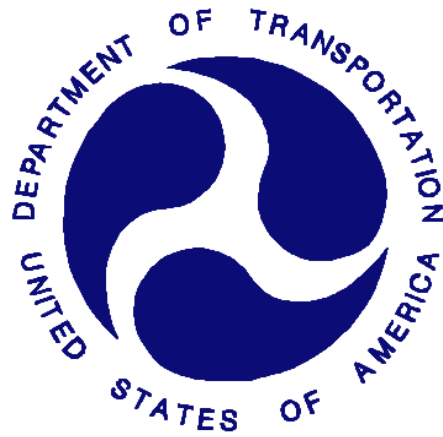


**Vehicle Research and Test Center
FMVSS 213 Testing
Hybrid III 3 Year Old**

**Prepared By:
Transportation Research Center Inc.
10820 State Route 347
P. O. Box B-67
East Liberty, OH 43319**



Summary Report

November 2018

**Prepared For
Vehicle Research and Test Center
P. O. Box 37
East Liberty, OH 43319**

SECTION 1
PURPOSE AND SUMMARY FOR HYBRID III 3 YEAR OLD

The purpose of this test was to evaluate the CRS performance data in a frontal FMVSS 213 test condition. The durability and repeatability of three other manufactured foams were tested and analyzed on the FMVSS 213 frontal buck.

SUMMARY

A Hybrid III 3 year old dummy (serial number 1869) was secured in the right rear occupant position (position 3 or P3) in a forward facing convertible and rearward facing convertible child restraint system (CRS). The Hybrid III 3 year old was instrumented with head, chest, and pelvis triaxial accelerometers, upper neck and lumbar force and moment load cells and a displacement potentiometer in the chest. During this test series the dummy was restrained with lower anchors and top tether (LATCH) and lower anchors only (LA Only)

Section 2 contains the testing performed using a forward facing CRS. Section 3 contains testing performed using a rearward facing CRS. Section 4 contains the dummy certification information.

SECTION 2
FORWARD FACING CRS TEST SUMMARY

TEST DUMMY INFORMATION

Description	Position # 3 CRS
ATD Type/Serial No.	Hybrid III 3 Year Old/1869
Restraint System	LATCH
CRS Direction	Forward Facing
Foam Cushion	CENT_1, WB, LEAR_1, PF_1

CAMERA POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Origin	mm	0.00	0.00	0.00
N1 Passenger Front	mm	1875.99	-336.13	-522.00
N6 Passenger Side	mm	367.09	905.24	-354.66

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181105-1

VRTC Test Number: FR_FM_24



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-117.74	-351.08	-681.24
Top of CRS	mm	-43.31	-350.87	-758.88
Top of Headrest	mm	20.62	-351.20	-750.40
Top of Head	mm	137.40	-349.97	-739.34
Bridge of Nose	mm	247.21	-351.09	-671.52
Head CG Outboard	mm	171.35	-284.77	-660.10
Neck Center	mm	203.95	-349.81	-568.36
Chest Clip	mm	280.75	-351.47	-529.14
Buckle	mm	400.38	-349.96	-412.68
Base Center	mm	600.36	-351.48	-289.12
Center of Seat Frame Bottom	mm	616.94	-349.64	-110.19
Outboard Knee	mm	513.73	-251.40	-387.96
Outboard Ankle	mm	705.69	-264.27	-375.26
Target 2 - Seat Base H-Point	mm	296.67	-125.86	-326.03
Target 3 - Seat Base Side	mm	445.60	-118.01	-346.23
Target 1 - Seat Side Upper	mm	39.95	-117.97	-616.16
Target 4 - Seat Side Lower	mm	126.14	-212.45	-347.30

DUMMY INJURY

HIC (36 ms)	369
Chest Clip (3 ms)	40.23 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181107-1

VRTC Test Number: FR_FM_30



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-119.38	-350.38	-680.89
Top of CRS	mm	-46.56	-350.53	-754.07
Top of Headrest	mm	15.55	-351.36	-742.57
Top of Head	mm	134.69	-351.21	-731.99
Bridge of Nose	mm	245.38	-351.02	-666.21
Head CG Outboard	mm	169.82	-285.67	-652.68
Neck Center	mm	204.50	-351.46	-562.29
Chest Clip	mm	280.34	-350.31	-525.61
Buckle	mm	406.26	-350.49	-407.22
Base Center	mm	600.88	-349.63	-284.39
Center of Seat Frame Bottom	mm	616.91	-349.74	-109.76
Outboard Knee	mm	519.92	-260.01	-389.34
Outboard Ankle	mm	708.13	-274.98	-348.44
Target 2 - Seat Base H-Point	mm	294.70	-125.81	-326.36
Target 3 - Seat Base Side	mm	446.25	-120.59	-349.34
Target 1 - Seat Side Upper	mm	51.00	-117.52	-597.86
Target 4 - Seat Side Lower	mm	122.66	-216.65	-345.37

DUMMY INJURY

HIC (36 ms)	406
Chest Clip (3 ms)	43.31 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181107-2

VRTC Test Number: FR_FM_40



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-117.75	-351.31	-682.07
Top of CRS	mm	-41.68	-350.45	-766.61
Top of Headrest	mm	12.44	-349.83	-752.40
Top of Head	mm	130.79	-351.17	-739.48
Bridge of Nose	mm	240.92	-349.23	-674.65
Head CG Outboard	mm	164.05	-284.13	-662.20
Neck Center	mm	201.30	-351.50	-569.92
Chest Clip	mm	278.24	-350.03	-531.28
Buckle	mm	399.32	-349.96	-412.64
Base Center	mm	596.59	-351.87	-282.64
Center of Seat Frame Bottom	mm	617.10	-349.66	-109.96
Outboard Knee	mm	508.62	-254.35	-390.54
Outboard Ankle	mm	703.20	-265.08	-362.57
Target 2 - Seat Base H-Point	mm	290.26	-124.89	-335.73
Target 3 - Seat Base Side	mm	444.20	-118.12	-350.65
Target 1 - Seat Side Upper	mm	42.13	-121.31	-623.22
Target 4 - Seat Side Lower	mm	122.78	-214.28	-352.30

DUMMY INJURY

HIC (36 ms)	356
Chest Clip (3 ms)	42.92 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181108-1

VRTC Test Number: FR_FM_36



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-119.31	-350.69	-680.87
Top of CRS	mm	-37.56	-351.65	-755.98
Top of Headrest	mm	15.60	-350.04	-744.92
Top of Head	mm	136.47	-350.27	-732.91
Bridge of Nose	mm	246.01	-349.91	-667.04
Head CG Outboard	mm	168.38	-284.46	-653.57
Neck Center	mm	203.16	-351.77	-561.98
Chest Clip	mm	279.64	-350.19	-523.34
Buckle	mm	398.16	-350.26	-407.51
Base Center	mm	598.98	-349.31	-280.36
Center of Seat Frame Bottom	mm	617.09	-349.71	-110.04
Outboard Knee	mm	512.56	-264.34	-383.53
Outboard Ankle	mm	706.16	-282.16	-367.11
Target 2 - Seat Base H-Point	mm	298.77	-123.65	-329.97
Target 3 - Seat Base Side	mm	448.02	-117.42	-355.49
Target 1 - Seat Side Upper	mm	58.82	-118.40	-619.53
Target 4 - Seat Side Lower	mm	128.22	-211.04	-346.94

DUMMY INJURY

HIC (36 ms)	386
Chest Clip (3 ms)	43.78 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181108-2

VRTC Test Number: FR_FM_22



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.83	-351.14	-681.05
Top of CRS	mm	-35.98	-350.26	-764.88
Top of Headrest	mm	22.32	-350.54	-754.31
Top of Head	mm	141.08	-351.94	-744.59
Bridge of Nose	mm	251.04	-350.64	-678.01
Head CG Outboard	mm	172.06	-286.53	-664.70
Neck Center	mm	208.12	-352.62	-573.61
Chest Clip	mm	285.78	-351.05	-532.90
Buckle	mm	403.38	-351.85	-414.05
Base Center	mm	598.48	-349.65	-290.21
Center of Seat Frame Bottom	mm	617.11	-349.76	-109.81
Outboard Knee	mm	512.67	-264.68	-384.52
Outboard Ankle	mm	707.75	-272.52	-405.23
Target 2 - Seat Base H-Point	mm	297.89	-129.16	-339.10
Target 3 - Seat Base Side	mm	445.47	-119.86	-355.20
Target 1 - Seat Side Upper	mm	62.25	-120.38	-620.61
Target 4 - Seat Side Lower	mm	132.47	-218.88	-348.03

DUMMY INJURY

HIC (36 ms)	424
Chest Clip (3 ms)	45.57 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181108-3

VRTC Test Number: FR_FM_26



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-120.87	-350.30	-680.59
Top of CRS	mm	-39.36	-351.12	-754.94
Top of Headrest	mm	24.66	-352.51	-742.18
Top of Head	mm	145.76	-350.58	-731.33
Bridge of Nose	mm	251.58	-349.38	-664.07
Head CG Outboard	mm	175.82	-284.03	-651.29
Neck Center	mm	210.62	-351.57	-559.47
Chest Clip	mm	280.87	-351.51	-523.49
Buckle	mm	400.32	-347.41	-400.66
Base Center	mm	593.64	-349.25	-277.86
Center of Seat Frame Bottom	mm	616.88	-349.61	-110.22
Outboard Knee	mm	510.92	-260.03	-374.03
Outboard Ankle	mm	706.54	-264.30	-369.52
Target 2 - Seat Base H-Point	mm	295.25	-125.34	-320.76
Target 3 - Seat Base Side	mm	448.20	-121.34	-337.40
Target 1 - Seat Side Upper	mm	48.16	-124.61	-612.70
Target 4 - Seat Side Lower	mm	132.75	-217.20	-339.82

DUMMY INJURY

HIC (36 ms)	414
Chest Clip (3 ms)	43.42 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181109-1

VRTC Test Number: FR_FM_28



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-121.73	-350.68	-679.93
Top of CRS	mm	-34.44	-351.38	-763.54
Top of Headrest	mm	20.45	-350.90	-751.76
Top of Head	mm	138.00	-348.67	-738.69
Bridge of Nose	mm	247.54	-349.58	-672.19
Head CG Outboard	mm	170.29	-283.13	-659.47
Neck Center	mm	205.69	-350.67	-567.58
Chest Clip	mm	281.35	-350.32	-528.10
Buckle	mm	400.59	-351.03	-410.38
Base Center	mm	597.04	-349.17	-283.42
Center of Seat Frame Bottom	mm	616.98	-349.68	-110.11
Outboard Knee	mm	514.63	-266.49	-380.30
Outboard Ankle	mm	709.62	-275.74	-376.45
Target 2 - Seat Base H-Point	mm	287.63	-123.36	-326.42
Target 3 - Seat Base Side	mm	436.55	-112.37	-347.60
Target 1 - Seat Side Upper	mm	46.82	-109.46	-593.38
Target 4 - Seat Side Lower	mm	127.66	-210.69	-348.00

DUMMY INJURY

HIC (36 ms)	401
Chest Clip (3 ms)	43.94 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181109-2

VRTC Test Number: FR_FM_34



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-121.25	-350.91	-679.99
Top of CRS	mm	-36.67	-351.20	-762.06
Top of Headrest	mm	24.12	-351.02	-751.81
Top of Head	mm	137.58	-351.11	-739.36
Bridge of Nose	mm	248.61	-350.47	-672.91
Head CG Outboard	mm	169.95	-286.67	-659.34
Neck Center	mm	206.93	-356.02	-568.81
Chest Clip	mm	276.48	-351.64	-529.29
Buckle	mm	397.23	-351.75	-405.99
Base Center	mm	594.80	-349.00	-284.35
Center of Seat Frame Bottom	mm	617.01	-349.66	-110.13
Outboard Knee	mm	512.82	-277.61	-371.98
Outboard Ankle	mm	702.66	-284.97	-416.14
Target 2 - Seat Base H-Point	mm	291.71	-126.11	-319.34
Target 3 - Seat Base Side	mm	438.71	-119.34	-349.85
Target 1 - Seat Side Upper	mm	65.91	-115.71	-620.42
Target 4 - Seat Side Lower	mm	127.40	-217.16	-345.27

DUMMY INJURY

HIC (36 ms)	381
Chest Clip (3 ms)	45.35 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181113-1

VRTC Test Number: FR_FM_32



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-119.18	-351.19	-681.12
Top of CRS	mm	-38.78	-351.13	-759.23
Top of Headrest	mm	22.32	-351.57	-749.83
Top of Head	mm	137.09	-350.76	-743.38
Bridge of Nose	mm	249.01	-349.80	-679.16
Head CG Outboard	mm	170.42	-284.44	-665.51
Neck Center	mm	208.95	-351.52	-573.34
Chest Clip	mm	281.64	-351.15	-533.18
Buckle	mm	398.61	-349.65	-408.23
Base Center	mm	594.49	-349.65	-289.87
Center of Seat Frame Bottom	mm	616.94	-349.62	-109.86
Outboard Knee	mm	507.98	-264.74	-375.08
Outboard Ankle	mm	698.50	-268.15	-420.50
Target 2 - Seat Base H-Point	mm	299.16	-130.94	-330.17
Target 3 - Seat Base Side	mm	449.44	-125.37	-352.74
Target 1 - Seat Side Upper	mm	70.43	-120.00	-618.76
Target 4 - Seat Side Lower	mm	132.28	-219.80	-343.73

DUMMY INJURY

HIC (36 ms)	443
Chest Clip (3 ms)	46.32 g

DUMMY POSITIONING

CRS: Safety 1st Air 65 – Forward Facing – LATCH

TRC Test Number: S181113-2

VRTC Test Number: FR_FM_38



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-119.89	-350.28	-681.13
Top of CRS	mm	-34.07	-351.24	-754.86
Top of Headrest	mm	20.41	-349.26	-740.95
Top of Head	mm	136.72	-350.29	-733.55
Bridge of Nose	mm	248.84	-350.26	-669.22
Head CG Outboard	mm	170.89	-283.44	-655.66
Neck Center	mm	208.34	-351.48	-563.51
Chest Clip	mm	279.85	-350.54	-523.24
Buckle	mm	397.75	-351.74	-402.38
Base Center	mm	599.03	-350.12	-284.97
Center of Seat Frame Bottom	mm	616.99	-349.58	-110.49
Outboard Knee	mm	509.98	-257.03	-373.03
Outboard Ankle	mm	705.00	-260.79	-388.62
Target 2 - Seat Base H-Point	mm	300.77	-127.65	-321.53
Target 3 - Seat Base Side	mm	447.38	-122.38	-337.63
Target 1 - Seat Side Upper	mm	46.99	-123.64	-636.43
Target 4 - Seat Side Lower	mm	130.82	-217.82	-339.18

DUMMY INJURY

HIC (36 ms)	391
Chest Clip (3 ms)	42.21 g

SECTION 3
REARWARD FACING CRS TEST SUMMARY

TEST DUMMY INFORMATION

Description	Position # 3 CRS
ATD Type/Serial No.	Hybrid III 3 Year Old/1869
Restraint System	LA Only
CRS Direction	Rearward Facing
Foam Cushion	CENT_1, WB, PF_1, LEAR_1

CAMERA POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Origin	mm	0.00	0.00	0.00
N1 Passenger Front	mm	1875.99	-336.13	-522.00
N6 Passenger Side	mm	367.09	905.24	-354.66

DUMMY POSITIONING

CRS: Cosco APT 40 – Rearward Facing – LA Only

TRC Test Number: S181114-1

VRTC Test Number: FR_FM_42



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.17	-351.33	-680.56
CRS Bottom Center	mm	102.00	-351.30	-380.99
CRS Mid Height	mm	671.76	-351.42	-513.60
Top of CRS	mm	746.05	-350.92	-631.21
Top of Head	mm	661.89	-351.66	-660.99
Bridge of Nose	mm	532.50	-351.40	-660.09
Head CG Outboard	mm	591.81	-287.26	-612.32
Neck Center	mm	514.36	-348.61	-540.84
Chest Clip	mm	439.49	-349.35	-520.85
Buckle	mm	273.05	-351.09	-405.55
Outboard Knee	mm	183.14	-243.07	-435.57
Outboard Ankle	mm	54.13	-229.90	-560.38
Center of Seat Frame Bottom	mm	617.14	-349.68	-109.37
Target 2 - Seat Base H-Point	mm	336.66	-172.30	-288.25
Target 3 - Seat Base Side	mm	152.97	-124.62	-358.40
Target 1 - Seat Side Upper	mm	605.44	-127.77	-659.61
Target 4 - Seat Side Lower	mm	537.93	-220.39	-354.90

DUMMY INJURY

HIC (36 ms)	510
Chest Clip (3 ms)	53.24 g

DUMMY POSITIONING

CRS: Cosco APT 40 – Rearward Facing – LA Only

TRC Test Number: S181116-1

VRTC Test Number: FR_FM_48



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.22	-351.36	-680.82
CRS Bottom Center	mm	109.99	-350.05	-386.85
CRS Mid Height	mm	669.89	-349.91	-517.07
Top of CRS	mm	743.56	-348.85	-628.57
Top of Head	mm	657.59	-350.33	-664.59
Bridge of Nose	mm	527.39	-351.17	-661.38
Head CG Outboard	mm	585.87	-286.64	-615.49
Neck Center	mm	511.35	-349.14	-543.44
Chest Clip	mm	436.44	-351.30	-522.79
Buckle	mm	270.03	-348.25	-410.71
Outboard Knee	mm	182.92	-228.83	-440.72
Outboard Ankle	mm	80.41	-197.51	-584.81
Center of Seat Frame Bottom	mm	616.70	-349.91	-110.34
Target 2 - Seat Base H-Point	mm	330.85	-174.73	-295.91
Target 3 - Seat Base Side	mm	147.93	-129.03	-363.95
Target 1 - Seat Side Upper	mm	605.67	-124.53	-655.68
Target 4 - Seat Side Lower	mm	529.45	-222.30	-355.34

DUMMY INJURY

HIC (36 ms)	431
Chest Clip (3 ms)	45.89 g

DUMMY POSITIONING

CRS: Cosco APT 40 – Rearward Facing – LA Only

TRC Test Number: S181116-2

VRTC Test Number: FR_FM_46



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.15	-351.37	-680.75
CRS Bottom Center	mm	115.42	-349.41	-376.81
CRS Mid Height	mm	668.67	-352.05	-518.24
Top of CRS	mm	737.34	-348.62	-634.06
Top of Head	mm	655.91	-351.22	-661.65
Bridge of Nose	mm	526.90	-348.58	-655.03
Head CG Outboard	mm	582.23	-290.95	-613.27
Neck Center	mm	512.47	-352.57	-539.32
Chest Clip	mm	438.31	-352.81	-519.03
Buckle	mm	270.83	-349.98	-401.98
Outboard Knee	mm	184.41	-228.52	-427.04
Outboard Ankle	mm	61.36	-195.73	-555.70
Center of Seat Frame Bottom	mm	616.61	-349.83	-110.27
Target 2 - Seat Base H-Point	mm	339.20	-175.75	-285.36
Target 3 - Seat Base Side	mm	164.51	-126.65	-359.85
Target 1 - Seat Side Upper	mm	568.93	-124.03	-648.07
Target 4 - Seat Side Lower	mm	535.50	-222.32	-354.47

DUMMY INJURY

HIC (36 ms)	516
Chest Clip (3 ms)	51.08 g

DUMMY POSITIONING

CRS: Cosco APT 40 – Rearward Facing – LA Only

TRC Test Number: S181119-1

VRTC Test Number: FR_FM_44



DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.26	-351.48	-680.54
CRS Bottom Center	mm	107.00	-350.51	-380.97
CRS Mid Height	mm	669.60	-350.32	-514.45
Top of CRS	mm	738.99	-350.43	-630.68
Top of Head	mm	665.10	-349.31	-663.74
Bridge of Nose	mm	535.44	-350.08	-667.92
Head CG Outboard	mm	592.10	-284.55	-618.62
Neck Center	mm	514.37	-348.91	-548.51
Chest Clip	mm	425.85	-349.06	-518.01
Buckle	mm	271.61	-348.46	-407.98
Outboard Knee	mm	184.37	-228.27	-433.43
Outboard Ankle	mm	77.28	-197.06	-574.28
Center of Seat Frame Bottom	mm	616.74	-350.25	-110.04
Target 2 - Seat Base H-Point	mm	331.92	-171.81	-296.25
Target 3 - Seat Base Side	mm	152.80	-126.06	-367.21
Target 1 - Seat Side Upper	mm	591.07	-125.95	-658.42
Target 4 - Seat Side Lower	mm	527.64	-218.94	-356.55

DUMMY INJURY

HIC (36 ms)	448
Chest Clip (3 ms)	48.57 g

SECTION 4
DUMMY CALIBRATION DATA