



RAIL

*MOVING AMERICA FORWARD*

# Grade Crossing Accident Prediction System (GXAPS)

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U.S. Department of Transportation  
Federal Railroad Administration

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## Background

The USDOT Accident Prediction Formula was first developed in the 1980s

$$a = K \times EI \times MT \times DT \times HP \times MS \times HT \times HL$$

Crossing Category	Formula Constant K	Exposure Index Factor EI	Main Tracks Factor MT	Day Thru Trains Factor DT	Highway Paved Factor HP	Maximum Speed Factor MS	Highway Type Factor HT	Highway Lanes Factor HL
Passive	0.002268	$\frac{c \times t + 0.2}{0.2}^{0.3334}$	$e^{0.2094mt}$	$\frac{d + 0.2}{0.2}^{0.1336}$	$e^{-0.6160(hp-1)}$	$e^{0.0077ms}$	$e^{-0.1000(ht-1)}$	1.0
Flashing Lights	0.003646	$\frac{c \times t + 0.2}{0.2}^{0.2903}$	$e^{0.1088mt}$	$\frac{d + 0.2}{0.2}^{0.0470}$	1.0	1.0	1.0	$e^{0.1380(hl-1)}$
Gates	0.001088	$\frac{c \times t + 0.2}{0.2}^{0.3416}$	$e^{0.2912mt}$	1.0	1.0	1.0	1.0	$e^{0.1036(hl-1)}$

## Background

### **It took into account the following factors:**

- Type of warning devices
- Total train traffic per day
- Daytime through trains
- Vehicle traffic
- Number of tracks
- Paved or unpaved roadway
- Timetable speed
- Type of roadway
- Number of lanes
- Previous accidents over the last 5 years
- Normalizing constants updated periodically to reflect past accidents trends

### **FRA Developed the Web-Based Accident Prediction System (WBAPS)**

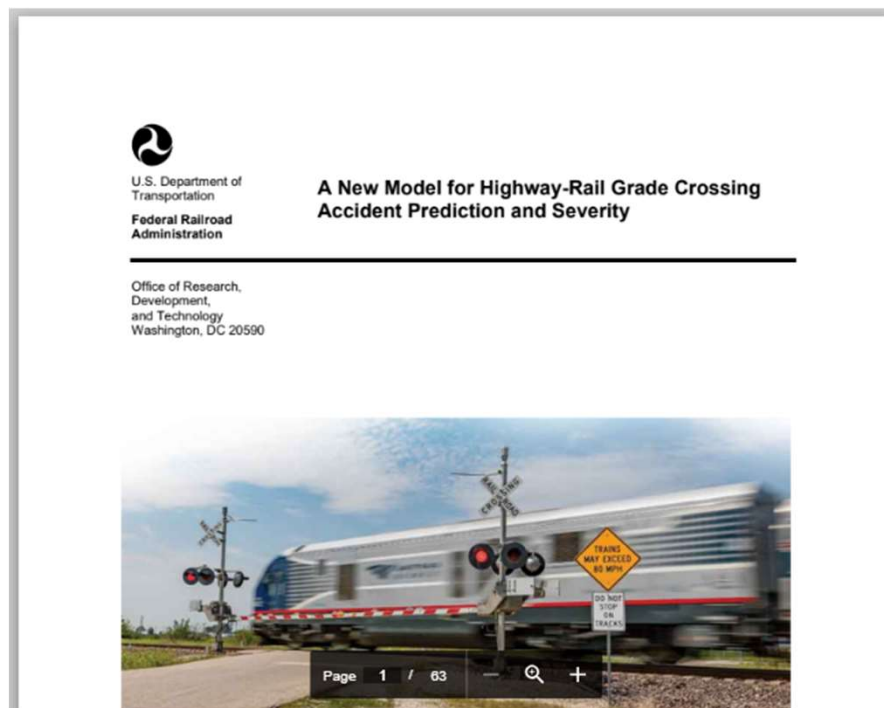
- **Predicts how many accidents per year at a crossing**
- **Rank crossings in order of predicted accidents**
- **Filter by railroad, state, county**

**(Not to be considered a list of “The most dangerous crossings”)**

### **Bipartisan Infrastructure Law (BIL):**

- **FRA must update their accident prediction formula**
- **Must develop a new web-based tool based on the formula**
- **Must provide training on the formula and tool**
- **Must be completed by December 31, 2024**

# FRA study to develop new formula



### Updated Accident Prediction Formula:

$$N_{CountPredicted} = e^{[\beta_0 + \beta_1 \cdot lExpo + \beta_2 \cdot D_2 + \beta_3 \cdot D_3 + \beta_4 \cdot RurUrb + \beta_5 \cdot XSurfID2s + \beta_6 \cdot lAadt + \beta_7 \cdot lMaxTtSpd]}$$

$$P_{InflatedZero} = \frac{z}{1 + z}$$

$$z = e^{(\gamma_0 + \gamma_1 \cdot lTotalTrains)}$$

$$N_{Predicted} = N_{CountPredicted} \cdot (1 - P_{InflatedZero})$$


$$N_{Expected} = w \cdot N_{Predicted} + (1 - w) \cdot N_{Observed}$$

## Develop New Website


### New Website:

Instead of updating WBAPS with the new formula, FRA developed a new website

An official website of the United States government [Here's how you know](#)

 U.S. Department of Transportation  
Federal Railroad Administration

**Accident Prediction System (APS)**  
v 2.0.0.88

[Export](#) 

**Refine your search**  
[Reset Filters](#)

Active Filters:

**Location** ▼  
**Railroad** ▼  
**Crossing ID** ▼

Display  
Historical

Total Crossings	Total Railroads	Average Predicted Accidents	2023 Total Accidents	2022 Total Accidents	2021 Total Accidents	2020 Total Accidents	2019 Total Accidents
0	0	0	0	0	0	0	0

Predicted Accident Rank	Average Predicted Accidents	Crossing ID	Railroad Code	State	County	City	Street
Apply filters to view results							

Items per page: 100 ▼ There is no items. [Prev](#) [Next](#)

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## Naming your baby

Time to come up with a new name and acronym...

## Naming your baby

Wait wait wait, can we just keep it the same name???

Everyone knows how to pronounce it!

## Naming your baby



## Naming your baby

- CBAPS - Cloud Based Accident Prediction System
- C-BAPS - Cloud-Based Accident Prediction System
- CAPS - Crossing Accident Prediction System
- GrCAPS - Grade Crossing Accident Prediction System
- GCAPS - Grade Crossing Accident Prediction System
- GxAPS - Grade Crossing Accident Prediction System
- G-CAPS - Grade-Crossing Accident Prediction System
- APS - Accident Prediction System

Hey this won the most votes in our Google Poll!

- CAPS - Crossing Accident Prediction System

OK no problems, right?

Too confusing to be called CAPS???



I love the new  
Crossing Accident  
Prediction System!  
Go CAPS!



## Opening Ourselves Up To Litigation???

# The Daily Whatever

06 AUG 2024

## Landmark Lawsuit! NHL Sues FRA for Copyright Infringement

By MR. NOBODY

The National Hockey League (NHL) is suing the Federal Railroad Administration (FRA) for \$1 BILLION DOLLARS! The Commissioner declares that FRA stands to profit massively from their new on-line web-based program that will predict how many accidents will occur at a crossing. "Anybody doing a Google Search for our franchise based in Washington DC will almost certainly be confused and will then go to FRA's site where FRA will generate BILLIONS in advertising revenue from their online tool."

## International Moose Count Underway

moose strongholds of Canada and the United States, with the larger developing moose ecologies also poised to make gains. The largest percentage increase in moose will likely come from China", says McRobson. The Chinese government has invested heavily in moose infrastructure over the past decade, and their commitment to macrofauna is beginning to pay dividends". Since 2004 China has expanded moose pasture from 1.5% of arable land to nearly 3.648% and moose numbers are expected to rise to 60,000 making China a net moose exporter for the first time. This is good news for neighbouring Mongolia, a barren moose-wasteland whose inhabitants nonetheless have an insatiable desire for the creatures. The increase in Beijing-Ulanbataar trade is anticipated to relieve pressure on the relatively strained Russian suppliers, but increase Mongolia's imbalance of trade with its larger neighbour.

Historically the only competitor to China in the far eastern moose markets has been Singapore but the tiny island nation is set to report a net loss, expecting a decrease of more than five percent on last year's 50,000 moose counted. The head of Singapore's Agency for Agriculture, Jing-Feng Lee, explained to an industry

year as a response to the European Union's move towards standardising the European moose. Stringent quality controls are holding back the development of the eastern european populations compared to last year when they contributed significantly to europe's strong growth figures. Norway, which is not an EU member but has observer status, strengthened in numbers relative to the Euro area with numbers of Norwegian moose, known locally as elk" expected to rise for the tenth consecutive year, particularly thanks to a strong showing in the last quarter.

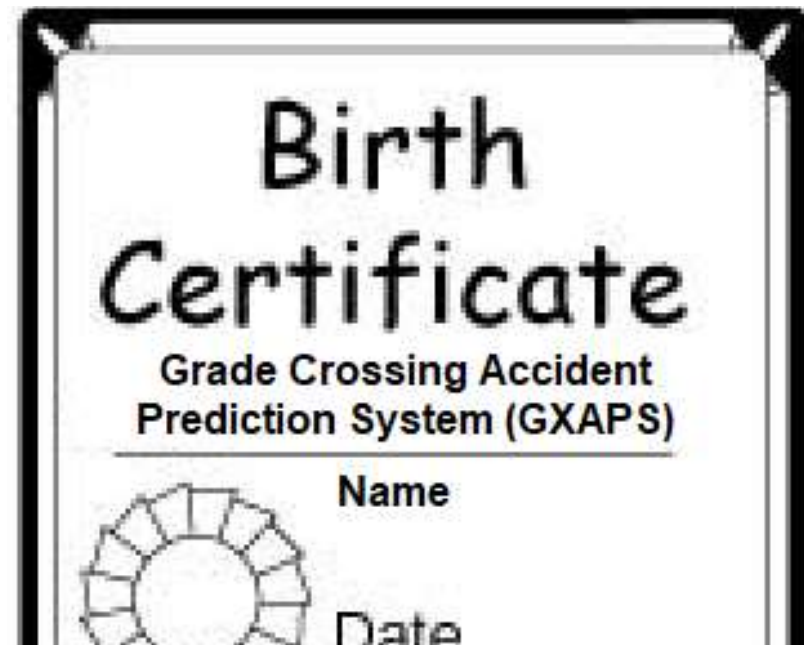
As moose season reaches its close, researchers world wide are turning to science in an attempt to boost next year's figures. NASA stunned the scientific community today with the announcement of their discovery that the moon is significantly smaller than previously believed. This conclusion, which is the conclusion of a ten-year collaborative project, will have profound implications for the moose community as the gravitational field is now known to be of the right strength to support moose in orbit.

According to John Johnson, head of the NASA Moon Sizing Experiment the first delivery of moose into low moon orbit could be achieved as



## Naming your baby

Congratulations, it's  
a new acronym!





## GXAPS

- New website interface
- Predicts accidents for each crossing based on new formula
- Similar filters to rank crossings
  - Railroad
  - State
  - County
  - City
  - Crossing Number
- Export data and reports to PDF or Excel
- Ability to compare and rank based on the *old formula*

### Important Considerations:

- It is not a ranking of the “Most Dangerous Crossings”
- It is one potential tool to identify crossings for further detailed analysis
- Private Crossings and Pedestrian Pathway Crossings are not included in the formula
- It does not take into account other local factors such as:
  - Sight Distance
  - Vegetation
  - Vertical and Horizontal Profile
  - Passenger Exposure on Intercity and Commuter Rail
  - Hazmat on Road or Rail
  - Pedestrian Counts and Sidewalks
  - Preemption Timing
  - Recent Construction or Site Development Changes

# Live Demo

<https://safetydata.fra.dot.gov/gxaps-app/>

## GXAPS

GXAPS:

<https://safetydata.fra.dot.gov/gxaps-app/>

Report and Study with new formula:

<https://railroads.dot.gov/elibrary/new-model-highway-rail-grade-crossing-accident-prediction-and-severity>

# Contact Us

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