2011 HASP payload proposal
Maple Leaf Particle Detector

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Revision: 1.0

1 Activities

March was a busy month for the Cosmic Canucks. The team finalized the new design, which incorporates the Geiger counters design. Later in the month however, the team finally received the permission to use three medipix chips in the detector. For this reason, the detector's design had to be adjusted to accommodate the chips in the enclosure (see the updated Mechanical Drawings at the end of the report). As a result, the energy channels in the detector were redefined from 50MeV, 100MeV, 175MeV to 50MeV, 100MeV, and 150MeV. Later, the design of the enclosure was finalized, accounting for the already purchased metal, without allowing for welding as originally planned (see Design/Development Issues) Finally, the team transitioned from designing to manufacturing.

The team finalized the detector design (see the proposal for more information). The following weeks were filled with obtaining quotes, and inquiring about materials and hardware. The team was very time constrained, as all the purchases had to be made by mid March, to account for the end of the CSA's fiscal year. The ordered materials included the steel for the housing of our detector and Geiger tubes for three identical prototypes (bench prototype, fly prototype and spare prototype), spare Geiger tubes for weather balloon testing, and all material for weather balloon testing, which included latex balloons, radios, gps trackers, etc.

Materials for the housing have been received and the team is looking into start devoting large amount of time into manufacturing in the next weeks. The team worked closely with the UofA's electronic shop on the steps to follow upon receiving electronic components to start populating the PCBs for each prototype. This will be started upon reception of materials.

2 Design/Development Issues

The electronics shop suffered a delay in ordering the PCBs, and the population of the PCBs has been postponed two weeks, upon reception of the materials. The new anticipated completion for the PCB is mid April. Due to the end of the fiscal year (March 31st), all purchases had to be made by mid March in order to be processed accordingly.

This posed many problems for the team, as they were forced into buying metal by a certain date, which left them stuck with it. The design of the detector needed to be changed to accommodate the medipix chips, however due to university technical staff moving to a new building, and the size of the detector, welding it was not an option. This lead to creating lap and dovetail joints in the metal so that the enclosure is entirely bound by the four threaded rods and their nuts. With the design finalized, the team will work the last two weeks of March to cut and mill the metal into the detectors' shape. Despite the above issues, the team will remain on schedule for manufacturing. The housing will be completed before the shops move. Further, two members of the team have the necessary personal equipment to help populating the PCBs in complement to the time assigned at the electronic shop, such that population is finished by April 20th.

3 Milestones

Sent new proposal to HASP	Feb 28th
Completed the detector design	Feb 28th
Completed part and materials acquisition	Second week March

Table 1: Completed Milestones

Financial and Technical Report to CSA	(31st Mar)
Scheduling testing at DFL (David Florida Labs)	TBD (April 29 - May 30)
Anticipated completion of manufacturing	(Apr 29)
Start of weather ballon launches (testing of components)	(April-June)
Preliminary PSIP document	(Apr 29)

Table 2: Upcoming (April) Milestones

4 Personnel

Nothing to report.

5 HASP questions

What are the expected count rates for each detector? Previous high altitude balloon have measured the proton flux at high altitudes. Three flights have been undertaken at a latitude of about 73° N, two flights during space weather quiet conditions, the other through a class 3 solar flare. The experimental count rates for the two balloon flight during quiet space weather conditions recorded count rates was approximately 1100protons/m^3secsr for protons with an energy above 187MeV. The count for protons between 70MeV to 187MeV is approximately 200protons/m^3secsr. During, the solar flare the count rates of protons of an energy above 187MeV is 1300protons/m^3secsr, and the count rates for protons between 70MeV to 187MeV is approximately 680protons/m^3secsr. The particle detector will be launched from a lower latitude thus the count rate is expected to be lower than these experimental values. Furthermore, the detector will pick up counts, and the Geiger tubes will not be saturated by the expected count rates. The Geiger tubes saturate at about 10000 counts per second [1].

Are the dates stated in the Timeline / milestones (section 4.3) correct? Yes

Your estimated current draw seems really low. Please provide a complete power budget +5V: GMT controller: 100mA, PC104 SBC: 2A; total power: 10.5W
30V: heater 3W
Total power : 13.5W, that is a total current of 450mA on 30V.

Please provide a more detailed power circuit diagram Please see Figure **??**

[1] Primary Cosmic-Ray and Solar Protons, Rochus Vogt, 1961

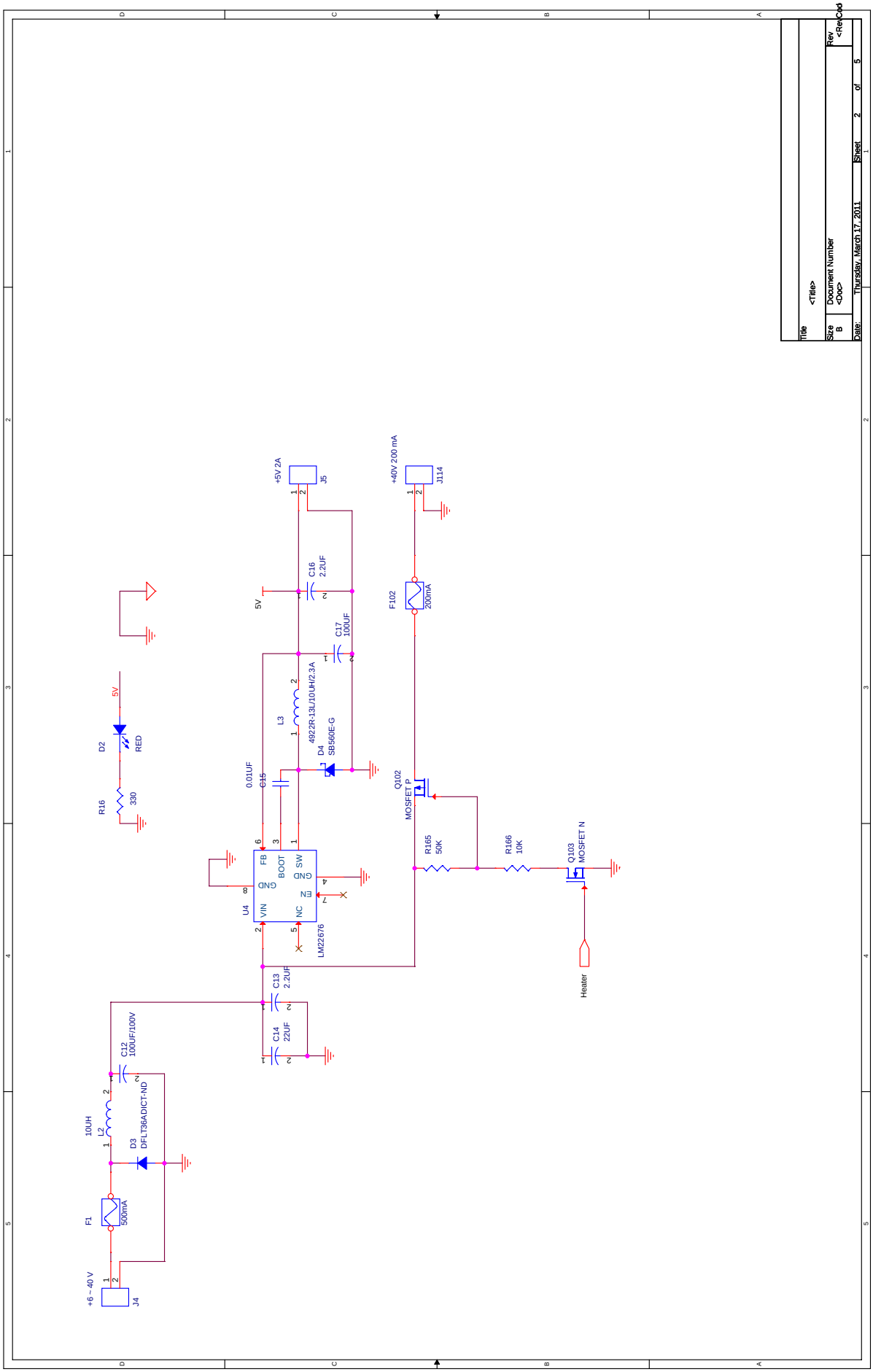
Show which pins on the EDAC connector are used by your power system; i.e. show how HASP power is connected to your systems We will use EDAC516 pin A,B,C,D and W,T,U,X for power and return ground.

Describe how you will protect against coronal discharging and arcing due to high voltage in a low pressure environment On the FR4 PCB, we will leave enough space between high voltage (600V) traces and ground copper. No sharp corners on the traces and soldering; PCB will be cleaned by alcohol; Use high voltage rated insulated wires for HV connections.

Do you plan to uplink commands to your payload Except the power switch command for the 30V, no command to the payload

Do you plan on making use of the analog channels provided to your system? Yes, both 2 channels.

Do you plan on using the discrete lines provided to your system? Yes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C17
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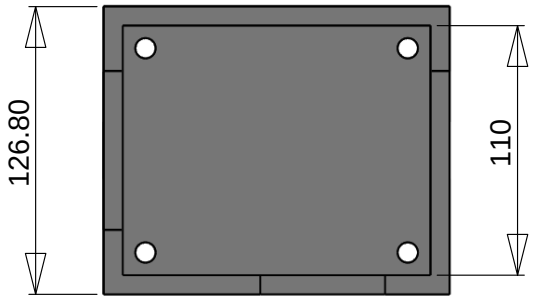
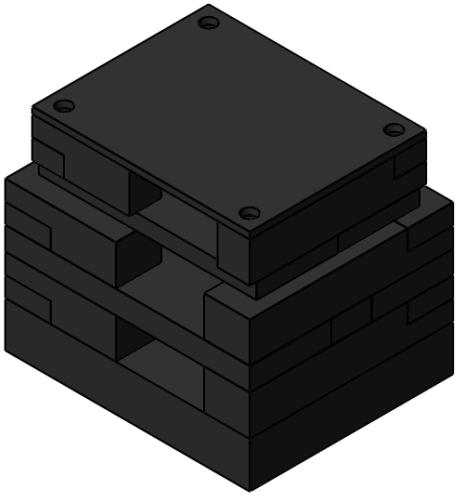
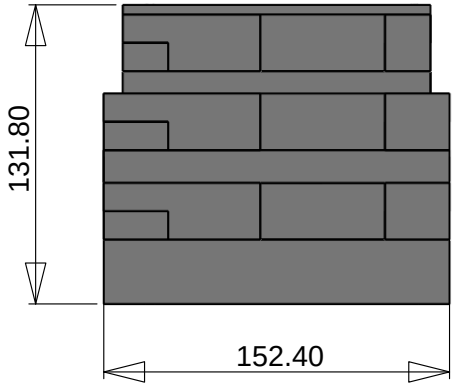
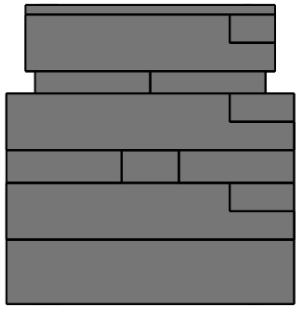
50K
R166
10K
Q103
MOSFET N
Heater

UA-HAB Updated Mechanical Drawings









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APPLICATION	

DIMENSIONS ARE IN MM
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

MATERIAL --

FINISH --

DO NOT SCALE DRAWING

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DRAWN BY: WYATT JOHNSON

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Main Basic

SIZE	DWG. NO.	REV.
A	1 of 9	

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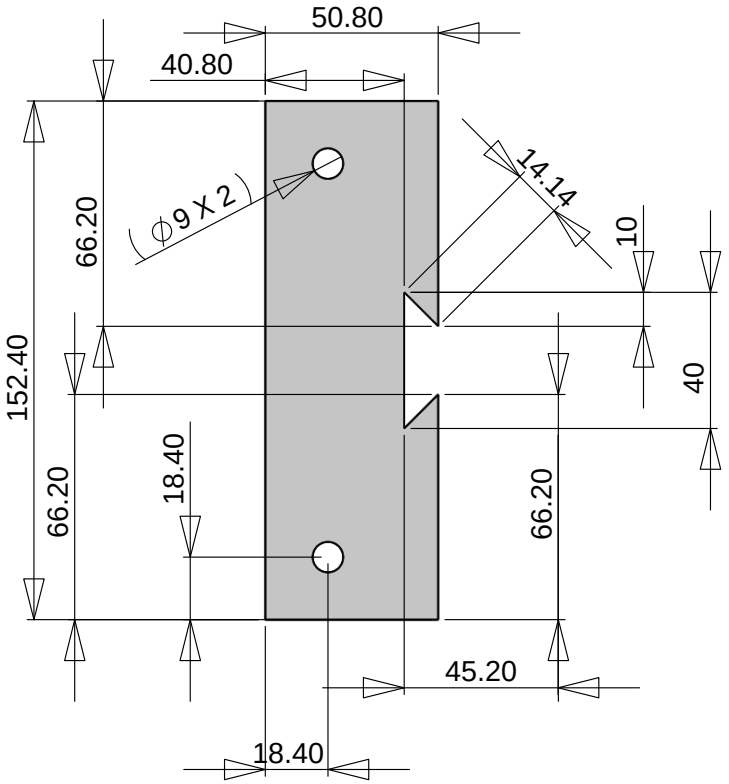

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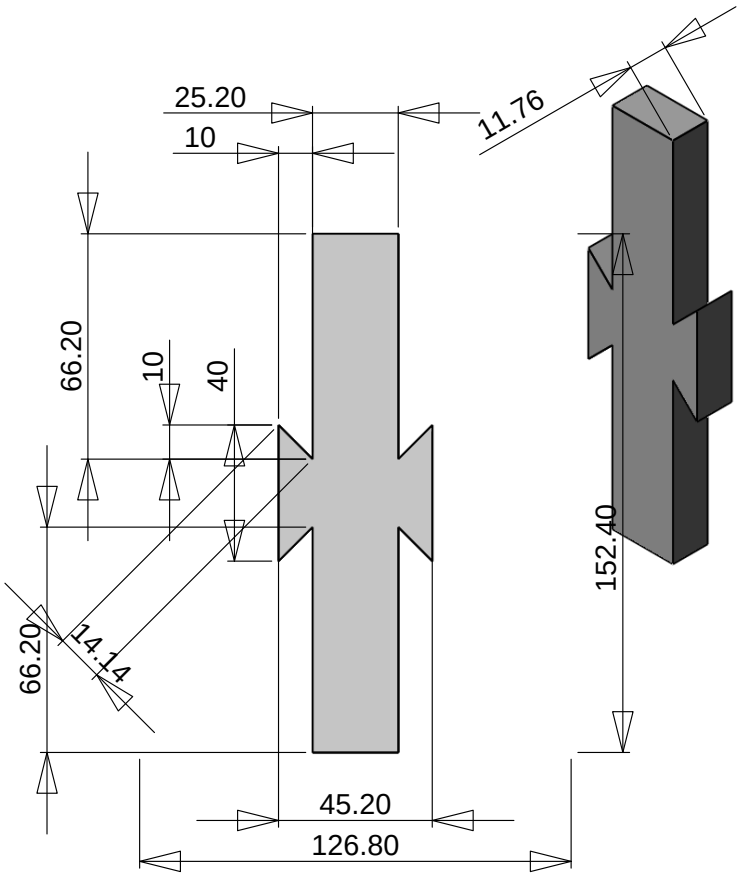
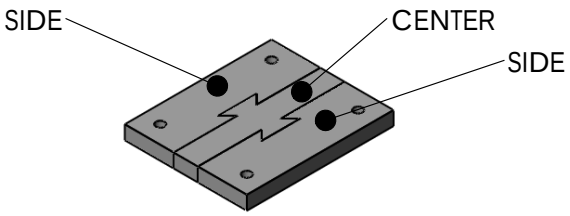


Absorber (2,3) SIDE (1:2 Scale) X 1



Assembled Cross
(1:5 Scale)

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		MATERIAL --	DRAWN BY: WYATT JOHNSON	
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APPLICATION		DO NOT SCALE DRAWING		

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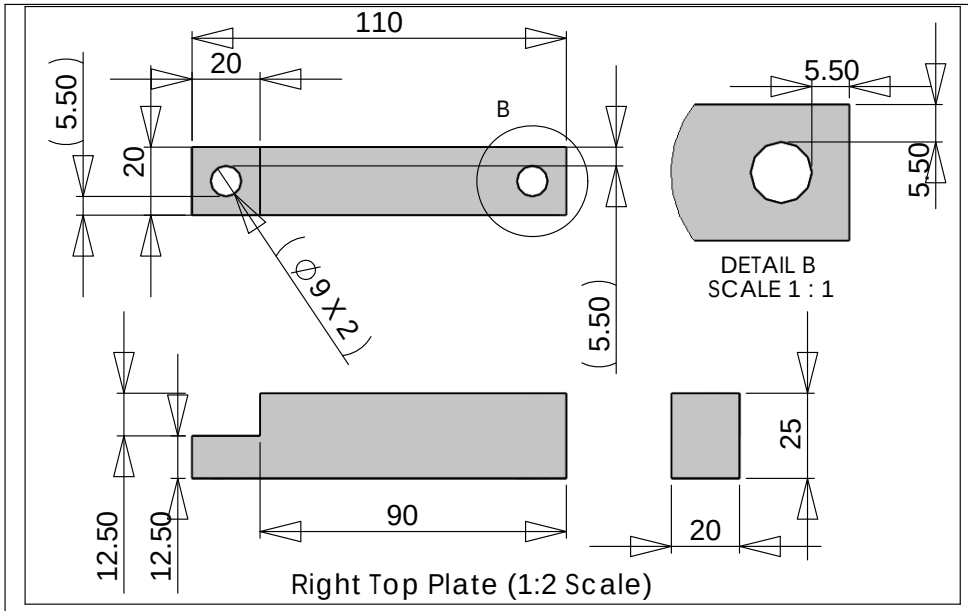
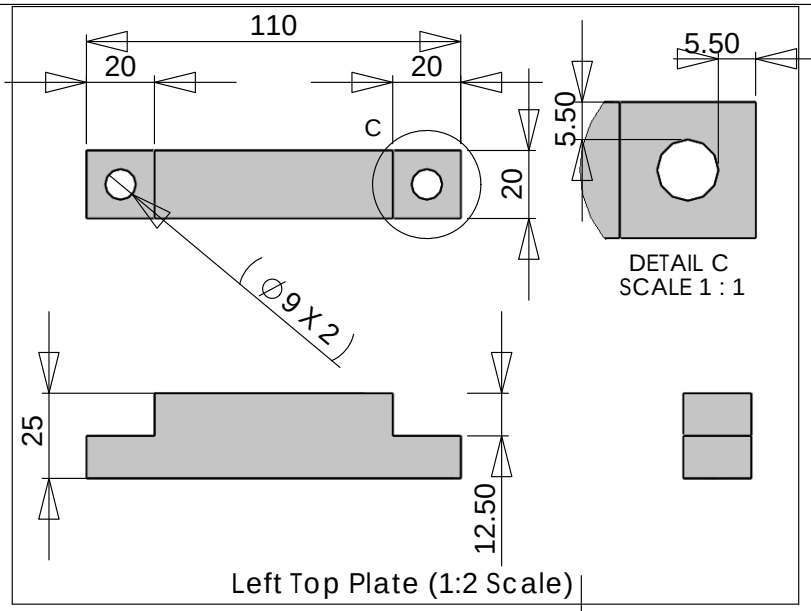
CROSS PLATE

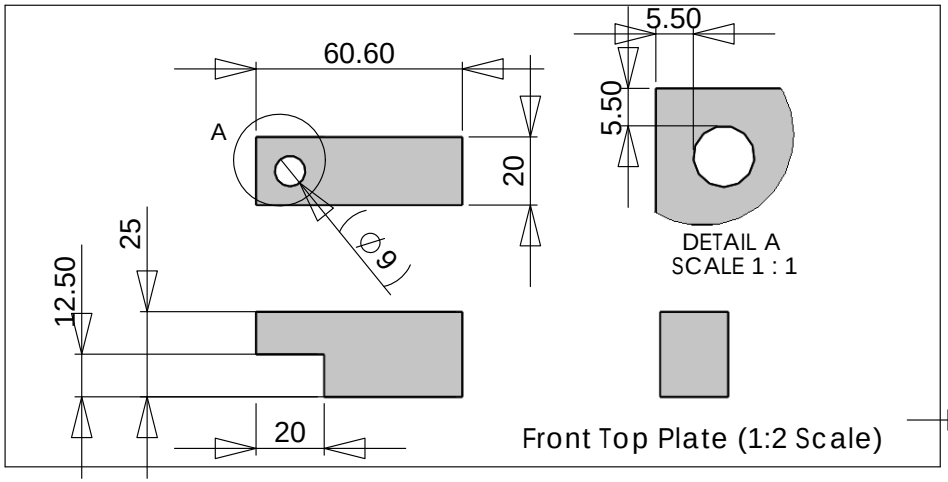
SIZE	DWG. NO.	REV.
A	2 of 9	
SCALE:1:5	WEIGHT:	SHEET 2 OF 9



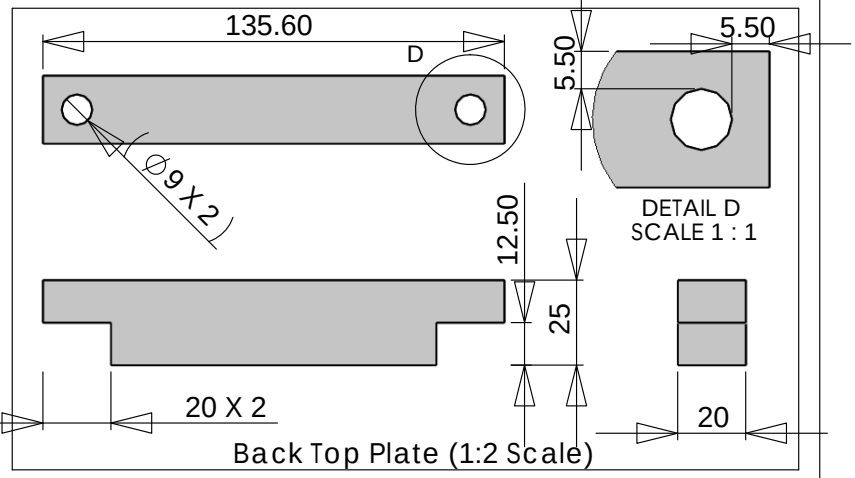
Right Top Plate (1:2 Scale)



Left Top Plate (1:2 Scale)



Front Top Plate (1:2 Scale)



Back Top Plate (1:2 Scale)

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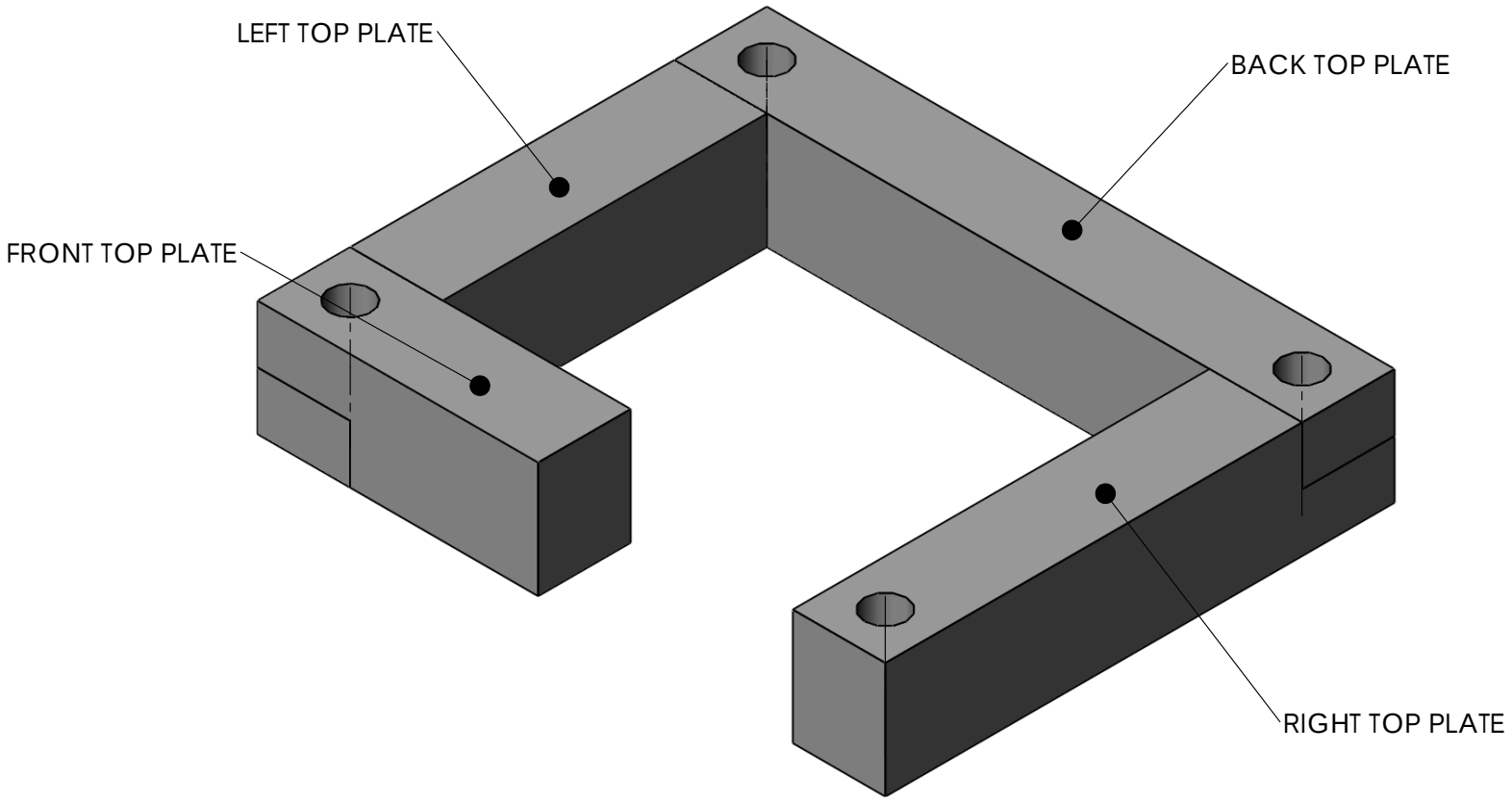
Top Wall Housing 1

SIZE	DWG. NO.	REV.
A	3 of 9	
SCALE:1:5	WEIGHT:	SHEET 3 OF 9



(1:1 Scale) X 1

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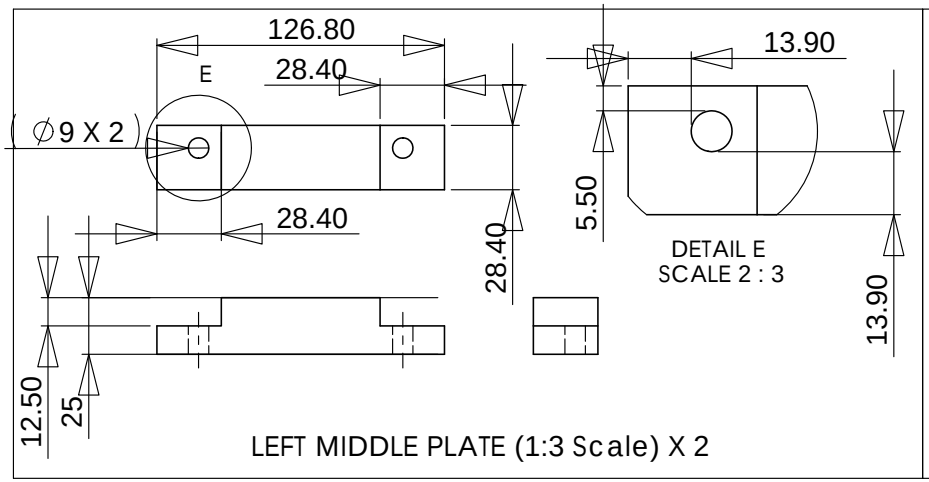
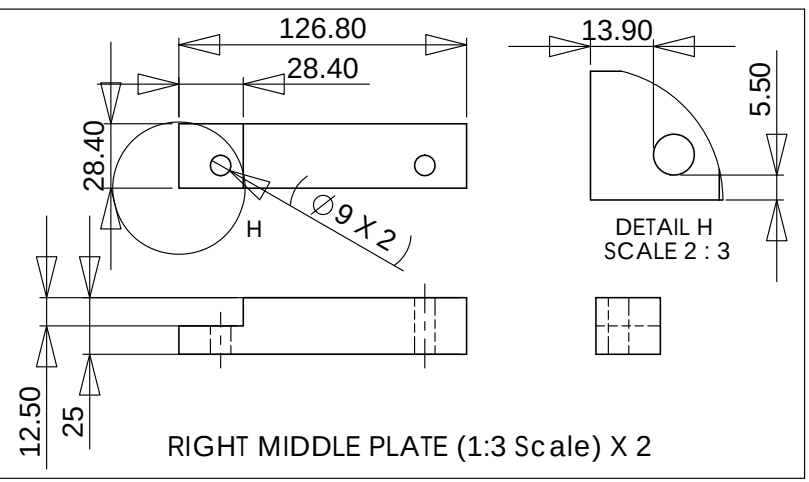
Top Plate Assembly

SIZE	DWG. NO.	REV.
A	4 of 9	

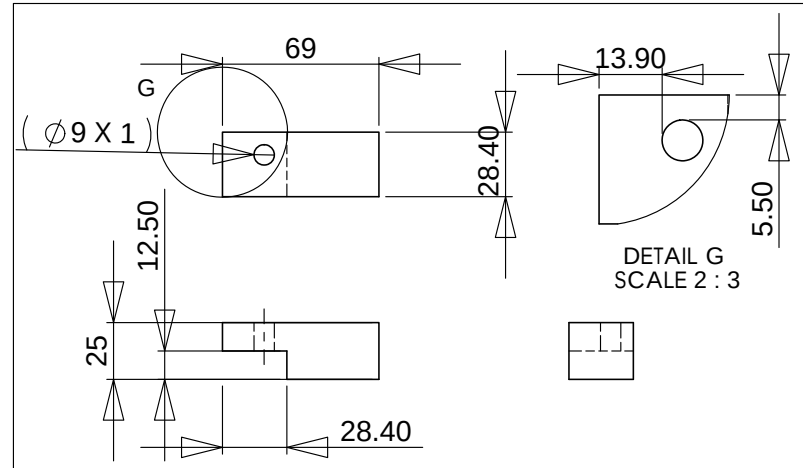
SCALE:1:5 | WEIGHT: | SHEET 4 OF 9



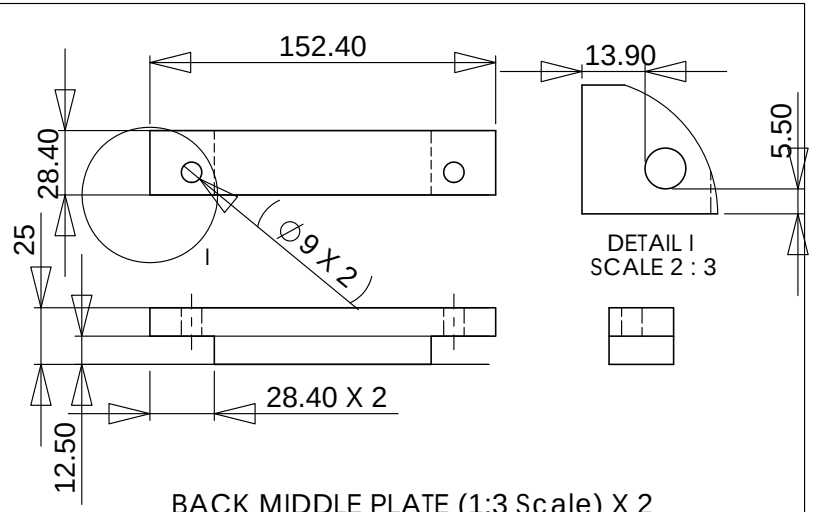
LEFT MIDDLE PLATE (1:3 Scale) X 2



RIGHT MIDDLE PLATE (1:3 Scale) X 2



FRONT MIDDLE PLATE (1:3 Scale) X 2



BACK MIDDLE PLATE (1:3 Scale) X 2

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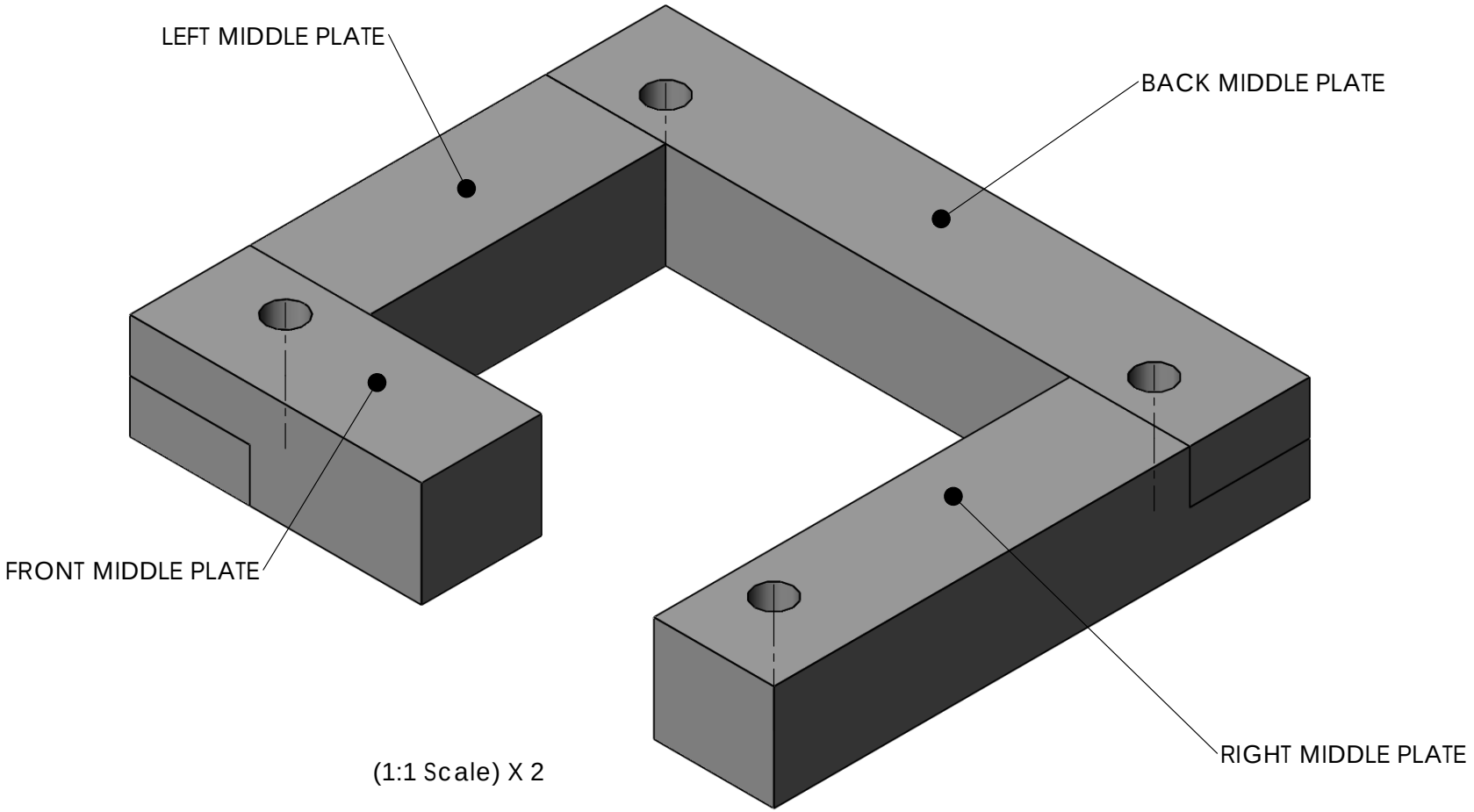
Right Middle Plate

SIZE	DWG. NO.	REV.
A	5 of 9	
SCALE:1:5	WEIGHT:	SHEET 5 OF 9



(1:1 Scale) X 2

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ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

MATERIAL --

FINISH --

DO NOT SCALE DRAWING

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MFG APPR.		
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DRAWN BY:
WYATT JOHNOSN

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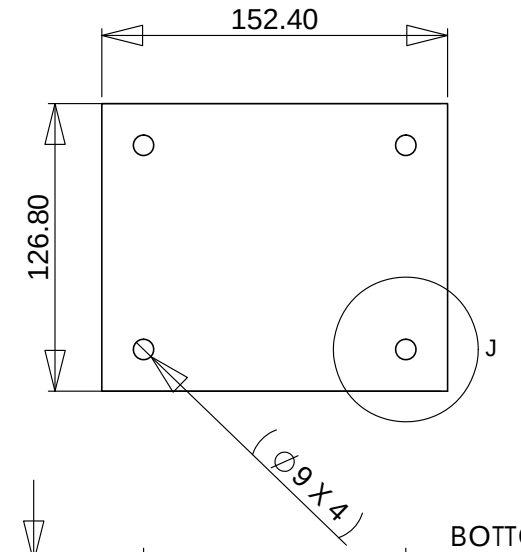
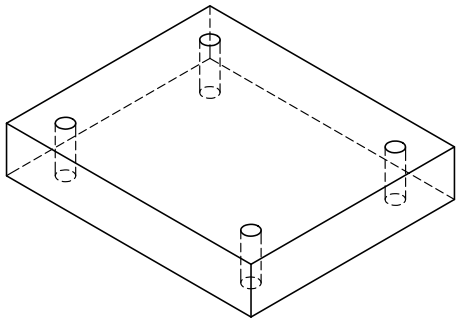
Middle Plate Assembly

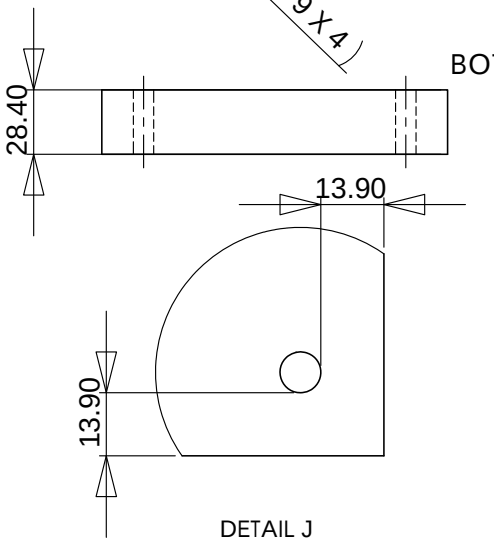
SIZE	DWG. NO.	REV.
A	6 of 9	

SCALE:1:5	WEIGHT:	SHEET 6 OF 9

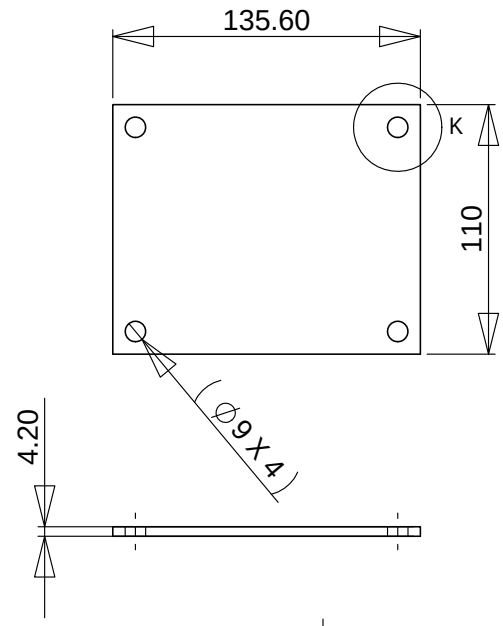


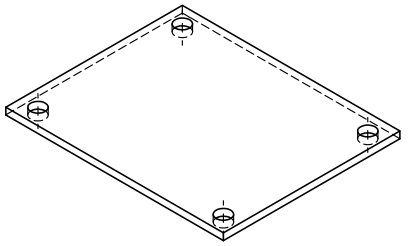


BOTTOM MAIN PLATE
(1: 3 Scale) X 1

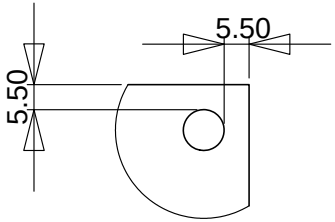


DETAIL J
SCALE 2 : 3





TOP MAIN PLATE
(1: 3 Scale) X 1



DETAIL K
SCALE 2 : 3

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		MATERIAL --	DRAWN BY: WYATT JOHNSON	
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Cosmic Canucks

Main Plates

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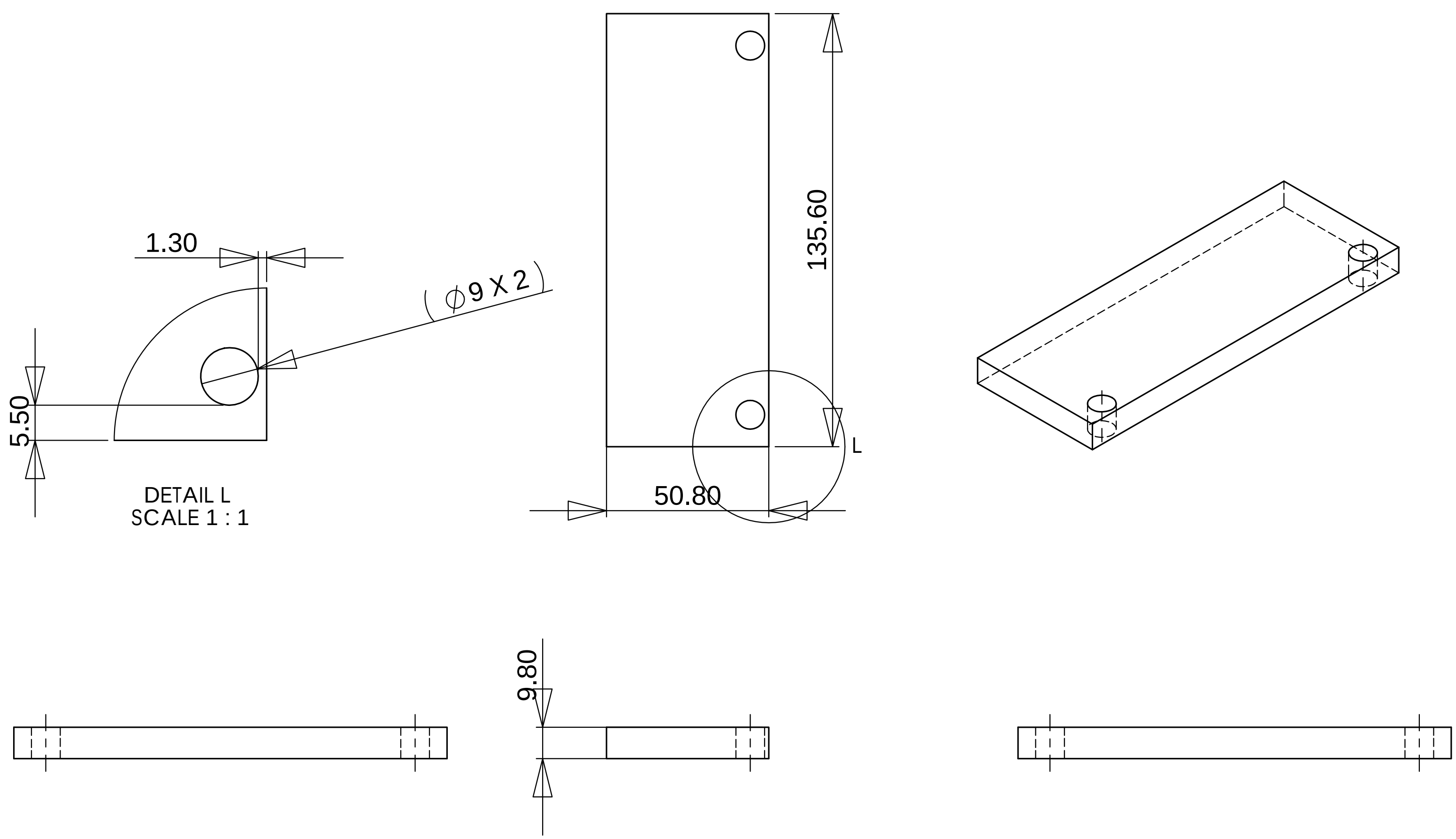
A	7 of 9	

SCALE:1:5 | WEIGHT: | SHEET 7 OF 9



TOP ABSORBER (1:2 Scale) X 2

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APPLICATION	

DIMENSIONS ARE IN MM
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

MATERIAL --

FINISH --

DO NOT SCALE DRAWING

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ENG APPR.		
MFG APPR.		
Q.A.		

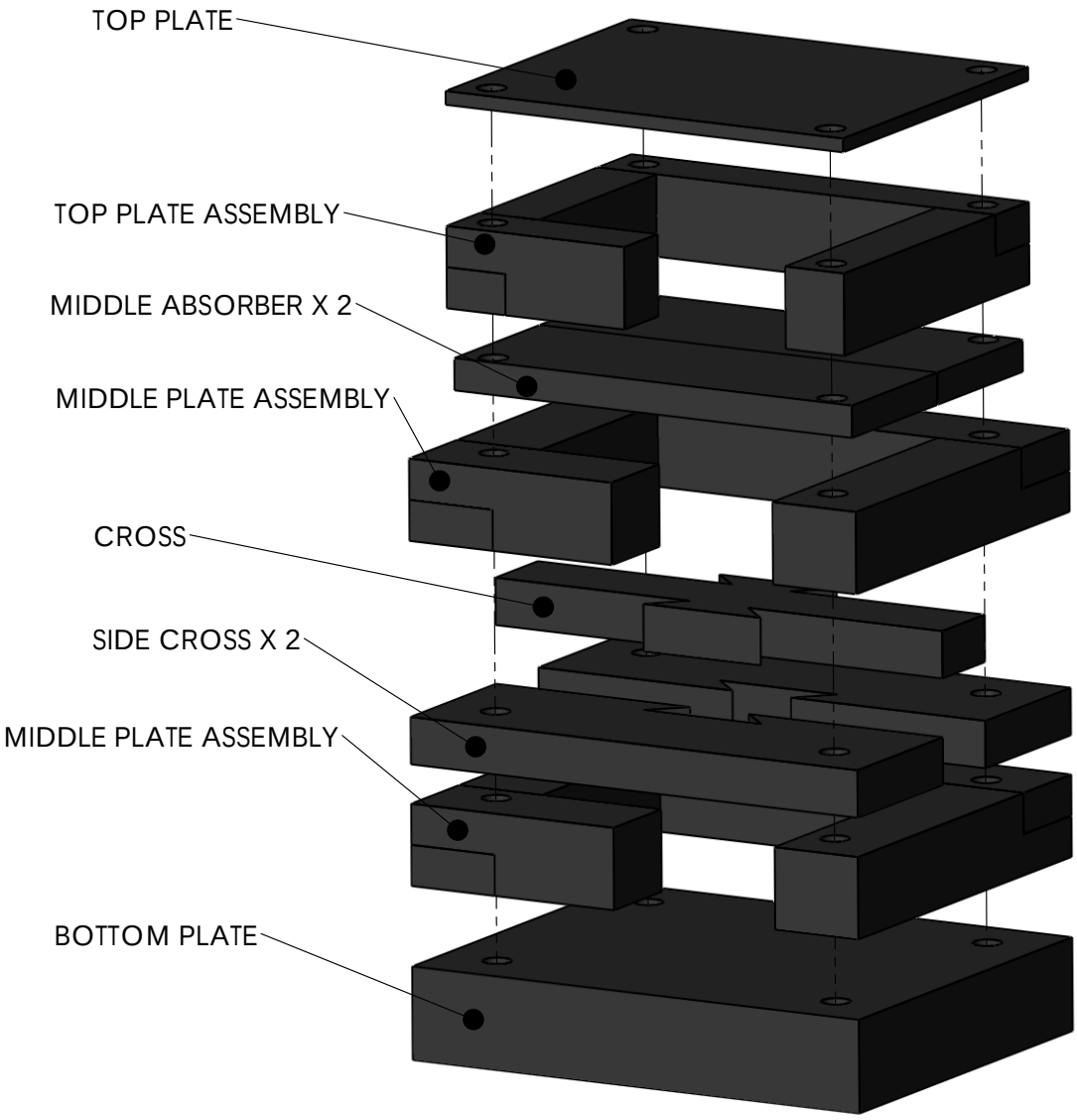
DRAWN BY:
WYATT JOHNSON

Cosmic Canucks

Middle Absorber

SIZE	DWG. NO.	REV.
A	8 of 9	

SCALE:1:5 | WEIGHT: | SHEET 8 OF 9



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APPV'D						
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Q.A				MATERIAL:	DWG NO. 9 of 9	A4
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