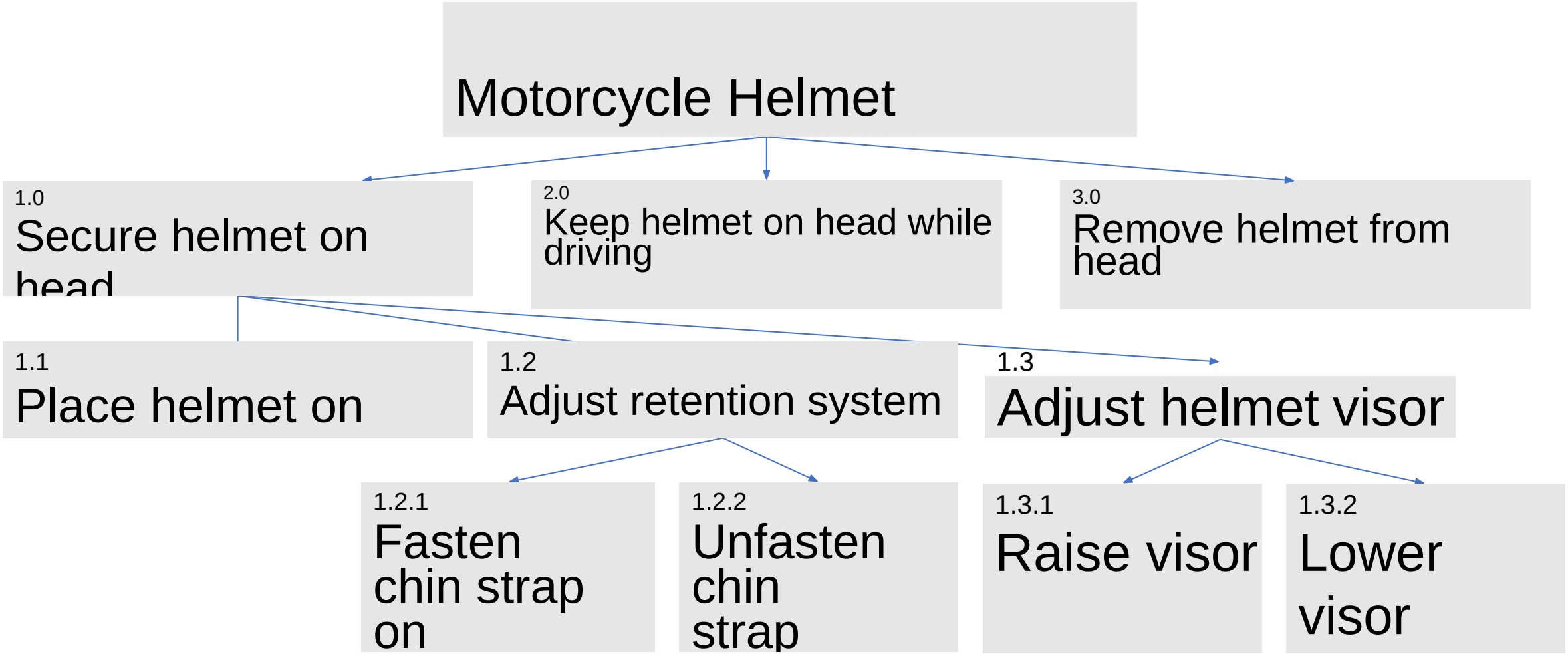
No.	Requirement	Verification Requirement	Method	Function
SR1	The helmet shall be sized to fit 90% of adult males in general US population.	VR1: Shall be verified that inner diameter from front (user's face) to back is [90% in inches] and inner diameter from one ear side to opposite ear side is [90% in cm]	Inspection	Design
SR2	The helmet shall be designed for all weather conditions in the continental United States.	VR2: Helmet shall be tested in temperatures ranging from 14˚F to 122˚F with a relative humidity of 50 percent for 12 hours.	Test	Design
		VR3: Helmet's outer surface shall be immerse in water at a temperature of 77˚F for 12 hours an validate that 0.5% water absorption through outer layer.	Test	Design
SR3	Helmet shall have an opening at face to provide peripheral vision clearance of a minimum of 120 deg vision angle.	VR4: Helmet shall be placed on a user in clear visibly and a vision clearance of at least 120 deg must be achieved by 90 percentile of US male population.	Demonstration	Human Factors

No.	Requirement	Verification Requirement	Method	Function
SR4	Helmet weight shall not exceed 1800 grams +/- 200 grams.	VR5: After assembly, it shall be verified that weight does not exceed 1800 grams +/- 200 grams.	Verification	Design
SR5	Helmet shall allow for a ventilation rate of 0.025 m^3/s.	VR6. Helmet shall allow for a ventilation rate of 0.025 m^3/s or more.	Test	Design
SR6	Helmet shall allow for an angular rotation of 0.1 degrees or less between user and helmet.	VR7. Helmet shall not allow for an angular rotation of more than 0.1 degrees.	Demonstration	Human Factors
SR7	Helmet shall be retained on head with a 200 mph windspeed.	VR8. Helmet shall be retained on head during 200 mph windspeed for 1 hour.	Test	Design
SR8	Helmet shall withstand a 12,500 psi.	VR9. Helmet shall withstand a 12,500 psi impact force without cracking.	Test	Design

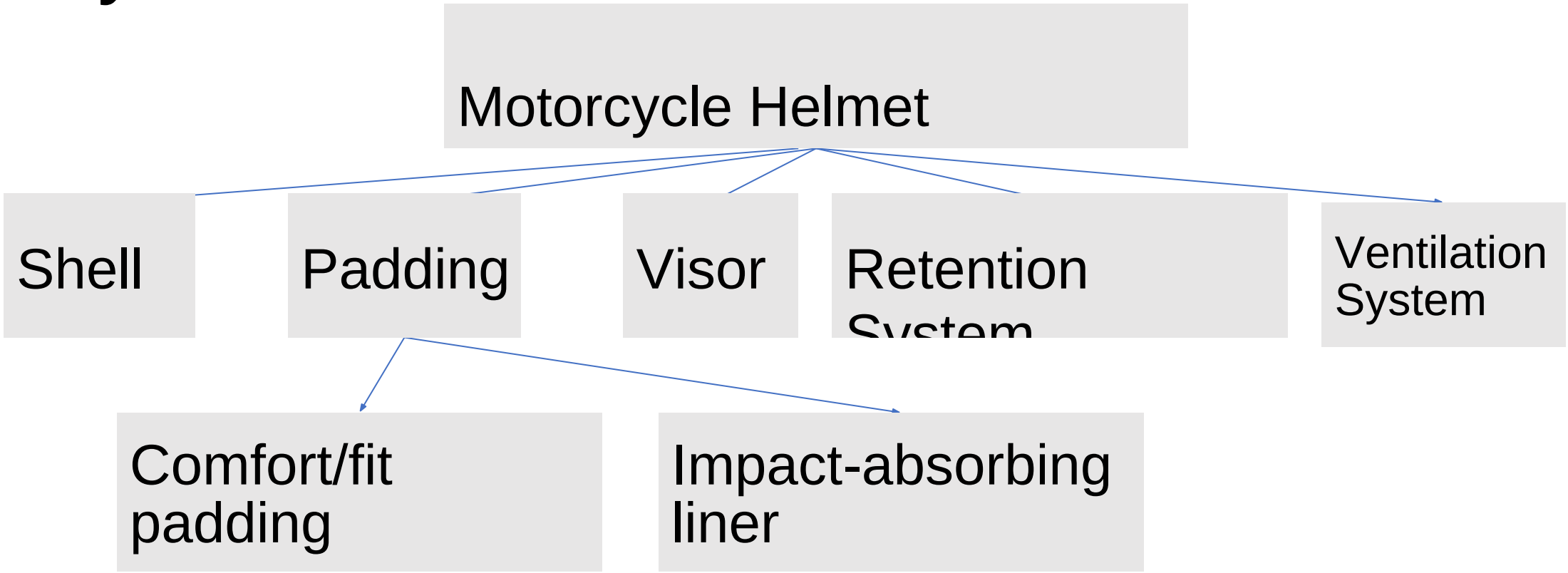
Functional Flow Block Diagram



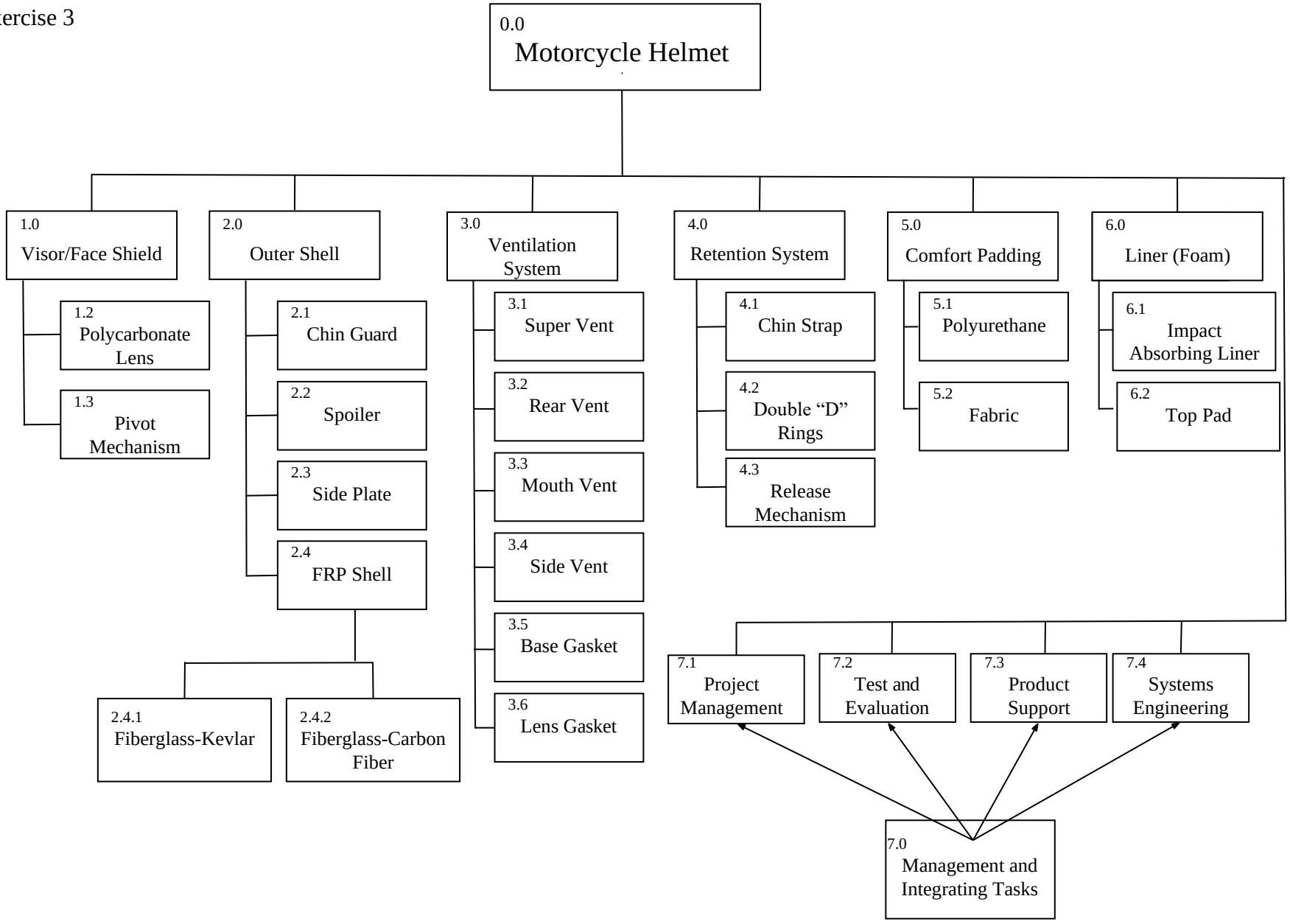
Functional Architecture



System Architecture



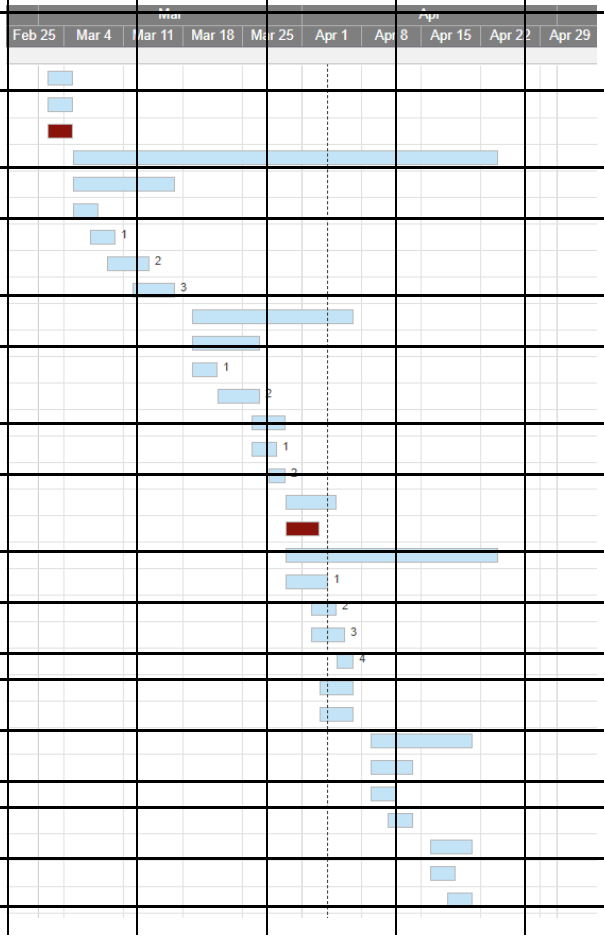
Exercise 3


0.0
Motorcycle Helmet
1.0
Visor/Face Shield
1.2
Polycarbonate Lens
1.3
Pivot Mechanism
2.0
Outer Shell
2.1
Chin Guard
2.2
Spoiler
2.3
Side Plate
2.4
FRP Shell
2.4.1
Fiberglass-Kevlar
2.4.2
Fiberglass-Carbon Fiber
3.0
Ventilation System
3.1
Super Vent
3.2
Rear Vent
3.3
Mouth Vent
3.4
Side Vent
3.5
Base Gasket
3.6
Lens Gasket
4.0
Retention System
4.1
Chin Strap
4.2
Double "D" Rings
4.3
Release Mechanism
5.0
Comfort Padding
5.1
Polyurethane
5.2
Fabric
6.0
Liner (Foam)
6.1
Impact Absorbing Liner
6.2
Top Pad
7.1
Project Management
7.2
Test and Evaluation
7.3
Product Support
7.4
Systems Engineering
7.0
Management and Integrating Tasks

Exercise 4

Exercise 4: IMP/IMS

ID	PE	SA	AC	Task	Description	Start	Finish	Duration in days
1	1				Management Approved to Start a New Helmet Design	Fri 3/2/2018	Sun 3/4/2018	2
2	1	1			Management Signed Contract for Approval	Fri 3/2/2018	Sun 3/4/2018	2
3	1	2			Management Sent out Approved Budget	Fri 3/2/2018	Sun 3/4/2018	2
4	2				Completion of Helmet Design	Mon 3/5/2018	Mon 4/23/2018	49
5	2	1			Overview of System Requirement	Mon 3/5/2018	Fri 3/16/2018	11
6	2	1	1		Completion of Requirments Analysis	Mon 3/5/2018	Wed 3/7/2018	2
7	2	1	1	1	General Requirements of Motorcycle Helmet	Wed 3/7/2018	Fri 3/9/2018	2
8	2	1	1	2	Certification Requirements of Motorcycle Helmet	Fri 3/9/2018	Tue 3/13/2018	4
9	2	1	1	3	System Design Requirements of Motorcycle Helmet	Mon 3/12/2018	Fri 3/16/2018	4
13	2	2			System Design Review	Mon 3/19/2018	Fri 4/6/2018	18
14	2	2	1		Overview of Design Requirement Completion	Mon 3/19/2018	Mon 3/26/2018	7
15	2	2	1	1	Complete Requirement Allocation Sheet	Mon 3/19/2018	Wed 3/21/2018	2
16	2	2	1	2	Complete Requirements Traceability	Thu 3/22/2018	Mon 3/26/2018	4
17	2	2	2		Functional Analysis and Allocation	Mon 3/26/2018	Thu 3/29/2018	3
18	2	2	2	1	Complete Functional Flow Block Diagram	Mon 3/26/2018	Wed 3/28/2018	2
19	2	2	2	2	Design Functional Architecture	Wed 3/28/2018	Thu 3/29/2018	1
20	2	2	2		Work Break Down Structure	Fri 3/30/2018	Wed 4/4/2018	5
21	2	3			Identify Risk, Opportunity, and Issue Management	Fri 3/30/2018	Mon 4/2/2018	3
22	2	3	1		Risk Identification of Helment Design	Fri 3/30/2018	Mon 4/23/2018	24
23	2	3	1	1	Identify Possible Risk Descriptions	Fri 3/30/2018	Tue 4/3/2018	4
24	2	3	1	2	Identify Source of Risk	Mon 4/2/2018	Wed 4/4/2018	2
25	2	3	1	3	Identify Consequences if Risk Realized	Mon 4/2/2018	Thu 4/5/2018	3
26	2	3	1	4	Risk Mitigation Plan Completed	Thu 4/5/2018	Fri 4/6/2018	1
27	2	4			Helmet Design Analysis	Tue 4/3/2018	Fri 4/6/2018	3
28	2	4	1		Helment Design Trade Study Completed	Tue 4/3/2018	Fri 4/6/2018	3
29	3				Completion of Verification	Mon 4/9/2018	Fri 4/20/2018	11
30	3	1			Completion of Verification plan	Mon 4/9/2018	Fri 4/13/2018	4
31	3	1	1		Verification Requirements Completed	Mon 4/9/2018	Wed 4/11/2018	2
32	3	1	2		Verification Plan Completed	Wed 4/11/2018	Fri 4/13/2018	2
33	3	2			Completion of Helmet Design Readiness Test	Mon 4/16/2018	Fri 4/20/2018	4
34	3	2	1		Test Procedure Completed	Mon 4/16/2018	Wed 4/18/2018	2
35	3	2	1		Test Preparation Completed	Wed 4/18/2018	Fri 4/20/2018	2



Program Risk Summary Worksheet

Risk Title Design Group Staffing [motorcycle helmet]

Risk No. 001

Owner Jane Wick

Date: 03/01/2018

Description of Risk

Potentially inadequate amount of personnel and scheduling resources are available to competently support a heavy emphasis in research and design for a motorcycle helmet.

Source of Risk

The unplanned demand for a heavy emphasis on research design, from users and project managers with a concern for product usability, increase the likelihood of a high-medium risk in scheduling and costs.

Consequence if Risk is Realized

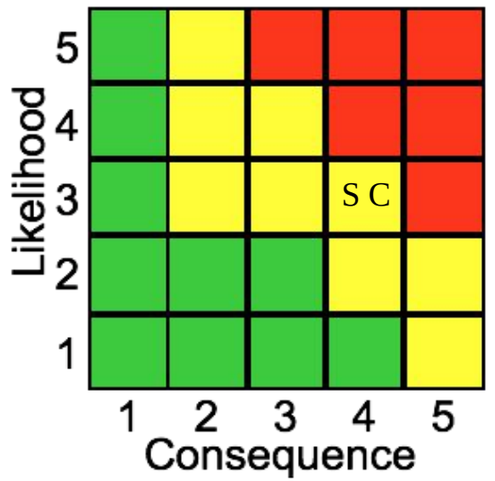
There is a high-Medium risk of scheduling consequences that may significantly delay milestones and cost up to 10% over the planned budget. No relevant technical risks are realized at this time.

Risk Consequence:

T - Technical

S - Schedule

C - Cost



Risk Reduction Plan

Action/Event	Date			Success Criteria	Risk Level if Successful	Owner
	Scheduled	Actual	Mitigation Option			
1. Advise management of potential performance impact if required resources are not available	03/01	03/01	Transfer	1. Management has been notified and is in review of impact of resource shortage	Medium	Gluteus Maximus
2. Management revising resources to meet scheduling and cost demands	03/05	03/05	Control	2. New plan: recruit design contractors to mitigate schedule and cost impact [immediately]	Medium	Green Ranger
3. Recruit and vet new design contractors with approval of users and project managers	03/10	03/10	Transfer	3. Users and project managers vetted contractors for approval	Medium	Patty Mayonnaise
4. Approved design contractors require skill and knowledge interviews	03/18	03/19	Control	4. Finalize selection of design contractors with desirable skill and knowledge sets	Medium	Rick Morty
5. Offer and hire contractors with competency to complete helmet design	03/29	03/29	Control	5. New hires allow Design Group to deliver helmet designs in timely manner. Risk consequences for schedule slips and cost overrun [<1%] are minimized.	Low	Rick Morty

Program Risk Summary Worksheet

Risk Title Production Safety [motorcycle helmet]

Risk No. 002

Owner Jack Reacher

Date: 04/01/2018

Description of Risk

Potential health hazard for production personnel - Safety engineers demand specialized impact absorbent foam liner materials, to meet and exceed safety regulations for the motorcycle helmet. The specialized foam materials emit gaseous chemicals with known health hazards during the manufacturing process.

Source of Risk

The specialized foam materials emit toxic gases during manufacturing formation and curing processes. This health hazard is highly likely to jeopardize scheduling and costs with High risks by harming production personnel. Technical risks are highly likely with some design modifications required.

Consequence if Risk is Realized

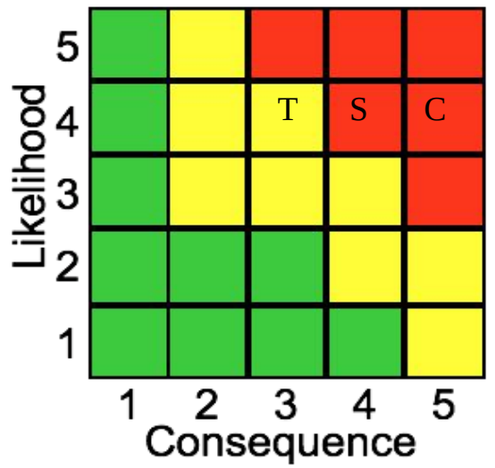
Work and time loss from sick or injured production personnel will result in delay at unacceptable levels for scheduled milestones, and cost overruns greater than 10% of the planned budget. Technical consequences will require redesign of helmet foam materials, to promote production personnel safety and efficiency.

Risk Consequence:

T - Technical

S - Schedule

C - Cost



Risk Reduction Plan

Action/Event	Date			Success Criteria	Risk Level if Successful	Owner
	Scheduled	Actual	Mitigation Option			

Program Risk Summary Worksheet

Risk Title Material Supply Chain [motorcycle helmet]

Risk No. 003

Owner Johnny Carson

Date: 04/15/2018

Description of Risk

The racing team with a performance and ergonomics emphasis demands an ultra lightweight material for the helmet's outer shell. The ultra lightweight material is difficult to acquire for production, which may require heavy technical redesign - impacting scheduling and costs.

Source of Risk

Suppliers may not be able to fabricate bleeding-edge ultra lightweight textiles fast enough to meet the demands of production. The ultra lightweight material has not been proven for mass manufacturing at an industrial rate. There is a high likelihood of risk consequences to scheduling, costs, and technical aspects to the project.

Consequence if Risk is Realized

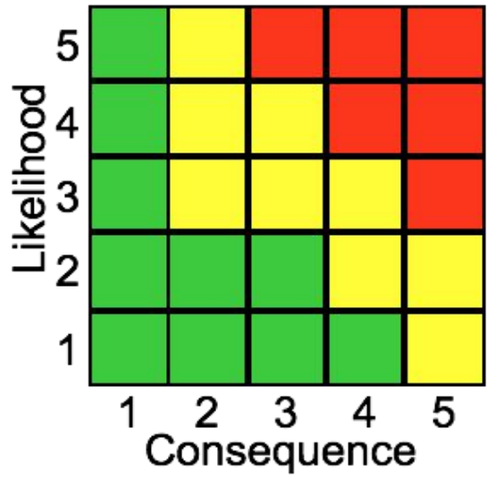
This delay in supply and production will significantly set back scheduled milestones, with up to 5% budget overrun. The outer shell will require significant redesigns with a new approach to meet ultra lightweight performance standards.

Risk Consequence:

T - Technical

S - Schedule

C - Cost



Risk Reduction Plan

Action/Event	Date			Success Criteria	Risk Level if Successful	Owner
	Scheduled	Actual	Mitigation Option			

Exercise 6

Option #1 – Use inexpensive material
Option #2 – Use non-toxic foam liner material
Option #3 - Use carbon fiber for outer shell

Example 1		Option #1		Option #2		Option #3	
Evaluation Criteria	Weight	RS	WS	RS	WS	RS	WS
1. The helmet shall be manufactured in three different sizes (small, medium, large) to fit 90% of adult males in general US population.	2	5	10	5	10	5	10
2. The helmet shall be operational in temperature ranges of -30 ˚F to 150 ˚F.	2	3	6	1	2	1	2
3. The helmet shall be constructed such that there is 0.5% water absorption at outer layer.	1	3	3	1	1	3	3
4. Face opening shall provide peripheral vision clearance of a minimum of 60 deg from the helmet midline.	4	5	20	5	20	1	4
5. The total weight of helmet system after manufacture shall not exceed 1800 grams +/- 200 grams.	2	3	6	5	10	1	2
6. Helmet design shall include vent holes that shall allow for a ventilation rate of 0.025 m^3/s.	2	5	10	5	10	5	10
7. The helmet shall be constructed with an inner layer of foam that is flush with user's head such that there is an angular rotation of 0.1 degrees or less between user and helmet.	3	5	15	5	15	5	15
8. The helmet shall be constructed to be retained on head with a 200 mph windspeed.	5	3	15	3	15	1	5
9. The helmet's rigid outer layer material shall withstand 12,500 psi without cracking.	5	5	25	1	5	1	5
10. Implementation Risk	5	3	15	1	5	3	15
Total	155		125		93		71
Normalization			81%		60%		46%

Exercise 6

Scoring Criteria			
Evaluation Criteria	5	3	1
1. The helmet shall be manufactured in three different sizes (small, medium, large) to fit 90% (136.6 million) of adult males in general US population (151.8 million).	100% ≥ male population in US ≥ 95%	95% > male population in US > 90%	=90% of male population in the US
2. The helmet shall be operational in temperature ranges of -30 ˚F to 150 ˚F.	Operational in temperature ranges of -100 ˚F to 200 ˚F.	Operational in temperature ranges of -50 ˚F to 170 ˚F.	Operational in temperature ranges of -30 ˚F to 150 ˚F.
3. The helmet shall be constructed such that there is 0.5% water absorption + 0.2% water absorption at outer layer.	≤0.5% absorption	0.7% > absorption > 0.5%	= 0.7% absorption
4. Face opening shall provide peripheral vision clearance of a minimum of 60 degrees from the helmet midline.	Clearance > 80 degrees from midline.	60 deg. ≤ clearance (degrees from midline) ≤ 80 deg.	Clearance = 60 degrees from midline.
5. The total weight of helmet system after manufacture shall not exceed 1800 grams + 200 grams.	Total weight < 1800g	1800g ≤ total weight ≤ 2000g	Total weight = 2000g
6. Helmet design shall include vent holes that shall allow for a ventilation rate of 0.025 m^3/s +/- 0.010 m^3/s.	0.035 m^3/s ≥ ventilation rate >0.030 m^3/s	0.030m^3/s ≥ ventilation rate ≥ 0.025m^3/s	0.025m^3/s ≥ ventilation rate ≥ 0.015m^3/s
7. The helmet shall be constructed with an inner layer of foam that is flush with user's head such that there is an angular rotation of 0.1 degrees or less between user and helmet.	0.00 deg .≤ rotation < 0.05 deg.	0.05 deg .≤ rotation < 0.1 deg.	= 0.1 deg. of rotation
8. The helmet shall be constructed to be retained on head with up to 200 mph windspeed.	350 mph ≥ windspeed > 250 mph	250 mph ≥ windspeed > 200 mph	= 200 mph windspeed
9. The helmet's rigid outer layer material shall withstand 12,500 psi +/- 500 psi without cracking.	14,000 psi ≥ strength rating > 12,700 psi	12,700 psi ≥ strength rating > 12,500 psi	= 12,500 psi strength
10. Implementation Risk	Low	Medium	High

Exercise 7: Identifies the Technical Performance Measurement (TPM)

a. Develop the information sheet and TPM profile for one TPM parameter

1) Each team Identifies the TPM Parameters

a) Weight
   i) Weighs 1800 grams
b) Survivability measures
   i) Withstand 12,500 psi without cracking
   ii) Operate in temperature ranges of -30 to 150 ℉
c) Cooling Capacity
   i) Ventilate air at the rate of 0.025 m3/s
d) Volume/Area
   i) Manufacture in three different sizes (small, medium, large)
      1) Used by at least 90% of the population
   ii) Does not rotate between user and helmet more than 0.1 degrees
e) Visibility range
   i) Provides 60 degrees of vision clearance from helmet midline
f) Reliability/Maintainability
   i) Reliability of motorcycle helmet
      1) Withstands cracking (refer to survivability measures)
      2) Lasts no less than 5 years
      3) Visor raises and lowers
      4) Outer Shell made of Fiberglass-Kevlar
   ii) Maintainability of motorcycle helmet
      1) Interior of helmet is easy to clean
      2) Exterior of helmet is easy to clean
g) Cost
   i) Pricing: Will cost customer $80
h) Schedule
   i) Plan schedule to:
      1) Design components
      2) Manufacture components
      3) Assemble components for prototyping
      4) Test Prototype
         (a) Test under specific conditions
            (i) Impact test
            (ii) Wind speed / retention test
            (iii) Temperature test
            (iv) Water absorption test
         (b) Take note of critical design errors
      5) Release to customers

2) Develop the information sheet and TPM profile for one TPM parameter

Parameter: Survivability

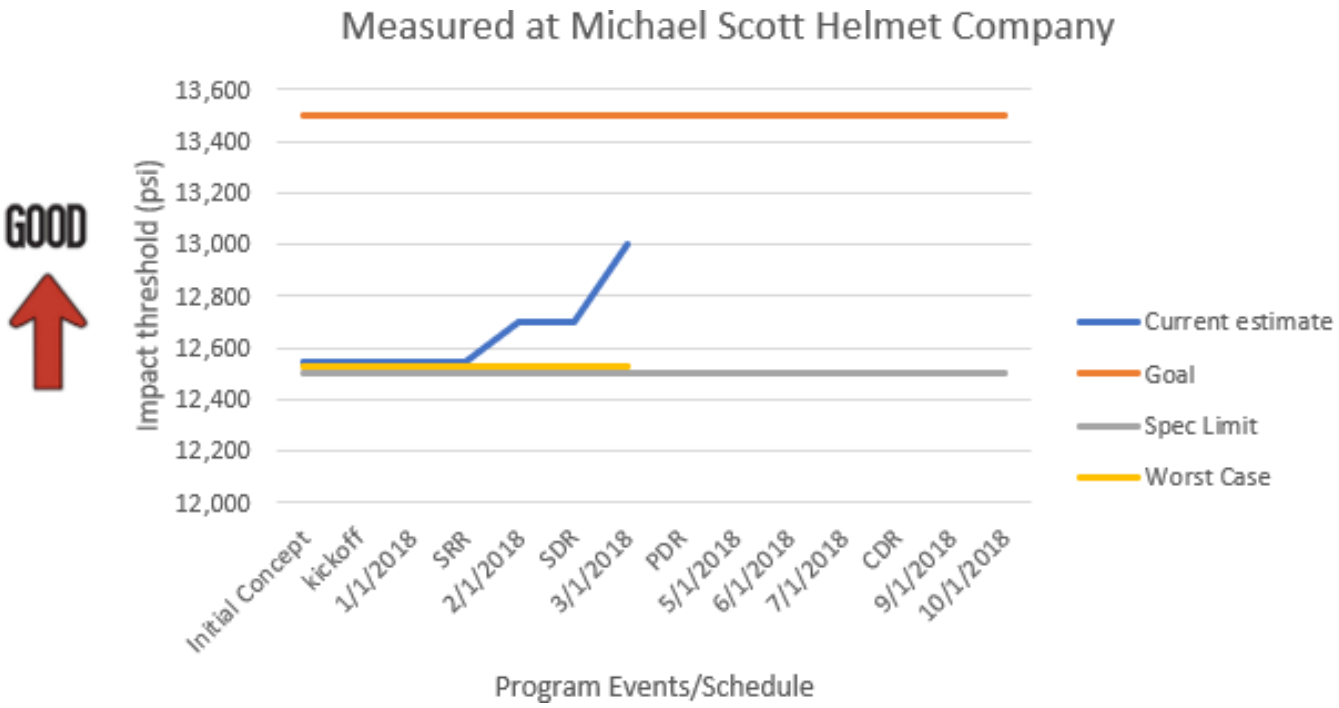
a) Descriptions
   i) The survivability measure of the motorcycle helmet is greatly related to its primary functionality. This functionality is to withstand 12,500 psi in cases of normal use and extreme impact. The failure of withstanding impact is a high-risk factor because the customer may endure major head trauma. This technical performance parameter was chosen because its performance is directly tied to the safety of the customer.

b) Requirements
   i) Objective (Goal): Withstand great impacts of at least 12,500 psi without structural damage.
      1) Determined by analysis of using a hardshell in simulated crash testing.
   ii) Threshold: Specification Value = 12,500 psi.
      1) Determined by analysis and measurement of the average pressure threshold of Fiberglass-Kevlar motorcycle helmets.

c) Measurement Approach
   i) SRR: Measured in design step.
   ii) PDR: Measured in design step.
   iii) CDR: Predictions will be based on crash simulation and analysis.
   iv) TRR: Predictions will be based on crash simulation and analysis.
   v) Development Tests: Estimates are to be measured in development testing.
   vi) Crash Test: Estimates are to be based on analysis helmet cracking measured under established conditions.
   vii) Production: Estimates shall be based on crash test analysis final report.

d) Concerns
   i) This technical performance measure parameter is most affected by reliability of the degree to which a realistic impact can be simulated. Effort is concentrated to minimize any potential adverse effects which may occur due to the situations that cannot be replicated in the simulation.
   ii) Efforts taken to minimize these effects are as follow:
      1) Analysis and simulation of the motorcycle helmet design implementation.
      2) Analysis to establish motorcycle shell requirements for all aspects of crash tests.
      3) Review and analysis of real-world motorcycle accidents.

Exercise



***SRR = System Requirements Review**
***SDR = System Design Review**
***TRR = Test Readiness Review**

	Initial Concept	kickoff	1/1/2018	SRR	2/1/2018	SDR	3/1/2018	PDR	5/1/2018	6/1/2018	7/1/2018	CDR	9/1/2018	10/1/2018
Current estimate	12,542	12,542	12,542	12,542	12,700	12,700	13,000							
Goal	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500
Spec Limit	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Worst Case														

***In addition to the key milestone (Kickoff, SRR, SDR) dates, monthly updates are performed (i.e., 3/1, 4/1), Key milestone dates are pulled from RAS (exercise 1).**
****The Preliminary Survivability Table is paired with TPM chart; the numeric values on the table make up the data points on the graph.**

Exercise 8

N-Squared Diagram

	Visor/ Face Shield	Outer Shell	Ventilation System	Retention System	Comfort Padding	Liner (Foam)
Visor/ Face Shield	FS/FS	OS/FS				
Outer Shell	OS/FS	OS/OS				
Ventilation System		OS/VS	VS/VS			
Retention System		OS/RS		RS/RS		
Comfort Padding					CP/CP	L/CP
Liner (Foam)		OS/L				L/L

Outer Shell/Face Shield Interface

Internal (Outer Shell-Visor/Face Shield Interface)	
Functional	Physical
Outer Shield shall have an open-close adjustment control interface to Visor/Face Shield.	Outer Shell shall provide a mechanical pivot control interface to Visor/Face Shield.
Outer Shield shall have an elastic compression interface for the Visor/Face Shield.	Outer Shell shall provide an eyeport gasket sealing barrier interface to a closed Visor/Face Shield.

Exercise 8

Interface Scope Sheet

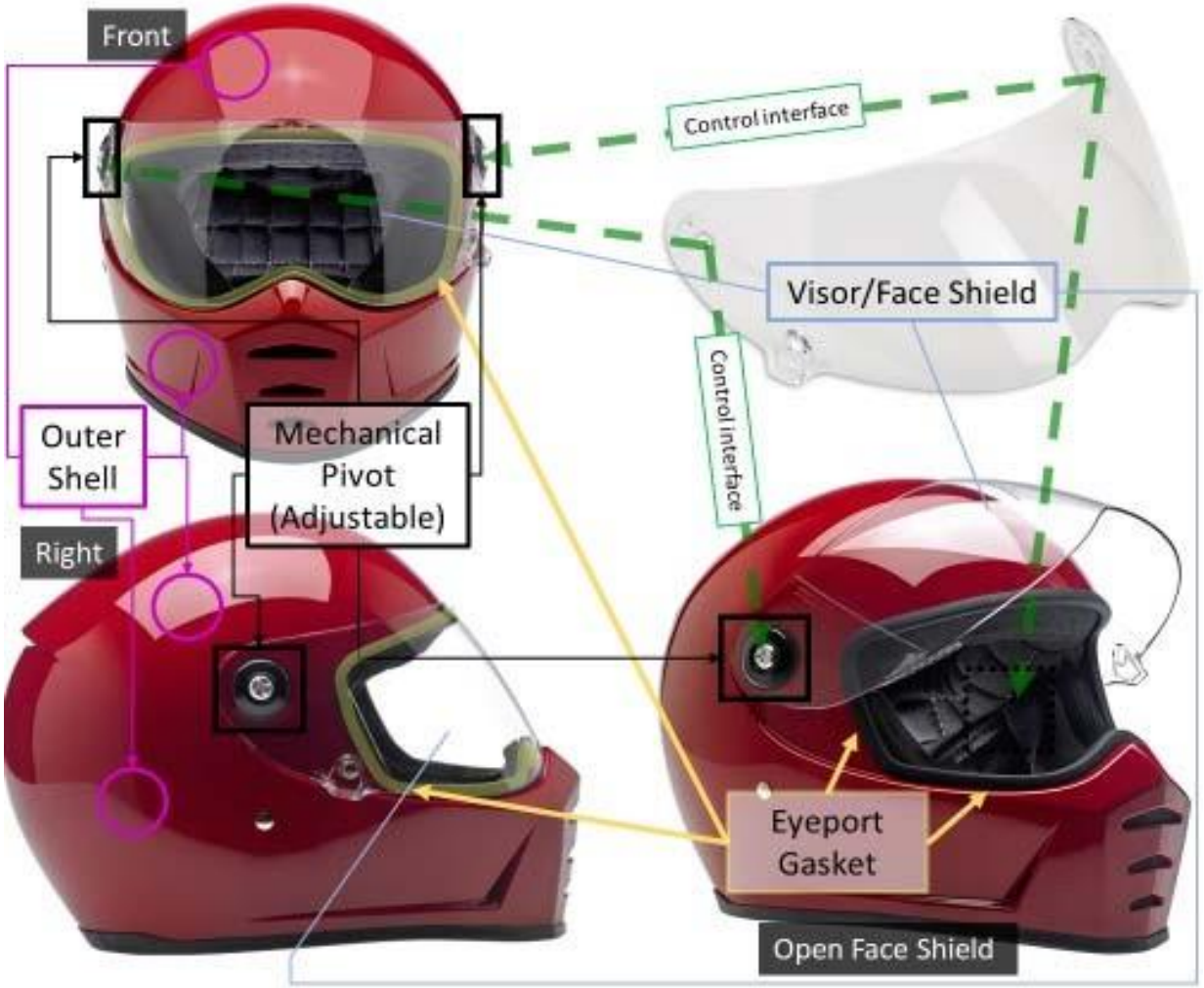
Outer Shell-Visor/Face Shield Interface

Narrative Description of Interface

Outer Shell
Outer Shell shall have an open-close adjustment control interface to Visor/Face Shield. The adjustable pivot mechanism shall be fixed the to the side-plate areas of the Outer Shell. The left and right-side pivot mechanisms shall lock Visor/Face Shield in place. The pivot mechanism shall allow for uniform open-close adjustment of the Visor/Face Shield.

Visor/Face Shield
Outer shell shall have an elastic compressible eyeport gasket interface for the Visor/Face Shield. When Visor/Face Shield is in the closed position eyeport gasket shall uniformly compress against the interior of the Visor/Face Shield and create an air/water sealing barrier between the interior and exterior of the Outer Shell-Visor/Face Shield interface.

Sketch of Interface



Verification Requirement Matrix

Requirements	Verification Requirements	Methods
1.0 **Size** Size of helmet shall be sized to fit 90% (136.6 million) of adult males in general US population (151.8 million).	V1.0: It shall be verified that the inner diameter from the front (user's face) to back is [90% in inches] and inner diameter from one ear side to opposite ear side is [90% in cm].	V1.0 Inspection
	V1.1: It shall be manufactured in three different sizes (small, medium, large) and have markers on the helmet shell to verify the size.	V1.1 Inspection
	V1.2: It shall have a follow-up assessment to determine whether the helmet is sized to fit 90% of the adult males in the general US population, during the testing phase.	V1.2 Analysis
2.0 **Protection** The helmet must protect user from all weather conditions.	V2.0: It shall be verified that the helmet is designed for all weather conditions in the continental United States.	V2.0 Inspection
	V2.1: It shall be operational in temperature ranges of - 30 ^{o} F to 150 ^{o}F.	V2.1 Quality Testing
	V2.2: It shall be constructed such that there is 0.5% water absorption + 2% water absorption at outer layer.	V2.2 Quality Testing
3.0 **Ergonomics** The helmet must be comfortable.	V3.0: It shall be verified that the helmet weight does not exceed 1800 grams + 200 grams.	V3.0 Inspection
	V3.1: It shall allow for a ventilation rate of 0.025 m^3s +/- 0.010 m^3s.	V3.1: Demonstration

Exercise 9

Verification Compliance Matrix

Item ID	Description	Method	Verification Requirements	Level	VTN
Q10	Weather Temperature Range	Quality Testing	V1.0: Weather Protection	System	010
Q12	Moisture Absorption	Quality Testing	V1.0 Weather Protection	System	011
T11	Front to Back	Inspection Testing	V2.0: Diameter Front to Back	System	012
T12	Ear to Ear	Inspection Testing	V2.0: Diameter Ear to Ear	System	013
T13	Temperature Protection	Inspection Testing	V2.0: Cold, Heat Resistance	System	014
T14	Ergonomics	Inspection Testing	V2.0: Helmet Weight	System	015
A11	Cooling	Demonstration	V3.0: Ventilation	System	016
A12	Number of operational personnel required	Analysis	V1.2: Follow-up Assessment	Item	X20
A13	Accessibility to operational personnel	Analysis	V1.2: Follow-up Assessment	Item	X21
Q13	Water Protection	Quality Testing	V1.2: Moisture Absorption Layer	Item	X22
A14	Size Range	Analysis	V2.1: Fit 90% of Population	Item	X58
T11	Size Markers	Inspection Testing	V2.1: Size Markers S, M, L.	Item	X59

Task Tracking Matrix

VTN	Task Title	Principal Engineer	Test Engineer	Status Tracking			Documents	
				Plan	Task	Rpt	Plan #	Rpt#
010	Weather Temperature Range	Tim	Mark	2	2	2		
011	Moisture Absorption	James	Andrea	1	2	1		
012	Front to Back	Jennie	Michael	1	2	2		
013	Ear to Ear	Mase	John	2	3	1		
014	Temperature Protection	Lupe	Kim	1	3	1		
015	Ergonomics	Miller	Jim	1	3	2		
023	Cooling	Sally	Sabrina	2	1	0		
X20	Number of operational personnel required	Yorba	Watson	2	1	1		
X21	Accessibility to operational personnel	Shelly	Kevin	1	2	0		
X22	Water Protection	Ben	Donnie	2	3	0		
X58	Size Range	Cynthia	Destyn	1	1	0		
X59	Size Markers	Mike	Tom	2	3	1		