People, Vehicle, Traffic Environment

Integrated 3-Part Initiative
People
- Older Drivers
- Teen Drivers
- Pedestrians

What can we do to address the needs of these populations?
EDUCATED +16M SAFER DRIVERS

NATIONS 1ST AND LARGEST SAFETY COURSE
491,641 older driver participants changed one key driving behavior in 2014.
TEENS

DISTRACTIONS WERE A FACTOR IN

58% OF TEEN RELATED CRASHES
PLEDGE TO BE THE DRIVER YOU WANT YOUR TEEN TO BE.

After all, they learn by watching you.

TAKE THE PLEDGE
PEDESTRIAN DETECTION:
PRE-COLLISION SYSTEM

“STEVE THE MANNEQUIN” STUDY
Vehicle

- Active Safety & Parking
- Pre-Collision Safety
- Passive Safety & Rescue

How do the safety systems work together?
Integrated Safety Management Concept

Integration of individual systems
Support in driving scenarios
Integrated Safety Management Concept

INTEGRATION OF INDIVIDUAL SYSTEMS

PARKING
- BACKUP MONITOR
- INTELLIGENT PARK ASSIST
- G-BOOK
- INTELLIGENT CLEARANCE SONAR
- DRIVE-START CONTROL

ACTIVE SAFETY
- ADAPTIVE CRUISE
- LANE KEEP ASSIST
- ADAPTIVE FRONT LIGHTING
- BLIND CORNER MONITOR
- BLIND SPOT MONITOR
- LANE DEPARTURE ALERT
- ADAPTIVE HIGH BEAM
- AUTOMATIC HIGH BEAM
- NIGHT VIEW

PRE-COLLISION
- FORWARD PRE-COLLISION SYSTEM
- PEDESTRIAN AND OBSTACLE DETECTION
- PRE-COLLISION BRAKE ASSIST
- REAR PRE-COLLISION SYSTEM

SUPPORT IN DRIVING SCENARIOS

PASSIVE SAFETY
- PASSIVE SAFETY BODY
- SEAT BELTS & AIR BAGS

RESCUE
- ADVANCED AUTOMATIC CRASH NOTIFICATION
- HELPNET ACN

INTEGRATION OF INDIVIDUAL SYSTEMS

ACCIDENT PREVENTION

MINIMIZE HARM
Pre-Collision and Active Safety Functions

- Pedestrian PCS (Pre-Collision System)
- Radar Cruise Control
- PCS (Pre-Collision System)
- LDA (Lane Departure Alert)
- AHB (Automatic High Beam)
TOYOTA SAFETY SENSE (TSS)

AN EXPANDED PACKAGE OF ADVANCED ACTIVE SAFETY TECHNOLOGIES
TOYOTA SAFETY SENSE (TSS)

KEY FEATURES PACKAGE C

PRE-COLLISSION SYSTEM
LANE DEPARTURE ALERT
AUTOMATIC HIGH BEAM
TOYOTA SAFETY SENSE (TSS)

KEY FEATURES PACKAGE C +P

PEDESTRIAN PRE-COLLISION SYSTEM

DYNAMIC RADAR CRUISE CONTROL
Passive Safety / Crashworthiness

- Mature and evolving technologies
- Aimed to mitigate injuries and fatalities in the event of a crash

| Whiplash Injury Lessening (WIL) Concept Seat | SRS Side Airbag |
| SRS Front Airbag | Seatbelt Pretensioner and Force Limiter |
| Impact Absorbing Front Body for Pedestrians | Impact Absorbing Body Structure |
| Head Impact Protection | Active Head Rest |
What is next in passive safety?

Toyota’s Total Human Model for Safety

Finite element model simulating human response
What is next in passive safety?

1st Correlate the simulated vehicle deformation with the real world accident

Next, add THUMS and analyze the injury response
What is next in passive safety?

- Restraints specific to the occupant
- Older occupant belt fit study
Rescue
Automatic Crash Notification (ACN)

- **Toyota Safety Connect**
  Notifies call center for emergency response when a crash occurs including location data

- *“Advanced”* ACN system
  Ongoing Research to develop an Algorithm Estimating Crash Severity Aid in Patient Transport Decision
Traffic Environment

- Communication Technologies
- Automated Driving Technologies

How will vehicles interact with each other and with roadways?
What is next?
Safety Features Using ITS Communications

Traffic Fatalities by Roadway Site in Japan

- Around Intersections: 46%
- Intersections: 34%
- Straight Roads: 33%
- Curved Roads: 15%

Reference: 2013 NPA Traffic Accident Statistics
Future Vehicle-to-Vehicle, Vehicle-to-Infrastructure

Camera and sensor technologies
Communication technologies
**Future Vehicle-to-Vehicle, Vehicle-to-Infrastructure**

Cooperative V-V

- **Obstacles**
  - Out of driver’s sight
  - Using vehicle communication

Autonomous

- **Obstacles**
  - In driver’s sight
  - Using Vehicle sensor

Cooperative V-I

- Traffic signal, restriction

Cooperative V-I

- **Obstacles**
  - Out of driver’s sight
  - Using roadside sensor

**ITS Proving Ground**
Automated Driving Technologies

Advanced Sensing of Total Environment

Integration with Driver Behavior

Prompts the driver to take action
WHAT'S NEXT:

ADVANCED SAFETY RESEARCH VEHICLE

INTELLIGENT DRIVER SUPPORT SYSTEM
Thank You