



Deval L. Patrick, Governor  
Frank DePaola, Acting Secretary & CEO  
Celia J. Blue, Registrar



# EZ-ID TASK FORCE

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## Report to the Legislature

December 2014

## EXECUTIVE SUMMARY

The ability for an eyewitness to remember and recall a license plate viewed for a short period of time can be critical to solving crimes. There has been limited scientific study conducted on license plate memory and the aspects of license plate design that can improve recall.

Section 271 of the General Appropriations Act of 2015 established a special task force (the EZ-ID Task Force) charged with analyzing the feasibility of a vehicle registration plate system that utilizes non-alphanumeric symbols (the EZ-ID license plate format). As described on the EZ-ID website, the EZ-ID license plate format uses “universally recognizable symbols” such as a square, triangle, diamond, star or heart, along with alpha-numeric characters, to give a graphic that is intended to be recognized, remembered and reported more easily.

Chaired by Registrar Celia J. Blue, the EZ-ID Task Force is comprised of eight individuals representing areas such as transportation, law enforcement, tolling, child advocacy and finance. It studied a variety of topics including, but not limited to: (1) the human factors involved in the mental recognition of vehicle license plates; (2) cost; the time frame for implementation; impact on federal, state and local law enforcement; and necessary tools and equipment.

Beyond assessing the EZ-ID license plate format, the EZ-ID Task Force approached its analysis asking: what can be done to improve the perception and memory of license plates to assist law enforcement in solving crimes? It is with this larger question in mind that the EZ-ID Task Force developed six main findings and recommendations:

1. Further scientific study is needed on the memory of license plates and the impact of symbols;
2. Major changes to license plate design should be pursued at a national level and not by individual states;
3. The American Association of Motor Vehicle Administrators (AAMVA) should play a lead role in any national changes to license plate design;
4. Law enforcement should pursue the use of memory recall interviewing techniques when interviewing eye-witnesses to a crime;
5. Greater randomization of plates will help law enforcement narrow down search results; and
6. The RMV should pursue a phased-in approach to enhance the memory of the Commonwealth’s license plates.

Details on these findings and recommendations are included in Section 10 of this report.

## SECTION 1: BACKGROUND

### 1.1 Massachusetts Legislative Requirements

Section 271 of the General Appropriations Act of 2015 established a special task force (the EZ-ID Task Force) charged with analyzing the feasibility of a vehicle registration plate system that utilizes non-alphanumeric symbols (the EZ-ID license plate format). The task-force was required to study: human factors involved in the mental recognition of vehicle license plates; cost; the time frame for implementation; impact on federal, state and local law enforcement; and necessary tools and equipment. The specific requirements of Section 271 are provided below.

*Section 271 There shall be a special task force to analyze the feasibility of a vehicle registration plate system that utilizes non-alphanumeric symbols as part of the registration identification for plates issued by the registrar of motor vehicles. The task force shall consist of:*

- *The registrar of motor vehicles, who shall serve as the chair;*
- *The colonel of state police or a designee;*
- *A representative of the Massachusetts Chiefs of Police Association Incorporated;*
- *A designee from The Molly Bish Foundation Incorporated;*
- *The secretary of administration and finance or a designee;*
- *The secretary of transportation or a designee;*
- *The secretary of public safety and security or a designee;*
- *A representative of the State Police Association of Massachusetts; and*
- *A member of a labor organization representing police officers designated by the governor.*

*The task force shall seek input from the United States Department of Transportation, the United States Department of Justice, United States Immigration and Customs Enforcement and the United States Department of Homeland Security.*

*The task force shall study the feasibility of such a system, its cost, the time frame for implementation, impact on federal, state and local law enforcement and between states and the tools and equipment necessary to produce enhanced recognition and identification registration plates. The study shall assess: (i) human factors involved in the mental recognition of vehicle license plates, including human reaction to numbers, letters, characters and symbols and the ability to cognitively process them; provided, however, that the task force shall rely upon scientific studies that analyze and assess such human reaction and such ability as applied to not fewer than 15 non-alpha-numeric symbols as appearing on*

*license plates traveling on public and non-public ways; provided further, that such scientific studies have been peer reviewed; and provided further, that the task force shall consult with relevant research or clinical scientists and medical professionals in the field of cognitive psychology and perception to verify the accuracy of the information it reviews; (ii) transportation-based factors including, but not limited to, the impact on toll revenues; (iii) interfaces with motor vehicle databases in other states including, without limitation, any licensing and registration system used by the registry of motor vehicles; and (iv) criminal information system accessibility.*

*The task force may conduct 1 or more public hearings to inform the public of its activities. The report of the task force shall be filed with the clerks of the senate and the house of representatives not later than December 31, 2014.*

This report was developed by the EZ-ID Task Force in response to Section 271.

## 1.2 EZ-ID Task Force Members

The members of the EZ-ID Task Force include:

- Registrar Celia J. Blue, Massachusetts Department of Transportation/Registry of Motor Vehicles (EZ-ID Task Force Chair);
- Lieutenant Colonel Edward Amodeo, Massachusetts State Police;
- Chief Bob Meaney, Massachusetts Chiefs of Police Association;
- Magi Bish, Molly Bish Center for Missing and Exploited Children;
- Ben Stone, Budget Analyst, Executive Office of Administration and Finance;
- Stephen Collins, Director of Statewide Tolling, Massachusetts Department of Transportation;
- Undersecretary Curt Wood, Executive Office of Public Safety & Security<sup>1</sup>; and
- Dana Pullman, State Police Association of Massachusetts.

## 1.3 Meetings of the EZ-ID Task Force

The EZ-ID Task Force met on September 16<sup>th</sup>, October 10<sup>th</sup>, November 17<sup>th</sup> and December 9<sup>th</sup>, 2014. As part of its research, the Task Force received information from a variety of presenters including, by not limited to:

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<sup>1</sup> Undersecretary Curt Wood replaced Undersecretary Anne Powers in October 2014 as the Executive Office of Public Safety and Security designee.

- Gary P. Richard, EZ-ID inventor, and Jay Gardiner, former Director of Anna Maria College’s Molly Bish Center, provided an overview of the EZ-ID license plate format;
- New England College of Optometry President Dr. Clifford Scott and former President Dr. Allan Lewis, O.D. PhD presented the results of a preliminary “pilot” study conducted to assess whether a plate number that contains a symbol is easier to recall than a plate with only alpha-numeric characters;
- Cathie Curtis, Director of Vehicle Programs for the American Association of Motor Vehicle Administrators provided an overview of best practices in license plate design and discussed the national impact of the EZ-ID license plate format;
- The Registry of Motor Vehicles (RMV) team presented an operational impact assessment of the EZ-ID license plate format on its manufacturing and inventory processes, associated costs, training, etc.;
- Lieutenant Colonel Amodeo from the Massachusetts State Police presented the impact of the EZ-ID license plate format on automated license plate readers (ALPRs) and E-Citation;
- Undersecretary Wood from the Executive Office of Public Safety and Security presented the impact of the EZ-ID license plate format on the Massachusetts Criminal Justice Information System (CJIS), the National Law Enforcement System (Nlets) and the FBI National Crime Information Center (NCIC);
- Stephen Collins from the Massachusetts Department of Transportation (MassDOT) presented the impact of the EZ-ID license plate format on tolling; and
- Andrew Cohen, PhD and Caren Rotello, PhD from the University of Massachusetts Amherst presented the results of their “Memory for License Plates” study recently published in *Psychology, Public Policy and Law*.<sup>2</sup>

The EZ-ID Task Force also consulted with several federal agencies to seek input on the EZ-ID license plate. In addition, it held a public meeting in Worcester on October 28, 2014 to solicit public opinion. Nine members of the public attended and five individuals provided comment. The EZ-ID Task Force also accepted public feedback via mail and email and received eight comments/letters of varying opinion from members of the public as well as legislators.

#### 1.4 Overview of EZ-ID License Plate Format<sup>3</sup>

As described on the EZ-ID website, the EZ-ID license plate format uses “universally recognizable symbols” such as a square, triangle, diamond, star or heart, along with alphanumeric

<sup>2</sup> Cohen, A.L., Rotello, C.M., Fiorenzo, L.M., 2014, Memory for License Plates, *Psychology, Public Policy, and Law*, 20:347-360.

<sup>3</sup> [www.ez-id.org](http://www.ez-id.org)

characters, to give a graphic that is intended to be recognized, remembered and reported more easily. The EZ-ID license plate format also includes the use of other symbols such as a music note, book, flag, etc. that may be less distinct and discernable than other symbols.

The EZ-ID concept was invented over twelve years ago by Gary P. Richard in response to the abductions of Molly Bish in June 2000 and Elizabeth Smart in 2002. The EZ-ID license plate format proposes to add symbols to general issue Massachusetts license plates. It is not intended to replace Massachusetts specialty plates, low number plates or vanity plates. As shown below, the EZ-ID license plate format has four characters and a stacked two-character prefix which denotes the location of the symbols. The “D3” prefix in the following image indicates a diamond in the 3<sup>rd</sup> position.<sup>4</sup>



EZ-ID License Plate

## 1.5 Report Contents

In conducting its analysis, the EZ-ID Task Force studied the following areas which represent the main contents of this report:

- Available research on license plate memory and the effects of symbols on recall;
- National considerations of the EZ-ID license plate format;
- The operational impact to the Massachusetts RMV including changes to the manufacture and inventory processes:
- The impact on law enforcement;
- The impact on tolling;
- EZ-ID activity in other states;
- The dollar amount associated with implementing the EZ-ID license plate format; and
- Findings and recommendations.

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<sup>4</sup> Image from [www.ez-id.org](http://www.ez-id.org)

## SECTION 2: OVERVIEW OF SCIENTIFIC STUDIES

### 2.1 Studies on License Plate Memory

There has been limited scientific study conducted on license plate memory, and even less study on the impact of symbols on memory recall. The EZ-ID Task Force reviewed three published studies that discussed: (1) the effects of avoiding alternations between letters and digits, using more digits than letters, and grouping by spacial separation;<sup>5</sup> (2) the effects of exposure time;<sup>6</sup> and (3) the principle of chunking (separating characters into two or more groups) as well as best practices in license plate design in Saudi Arabia.<sup>7</sup>

The EZ-ID Task Force also reviewed a study that evaluated methods for maximizing the completeness and accuracy of eyewitness recall for license plates including specific interviewing techniques.<sup>8</sup> This study found that, with the aid of hypnosis, law enforcement may be able to retrieve seemingly forgotten information from eyewitnesses to a crime. Researchers developed memory retrieval procedures for eyewitnesses called the Cognitive Interview which includes: (1) mentally putting oneself back at the scene of a crime; (2) reporting everything, even partial information; (3) recounting the events in a variety of orders, even reverse; and (4) reporting events from a variety of perspectives, including that of the suspect. These techniques found to increase the amount of correct information obtained from eyewitnesses by 35%.

With respect to the impact of symbols on memory recall, the EZ-ID Task Force received a presentation from Dr. Andrew L. Cohen, PhD and Dr. Caren M. Rotello, PhD from the University of Massachusetts Amherst on the results of their peer-reviewed study “Memory for License Plates”, which was published in *Psychology, Public Policy and Law* in November 2014. Additionally, the EZ-ID Task Force received a presentation from Dr. Alan L. Lewis, O.D., PhD and Dr. Clifford A. Scott from the New England College of Optometry on results of a preliminary “EZ-ID pilot study” they conducted in 2014 which assessed whether a license plate with a symbol is easier to recall than a plate with only alpha-numerics.

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<sup>5</sup> Schraagen, J.M., Van Dongen, Kees, 2005, Designing a License Plate for Memorability, *Ergonomics*, 48:7, 796-806.

<sup>6</sup> Mende, L., MacKinnon, D.P., Geiselman, R. E., 1987, Memory for License Plates as a Function of Exposure Time, *Journal of Police Science and Administration*, 15: 68-71.

<sup>7</sup> Al-Haboubi, M.H., 1990, Designing a License Plate, *Applied Ergonomics*, 30: 421-428.

<sup>8</sup> Mackinnon, D.P., O'Reilly, K. E., Geiselman, R.E., 1998, Improving Eyewitness Recall for License Plates, *Applied Cognitive Psychology*, 4:129-140.

## 2.2 University of Massachusetts Amherst “Memory for License Plates” Study

The “Memory for License Plate” study conducted by Dr. Cohen and Dr. Rotello at the University of Massachusetts Amherst has three main findings: (1) symbols neither increase nor decrease memory; (2) three-four characters are typically remembered; and (3) symbols *can* reduce plate length and vehicle search under certain conditions.

A total of 1,859 individuals participated in the study. They were required to be fluent English speakers located in the United States and between the ages of 18 and 74. Participants were recruited from Amazon Mechanical Turk, an online experiment site where individuals can sign-up to participate in research studies.<sup>9</sup>

Each participant viewed a short video comprised of three main sections: (1) a three second “get ready” prompt; (2) a one-three second view of a license plate; (3) and a 15-30 second view of a car driving down a country road. After the “get ready” prompt, participants viewed a static image of a license plate situated on the rear of a car. They were prompted in advance to try and remember the characters on the plate and the car color. The plates shown were composed of approximately one-third of each of the following combinations: five alpha-numeric characters, four alpha-numeric characters and a symbol and six alpha-numeric characters. It is important to note that the plate shown did not use the stacked two-character prefix used in the EZ-ID license plate format. After viewing the image of the license plate, the participants watched a brief clip filmed from the inside of a moving car driving down a country road looking through the front window. No license plate was visible during this part of the exercise. After each video was viewed in entirety, participants were asked to recall the car color and as many plate characters as possible.

The researchers found that regardless of the combination, most participants remembered 3-4 characters out of the entire set. They also found that symbols neither increased nor decreased memory. Symbols were remembered almost identically to the other alpha-numeric characters. The study found that the longer someone was shown the plate, the better their memory, and that a larger delay between seeing the plate and asking someone to recall it hurt performance. Additionally, it found that characters located in the first few positions were generally remembered better, as people read left to right.

The researchers found that symbols in the first position were not as likely remembered. The researchers speculated that participants likely interpreted the symbol in the first position as

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<sup>9</sup> <https://www.mturk.com/mturk/welcome>



part of the plate graphic and not the plate number. Symbols in the second position were remembered slightly worse than alpha-numerics, but symbols in the third, fourth and fifth positions were remembered the same. Given the larger number of participants in this study, the results strongly suggest that any recall difference between symbols and characters is likely to be very small.

The study does propose that an indirect benefit of adding symbols to license plates is the increase in the number of possible plate combinations which would allow for fewer characters on the plate. It also found that the randomness in which plates are issued can narrow the search of a vehicle if only some of the characters on the plate were recalled.

Beyond the scope of the “Memory for License Plates” study, Dr. Cohen and Dr. Rotello indicated there are several other areas for additional study including: (1) perceptual factors (i.e. do people call symbols by the same name, can they tell the difference between one symbol versus another, and do different viewing conditions have an effect); (2) the effects of stress or alcohol on plate recall; and (3) the effects of literacy on plate recall (i.e. young children, illiterate adults and non-native speakers of English).

### **2.3 New England College of Optometry “EZ-ID Pilot Study”**

The “EZ-ID Pilot Study” conducted by Dr. Lewis and Dr. Scott from the New England College of Optometry found that the inclusion of symbols in a six character plate increases the recall of a complete license plate number and that symbols are significantly more apt to be recalled than letters or numbers.

A total of 40 individuals participated in the study, all of whom were volunteers from the graduate professional program at the New England College of Optometry. Participants were between the ages of 22 and 35 and all had 20/20 vision and normal ocular health.

Each subject participated in a three section testing procedure consisting of: (1) a short countdown; (2) a three second presentation of a static image of a license plate; and (3) a 30 second presentation of a picture of a U.S. president as a “distracter”. This sequence was repeated for a total of 10 license plates. All plates contained 6 characters; mixed numbers and letters. Five plates were modified to replace one of the two middle characters with a symbol (star, heart, triangle, or square). The image shown did not use the stacked two-character plate prefix used in the EZ-ID license plate format. Prior to their participation in the experiment, subjects received a presentation on the EZ-ID license plate format and the background behind its development.

The study found that 43% of all plates were recalled correctly and that 61% of the participants correctly identified more plates containing symbols than containing only alpha-numerics. The study also found that 96% of all symbols were recalled correctly.

Beyond the scope of the “EZ-ID Pilot Study”, Dr. Lewis and Dr. Scott indicated there are other areas for additional study needed including which symbols are most easily recalled (i.e. do individuals remember triangles more easily than squares, for example). They also indicated that their pilot study had a small sample size and was limited in scope and that other studies have been conducted that counter the findings of the “EZ-ID Pilot Study”.

## SECTION 3: A NATIONAL PERSPECTIVE ON LICENSE PLATE DESIGN

### 3.1 Overview of the American Association of Motor Vehicle Administrators

The American Association of Motor Vehicle Administrators (AAMVA)<sup>10</sup> is a tax-exempt, nonprofit organization that develops model programs in motor vehicle administration, law enforcement and highway safety. The association also serves as an information clearinghouse in these areas, and acts as the international spokesman for these interests.

Founded in 1933, AAMVA represents the state and provincial officials in the United States and Canada who administer and enforce motor vehicle laws. AAMVA's programs encourage uniformity and reciprocity among the states and provinces. AAMVA develops best practices and model legislation; unites people with common goals and issues through task forces and working groups; and works closely with federal partners and industry representatives.

### 3.2 Best Practices in License Plate Design

On October 10, 2014, Cathie Curtis, AAMVA's Director of Vehicle Programs, presented to the EZ-ID Task Force information on license plate design best practices and a national perspective on the EZ-ID license plate format. Ms. Curtis has served as AAMVA's vehicle expert for the last three years and has 32 years of service with the State of Maine's Bureau of Motor Vehicles.

In 2012, AAMVA developed the "Best Practices Guide for Improving Automated License Plate Reader Effectiveness through Uniform License Plate Design and Manufacture".<sup>11</sup> This document offers guidelines and recommendations to create cross-jurisdictional uniformity in the design and manufacture of license plates. It is based on four guiding principles:

1. Jurisdictions that adopt the AAMVA best practices for plate design and manufacture will improve plate identification;
2. Plates across jurisdictions should share common characteristics that allow readability, usability, and connections to vehicle registration records;
3. Jurisdictions should standardize their license plates; and
4. Motor vehicle agencies should consult with jurisdictional law enforcement as they design plates.

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<sup>10</sup> <http://www.aamva.org/>

<sup>11</sup> <http://www.aamva.org/Best-Practices-and-Model-Legislation/>

With regard to best practices in license plate design and manufacture, AAMVA's guide cites the following:

- Graphics: Graphics should not distort or interfere with the readability of alpha-numeric characters by the human eye or automated license plate readers (ALPRs).
- Jurisdiction of origin and plate number: The name of the issuing jurisdiction should be prominently displayed on the top center of the plate and the characters at the center of the plate.
- Plate numbers: The configuration of a license plate should be limited to alpha-numeric characters. Non-alphanumeric characters such as hearts, dashes, ampersands, etc. should not be part of the license plate number.
- Fonts: Characters should be at least 2.5 inches in height and proportionally wide and should be spaced .25 inches apart. Standardized fonts and sizes that clearly distinguish alphas and numerics should be used. Similar characters like A and R, 8 and B, and 0 (zero), O and Q should be easily distinguishable from each other.
- Stacked characters: Stacked characters should be part of the plate number. They should be vertical, not staggered and not less than half the size of regular plate characters. No more than two characters should be stacked.

The Massachusetts passenger normal "Spirit of America" plate and the vast majority of its special plates comply with AAMVA license plate design best practices.

### **3.3 A National Perspective of the EZ-ID License Plate Format**

From AAMVA's perspective, there are several important things to consider with the EZ-ID license plate format:

- Potential for increase in data entry errors: Because symbols are not available on a standard keyboard, registry/division/bureau of motor vehicle staff and other users will have to perform interpretation when entering an EZ-ID plate. Users will have to refer to the EZ-ID stacked prefix to identify the location of the symbol and eliminate the symbol when entering data. A plate with a diamond in the third position, for example, would be entered as D3A25. Such interpretation will likely result in data entry errors.
- Potential increase in misidentification of plates: Plate numbers are looked up by law enforcement during every day traffic stops. An officer from a state that is not familiar with the EZ-ID license plate format will likely not know how to enter the plate. If an officer pulls over a driver and is unable to run the plate, his/her safety is at jeopardy if that driver is

dangerous. Additionally, the EZ-ID license plate format could result in the wrong person being identified as taking part of a crime or the wrong person being billed by tolling or parking authorities. Members of the EZ-ID Task Force representing law enforcement also indicated that the introduction of symbols may cause confusion or misunderstanding in transmission of characters and symbols when voice requests are made to dispatchers: “A-Adam, B-Boy, Star, One, Two, Three”.

- Lack of combinations of characters and symbols to meet demand: States that have a large number of registered vehicles such as California with over 23 million registered vehicles will require symbols beyond a square, triangle, diamond, star or heart in order to develop enough permutations to meet demand. In order to reduce the number of characters on a plate, states with a larger number of registered vehicles will likely require two sets of stacked prefixes to designate the location of multiple symbols. The use of two prefixes will clutter the plate, increase the total number of characters that appear and create greater instances of data entry error and misidentification of plates.
- Potential loss of physical real-estate on plates: Some plate types in other states are already identified by the use of one set of stacked characters; the EZ-ID license plate format would require a second set and could result in the aforementioned issues. The EZ-ID stacked characters may also limit the ability to have graphics on license plates.

It is AAMVA’s view that while the current national plate identification system is not without imperfection, it is widely understood. There are risks with adopting a different system of plate identification, especially if changes are pursued by individual states as opposed to a coordinated national effort. Building on its “Best Practices Guide for Improving Automated License Plate Reader Effectiveness through Uniform License Plate Design and Manufacture”, AAMVA will be releasing follow-up standards in the fall of 2015. The development of these standards will be consistent with AAMVA’s license plate policy which states:

- License plates serve one common purpose: to identify motor vehicles. Across jurisdictions, they also identify vehicle registrants and demonstrate compliance with motor vehicle registration laws. Through the use of bright, reflective surfaces, license plates contribute to highway safety and law enforcement efforts by making the vehicle more visible.
- AAMVA supports the horizontal display of a front and rear plate and the uniform manufacture and design of plates, to increase the effective and efficient identification of license plates. Jurisdictions are encouraged to adopt the best practices identified in

AAMVA's "Best Practices Guide for Improving Automated License Plate Reader Effectiveness through Uniform License Plate Design and Manufacture".

- The use of common characteristics and predictable designs on license plates will enhance readability, usability, and connections to vehicle registration records. It will also support law enforcement efforts and highway safety, and may increase certain revenue collection which is dependent upon license plate identification, such as toll collection and parking regulations.

## SECTION 4: MASSACHUSETTS RMV OPERATIONAL IMPACT ASSESSMENT

### 4.1 Overview of Massachusetts Plates

License plates display a vehicle's registration number and serve as the method for identifying a vehicle. Passenger license plates are the most common plates on Massachusetts' roadways. These are plates used for private passenger vehicles, a category of vehicles that usually encompasses cars, sport utility vehicles, vans, and light duty trucks, which are not used for commercial purposes. The Massachusetts RMV offers the following types of passenger plates for private passenger motor vehicles:

- **Passenger Normal (PAN):** A plate with a six character combination of letters and numbers. This plate features either a white background with red lettering or a white background with green lettering.<sup>12</sup> There are 4.1M active PAN plates. These plates have a biennial registration at a cost of \$60.00. Example: 120WZZ, 1234AA, 12AA34, 1AA234, 123AA4



- **Passenger Reserved (PAR):** A plate with five or less characters which is either all numbers, or a combination of letters and numbers. Low number lottery plates fall under this category. This plate features a white background with red lettering. There are 117,000 active PAR plates. These plates have a base biennial registration at a cost of \$60.00 and an additional \$40.00 fee. Example: 123A, 1R1, A1A, I122, 12345



- **Passenger Vanity (PAV):** A personalized plate which is all letters, or a combination of letters and numbers which must start with two letters, and may not contain periods, spaces, or punctuation marks. This plate features a white background with red lettering. There are 67,000 active PAV plates. These plates have a \$30.00 annual base registration fee and an additional \$50.00 vanity fee. Example: SAMPLE

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<sup>12</sup> Passenger normal plates with green lettering are no longer issued by the RMV.



- Passenger Special (PAS): A plate made in support of a charitable organization that contains an image representative of the organization. The veteran’s series of plates and other specialty plates (e.g. ham operator, antique) also share the PAS plate type. There are 280,000 active PAS plates. These plates have a \$60.00 base biennial registration fee and a \$40.00-\$50.00 special fee.



The issuance of a plate type depends on the type of the vehicle and its intended use. Plate type determines the following characteristics of a registration or a plate: (1) the design of the plate; (2) the duration of the registration; (3) the registration fee and/or renewal fee; and (3) the roads on which the vehicle may or may not be driven.

As mentioned in Section 3 of this report, the majority of Massachusetts plates follow AAMVA’s “Best Practices Guide for Improving Automated License Plate Reader Effectiveness through Uniform License Plate Design and Manufacture”. In addition, the RMV has established the following practices to increase the readability of a Massachusetts plate: (1) the RMV requires a white background on special plates and that the logo appear to the far left; (2) by state law, license plates must be readable from sixty feet away; and (3) the RMV restricts the use of the letters I, O, U and Q on passenger normal plates as these letters could easily be construed as different characters. These letters are only allowed on passenger vanity plates if they appear in a clearly defined word.

Each year, the RMV orders 1.1 million plates and issues 960,000. One plate costs the RMV \$1.83 to produce and a pair of plates costs \$3.66. Plates are funded through an appropriation to the Department of Correction (DOC) and require \$3.8 million dollars in funding annually.



## 4.2 Overview of Manufacture and Inventory Processes

MassCOR Industries oversees the manufacturing of plates by inmates at the MCI Cedar Junction facility in South Walpole, Massachusetts. Plates are manufactured according to the plate order sent from the RMV Special Plate Department. Plates are ordered based on projected need and the current inventory. Plates are manufactured in plate series (e.g. 1AAA10 to 1AAB10). Prisoners emboss the plates using machine presses and physically arrange the letter and number dies (a tool that is used for cutting, shaping, or stamping a material or an object) on the plate mask and sequence. Plates are manufactured manually in a sequence that ensures that they are boxed according to expiration date. For example, with plate 1AAA11 the prisoner will manually change the dies as follows:

- Last number will indicate the month of expiration and remains the same;
- The second number will increment until exhausted;
- Next the third letter will increment until exhausted;
- Next the second letter will increment until exhausted;
- Next the first letter will increment until exhausted; and
- Finally the first number will increment, and the cycle continues.

Currently, the ordering and plate inventory processes are manual. If symbols were introduced, each symbol would require its own inventory with a set of rules for sequencing.

## 4.3 Impact to Manufacture Process

There are two options for the manufacture of the EZ-ID license plate format. The first is to emboss the symbol on the plate utilizing the same manufacture process described above. This would require new dies for each symbol and corresponding plate prefix at a cost of \$285.00 each. The current equipment would need to be tested to ensure embossed symbols would not stress or rip the aluminum and reflective sheeting. If the current manufacturing equipment needs to be altered to accommodate the new design, there will be additional costs. This option increases the complexity of the die placement and sequencing for the prison and will likely result in errors.

The second option is to pre-print the symbols and stacked prefixes on 3M Scotchlite™, the white reflective material that covers the aluminum plate. This option would require a unique roll of Scotchlite™ to be ordered for each symbol and position. For example, if five symbols were selected with the possibility of being located in four positions on the plate, twenty rolls of

Scotchlite™ would need to be ordered. This option would also increase the complexity of die placement and sequencing and will likely result in errors.

#### **4.4 Impact to Inventory Process**

The last number on a Massachusetts passenger normal plate represents the month the registration will expire. RMV branch offices are therefore stocked with essentially ten inventories so that they can issue plates with the correct expiration month to customers. Each branch has boxes of 0 through 9 ending plates, with 0 representing the months October, November and December. If EZ-ID plates with five different symbols were introduced, “month ending” plates for all five symbols would need to be stocked at the RMV’s thirty branch locations. Required inventory would increase further if plates were stocked with symbols in different positions. In addition to the RMV branches, there are over 650 business partners (i.e. car dealerships, insurance agents, the airport fleets, etc.) that issue plates and would need to be stocked with inventory. The EZ-ID license plate format would add more complexity to the RMV’s current inventory and control processes.

#### **4.5 Plate Replacement Program and Associated Costs**

In order to transition to EZ-ID plates, the RMV would need to execute a plate replacement program. This could be accomplished in one of two ways: (1) every plate could be replaced with the two-year passenger normal registration cycle or (2) through a rolling replacement over a set period of time such as five years. There are pros and cons to each; however a rolling replacement would be more manageable and would allow for the amortization of costs over a longer period of time.

With 4.1 million passenger plates to replace, the cost for plate production and postage alone is \$25.6 million. Based on the sheer volume of plates in circulation, additional staff would be necessary to properly roll-out a replacement program. The annual cost of ten new employees at \$50,000 a year is \$500,000.

#### **4.6 Training and Associated Costs**

If the EZ-ID license plate format were implemented, the RMV’s staff and business partners will require training on how to read the plates and enter them into registration databases. Entities that will need to be trained include, but are not limited to: law enforcement, RMV branch staff, AAA, Electronic Vehicle Registration (EVR) participants (i.e. car dealerships and insurance agencies), airport fleets, the inspection station network, insurance companies, state and federal

agencies such as the Federal Motor Carrier Safety Administration (FMCSA), the Department of Revenue (DOR), the Department of Public Utilities (DPU), the Department of Environmental Protection (DEP), etc.

In addition to staff and business partners, the RMV will need to conduct public outreach and training for all of its customers and the general public. Customers will need to be trained on how to enter their registration information when completing online transactions on the RMV website. Additionally, they will need to be trained that while their physical plate includes the visual of a symbol, it will not be included on their registration document. A plate with a diamond in the third position would be denoted by the prefix D3 on the paper registration form. If the EZ-ID license plate format were implemented, training would be a critical component not to be underestimated. Training and outreach for RMV staff, its business partners as well as its customers is estimated at an approximate cost of \$8.2 million.

#### **4.7 Customer Reaction**

Drivers in Massachusetts have a certain affinity for their plates. As a testament to this, over 6,000 people applied for the 158 plates available in the 2014 low plate lottery. People are not just attached to low number plates, but to certain combinations of characters, especially if they have had the plate for a number of years. Regardless of the number of characters, the years registered, or the plate color, a plate replacement program will likely meet resistance from the RMV's customers.

## SECTION 5: IMPACT ON LAW ENFORCEMENT

### 5.1 Massachusetts Local Law Enforcement

The implementation of the EZ-ID license late format in Massachusetts would likely result in serious communication issues between Massachusetts law enforcement and the law enforcement agencies of other states unfamiliar with how to read and interpret the EZ-ID plate. The use of symbols would create complications with issuing the critical law enforcement message – Be on the Lookout (BOLO) – broadcast through the Criminal Justice Information System (CJIS) for in-state law enforcement. In these instances, law enforcement uses the CJIS to inform other jurisdictions of incidents such as a hit and run accident, missing or wanted person, stolen vehicle or some other event that needs attention by the general law enforcement community. These types of messages are usually free text and are composed in a formatted fashion familiar to law enforcement for easy and expedient interpretation. There is a common format for messaging across the nation in which dispatch and E911 personnel are trained in the use and interpretation. Adding symbols to this type of messaging/broadcasting or requiring police dispatchers or E911 call takers to communicate using either automated dispatch systems and/or radio communications adds great complexity and will present training challenges.

How one identifies or interprets a symbol within a text broadcast or radio dispatch is an area that needs additional research and discussion, both at a policy and front-line level. At a minimum, a comprehensive training and awareness program would need to be developed and implemented by the Department of Criminal Justice Information Services for the nearly 20,000 Massachusetts users of CJIS as well as a coordinated training with the Commonwealth's state and national partners through its National Law Enforcement Telecommunications System (Nlets) membership.

Another major unknown is how Massachusetts law enforcement would enter the EZ-ID license plate format into the FBI National Crime Information Center's (NCIC) national stolen vehicle file or wanted file. Massachusetts law enforcement currently enters thousands of stolen vehicles into CJIS/NCIC on an annual basis. The FBI maintains this national system that all state and local law enforcement use. Any modifications to the system or changes in protocol will need to be presented to the FBI through its long-standing CJIS Advisory Policy Board process which is regulated by federal law.

## 5.2 Automated License Plate Readers

ALPRs provide law enforcement with the critical ability to check license plates against various databases. Currently, there are three approved vendors authorized to sell ALPR units in the Commonwealth. The ALPR technology used by these companies does not vary greatly between vendors. ALPR cameras capture images of vehicles and license plates. The optical character recognition (OCR) software, utilizing sophisticated algorithms, translates the alpha-numeric characters on each license plate into an electronically readable format. The image collected by an ALPR camera is maintained in the information system to provide a means of ensuring that the license plate number was properly converted into an electronically readable format. The success of ALPR relies upon the system's ability to accurately identify the characters on a license plate.

Historically, some of the Commonwealth's license plates have been challenging for ALPR units to "read". Contributing factors include the overall age and condition of some plates, material used in the red lettering, the type of reflective coating and the use of stacked letters on special plates. Given that the stacked prefix in the EZ-ID license plate format is an identifier of both the symbol and its location, there may be some potential challenges with ALPRs reading EZ-ID plates.

Members of the EZ-ID Task Force representing law enforcement contacted 3M, an approved ALPR vendor, to discuss the impact of EZ-ID on ALPRs. 3M recommended that (1) engineers should be involved in the design and specs of any new plate and that stacked letters should be no less than one-half the size of the other letters on the plate; (2) the symbols utilized should be easily distinguishable to lessen the chances of a bad "read"; and (3) EZ-ID plates should utilize the same font or syntax as the other Massachusetts plates that are proposed to remain in circulation (specialty, low number and vanity plates). With an estimated cost of \$250,000 in software changes to accommodate EZ-ID, ALPRs and the EZ-ID license plate format can co-exist but the aforementioned recommendations should be considered in plate design.

## 5.3 Impact to the Massachusetts Motor Vehicle Automated Crash and Citation System

The Motor Vehicle Automated Crash and Citation System (MACCS)/E-Citation application was developed to promote the electronic capture and editing of motor vehicle incident data and to eliminate costly duplicative data entry processes across government agencies. The application has been built and initial pilot testing is complete. The system allows users to capture citation and crash report data, print reports in vehicle, and to transmit the data electronically to the Registry of Motor Vehicles, the Merit Rating Board, and the Administrative Office of the Trial

Court (AOTC). This project also includes the development of a public safety data warehouse and a data analytics platform for conducting in-depth public safety analysis.

Members of the EZ-ID Task Force representing law enforcement, the MACCS project manager and several troopers who participated in an E-Citation pilot conducted last year assessed the potential impact of the EZ-ID license plate format on the MACCS/E-Citation System. The group found that the use of symbols and the stacked two-character prefix on EZ-ID plates does not represent a technical issue and would not negatively impact the MACCS application.

#### **5.4 Feedback from Out-of-state Law Enforcement Partners**

Members of the EZ-ID Task Force representing law enforcement contacted their out-of-state partners via survey to obtain feedback on the EZ-ID license plate format. Ten states responded with comments including the Wisconsin Department of Justice, the Michigan State Police, the Rhode Island State Police, the Colorado Bureau of Investigation, Nebraska State Police, the Iowa Department of Public Safety, the Minnesota Bureau of Criminal Apprehension, the Delaware State Police, the Florida Department of Law Enforcement and the Vermont Department of Public Safety.

The majority of respondents were not aware of the EZ-ID license plate format. Those that were familiar expressed a number of concerns: (1) modifications that would need to be made to software applications and databases nationwide; (2) complications with license plates being entered and queried incorrectly which could jeopardize the safety of law enforcement and the public; (3) lack of alignment with AAMVA best practices; (4) lack of empirical evidence that symbols improve memory of license plates; (5) training of nearly 18,000 law enforcement agencies nationwide; (6) complications with issuing the critical law enforcement message – Be on the Lookout (BOLO) – broadcast through CJIS and Nlets; and (7) uncertainty as to whether the FBI NCIC systems would accommodate the symbols in the entry of stolen and wanted license plates into the national database.

## **SECTION 6: IMPACT ON TOLLING**

### **6.1 All Electronic Tolling**

MassDOT is in the process of installing an All Electronic Tolling (AET) system on all of its tolled facilities including the Western Turnpike, Metropolitan Highway System, the Sumner/Callahan and Ted Williams tunnels and the Tobin Memorial Bridge. The system is projected to go live in the summer of 2016. When this \$335 million project is completed, drivers will be able to pass through the toll zones at highway speeds without the need to slow down or stop.

The AET system is broken into two components: (1) the \$130 million roadside infrastructure that includes gantries, cameras, imbedded loops, antennae, computer servers, a license plate recognition program and communication links to a computer host and ultimately to the customer service center; and (2) the \$205 million customer service center which facilitates account processing, image review of plates which cannot be automatically read, invoicing and toll collection. This project is underway and built on the assumption that license plates are alpha-numeric. A change to the EZ-ID license plate format, while realizable, would require software changes and contract change orders that would cost approximately \$2 million and likely impact the delivery schedule for AET.

### **6.2 Impact to the E-ZPass Interagency Group**

Beyond the impact to MassDOT's AET project, the implementation of EZ-ID would affect Massachusetts' partner toll agencies. MassDOT is a member of the E-ZPass Interagency Group (IAG), an association of 26 toll agencies in 15 states that operates the extremely successful E-ZPass electronic toll collection program. The Commonwealth collects around \$330 million in tolls annually, of which 78% is collected via E-ZPass transponders.

In the event a transponder is not read when a vehicle travels through a toll lane, the license plate is run through the IAG system to obtain a match so the appropriate customer can be billed. For instance, if a plate from Pennsylvania travels through a Massachusetts lane and no transponder is detected, an image is captured and the plate is run through the E-ZPass database to search for a match. The implementation of the EZ-ID license plate format in Massachusetts would require all 26 IAG agencies to update their systems and databases, a significant and costly task. From the perspective of MassDOT Tolling, the EZ-ID license plate format would be best pursued at a national level.

### 6.3 Plate Recognition Capabilities

The MassDOT Toll Division does not anticipate that the EZ-ID system would improve its plate recognition capabilities or accuracy. MassDOT deployed an early AET system on the Tobin Memorial Bridge to help prepare for the future, much larger system. The system has been operable since July 2014. On average, 250,000 plate images are reviewed each month and only about 1.2% of those are voided due to issues such as unreadability, damage, fading, obstruction or system malfunction.



## **SECTION 7: ACTIVITY IN OTHER STATES**

The EZ-ID license plate format is not currently used in any state. The EZ-ID Task Force is not aware of any state registry/division/bureau of motor vehicles that is actively pursuing the implementation of EZ-ID. There may be legislation filed in Pennsylvania by a state representative in early 2015, but it is not known whether it will call for full implementation, a pilot program or further study.

## SECTION 8: PERMUTATION ANALYSIS AND RANDOMIZATION

### 8.1 Random Assignment

Any license plate design must generate enough possible combinations to have a unique license plate for every vehicle on the road. Randomly generating plate characters creates far more potential combinations aiding vehicle search through two mechanisms:

- A reduction in the number of characters on a plate: As described, studies show that eyewitnesses tend to remember only 3-4 characters correctly. With fewer characters on a plate, eyewitnesses have a better chance of recalling a plate correctly. Additionally, identifying one digit out of five rather than six dramatically narrows the number of possible matches. As illustrated in the table below, randomly assigning alpha-numerics in five spaces allows for over 33 million combinations.
- More “unique” combinations: Random assignment of plate characters allows for a greater number of possible combinations meaning each license plate will share fewer characteristics with other plates. This “uniqueness” will enable law enforcement to narrow the search more quickly when only part of a plate is identified.

The inclusion of a symbol on a license plate has the potential to increase the number of possible combinations with a given number of spaces if there are enough possible symbols and the symbol can appear anywhere on the plate. Including one symbol, with an “alphabet” of 20 symbols more than triples the potential combinations with five spaces and quadruples the number of combinations with six spaces. With five spaces, there must be at least seven different symbols to create more combinations than using alpha-numerics alone, while with six spaces there must be at least six different symbols.<sup>13</sup> Determining the number of symbols that are most easily remembered and recalled requires further study and will greatly influence the relative benefits of the EZ-ID license plate format with respect to randomization.

#### Combinations with Random Assignment

# of spaces	no symbol	# of permutations	20 symbols	# of permutations 2	5 symbols	# of permutations 3
1	32	32	20	20	5	5
2	32 x 32	1,024	32 x 20 x 2	1,280	32 x 5 x 2	320
3	32 x 32 x 32	32,768	32 x 20 x 3 x 32	61,440	32 x 5 x 3 x 32	15,360
4	32 x 32 x 32 x 32	1,048,576	32 x 32 x 32 x 20 x 4	2,621,440	32 x 5 x 32 x 32 x 4	655,360

<sup>13</sup> A five character plate with only alpha-numerics has over 33 million possible combinations. Incorporating 20 symbols increases the number of possible combinations to over 104 million. Introducing only five symbols, however, reduces the possible combinations to just over 26 million.

# of spaces	no symbol	# of permutations	20 symbols	# of permutations 2	5 symbols	# of permutations 3
5	32x 32 x 32 x 32 x 32	33,554,432	32 x 32 x 32 x32 x 20 x5	104,857,600	32 x 32 x5x32 x32 x5	26,214,400
6	32 x 32 x 32 x 32 x 32	1,073,741,824	32x 32 x 32 x32 x32x 20 x6	4,026,531,840	32 x 32 x32 x5x32 x 6	1,006,632,960

## 8.2 Applying Business Rules

The University of Massachusetts Amherst “Memory for License Plates” study referenced earlier in this report found that the randomization of plate combinations can reduce the pool of license plates in a partial plate search. Massachusetts currently has a manual manufacture process and orders its plates in sequential blocks to speed production. Using the current Massachusetts business rule for six character plates which requires the first and last two spaces to be numbers and the middle three spaces to be letters, and assuming the symbol can only replace a letter, one would need at least 8 symbols to generate more combinations than alpha- numerics alone. As shown in the table below, even with 20 symbols, there are not enough possible combinations with five plate spaces to cover more than a small fraction of Massachusetts’ registered vehicles. With five symbols, there are less available combinations than when just using alpha-numerics.

### Combinations with RMV Business Rules Applied

# of spaces	no symbol	# of permutations	20 symbols	# of permutations 2	5 symbols	# of permutations 3
5	9x22x22x9x10	392,040	9x22x20x2x9x10	712,800	9 x22x5x2x9x10	178,200
6	9x22x22x22x9x10	8,624,880	9x22x20x22x3x9x10	23,522,400	9x22x22x5x3x9x10	5,880,600

## 8.3 RMV Modernization (also known as ALARS Modernization)

The RMV is exploring different means by which its current inventory and manufacture processes can be improved to achieve a smaller pool in a partial plate search. One opportunity is through the changes that will be made to the inventory, ordering and manufacturing processes under the RMV’s mainframe modernization effort, or RMVM. RMVM will eliminate the need for ancillary systems, spreadsheets and databases that are used today and automate many of the functions that are currently done manually. These technological advancements will allow the RMV to reconsider certain business processes. With improvement to the plate process, and through other proposed advances, the RMV will be in a better position to order, manufacture and distribute plates in a way that achieves greater randomization.

## SECTION 9: FISCAL IMPACT

The table below presents *estimated and approximate* costs associated with the implementation of the EZ-ID license plate format. Utilizing information from various state agencies, the EZ-ID Task Force estimates costs to exceed \$47 million over a five-year roll-out period, with up to \$22 million incurred during the first year of roll-out. It is not clear how these costs would be absorbed, either by the Commonwealth, Massachusetts residents via fee increase or a combination of both.

Aside from the labor and postage costs associated with the license plate replacement program and training for Commonwealth agencies and RMV business partners, several of the estimates below require further evaluation or are unknown. The largest unknown costs include training for law enforcement agencies across the country unfamiliar/unaware of the EZ-ID license plate format, potential impacts to the Criminal Justice Information System as well as the National Law Enforcement Telecommunications Systems and general public outreach for the residents of the Commonwealth.

Department	Cost Driver	Estimated 5 year impact (\$)	Comment
Registry of Motor Vehicles	<i>Plate Replacement Program</i>	25,600,000	Cost for production of new plates and postage
	<i>10 New Employees</i>	2,500,000	Based on \$50K/year cost for ten new employees to manage plate replacement program
	<i>Training Costs for RMV Staff &amp; Business Partners</i>	290,000	Based on 1 day of training for 800 RMV employees and 650 business partners
	<i>Production and Stocking of Inventory</i>	3,500,000	Costs associated with stocking new plate inventory at 30 RMV branches and 700 partner organizations
	<i>Public Outreach</i>	8,000,000	Estimates based on adjusted costs for previous public outreach efforts conducted for changes to CDL requirements (variable)
	<b><i>Registry of Motor Vehicles Total</i></b>	<b>39,890,000</b>	
MassDOT Toll Division	<i>Changes to MA Equipment &amp; Software</i>	2,000,000	Based on estimates provided from the Commonwealth's AET vendors
	<i>Changes to E-ZPass Interagency Group (IAG) Equipment and Software</i>	Unknown	Cost is uncertain but could potentially range from \$200-250,000 for IAG participants (variable)
	<b><i>MassDOT Toll Division Total</i></b>	<b>2,000,000</b>	

Department	Cost Driver	Estimated 5 year impact (\$)	Comment
Dept. of Correction	<i>New Dies</i>	28,500	Cost of new dies (5 symbols and 5 prefixes)
	<i>Changes to Existing Equipment for Plate Production</i>	Unknown	
	<b>Dept. of Correction Total</b>	28,500	
Exec. Office of Public Safety and Security	<i>Criminal Justice Information System (CJIS) Upgrade</i>	Unknown	The current CJIS can support a symbol transaction query to RMV; however, the broadcasting functionality within CJIS would need to be looked at to determine if changes would be required in technology or how law enforcement constructs messaging
	<i>National Law Enforcement Telecommunications System and FBI CJIS Programming Modifications</i>	Unknown	Nlets provides the infrastructure and communications enabling states to share information such as license plates; the FBI provides sharing of information through its National Crime Information Center; each state and the FBI would need to provide cost estimates
	<i>Training and Outreach to Massachusetts and National Law Enforcement</i>	2,000,000	DCJIS would need to modify the current CJIS training program including its documentation and testing system; training and awareness materials would need to be developed for both state and national stakeholders (variable)
	<i>Public Outreach</i>	3,000,000	Estimated costs for educational campaign including print, television, and online materials (variable)
	<i>Training Costs for State Police</i>	60,000	Based on costs for previous training efforts
	<i>Changes to ALPR Software</i>	250,000	Provided from Commonwealth ALPR vendors
	<b>Exec. Office of Public Safety and Security Total</b>	5,310,000	
	Total Costs	<b>Total Costs</b>	<b>47,228,500</b>
<b>One Time (FY16) costs</b>		<b>21,920,000</b>	

## SECTION 10: KEY FINDINGS AND RECOMENDATIONS

The EZ-ID Task Force developed the following findings and recommendations:

- 1. Further scientific study is needed on the memory of license plates and the impact of symbols:** The memory of license plates and the impact of symbols on memory recall are understudied topics. The EZ-ID Task Force is aware of only one peer-reviewed study that has been conducted on the impact of symbols. This study found that symbols neither increase nor decrease memory. In the absence of scientific evidence, it is not fiscally prudent to invest potentially \$47 million in the EZ-ID license plate format. There are several areas that require additional research including which symbols are recalled more easily than others, the effects of age and literacy, the impact of stress and alcohol, subtle factors such as the impact of color and font size of license plate characters, etc. With limited scientific research available, the EZ-ID Task Force recommends that further study be conducted on the aforementioned topics.
- 2. Major changes to license plate design should be pursued at a national level and not by individual states:** The implementation of the EZ-ID license late format in Massachusetts would likely result in serious communication issues between Massachusetts law enforcement and the law enforcement agencies of other states unfamiliar with how to read and interpret the EZ-ID plate. These communication complications could potentially jeopardize the safety of police officers as well as the public. The EZ-ID Task Force recommends that major changes to license plate design be pursued at a national level. This will ensure that plates are read, interpreted and understood consistently across states, both by humans and technology.
- 3. The American Association of Motor Vehicle Administrators (AAMVA) should play a lead role in any national changes to license plate design:** AAMVA, a national tax-exempt, nonprofit organization that develops model programs in motor vehicle administration, law enforcement and highway safety, issued guidelines and recommendations on best practices in license plate design in 2012 to create cross-jurisdictional uniformity in the design and manufacture of license plates. AAMVA is expected to release follow-up standards in the fall of 2015. The EZ-ID Task Force recommends that all states comply with AAMVA's best practices and standards and that major changes to license plate design be supported and driven by AAMVA.
- 4. Law enforcement should pursue the use of memory recall interviewing techniques when interviewing eye-witnesses to a crime:** As described in Section 2.1, studies show that with

the aid of hypnosis and memory recall strategies, law enforcement has been able to increase the amount of correct information obtained from eyewitnesses by 35%. The EZ-ID Task Force recommends that local law enforcement incorporate the use of these memory recall strategies when interviewing eye-witnesses to a crime. It also recommends that under the oversight of the Executive Office of Public Safety and Security, the Massachusetts State Police and the Municipal Police Training Committee, in coordination with the Massachusetts Chief of Police Association, should develop an on-line training program focused on these techniques and that such training be considered mandatory for all police in-service training and recruit training.

5. **Greater randomization of plates will help law enforcement narrow down search results:** Randomly generating the alpha-numeric characters on license plates creates a greater number of possible combinations that would allow for a reduction in the number of characters on a plate and more “unique combinations”. With fewer characters on a plate, eyewitnesses have a better chance of recalling a plate correctly. Additionally, identifying one character out of five rather than six dramatically narrows the number of possible matches. Random assignment of plate characters also means that license plates will share fewer characteristics with one another. This “uniqueness” will enable law enforcement to narrow the search more quickly when only part of a plate is identified. The EZ-ID Task Force recommends the RMV continue its efforts through its modernization program to re-assess the way it manufactures and distributes plates to ensure greater randomization.
  
6. **The RMV should pursue a phased-in approach to enhance the memory of the Commonwealth’s license plates:** The Massachusetts passenger normal “Spirit of America” plate and the vast majority of its special plates comply with AAMVA license plate design best practices. In order to ensure that all plates on the Commonwealth’s roadways achieve maximum visibility, the EZ-ID Task Force recommends the RMV hold a public awareness campaign to remind drivers to keep their plates uncluttered, unobstructed and clean, especially in the winter months. Additionally, it recommends that the RMV work with the inspection station network to ensure plates are readable from 60 feet away and that their overall condition meets stated requirements. As stated, the EZ-ID Task Force also recommends that the RMV continue efforts to enhance its current manufacture and inventory processes through its modernization program to ensure greater randomization.