

**Technical Assessment of
FMVSS No. 208, Occupant Crash Protection,
Appendix A-1**

**Light Duty Vehicle Division
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1. Background

To address the risk air bags pose to young children in child restraint systems (CRSs), FMVSS No. 208 includes three compliance options for the passenger air bag. One option requires the front passenger air bag system to automatically suppress when a child or child in a CRS is present. The second option requires that the passenger air bag deploy only at a low level of force (low-risk deployment). For the passenger air bag low risk deployment (LRD) compliance option, performance requirements were made using 1, 3, and 6-year-old dummies. The third option requires the passenger air bag system to track the occupant's motion and suppress the air bag if they are too close ("dynamic automatic suppression"). To date, the last option of dynamic automatic suppression, which requires the development of a test procedure through the submission of an acceptable rulemaking petition, has never been implemented.

Vehicle manufacturers can opt to use a combination of suppression and LRD passenger air bag strategies. Some manufacturers rely on weight-based technologies to comply with the automatic air bag suppression requirement. Weight-based technologies utilize load cells or other sensors in the vehicle seat that suppress the air bag when a child or a child in a CRS is placed on the seat and enables the air bag's deployment if an adult occupies the front passenger seat. The threshold for enabling the air bag's deployment is dependent on the design and calibration of the suppression system used. Manufacturers choosing to rely on an air bag suppression system to minimize the risk to children in a CRS must ensure that the vehicle complies with the suppression requirements when tested with the CRSs specified in the appendix of the standard. To ensure the robustness of automatic air bag suppression systems, NHTSA intended for the appendix to represent a large portion of the CRS market, while including exceptionally large or small restraints.

The appendix is made up of four (4) subparts. Subpart A lists a car bed that can be used to test the suppression system of a vehicle that has been certified as being in compliance with 49 CFR 571.208, S19. Subpart B lists rear-facing infant CRSs that can be used by the agency to test the suppression system or the low risk deployment capabilities of a vehicle that is certified as being in compliance with 49 CFR 571.208, S19. Subpart C lists forward-facing toddler and convertible CRSs that can be used by the agency to test the suppression system or the low risk deployment capabilities of a vehicle that has been certified as being in compliance with 49 CFR 571.208, S19 or S21. Subpart D lists CRSs that have belt-positioning booster (BPB) capabilities (e.g., combination and 3-in-1 CRSs) and BPBs that can be used by the agency to test the suppression system capabilities of a vehicle that has been certified as being in compliance with 49 CFR 571.208 S21 or S23.

A November 19, 2003 final rule (68 FR 65179) that amended the then Appendix A, also discussed how we decided to perform an annual review of Appendix A with the objective of making necessary updates without varying the number of CRSs by more than 10-20 percent, absent any dramatic changes in the design of restraints. This final rule included a discussion of the factors we would use in determining whether amendments to the appendix were necessary. These factors included such things as whether a particular restraint has been a high-sales volume model, whether its mass and dimensions are representative of many restraints on the market, whether its mass and dimensions represent outliers,¹ and whether a variety of restraint manufacturers are represented in the appendix. The review would also enable NHTSA to

¹ An outlier would be a large/small and/or heavy/light CRS that is significantly different than most seats in its class.

determine the availability of the CRSs and determine any change in design, other than those that are purely cosmetic.

On November 12, 2008, the agency published a final rule (73 FR 66786), amending FMVSS No. 208, "Occupant crash protection," to update the child restraints listed in Appendix A. This final rule created a revised appendix titled, Appendix A-1, that deleted seven (7) of the previous CRSs, added five (5) new CRSs, and included cosmetic replacements for seven (7) CRSs. Both Appendices were included in the regulatory text due to the phase-in of the amendments and the option for early compliance. Currently only Appendix A-1 is in effect.

The 2008 final rule made extensive use of data that the agency developed through the Ease of Use (EOU) ratings program. The EOU program began in 2002. This program strives to encourage CRS manufacturers to improve their products and make them user-friendly. The purpose of the ratings program is to educate parents and caregivers about child safety seat features and to assist them in finding the appropriate child safety seat that fits their needs. The EOU program tries to cover all CRSs available for sale at retail outlets. Each fall, NHTSA requests a list from the CRS manufacturers of the CRSs they plan on producing during the upcoming year along with production estimates. The agency then determines which seats are continuing to be offered and what new models are available (not just cosmetically changed and renamed models) and then they select most if not all of them for testing. Measurements are taken for each CRS assessed through the EOU program, and used when performing an update to the appendix. The 2015 EOU program assessed 53 different CRSs selected from 27 different manufacturers. Originally, the assessment presented in this report was primarily based on the 2015 EOU data, but in light of the availability of newer EOU data, references to the 2015 EOU data averages have been updated to reflect the 2019 EOU data averages.

2. Assessment method

The data collected from the EOU program on the CRSs currently listed in Appendix A-1, and the production status of the CRSs were used in this review of the appendix to determine which CRSs needed to be removed or updated. The data collected from the EOU program was also utilized to identify new CRSs to add to the appendix. As stated in the Background section, we attempted to restrict the variation in the number of CRSs by no more than 10-20 percent. However, through this assessment it was determined that nearly all of the existing CRSs in the appendix are no longer in production.

The factors we considered in determining which CRSs should be deleted or added are:

- Dimensions – CRSs having dimensions that were representative of the average restraint in today's market were identified. CRSs that had dimensions that would classify them as outliers were also identified.
- Weight – Since these CRSs are used to test air bag suppression systems it was important to identify which CRSs were the lightest and heaviest, and those that are representative of the average restraint in today's market in terms of weight.
- Footprint – The footprint on every CRS is unique. Some air bag suppression systems have trouble sensing a CRS if the footprint is shaped in a way that does not allow the CRS to load the sensors or load cells, as anticipated (e.g., the footprint contact points with the seat do not align with the position of seat sensors).
- Production total – The agency considered production totals of the CRSs. We assumed that CRSs with high production totals also have high sales volume. For

simplicity, in this report we use the term “popular” to refer to these high production CRSs.”

3. Deletions:

The CRSs that we recommended be deleted from Appendix A-1 do not offer any unique characteristics or were no longer in production. The following sections will discuss which deletions were identified with the corresponding rationale.

3.1 Deletion of CRSs from Appendix A-1 that have been discontinued by the manufacturer

The 2008 final rule established Appendix A-1 through the deletion of some of the original Appendix A CRSs and addition of other CRSs. Appendix A-1 also included several carry-over CRSs from Appendix A.² These CRSs are listed below:

- Subpart B
 - Century Smart Fit 4543
 - Graco Infant 8457
- Subpart C
 - Cosco Touriva 02519
 - Evenflo Medallion 254
- Subpart D
 - Britax Roadster 9004
 - Evenflo Right Fit 245

The agency has confirmed that all of these CRSs have been out of production for many years and are not readily available for purchase. Given this, and the fact that most CRSs have an expiration date that is 6 years from the date of manufacture,³ we believe the deletion of these CRSs is justified.

In addition to these carry-over CRSs from Appendix A, Appendix A-1 has other CRSs that are also not in production, making them difficult to acquire for testing purposes and reducing the likelihood they are in actual use by consumers. These are listed below:

- Subpart A
 - Angel Guard AngelRide AA243FOF
- Subpart B
 - Cosco Arriva 22-013 PAW with the 22-999 WHO base
- Subpart C
 - Graco Toddler SafeSeat Step 2
 - Evenflo Generations #352
 - Graco Platinum Cargo
- Subpart D
 - Evenflo Generations #352

² CRSs that were replaced with similar models that were more recently produced, at the time of the 2008 final rule, are not considered carry-over CRSs.

³ NHTSA does not require “expiration dates” on child restraint systems. CRS manufacturers developed the expiration date idea and label CRSs with an expiration date following industry practice.

- Graco Platinum Cargo

The Angel Guard AngelRide #AA2403FOF, is a car bed with a 3-point harness. This car bed is no longer in production; therefore, we propose deleting this car bed from Subpart A.

The Cosco Arriva 22-013 PAW with the 22-999 WHO base is a rear-facing infant CRS with a 5-point harness. The model number for this CRS was updated in Appendix A-1 since the previous model number was no longer available. As explained in the 2008 final rule, this was a CRS that was mainly distributed to hospitals, health departments or other organizations. In fact, the 2008 final rule noted that the manufacturer was contemplating phasing-out this CRS. This seat was not considered an outlier, and as will be shown below, we are proposing to add a CRS with similar characteristics to the appendix.

The Graco Toddler SafeSeat Step 2 is a forward-facing-only CRS with a 5-point safety harness. It was added with the creation of Appendix A-1 and it was among the heavier forward-facing CRSs on the market at that time. The rationale for including it in Appendix A-1 was its weight and its uniquely flat footprint. As will be shown, we are proposing to add heavy CRSs to Subpart C and CRSs with footprints that are flat (e.g., large contact surface area) in this update.

The Evenflo Generations is a forward-facing-only combination CRS with a 5-point safety harness. At the time of the 2008 final rule it was among the lighter forward-facing CRSs. It was included in Appendix A-1 because its footprint was unique and because it was lightweight for this CRS category. We are proposing to include a lightweight seat in Subparts C and D to replace the Evenflo Generations.

The Graco Platinum Cargo is a forward-facing-only combination CRS with a 5-point harness listed in both Subparts C and D of Appendix A-1. As part of the 2008 final rule, this CRS was a replacement for the Century Next Step 4920, and there are no remarkable features that would warrant finding a comparable replacement for it in this update.

In light of the fact that these CRSs are discontinued and the fact that many years have passed since our last update, deleting these CRSs to allow the inclusion of newer CRS models is recommended.

3.2 Deletion of the Graco Snugride #E9L02XX from Subpart B

The Graco Snugride #E9L02XX is a rear-facing infant CRS in Subpart B of Appendix A-1, with a detachable base. The Graco Snugride was included in Appendix A-1 in the previous update because it was lightweight (12 lbs. with the base) and had a high sales volume in the U.S. This specific model of the Graco Snugride is no longer in production. There is a newer model available, but as will be shown, there are newer lightweight infant CRSs that are also popular in the market now. As a result, we propose deleting this CRS from Subpart B.

3.3 Deletion of the Peg Perego Primo Viaggio from Subpart B

The Peg Perego Primo Viaggio is a rear-facing infant CRS, with a detachable base and a 5-point safety harness. It weighs 18.80 lbs. with its base and 11.20 lbs. without its base, making it a heavier than average rear-facing infant CRSs. It has a relatively large base (base depth and width dimensions are 19.00 in. and 15.50 in. respectively). This CRS was added in Appendix A-1 because we concluded that this CRS is somewhat of an outlier in terms of its dimensions and unique footprint, and we believed that testing an air bag suppression system using this CRS would be a good measure of a system's robustness. This specific model of the Primo Viaggio is no longer in production. In addition, a newer CRS, from a different manufacturer, with similar

characteristics as the Primo Viaggio has been identified. As a result, deleting this CRS from Subpart B is recommended.

3.4 Deletion of the Evenflo Tribute V #379XXXX from Subpart C

The Evenflo Tribute V #379XXXX, is a convertible CRS with a 5-point harness. The design and characteristics of this CRS were not evaluated in the previous update because it was a replacement for a CRS listed in Appendix A. While this CRS is still under production with a different model number, we have been informed that it will be phased-out in the near future. We do not see a need to find an equivalent replacement for this CRS because it would be redundant with the Cosco Scenera Next #CC123---, a recommended addition to Subpart C discussed in Section 5, vi. Therefore, deleting this CRS from Subpart C is recommended.

3.5 Deletion of the Graco ComfortSport from Subpart C

The Graco ComfortSport is a convertible CRS with a 5-point harness. The design and characteristics of this CRS were not evaluated in the previous update because the mold for this CRS closely resembled a CRS listed in Appendix A. While this CRS is still in production we have identified other CRSs to add to the Appendix with unique footprints and or dimensional characteristics. In order to properly assess the robustness of air bag systems we deem it necessary to delete this CRS in order to accommodate adding one of the newly identified CRSs.

3.6 Deletion of the Cosco Summit Deluxe High Back Booster #22-262 from Subparts C and D

The Cosco Summit Deluxe High Back Booster #22-262 is a forward-facing CRS with 5-point safety harness that can also be used as a BPB. The Cosco Summit Deluxe High Back Booster was included in Appendix A-1 because of its wide base and because it was a tall CRS. The agency has identified CRSs that are taller and wider that we are proposing be included in the revised appendix. While, this CRS is still being produced under a different model name (with cosmetic differences) we think it would still be prudent to include one of the newly identified CRS(s) on the market that are taller and or have a wider base.

3.7 Deletion of the Cosco High Back Booster #22-209 from Sections C and D

The Cosco High Back Booster #22-209 is a forward-facing-only combination CRS with a 5-point harness in Subparts C and D of Appendix A-1. The 2008 final rule modified the identification information for this CRS to one that was more readily available at the time. While this CRS is still in production, it is available under a different model number. Rather than updating the model number again for this CRS, we recommend removing it to accommodate other newer CRSs that offer different characteristics.

4. CRS Replacements with Newer Models

4.1 Replacement of the Evenflo Discovery Adjust Right 212 from Subpart B

The Evenflo Discovery Adjust Right 212 is a rear-facing infant CRS with a detachable base, sunshield, handle bar, and a 5-point safety harness, in Subpart B of Appendix A-1. This

CRS was a carry-over from Appendix A. This CRS is now being manufactured under the model name Evenflo Nurture, and as shown in Figures 1 and 2 below, they are equivalent.

The Evenflo Nurture #362-----⁴ weighs 9.80 lbs. with its base and 6.20 lbs. without its base, making it lighter than the average rear-facing infant CRS in the 2019 EOU program (19 lbs. with the base and 9.7 lbs. without the base). Its base footprint measures 11.38 in. wide and 15.50 in. deep (average 2019 rear-facing infant CRS base footprint is 11.3 in. wide and 19.6 in. deep). Its footprint without the base is 11.00 in. wide and 8.75 in. deep (average 2019 rear-facing infant CRS footprint without the base is 10.6 in. wide and 10.2 in. deep).

Updating the identification information for this CRS to adopt the newer version is recommended.

Figure 1 – Evenflo Discovery Adjust Right 212



Figure 2 – Evenflo Nurture

⁴ When selecting new CRSs for the appendix, the agency sought to provide, to the extent possible, generic model numbers. Therefore, the use of hyphens indicates digits in the model number that are not needed because they indicate a specific fabric design.



4.2 Replacement of the Britax Roundabout #E9L02XX from Subpart C

The Britax Roundabout #E9L02XX is a convertible CRS with a 5-point harness. The 2008 final rule modified the model number for this CRS to one that was more readily available at the time. Consequently, its dimensions and design were not taken into consideration in the previous appendix update. The Britax Roundabout #E9L02XX is no longer in production. Britax replaced it with a version called the Britax Roundabout G4 (See Figure 5). The Britax Roundabout underwent changes to the design and mold and thus would not be considered an equivalent CRS to the version currently in the Appendix A-1 (See Figures 3 and 4, of the older and newer Britax Roundabout models, respectively). More recently the Britax Roundabout has been renamed the Britax Allegiance (See Figure 4). It weighs 18.10 lbs., which is close to the average weight of convertible CRSs in the 2019 EOU program which is 18.70 lbs. It has a wider footprint (14.63 in. wide by 15.25 in. deep) than the average footprint of convertible CRSs in the 2019 EOU program (13.1 in. wide by 15.1 in. deep). Replacing the previous Roundabout version with the newer Britax Allegiance is recommended because it is wider than the average footprint of convertible CRSs (14.63 in. vs 13.1 in.) and its footprint is unique (See Figure 5).

Figure 3 – Britax Roundabout #E9L02XX



Figure 4 – Britax Allegiance



Figure 5 – Britax Roundabout G4



5. Additions:

This section will discuss the recommended CRS additions that will comprise the revised Appendix A-1. If a CRS that offered a unique characteristic was recommended for deletion an attempt was made to replace it with a CRS that had similar unique characteristics. Attachment 1 includes additional pictures and provides some basic measurements of the recommended CRS additions.

5.1 Addition of the Evenflo Embrace #315----- to Subpart B

The Evenflo Embrace #315----- is a rear-facing infant CRS, with a 5-point safety harness and detachable base, sunshield and handle bar. It weighs 12.00 lbs. with its base and 7.50 lbs. without its base, making it lighter than the average rear-facing infant CRSs in the 2015 EOU program (17.49 lbs. with the base and 9.68 lbs. without the base). Its base footprint measures 10.50 in. wide and 17.38 in. deep (average 2019 EOU program rear-facing infant CRS base footprint is 11.3 in. wide and 19.6 in. deep). Its base footprint appeared to be unique and it is a popular CRS. Because of the CRS's unique footprint, we believe that testing an air bag suppression system using this CRS would be a good measure of a system's robustness. Therefore, its addition to Subpart B is recommended.

5.2 Addition of the Doona Car Seat & Stroller to Subpart B

The Doona Car Seat & Stroller is a rear-facing infant CRS and stroller combo with a detachable base, sunshield, handle bar, and a 5-point safety harness. It weighs 28 lbs. with its base and 17.40 lbs. without its base, which is significantly heavier than the average weight of rear-facing infant CRSs in the 2019 EOU program (19 lbs. with the base and 9.7 lbs. without the base). It can be considered as having a wide base because its base width measures 15.25 in.,

which is larger than the average for the rear-facing infant CRSs in the 2019 EOU program (11.30 in.). What is of particular interest about this CRS, for testing purposes, is the weight, the base width, and overall design of the car seat. This CRS also captures a significant portion of the rear-facing infant CRS market. The base of the CRS is shown in Figure 6 below.

Figure 6 – Doona Car Seat & Stroller Base Footprint



We believe that testing an air bag suppression system using this CRS would be a good measure of a system's robustness. Therefore, its addition to Subpart B is recommended.

5.3 Addition of the Britax B-Safe 35 to Subpart B

The Britax B-Safe 35 is a rear-facing infant CRS, with a 5-point safety harness and detachable base, sunshield, and handle bar. It weighs 20.10 lbs. with its base and 10.30 lbs. without its base, making it slightly heavier than the average rear-facing infant CRSs in the 2019 EOU program (19 lbs. with the base and 9.7 lbs. without the base). It has a large base footprint compared to the average rear-facing infant CRSs in the 2019 EOU data (with the base: 14.00 in. wide and 21.00 in. deep; 2019 EOU average: 11.3 in. wide and 19.6 in. deep). This CRS also has a unique base configuration because of its flatness. We believe this CRS can be considered a good replacement for the Peg Perego Primo Viaggio because of its large flat base footprint and weight. Therefore, its addition to Subpart B is recommended.

5.4 Addition of the Cybex Aton 2 to Subpart B

The Cybex Aton 2 is a rear-facing infant CRS, with a 5-point safety harness and detachable base, sunshield, and handle bar. It is similar to the Cybex Aton Q; however, it has a Linear Side-impact Protection System on the handle bar. We do not have official measurements or photographs of the Cybex Aton 2, so we will instead use the Cybex Aton Q's measurement data and photographs. It weighs 23.90 lbs. with its base and 11.60 lbs. without its base, making it heavier than the average rear-facing infant CRSs in the 2019 EOU program (19 lbs. with the base and 9.7 lbs. without the base). Its base footprint measures 11.50 in. wide and 17.00 in. deep

(average 2019 EOU program rear-facing infant CRS base footprint is 11.3 in. wide and 19.6 in. deep). Its base footprint appeared to be unique among rear-facing infant CRSs because of its shape and because it is designed to accommodate a load leg as shown in Figure 7 below.

Figure 7 – Cybex Aton Q Base Footprint



The load leg is an optional installation feature for this CRS. Based on our analysis we believe that this CRS is somewhat of an outlier in terms of its weight and by having a unique base footprint. In addition, if the seat is installed without the steel-enforced load leg and it is stowed away as pictured above we think this may challenge air bag suppression systems that use capacitive sensors. We believe that testing an air bag suppression system using this CRS would be a good measure of a system's robustness. Therefore, its addition to Subpart B is recommended.

5.5 Addition of the Chicco KeyFit 30 #04061472----- to Subpart B

The Chicco KeyFit 30 #04061472----- is a rear-facing infant CRS, with a detachable base, sunshield, and handle bar. It weighs 16.90 lbs. with its base and 9.20 lbs. without its base, making it lighter than the average rear-facing infant CRSs in the 2019 EOU program with the base. This CRS captures a significant portion of the rear-facing infant CRS market. This CRS also has a unique footprint configuration. It has a wide base footprint compared to the average rear-facing infant CRSs in the 2019 EOU data. Its footprint width and base depth measurements were 15.25 in. and 19.00 in. respectively, compared to the average footprint width (11.30 in.) and base depth (19.60 in.) for rear-facing CRSs in the 2019 EOU program. We believe that testing an air bag suppression system using this CRS would be a good measure of a system's robustness because of the CRS's unique base footprint as shown in Figure 8 below. Because of its high sales volume, wide base, and weight, we believe this CRS can be considered a good replacement for the Graco Snuggly, which we are proposing to delete. Therefore, we propose its addition to Subpart B.

Figure 8 – Chicco KeyFit 30 Footprint



5.6 Addition of the Britax Marathon ClickTight to Subpart C

The Britax Marathon ClickTight is a convertible CRS, with a 5-point safety harness. It is heavier than the average weight of convertibles in the 2019 EOU data. It weighs 28.30 lbs. and the average weight of convertible CRSs in the 2019 EOU program is 18.70 lbs. It has a larger than average footprint. Its footprint width and base depth measurements were 14.50 in. and 15.50 in. respectively, compared to the average footprint width (13.10 in.) and base depth (15.10 in.) for convertible CRSs in the 2019 EOU program. This CRS also has a unique footprint as shown in Figure 9 below.

Figure 9 – Britax Marathon ClickTight Footprint



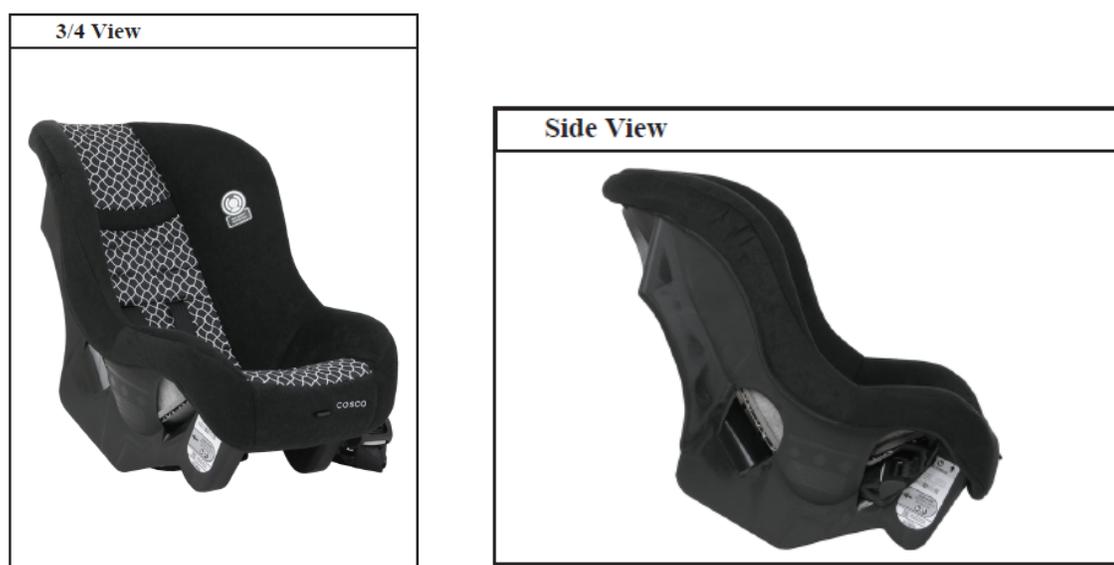
This is a popular convertible CRS and Britax uses this same shell for other similar CRS models (e.g., Britax Advocate ClickTight and Britax Boulevard ClickTight), which increases this shell's

market representation. Based on our analysis of this CRS it meets the inclusion criteria because it is a heavy CRS and has a large unique footprint and our data indicates it captures a significant portion of the CRS market. Therefore, adding it to Section C is recommended.

5.7 Addition of the Cosco Scenera Next #CC123--- to Subpart C

The Cosco Scenera Next #CC123--- is a convertible CRS, with a 5-point safety harness. It is light compared to the average convertible CRS weight based on the 2019 EOU data. It weighs 7.20 lbs. and the average weight of convertible CRSs in the 2019 EOU program is 18.70 lbs. It has a smaller than average convertible footprint. Its footprint width and base depth measurements were 10.25 in. and 9.00 in. respectively, which are small compared to the average footprint width (13.10 in.) and base depth (15.10 in.) for convertible CRSs in the 2019 EOU program. This CRS also has a unique footprint that would have minimal contact surface area with the vehicle seat as shown in the views in Figure 10 below.

Figure 10 – Views of Cosco Scenera Next



In addition, this CRS captures a significant portion of the CRS market. Based on our findings we believe this is a good addition to Subpart C.

5.8 Addition of the Graco 4Ever All-in-1 to Subpart C

The Graco 4Ever All-in-1 is a 3-in-1 CRS, with a 5-point safety harness. It is heavier than the average weight for 3-in-1 CRSs in the 2019 EOU data and heavier than the average convertible CRS in the 2019 EOU data. It weighs 22.30 lbs. and the average weight of 3-in-1 CRSs in the 2015 EOU program is 20.40 lbs. and the average weight of convertible CRSs in the 2019 EOU program is 18.70 lbs. It is wider than the average footprint width (15.75 in.) of all forward-facing capable CRSs (includes, convertibles, combination, and 3-in-1 CRSs) in the 2019 EOU program. It also has a flat footprint as shown in Figure 11 below. Based on its weight and footprint width we propose adding it to Subpart C.

Figure 11 – Graco 4Ever All-in-1 Footprint View



5.9 Addition of the Graco Contender 65 to Subpart C

The Graco Contender 65 is a convertible CRS, with a 5-point safety harness. It was evaluated in the 2014 EOU program. It weighs 15.50 lbs., which is below the average weight of convertible CRSs in the 2019 EOU program which is 18.70 lbs. It has a narrow and slightly longer footprint (11.88 in. wide by 16.00 in. deep) compared to the average footprint of convertible CRSs in the 2019 EOU program (13.10 in. wide by 15.10 in. deep). The footprint changes between the rear and forward-facing modes. It also has a unique footprint shape as shown in Figure 12 below. Based on the dimensions of its footprint and its uniqueness, adding it to Subpart C is recommended.

Figure 12 – Graco Contender 65 Footprint View



5.10 Addition of the Cybex Eternis to Subparts C&D

The Cybex Eternis is a 3-in-1 CRS. It weighs 27.10 lbs., making it heavier than the average weight of all 2019 EOU program forward-facing capable CRSs with a harness. The average weight of 3-in-1, convertible, and combination CRSs in the 2019 EOU program is 20.40 lbs., 18.70 lbs., and 23.40 lbs., respectively. This CRS is also much heavier than the average weight of BPBs in the 2019 EOU program (11.60 lbs.). It has footprint dimensions (13.38 in. wide by 16.13 in. deep) that are larger than the average footprint of 3-in-1 CRSs in the 2019 EOU program (12.40 in. wide by 14.00 in. deep). It also has a unique footprint as shown in Figure 13 below. Based on its weight and unique footprint, adding it to Subparts C and D is recommended.

Figure 13 – Cybex Eternis Footprint View



5.11 Addition of the Safety 1st Grow and Go #CC138--- to Subparts C&D

The Safety 1st Grow #CC138--- is a 3-in-1 CRS. It weighs 15.20 lbs., making it lighter than the average weight of all forward-facing capable CRSs with a harness. The average weight of 3-in-1, convertible, and combination CRSs in the 2019 EOU program is 20.40 lbs., 18.70 lbs., and 23.40 lbs., respectively. Its footprint dimensions are 10.25 in. wide by 16.13 in. deep, making it much narrower than the average 3-in-1 CRSs in the 2015 EOU program (12.40 in. wide by 14 in. deep). It also has a unique footprint as shown in Figure 14 below. Based on these evaluated characteristics, adding it to Subparts C and D is recommended.

Figure 14 – Safety 1st Grow and Go Footprint View

5.12 Addition of the Evenflo Chase #306----- to Subparts C&D

The Evenflo Chase #306----- is a combination CRS. It weighs 8.5 lbs., making it lighter than the average weight of all forward-facing capable CRSs with a harness. The average weight of 3-in-1, convertible, combination CRSs, and high-back BPBs in the 2019 EOU program is 20.40 lbs., 18.70 lbs., and 23.40 lbs., 11.60 lbs., respectively. Its footprint dimensions are 17.00 in. wide by 15.25 in. deep, (average footprint of combination CRSs in the 2019 EOU program is 15.20 in. wide by 16.40 in. deep). It also has a unique footprint with not a lot of contact surface area as shown in Figure 15 below. Based on its footprint characteristics, adding it to Subparts C and D is recommended.

Figure 15 – Evenflo Chase



5.13 Addition of the Cosco Finale #BC121--- to Subparts C&D

The Cosco Finale is a combination CRS. It weighs 8.70 lbs. as a forward-facing CRS and 8.30 lbs. as a BPB, making it lighter than the average weight of combination CRSs in the

2019 EOU program (23.40 lbs.) and lighter as a BPB than the average weight of high-BPBs in the 2019 EOU program (11.60 lbs.). Its footprint measures 9.13 in. wide by 14.60 in., making it smaller than the average footprint of combination CRSs in the 2019 EOU program (15.2 in. by 16.4 in.). It also has a unique footprint shape as shown in Figure 16 below. Its footprint characteristics make it a good addition to Subparts C and D.

Figure 16 – Cosco Finale Footprint View



5.14 Addition of the Chicco MyFit #04079783--0070 to Subparts C&D

The Chicco MyFit #04079783--0070 is a combination CRS that was evaluated in the 2018 EOU program. It weighs 24.2 lbs., putting it just slightly above the average weight of combination CRSs in the 2019 EOU program (23.4 lbs.). Its footprint measures 14.38 in. wide by 15.00 in. deep, making its footprint smaller than the average footprint of combination CRSs in the 2019 EOU program (15.2 in. by 16.4 in.). It is a popular CRS, so we believe it captures a large portion of the market. Based on its weight, footprint size, and popularity we propose adding it to Subparts C and D.

5.15 Addition of the Cosco Rise Belt-Positioning Booster Seat #BC126--- to Subpart D

The Cosco Rise Belt-Positioning Booster Seat #BC126--- is a backless BPB that was evaluated in the 2018 EOU program. It weighs 2.10 lbs., making it lighter than the average weight of backless BPBs in the 2019 EOU program (5.60 lbs.). Its footprint measures 13.50 in. wide by 12.50 in. deep, making its footprint shallower than the average footprint for BPBs in the 2019 EOU program (12.7 in. by 14.10 in.). It also has a unique footprint shape as shown in Figure 17 below. It is a popular BPB, so we believe it captures a large portion of the market. Based on its characteristics, adding it to Subpart D is recommended.

Figure 17 – Cosco Rise Belt-Positioning Booster Seat Footprint View



5.16 Addition of the Graco Backless TurboBooster to Subpart D

The Graco Backless TurboBooster is a backless BPB. It weighs 4.30 lbs., which is lighter than the average weight of backless BPBs in the 2019 EOU program (5.60 lbs.). Its footprint measures 15.75 in. wide by 14.00 in. deep, making it wider than the average footprint of all BPBs in the 2019 EOU program (12.70 in. wide and 14.10 in. deep). It is a popular BPB, so we believe it captures a large portion of the market. It also has a unique footprint shape as shown in Figure 18 below. Therefore, based on its footprint characteristics, weight, and popularity, adding it to Subpart D is recommended.

Figure 18 – Graco Backless TurboBooster Footprint View



5.17 Addition of the Britax Grow With You # E1C19-- to Subpart D

The Britax Grow With You #E1C19-- is a combination CRS that was evaluated in the 2019 EOU program. It weighs 25.20 lbs., making it heavier than the average combination CRS in the 2019 EOU program (23.40 lbs.). Its footprint measures 15.125 in. wide by 16.5 in. deep, making it representative of the average footprint for combination CRSs in the 2019 EOU program (15.20 in. wide and 16.40 in. deep). It also has a flat footprint as shown in Figure 19 below. Therefore, based on its footprint characteristics and weight, adding it to Subpart D is recommended.

Figure 19 – Britax Grow With You Footprint View



6. Additional Considerations

After the CRS selections were made, the agency verified that the CRSs selected took other factors into consideration. As discussed previously, LRD systems reduce the air bag deployment energy by venting gas when the deploying air bag encounters resistance. Because of our awareness of the increased use of LRD systems, we see the continued need to have a spectrum of seat back heights for the rear-facing infant CRSs in the appendix to address any potential safety concerns. First, for rear-facing infant CRSs with relatively low seat back heights, an air bag mounted on the top of the instrument panel may not encounter any reaction surface from the CRS seat back, so the air bag would be allowed to fully pressurize. Yet the deploying air bag may interact with the dummy head as it comes over the top of the CRS seat back. It is important that the air bag interaction be safe as measured against our dummy injury criteria. Second, for a rear-facing infant CRS with a relatively high seat back, the deploying air bag will impact the seat back. If the venting system operates as intended, this should be a benign impact. However, if it does not, the test dummy response may indicate high injury potential. Thus, it is important for Subpart B of Appendix A to have CRSs with various seat back heights and weights.

In the 2019 EOU program, the seat back heights for rear-facing infant and rear-facing capable CRSs range from 14.88 in. to 26.25 in (See Attachment 1).⁵ The recommended changes to the appendix aim to maintain a spectrum of seat back heights. The recommended additions to Subpart B of the appendix have seat back heights that range from 14.88 in. to 26.25 in. Furthermore, CRSs that are being added to Subpart C, that have the capability of being installed in a rear-facing mode, can also be used for testing in the rear-facing mode. It is recommended that seven CRSs be added to Subpart C that are rear-facing capable and have seat back heights in the rear-facing mode ranging from 18.38 in. to 19.75 in.

For the purpose of addressing challenges to Dynamic Automatic Suppression Systems (DASS) it is recommended that the rear-facing infant CRSs being added to the appendix have handles and sunshields.

7. Summary of the Recommended Amendments

Below are tables that summarize the recommended deletions, additions, and model identification updates.

ADDITIONS		
MODEL NAME	APPENDIX SUBPART	MODEL TYPE
SAFETY 1ST DREAMRIDE SE LATCH #IC238---	A	Car Bed
CHICCO KEYFIT 30 #04061472-----	B	Rear-Facing Infant
EVENFLO EMBRACE #315-----	B	Rear-Facing Infant
DOONA CAR SEAT & STROLLER	B	Rear-Facing Infant
BRITAX B-SAFE 35 #E1A72--	B	Rear-Facing Infant
CYBEX ATON 2	B	Rear-Facing Infant
BRITAX MARATHON CLICKTIGHT #E1A38--	C	Convertible
COSCO SCENERA NEXT #CC123---	C	Convertible
GRACO 4EVER ALL-IN-1	C	3-in-1
GRACO CONTENDER 65	C	Convertible
CYBEX ETERNIS	C&D	3-in-1
SAFETY 1ST GROW AND GO #CC138---	C&D	3-in-1
EVENFLO CHASE #306-----	C&D	Combination
COSCO FINALE #BC121---	C&D	Combination
CHICCO MYFIT #04079783--0070	C&D	Combination
COSCO RISE #BC126---	D	BPB
GRACO BACKLESS TURBOBOOSTER	D	BPB
BRITAX GROW WITH YOU #E1C19--	D	Combination

⁵ The height measurement used for the rear-facing infant CRSs is the height with their base.

DELETIONS		
MODEL NAME	APPENDIX SUBPART	MODEL TYPE
ANGEL GUARD ANGELRIDE #AA243FOF	A	Car Bed
CENTURY SMART FIT 4543	B	Rear-Facing Infant
GRACO SNUGRIDE	B	Rear-Facing Infant
GRACO INFANT 8457	B	Rear-Facing Infant
COSCO ARRIVA 22-013 PAW & 22-999 WHO	B	Rear-Facing Infant
PEG PEREGO PRIMO VIAGGIO SIP IMUN00US	B	Rear-Facing Infant
COSCO TOURIVA 02519	C	Convertible
EVENFLO TRIBUTE V 379XXXX	C	Convertible
EVENFLO MEDALLION 254	C	Convertible
GRACO COMFORTSPORT	C	Convertible
GRACO TODDLER SAFESEAT STEP 2	C	Forward-Facing
COSCO SUMMIT DELUXE HIGH BACK BOOSTER 22-262	C&D	Combination
COSCO HIGH BACK BOOSTER 22-209	C&D	Combination
EVENFLO GENERATIONS 352XXXX	C&D	Combination
GRACO PLATINUM CARGO	C&D	Combination
BRITAX ROADSTER 9004	D	BPB
EVENFLO RIGHT FIT 245	D	BPB

UPDATING MODEL IDENTIFICATION INFORMATION		
MODEL NAME	APPENDIX SUBPART	MODEL TYPE
EVENFLO DISCOVERY ADJUST RIGHT IS NOW CALLED EVENFLO NURTURE #362-----	B	Rear-Facing Infant
BRITAX ROUNDABOUT E9L02XX IS NOW THE BRITAX ALLEGIANCE #E9LR4--	C	Convertible

The table below quantifies the number of changes for each Subpart of the appendix. This includes replacing seventeen (17) existing CRSs with eighteen (18) new CRSs, and updating model identification information for two (2) existing CRSs.⁶ Therefore, the total number of CRSs in the appendix has increased by two.

⁶ Technically, the number of specific CRSs that are being deleted and added (16 and 17, respectively) is less than the totals shown because some CRSs appear in more than one subpart of the appendix.

	SUBPART A	SUBPART B	SUBPART C	SUBPART D	TOTAL
CURRENT TOTAL	1	6	10	6	23
ADDITIONS	1	5	9	8	23
DELETIONS	1	5	9	6	21
UPDATES	-	1	1	-	2
TOTAL AFTER CHANGES	1	6	10	8	25

The revised appendix captures CRSs with a variety of different weights, heights, footprints, and unique features as described in the Additions section, Section 5, and as detailed in Attachment 2. In addition, 8 (eight) different CRS manufacturing brands will be represented in the proposed revised appendix.

Attachment 1 – Data and Pictures of Proposed Additions

Evenflo Embrace Data and Pictures

Weight w/base (lbs.)	12.00
Weight w/o base (lbs.)	7.50
Base Outer W (in.)	10.50
Base Outer D (in.)	17.38
Reclined Height (in.)	16.13
Unreclined Height (in.)	16.75



Evenflo Nurture Data and Pictures

Weight w/base (lbs.)	9.80
Weight w/o base (lbs.)	6.20
Base Outer W (in.)	11.38
Base Outer D (in.)	15.50
Reclined Height (in.)	-
Unreclined Height (in.)	18.13



Chicco KeyFit 30 Data and Pictures

Weight w/base (lbs.)	16.90
Weight w/o base (lbs.)	9.20
Base Outer W (in.)	15.25
Base Outer D (in.)	19.00
Reclined Height (in.)	14.88
Unreclined Height (in.)	-



Doona Car Seat & Stroller Data and Pictures

Weight w/base (lbs.)	28.00
Weight w/o base (lbs.)	17.40
Base Outer W (in.)	15.25
Base Outer D (in.)	18.88
Reclined Height (in.)	26.25
Unreclined Height (in.)	-



Cyber Aton Q Data and Pictures

Weight w/base (lbs.)	23.90
Weight w/o base (lbs.)	11.60
Base Outer W (in.)	11.50
Base Outer D (in.)	17.00
Reclined Height (in.)	25.13
Unreclined Height (in.)	25.75



Britax B-Safe 35 Data and Pictures

Weight w/base (lbs.)	20.10
Weight w/o base (lbs.)	10.30
Base Outer W (in.)	14.00
Base Outer D (in.)	21.00
Reclined Height (in.)	17.88
Unreclined Height (in.)	18.50



Cybex Eternis Data and Pictures

Weight (lbs.)	27.10
Footprint Outer W (in.)	13.38
Footprint Outer D (in.)	16.13
Reclined Height (in.)	18.75



Britax Marathon Data and Pictures

Weight (lbs.)	28.30
Footprint Outer W (in.)	14.50
Footprint Outer D (in.)	15.50
Reclined Height (in.)	21.50-26.25



Cosco Scenera Next Data and Pictures

Weight (lbs.)	7.20
Footprint Outer W (in.)	7.50
Footprint Outer D (in.)	9.00
Reclined Height (in.)	22.50



Graco 4Ever All-in-1 Data and Pictures

Weight (lbs.)	22.30
Footprint Outer W (in.)	15.75
Footprint Outer D (in.)	14.00
Reclined Height (in.)	21.50-31.00



Safety 1st Grow and Go Data and Pictures

Weight (lbs.)	15.20
Footprint Outer W (in.)	10.25
Footprint Outer D (in.)	16.13
Reclined Height (in.)	18.38-22.50



Evenflo Chase Data and Pictures

Weight (lbs.)	8.50
Footprint Outer W (in.)	17.00
Footprint Outer D (in.)	15.25



Britax Allegiance Data and Pictures

Weight (lbs.)	18.10
Footprint Outer W (in.)	14.63
Footprint Outer D (in.)	15.25
Reclined Height (in.)	25.38



Cosco Finale Data and Pictures

Weight (lbs.)	8.70
Footprint Outer W (in.)	9.13
Footprint Outer D (in.)	14.50



Graco Contender 65 Data and Pictures

Weight (lbs.)	15.50
Footprint Outer W (in.)	11.88
Footprint Outer D (in.)	16.00
Reclined Height (in.)	18.63



Chicco MyFit Data and Pictures

Weight (lbs.)	24.20
Footprint Outer W (in.)	14.38
Footprint Outer D (in.)	15.00



Cosco Rise Belt-Positioning Booster Seat Data and Pictures

Weight (lbs.)	2.10
Footprint Outer W (in.)	13.50
Footprint Outer D (in.)	12.50



Graco Backless TurboBooster Data and Pictures

Weight (lbs.)	4.30
Footprint Outer W (in.)	15.75
Footprint Outer D (in.)	14.00



Britax Grow With You Data and Pictures

Weight (lbs.)	25.20
Footprint Outer W (in.)	15.13
Footprint Outer D (in.)	16.50



Attachment 2 – Data on New Additions as well as 2019 EOU Statistical Data

Rear-Facing Infant									
	2019 EOU Average	2019 EOU Max	2019 EOU Min	Evenflo Embrace*	Evenflo Nurture*	Chicco Keyfit	Doona Infant*	Cyberx Aton 2*	Britax B-Safe 35*
WEIGHT W/BASE (lbs.)	19.00	27.70	11.30	12.00	9.80	16.90	28.00	23.90	20.10
WEIGHT W/O BASE (lbs.)	9.70	11.30	7.20	7.50	6.20	9.20	17.40	11.60	10.30
BASE OUTER W (in.)	11.30	15.30	6.30	10.50	11.38	15.25	15.25	11.50	14.00
BASE OUTER D (in.)	19.60	22.10	16.80	17.38	15.50	19.00	18.88	17.00	21.00

*CRSs evaluated in a different EOU program year

Convertible							
	2019 EOU Average	2019 EOU Max	2019 EOU Min	Britax Marathon Click Tight*	Cosco Scenera Next*	Britax Allegiance*	Graco Contender 65*
WEIGHT (lbs.)	18.70	25.40	14.40	28.30	7.20	18.10	15.50
FOOTPRINT OUTER W (in.)	13.10	14.80	11.10	14.50	10.25	14.63	11.88
FOOTPRINT OUTER D (in.)	15.10	16.50	13.30	15.50	9.00	15.25	16.00

*CRSs evaluated in a different EOU program year

Combination							
	2019 EOU Average	2019 EOU Max	2019 EOU Min	Evenflo Chase*	Cosco Finale*	Britax Grow With You	Chicco MyFit*
WEIGHT (lbs.)	23.40	25.20	21.60	8.50	8.70	25.20	24.20
FOOTPRINT OUTER W (in.)	15.20	15.30	15.10	17.00	9.13	15.13	14.38
FOOTPRINT OUTER D (in.)	16.40	16.50	16.30	15.25	14.50	16.50	15.00

*CRSs evaluated in a different EOU program year

3-in-1

	2019 EOU Average	2019 EOU Max	2019 EOU Min	Cybox Eternis	Graco 4Ever All-in-1*	Safety 1st Grow and Go*
WEIGHT (lbs.)	20.40	28.20	14.40	27.10	22.30	15.20
FOOTPRINT OUTER W (in.)	12.40	15.40	10.50	13.38	15.75	10.25
FOOTPRINT OUTER D (in.)	14.00	16.10	9.00	16.13	14.00	16.13

*CRSs evaluated in a different EOU program year

BPB					
	2019 EOU Average	2019 EOU Max	2019 EOU Min	Cosco Rise*	Graco Backless TurboBooster
WEIGHT HB (lbs.)	11.60	18.40	8.60	-	-
WEIGHT LB (lbs.)	5.60	6.90	3.70	2.10	4.30
FOOTPRINT OUTER W (in.)	12.70	16.30	7.80	13.50	15.75
FOOTPRINT OUTER D (in.)	14.10	15.50	12.50	12.50	14.00

*CRSs evaluated in a different EOU program year

Attachment 3 – Matrices of CRS Characteristics by Appendix Subparts

SUBPART B

	Heavy	Lightweight	Wide Footprint	Narrow Footprint	Short Footprint	Long Footprint	High Seat Back	Low Seat Back	Popular	Unique Footprint and/or Feature
Doona Car Seat & Stroller	X		X				X		X	X
Britax B-Safe 35	X		X			X				X
Cyberx Aton 2	X				X		X			X
Evenflo Embrace		X							X	X
Evenflo Nurture		X			X					X
Chicco Keyfit		X	X					X	X	X

SUBPART C

	Heavy	Lightweight	Wide Footprint	Narrow Footprint	Short Footprint	Long Footprint	Popular	Unique Footprint and/or Feature
Cosco Finale		X		X	X		X	X
Britax Marathon ClickTight	X		X				X	X
Britax Allegiance			X			X		X
Cosco Scenera Next		X		X	X		X	X
Cyberx Eternis	X		X			X		X
Evenflo Chase		X	X					X
Graco 4Ever	X		X				X	X
Graco Contender		X		X		X		X
Chicco MyFit	X				X		X	X
Safety 1 st Grow and Go		X		X			X	X

SUBPART D

	Heavy	Lightweight	Wide Footprint	Narrow Footprint	Short Footprint	Long Footprint	Popular	Unique Footprint and/or Feature
Cosco Finale		X		X	X		X	X
Britax Grow with You	X							X
Cybox Eternis	X		X			X		X
Evenflo Chase			X					X
Graco Backless Turbo booster			X				X	X
Cosco Rise		X			X		X	
Chicco MyFit	X				X		X	X
Safety 1st Grow and Go		X		X		X	X	X

Attachment 4 – Estimated Cost of CRSs

CRS NAME	APPENDIX SUBPART	COST*
Safety 1st Dreamride	A	\$ 175.00
Evenflo Embrace	B	\$ 80.00
Chicco Keyfit 30	B	\$ 200.00
Doona Car Seat & Stroller	B	\$ 500.00
Britax B-Safe 35	B	\$ 210.00
Cybex Aton 2	B	\$ 224.00
Evenflo Nurture	B	\$ 60.00
Britax Marathon ClickTight	C	\$ 260.00
Cosco Scenera Next	C	\$ 50.00
Graco 4Ever All-in-1	C	\$ 240.00
Britax Allegiance	C	\$ 180.00
Graco Contender 65	C	\$ 115.00
Chicco MyFit	C&D	\$ 200.00
Cybex Eternis	C&D	\$ 380.00
Safety 1 st Grow and Go	C&D	\$ 140.00
Evenflo Chase	C&D	\$ 58.00
Cosco Finale	C&D	\$ 50.00
Cosco Rise Belt-Positioning Booster Seat	D	\$ 14.00
Graco Backless TurboBooster	D	\$ 18.00
Britax Grow With You	D	\$ 210.00
	TOTAL:	\$ 3,364.00

*Cost will vary depending on the vendor and CRS styling, and may also vary with time.