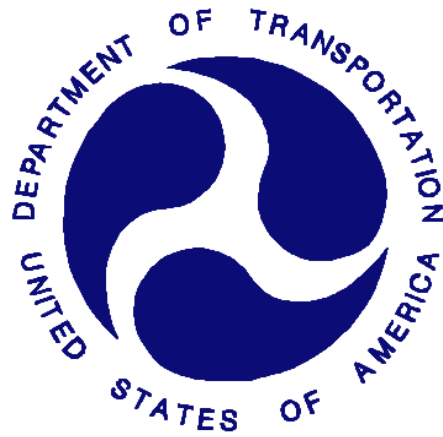


**Vehicle Research and Test Center  
FMVSS 213 Testing  
Hybrid III 6 Year Old**

**Prepared By:  
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**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 6 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 6 year old dummy (serial number 027) was secured in the left rear occupant position (position 4 or P4) in a forward facing convertible child restraint system (CRS). The Hybrid III 6 year old was instrumented with head, chest, and pelvic triaxial accelerometers, upper neck, and lumbar force and moment load cells, a displacement potentiometer and a rate gyro in the chest. During this test series the dummy was restrained with a 3-point seatbelt (SB3PT).

Section 2 contains the testing performed in November 2018. Section 3 contains the dummy certification data.

**SECTION 2**  
**FORWARD FACING CRS TEST SUMMARY**

**TEST DUMMY INFORMATION**

Description	Position # 4 CRS
ATD Type/Serial No.	Hybrid III 6 Year Old/027
Restrain System	SB3PT
CRS Direction	Forward Facing
Foam Cushion	LEAR_1, PF_1, WB, CENT_1

**CAMERA POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Origin	mm	0.00	0.00	0.00
N5 Driver Front	mm	1900.66	346.17	-486.70
N3 Driver Side	mm	428.43	-911.77	-387.87

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181105-1

VRTC Test Number: FR\_FM\_23



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.75	352.44	-681.82
Top of CRS	mm	-20.20	351.49	-646.25
CRS Top of Headrest	mm	-70.91	352.81	-898.67
Top of Head	mm	148.91	350.13	-852.43
Neck Center	mm	180.25	352.44	-655.47
Bridge of Nose	mm	235.53	350.91	-758.20
Head CG Outboard	mm	161.02	288.34	-752.17
Chest Clip	mm	258.09	350.12	-598.14
Buckle	mm	372.17	350.98	-413.19
Knee	mm	543.94	251.04	-397.46
Ankle	mm	657.15	268.83	-180.97
CRS Base Center	mm	560.54	350.70	-220.88
Center of Seat Frame Bottom	mm	619.74	349.85	-102.49
Target 2 - Seat Base H-Point	mm	266.12	137.85	-309.11
Target 3 - Seat Base Side	mm	439.02	115.62	-237.98
Target 1 - Seat Side Upper	mm	47.78	162.53	-605.72
Target 4 - Seat Side Lower	mm	115.78	211.10	-333.16

**DUMMY INJURY**

HIC (36 ms)	528
Chest Clip (3 ms)	32.71 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181107-1

VRTC Test Number: FR\_FM\_29



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.46	352.42	-682.60
Top of CRS	mm	-16.04	352.54	-652.61
CRS Top of Headrest	mm	-69.60	352.72	-903.02
Top of Head	mm	148.13	350.38	-859.33
Neck Center	mm	182.49	350.29	-662.06
Bridge of Nose	mm	237.24	350.74	-766.55
Head CG Outboard	mm	163.58	286.61	-759.74
Chest Clip	mm	263.05	350.17	-604.06
Buckle	mm	373.00	352.29	-418.10
Knee	mm	546.41	253.05	-405.33
Ankle	mm	660.78	269.09	-189.09
CRS Base Center	mm	557.71	351.55	-222.68
Center of Seat Frame Bottom	mm	619.30	350.45	-104.30
Target 2 - Seat Base H-Point	mm	265.15	138.85	-311.40
Target 3 - Seat Base Side	mm	439.75	119.08	-237.02
Target 1 - Seat Side Upper	mm	39.90	159.87	-602.11
Target 4 - Seat Side Lower	mm	113.57	212.15	-334.17

**DUMMY INJURY**

HIC (36 ms)	550
Chest Clip (3 ms)	47.99 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181107-2

VRTC Test Number: FR\_FM\_39



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.39	352.21	-682.43
Top of CRS	mm	-20.89	351.13	-654.15
CRS Top of Headrest	mm	-70.64	353.10	-906.63
Top of Head	mm	143.03	349.45	-855.67
Neck Center	mm	177.87	352.84	-659.39
Bridge of Nose	mm	232.90	350.58	-763.42
Head CG Outboard	mm	156.62	288.36	-754.69
Chest Clip	mm	256.63	352.86	-605.26
Buckle	mm	365.20	350.77	-423.13
Knee	mm	542.47	247.85	-421.59
Ankle	mm	663.16	261.00	-207.77
CRS Base Center	mm	561.87	351.62	-233.43
Center of Seat Frame Bottom	mm	619.23	350.30	-104.32
Target 2 - Seat Base H-Point	mm	270.90	138.78	-318.68
Target 3 - Seat Base Side	mm	441.78	118.82	-246.94
Target 1 - Seat Side Upper	mm	40.83	160.62	-605.58
Target 4 - Seat Side Lower	mm	116.94	212.67	-347.63

**DUMMY INJURY**

HIC (36 ms)	476
Chest Clip (3 ms)	41.45 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181108-1

VRTC Test Number: FR\_FM\_35



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.78	352.34	-681.59
Top of CRS	mm	-18.25	352.01	-651.63
CRS Top of Headrest	mm	-71.04	352.71	-902.61
Top of Head	mm	152.02	350.47	-859.32
Neck Center	mm	183.24	351.85	-662.09
Bridge of Nose	mm	239.07	350.84	-764.63
Head CG Outboard	mm	165.80	288.76	-759.67
Chest Clip	mm	258.62	350.43	-605.32
Buckle	mm	370.54	351.05	-421.05
Knee	mm	543.29	259.38	-404.95
Ankle	mm	667.59	280.06	-192.82
CRS Base Center	mm	560.57	351.04	-225.45
Center of Seat Frame Bottom	mm	619.55	349.89	-102.50
Target 2 - Seat Base H-Point	mm	266.22	137.90	-313.37
Target 3 - Seat Base Side	mm	439.31	114.64	-242.45
Target 1 - Seat Side Upper	mm	37.50	161.59	-602.61
Target 4 - Seat Side Lower	mm	116.95	211.90	-339.31

**DUMMY INJURY**

HIC (36 ms)	525
Chest Clip (3 ms)	44.8 g

## DUMMY POSITIONING

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181108-2

VRTC Test Number: FR\_FM\_21



## DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.48	352.32	-682.18
Top of CRS	mm	-24.04	352.13	-649.29
CRS Top of Headrest	mm	-75.61	351.57	-902.37
Top of Head	mm	147.17	350.26	-859.27
Neck Center	mm	179.92	351.52	-662.05
Bridge of Nose	mm	237.09	350.42	-765.15
Head CG Outboard	mm	162.05	287.29	-759.54
Chest Clip	mm	262.37	350.92	-602.97
Buckle	mm	368.61	351.68	-418.69
Knee	mm	541.79	260.35	-405.04
Ankle	mm	661.55	277.87	-191.46
CRS Base Center	mm	557.70	351.64	-227.86
Center of Seat Frame Bottom	mm	619.76	349.84	-102.75
Target 2 - Seat Base H-Point	mm	259.68	141.40	-308.33
Target 3 - Seat Base Side	mm	434.51	117.52	-239.93
Target 1 - Seat Side Upper	mm	31.68	162.15	-597.93
Target 4 - Seat Side Lower	mm	110.95	217.66	-335.72

## DUMMY INJURY

HIC (36 ms)	529
Chest Clip (3 ms)	46.01 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181108-3

VRTC Test Number: FR\_FM\_25



**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	352.28	-682.43
Top of CRS	mm	-19.64	349.11	-654.40
CRS Top of Headrest	mm	-73.21	351.88	-905.60
Top of Head	mm	149.32	350.09	-860.35
Neck Center	mm	179.55	352.36	-662.55
Bridge of Nose	mm	236.69	351.40	-765.21
Head CG Outboard	mm	162.04	289.09	-759.48
Chest Clip	mm	259.80	352.46	-604.58
Buckle	mm	367.22	350.64	-419.20
Knee	mm	536.86	247.10	-406.21
Ankle	mm	659.59	260.06	-194.24
CRS Base Center	mm	557.33	350.30	-227.95
Center of Seat Frame Bottom	mm	619.21	350.53	-104.62
Target 2 - Seat Base H-Point	mm	261.51	138.67	-311.96
Target 3 - Seat Base Side	mm	435.19	117.85	-238.91
Target 1 - Seat Side Upper	mm	46.83	161.40	-610.08
Target 4 - Seat Side Lower	mm	115.69	213.21	-337.98

**DUMMY INJURY**

HIC (36 ms)	539
Chest Clip (3 ms)	44.01 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181109-1

VRTC Test Number: FR\_FM\_27



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.47	352.20	-682.31
Top of CRS	mm	-25.51	352.09	-652.43
CRS Top of Headrest	mm	-70.93	351.24	-905.54
Top of Head	mm	145.80	350.56	-854.54
Neck Center	mm	178.85	352.36	-657.07
Bridge of Nose	mm	234.65	350.41	-760.54
Head CG Outboard	mm	158.33	288.86	-753.74
Chest Clip	mm	256.39	349.81	-597.10
Buckle	mm	362.08	350.08	-416.59
Knee	mm	537.18	250.77	-403.08
Ankle	mm	641.73	278.53	-182.86
CRS Base Center	mm	549.83	349.54	-224.87
Center of Seat Frame Bottom	mm	619.02	350.47	-104.33
Target 2 - Seat Base H-Point	mm	254.04	142.06	-303.88
Target 3 - Seat Base Side	mm	427.29	119.45	-237.02
Target 1 - Seat Side Upper	mm	30.13	162.25	-598.09
Target 4 - Seat Side Lower	mm	108.40	218.46	-331.48

**DUMMY INJURY**

HIC (36 ms)	544
Chest Clip (3 ms)	42.71 g

**DUMMY POSITIONING**

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181109-2

VRTC Test Number: FR\_FM\_33



**DUMMY POSITIONING FARO MEASUREMENTS**

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.42	352.33	-682.02
Top of CRS	mm	-22.51	349.43	-648.01
CRS Top of Headrest	mm	-78.15	350.52	-897.55
Top of Head	mm	143.17	349.97	-859.14
Neck Center	mm	174.93	351.11	-661.31
Bridge of Nose	mm	230.50	350.19	-764.40
Head CG Outboard	mm	156.80	287.29	-759.18
Chest Clip	mm	258.30	352.13	-597.79
Buckle	mm	362.41	351.73	-418.77
Knee	mm	537.86	256.99	-399.19
Ankle	mm	672.09	266.46	-194.00
CRS Base Center	mm	555.04	352.13	-226.37
Center of Seat Frame Bottom	mm	619.15	350.48	-104.13
Target 2 - Seat Base H-Point	mm	262.89	136.51	-307.36
Target 3 - Seat Base Side	mm	438.32	114.09	-239.68
Target 1 - Seat Side Upper	mm	34.51	158.21	-596.67
Target 4 - Seat Side Lower	mm	109.60	210.34	-333.51

**DUMMY INJURY**

HIC (36 ms)	522
Chest Clip (3 ms)	42.54 g

## Dummy Positioning

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181113-1

VRTC Test Number: FR\_FM\_31



Dummy Positioning FARO Measurements

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.57	352.25	-682.16
Top of CRS	mm	-20.85	351.04	-650.68
CRS Top of Headrest	mm	-74.37	350.66	-905.18
Top of Head	mm	146.81	349.69	-860.31
Neck Center	mm	178.96	352.50	-662.13
Bridge of Nose	mm	235.38	351.15	-764.65
Head CG Outboard	mm	160.39	288.77	-758.26
Chest Clip	mm	258.86	352.37	-602.98
Buckle	mm	365.94	351.74	-420.93
Knee	mm	541.61	252.22	-401.37
Ankle	mm	672.88	269.51	-194.15
CRS Base Center	mm	557.12	350.25	-229.68
Center of Seat Frame Bottom	mm	619.31	350.47	-104.31
Target 2 - Seat Base H-Point	mm	265.28	140.86	-314.58
Target 3 - Seat Base Side	mm	439.36	119.88	-243.91
Target 1 - Seat Side Upper	mm	40.02	160.87	-601.44
Target 4 - Seat Side Lower	mm	116.05	214.78	-334.00

## DUMMY INJURY

HIC (36 ms)	539
Chest Clip (3 ms)	47.66 g

## DUMMY POSITIONING

CRS: Graco Nautilus 65 3-in-1 – Forward Facing – SB3PT

TRC Test Number: S181113-2

VRTC Test Number: FR\_FM\_37



## DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.79	352.24	-681.70
Top of CRS	mm	-19.88	351.46	-653.44
CRS Top of Headrest	mm	-72.16	351.38	-904.19
Top of Head	mm	147.90	350.05	-859.59
Neck Center	mm	180.18	351.81	-662.59
Bridge of Nose	mm	235.75	351.95	-764.83
Head CG Outboard	mm	161.29	288.37	-758.54
Chest Clip	mm	263.78	351.13	-598.18
Buckle	mm	369.12	351.78	-420.74
Knee	mm	542.73	260.74	-405.05
Ankle	mm	666.84	281.35	-193.50
CRS Base Center	mm	555.96	351.18	-229.97
Center of Seat Frame Bottom	mm	619.55	349.82	-102.62
Target 2 - Seat Base H-Point	mm	259.68	141.05	-308.49
Target 3 - Seat Base Side	mm	430.41	117.97	-241.53
Target 1 - Seat Side Upper	mm	40.15	162.14	-601.63
Target 4 - Seat Side Lower	mm	114.83	217.32	-336.00

## DUMMY INJURY

HIC (36 ms)	547
Chest Clip (3 ms)	45.34 g

## DUMMY POSITIONING

CRS: Graco Turbo Booster (HB) – Forward Facing Booster– SB3PT

TRC Test Number: S181114-1

VRTC Test Number: FR\_FM\_41



## DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.41	352.41	-682.22
CRS Top of Headrest	mm	-72.37	350.92	-797.55
Top of Head	mm	150.76	350.31	-831.17
Bridge of Nose	mm	224.05	351.61	-727.51
Head CG Outboard	mm	149.49	286.71	-731.98
Neck Center	mm	156.20	350.30	-632.50
Shoulder Belt Upper	mm	205.17	350.71	-564.10
Shoulder Belt Lower	mm	242.93	350.20	-492.05
Lap Belt Upper	mm	277.67	350.64	-380.74
Lap Belt Lower	mm	319.20	351.10	-359.42
Knee	mm	495.87	254.59	-359.35
Ankle	mm	658.74	284.30	-178.08
CRS Base Center	mm	520.15	350.41	-271.71
Center of Seat Frame Bottom	mm	619.48	350.53	-104.06
Target 2 - Seat Base H-Point	mm	215.23	148.37	-276.39
Target 3 - Seat Base Side	mm	382.59	140.69	-236.90
Target 1 - Seat Side Upper	mm	22.49	203.71	-665.23
Target 4 - Seat Side Lower	mm	126.27	203.59	-354.02

## DUMMY INJURY

HIC (36 ms)	439
Chest Clip (3 ms)	45.30 g

## DUMMY POSITIONING

CRS: Graco Nautilus 65 3-in-1 – Forward Facing with Harness – SB3PT&T

TRC Test Number: S181119-1

VRTC Test Number: FR\_FM\_43



## DUMMY POSITIONING FARO MEASUREMENTS

Description	Units	X	Y	Z
Z-Point	mm	0.00	0.00	0.00
Center of Seat Frame Back	mm	-118.66	352.51	-681.90
Top of CRS	mm	-9.78	351.11	-655.04
CRS Top of Headrest	mm	-71.48	351.56	-902.30
Top of Head	mm	143.19	350.17	-856.09
Bridge of Nose	mm	234.90	351.67	-762.45
Head CG Outboard	mm	161.62	287.51	-755.47
Neck Center	mm	179.91	351.65	-658.26
Chest Clip	mm	257.46	351.52	-602.25
Buckle	mm	370.92	352.02	-414.12
Knee	mm	545.29	259.72	-401.55
Ankle	mm	668.60	278.98	-190.49
CRS Base Center	mm	558.43	349.11	-226.11
Center of Seat Frame Bottom	mm	619.60	349.87	-102.55
Target 2 - Seat Base H-Point	mm	265.52	137.24	-300.33
Target 3 - Seat Base Side	mm	422.33	112.64	-339.76
Target 1 - Seat Side Upper	mm	34.22	163.53	-606.33
Target 4 - Seat Side Lower	mm	111.50	211.29	-335.81

## DUMMY INJURY

HIC (36 ms)	517
Chest Clip (3 ms)	45.14 g

**SECTION 3**  
**DUMMY CALIBRATION DATA**