THE CENTER OF GRAVITY
OF THE
ENDCAP CALORIMETERS

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CGEC= REPORT ON THE CENTER OF GRAVITY OF THE ENDCAP CALORIMETERS....2/12/86

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INTRODUCTION:

THE PURPOSE OF THIS REPORT IS TO SHOW THE RESULTS OF ENLARGING THE LIQUID ARGON VESSEL AND MOVING THE HEAVY SUPPORTS BY A VARYING MAGNITUDE LESS THAN OR EQUAL TO 6 INCHES. IN ORDER TO ACCOMPLISH THIS, THE CENTER OF GRAVITY OF THE ENTIRE CALORIMETER HAD TO BE CALCULATED, WHICH INCLUDES: THE CENTER OF GRAVITY OF THE LIQUID ARGON VESSEL, THE MODULES AND THE ARGON.

RESULTS: SEE APPENDIX FOR EXPLANATIONS

*PRESENT DESIGN:

	WEIGHT(LBS.)	X(IN.)	WX
	*****	*****	*****
ARGON	57360.00= 4966.2 GAL.	89.58	5138308.8
MODULES	434061.00	98.05	42559681.0
VESSEL	44360.00	96.60	4285176.0
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TOTAL	535781.00		51983165.8

CG= 97.02 INCHES FROM D0 INTERACTION POINT WITH ARGON

CG= 97.92 INCHES WITHOUT ARGON

*VESSEL ENLARGED BY 2 INCHES:

	WEIGHT(LBS.)	X(IN.)	WX
	*****	*****	*****
ARGON	60298.54= 5220.0 GAL.	91.59	5522743.3
MODULES	434061.00	98.05	42559681.0
VESSEL	45377.55	97.19	4410244.1
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TOTAL	539737.09		52492668.4

CG= 97.25 INCHES FROM D0 INTERACTION POINT WITH ARGON

CG= 97.97 INCHES WITHOUT ARGON

*VESSEL ENLARGED BY 4 INCHES:

	WEIGHT(LBS.)	X(IN.)	WX
	*****	*****	*****
ARGON	63237.09= 5475.0 GAL.	93.46	5910138.4
MODULES	434061.00	98.05	42559681.0
VESSEL	46395.10	97.79	4536976.8
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TOTAL	543693.19		53006796.2

CG= 97.49 INCHES FROM D0 INTERACTION POINT WITH ARGON

CG= 98.02 INCHES WITHOUT ARGON

*VESSEL ENLARGED BY 6 INCHES:

	WEIGHT (LBS.) *****	X (IN.) *****	WX *****
ARGON	66175.60= 5729.5 GAL.	95.21	6300578.9
MODULES	434061.00	98.05	42559681.0
VESSEL	47412.70	98.42	4666353.5
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TOTAL	547649.30		53526613.4

CG= 97.73 INCHES FROM D0 INTERACTION POINT WITH ARGON

CG= 98.09 INCHES WITHOUT ARGON

LOAD DISTRIBUTION ON SUPPORTS: (TONS)

	PRESENT *****	2" *****	4" *****	6" *****
W/LIQ. ARGON				
FRONT SUPPORT	16.46	23.01	28.90	34.28
REAR SUPPORT	117.48	111.93	107.02	102.65

W/OUT LIQ. ARGON				
FRONT SUPPORT	15.57	21.55	26.89	31.63
REAR SUPPORT	104.03	98.31	93.23	88.74

ENLARGING THE CRYOSTAT FOR THE ENDCAP CALORIMETER AND MOVING THE REAR SUPPORTS ALONG WITH IT RESULTS IN DIFFERENT LOAD DISTRIBUTIONS ON EACH SUPPORT. BY TAKING MOMENTS AND FINDING THESE LOADS ONE CAN PLOT THE LOADS ON EACH SUPPORT VERSUS THE ENLARGEMENT OF THE CRYOSTAT AND MOVEMENT OF THE REAR SUPPORTS. THIS PLOT IS SHOWN IN FIGURES 2 AND 3 FOR AN EMPTY AND FILLED ENDCAP RESPECTIVELY.

*NOTE: LOAD DISTRIBUTIONS OF THE CALORIMETER WITH ARGON ARE FOR VESSEL SUPPORTS ONLY. THE FLEXIBLE FEET WILL EXPERIENCE A SLIGHTLY LESSER LOAD AS A RESULT OF THE BUOYANCY FORCE CAUSED BY THE LIQUID ARGON.

CONCLUSIONS:

THE GRAPH OF WEIGHT VS. LENGTH OF THE VESSEL ENLARGEMENT SHOWS A SIGNIFICANT DECREASE IN THE LOAD THAT THE HEAVY SUPPORT EXPERIENCES AS THE VESSEL GETS LARGER, THEREFORE THE STRESS IN THE MEMBER DECREASES.

CENTER OF GRAVITY CHANGE OF CALORIMETER VS. ENLARGEMENT OF CRYOSTAT

FIG. 1

Distance, (in.)

LOAD ON EACH SUPPORT VS. DISTANCE VESSEL AND REAR SUPPORTS MOVED OUT (WITH LM)

LOAD ON EACH SUPPORT VS. DISTANCE VESSEL AND REAR SUPPORTS MOVED OUT (WITHOUT Δ)

APPENDIX

THE CG OF THE LIQUID ARGON VESSEL WAS FOUND BY DIVIDING UP THE VESSEL INTO FOUR PARTS, FINDING THE CENTER OF GRAVITY OF EACH PART USING VOLUMES. FROM THESE CGS, THE CG OF THE ENTIRE VESSEL WAS DETERMINED.

THE CG OF THE CALORIMETER WAS DETERMINED BY FINDING THE CG OF EACH DIFFERENT TYPE OF MODULE AND FROM THESE THE CALORIMETER CENTER OF GRAVITY WAS CALCULATED.

THE CG OF THE LIQUID ARGON WAS FOUND BY TAKING THE DIFFERENCE OF THE PRODUCTS OF THE VESSEL VOLUME AND ITS CG AND THE CALORIMETER VOLUME AND ITS CG AND DIVIDING THIS VALUE BY THE DIFFERENCE OF THE VOLUMES.