Table 7. Analysis of train accidents from FRA data.

	Statistic	1997-2016
Mainline, Speed ≤ 25mph	Total Accidents	22,192
	Total Derailments	14,180
	% of All Accidents	33.7%
	Probability that Derailment Occurs	64.0%
Mainline, Speed from > 25 to ≤ 50 mph	Total Accidents	6,580
	Total Derailments	3,501
	% of All Accidents	9.98%
	Probability that Derailment Occurs	53.2%

3.1.2.1 Probability of Number of LNG DOT-113 Cars Derailed

Not all accidents-leading-to-derailment will involve an LNG DOT-113 car. Several factors are expected to affect the likelihood that an LNG DOT-113 car is derailed including: (1) the position of the LNG DOT-113 car(s) within the train and (2) the number of LNG DOT-113s grouped together. In this analysis, it was conservatively assumed that the unit-trains of LNG DOT-113s started at train position eleven (11) and continued throughout the remainder of the train. The historical FRA accident data was analyzed to develop a model for estimating the probability of derailment of an individual car versus its position in the train.

The probability of derailment for one or more LNG DOT-113 cars is dependent on the position of the first car derailed in the train, the average number of cars derailed during an accident, and the location of LNG DOT-113s in the train. These parameters are expected to be affected by the train speed, which was explored here using the FRA 20-year accident data.

The FRA 20-year accident data from 1997-2016 was first filtered to include only mainline accidents. The mainline accidents were then further split into either low speed mainline accidents with train speeds less than or equal to 25 mph or high speed mainline accidents with train speeds greater than 25 mph up to 50 mph. Next, the accidents were filtered in the database by including only accidents resulting in derailment. The average number of cars derailed for each of the two cases was then calculated (rounded up to whole numbers):

Case 1. Mainline derailments, speed ≤ 25 mph, average number of cars derailed = 5

Case 2. Mainline derailments, speed 25-50 mph, average number of cars derailed = 11

Based upon the dynamics of a derailment, it was assumed that in an average derailment, the first car would derail plus the immediately following sequence of n-1 cars would derail, where n is