Monitor Concepts

Some ITS concepts are applicable to the Dulles Corridor but are technologically immature. However, these technologies are expected to become more reliable and proven over time. A few other concepts are technologically mature but ranked lower than the implementation concepts during the prioritization process (i.e., APCs and platform screen doors). However, their deployment would still be beneficial for the Corridor and their ranking may improve in the future, depending on needs.

These concepts should be monitored over time and should be implemented if it is determined that they are reliable and address the needs of and goals for the Corridor. The monitor concepts are shown in the outer ring of Exhibit 1. A brief description of each concept is provided below.

- **Driver Visibility Improvement** – Enhances driver visibility using an enhanced vision system. For example, infrared vision can be used to improve visibility for a bus driver when he/she is driving in dust, rain, snowstorms, and fog. This technology increases safety. However, the Dulles Corridor rarely experiences severe weather that inhibits driving visibility.
- **In-vehicle Signing** – Provides travel advisory, warning/regulatory, and other driver information through in-vehicle devices. An example includes roadway warnings, such as sharp curves or reduced speeds ahead, provided visually and/or audibly to the bus driver via a heads-up display. The information can help transit drivers operate transit vehicles safely and efficiently. However, information must be very accurate and should not be announced frequently or it will not be useful and viewed as an annoyance.
- **Longitudinal Safety Warning** – Warns driver of a potential rear-end collision. Uses collision sensors on the front and rear of the vehicle to detect impending longitudinal collisions. An example of this concept is a system that warns a bus driver that he/she is following a vehicle too closely. This technology improves safety and decreases costs from accidents.
- **Lateral Safety Warning** – Warns driver of a potential side collision. Uses collision sensors on the sides of the vehicle to detect impending lateral collisions. An example of this concept is a system that warns a bus driver that he/she is about to sideswipe a vehicle in an adjacent lane (in the driver's blind spot) during a lane change. Like longitudinal safety warning, this technology improves safety and decreases costs from accidents.
- **Advanced Vehicle Longitudinal Control** – This concept is one step more advanced than longitudinal safety warning. Rather than warning the driver, it automates speed and headway control functions using collision sensors and vehicle dynamics processing to control the throttle and brakes. For example, this system prevents a bus driver from committing a rear-end collision by taking control of the vehicle. This system needs to be very reliable. Some drivers may not like relinquishing control of the vehicle.
- **Advanced Vehicle Lateral Control** – This concept is one step more advanced than lateral safety warning. Rather than warning the driver, it automates the steering control function using collision sensors, vehicle dynamics, and other sensors to measure the lane position and lateral deviations, and to control steering. For example, this system prevents a bus driver from committing a lateral collision by taking control of the vehicle. Like advanced vehicle longitudinal control, this system needs to be very reliable, and some drivers may not like relinquishing control of the vehicle.

- **Driver Safety Monitoring** – Determines a driver's condition and performance, and warns the driver of potential dangers. For example, the system monitors the physiological conditions of the driver and warns the driver that he/she is too sleepy to operate the vehicle. It warns the driver that he/she is weaving or driving too aggressively. This technology improves safety, but may not be supported by transit drivers. They may view the system as being too restrictive and an infringement on their privacy.
- **Automatic Passenger Counters** – Automatically counts the number of people boarding and alighting a transit vehicle to determine passenger loading. Data are used for planning and analysis purposes, in determining real-time loads (to dispatch additional vehicles during periods of heavy ridership), and sometimes in determining traffic signal priority requests. The system is often linked to an AVL system to mark the location of passenger data. Data may be downloaded to the control center manually or automatically (via vehicle communications system). Technologies include treadle mats and horizontal or vertical infrared beams. This system greatly decreases the time and cost to gather passenger data. However, the accuracy of data is debatable.
- **Platform Screen Doors** – Provides a safety barrier between a platform edge and transitway (prevents passengers from falling from the platform onto the transitway). When the transit vehicle arrives at a stop, the transit vehicle doors line up with the platform screen doors, through which passengers board and alight the transit vehicle. The doors close shortly before the vehicle departs from the station platform. The system may have integral precision docking, or may interface to a pre-existing precision docking system. Platform screen doors improve safety, and conserve energy for enclosed stations (heating and cooling). The system may be applied to rail and BRT stations.
- **Personal Rapid Transit** – Provides direct origin to destination transportation service, on demand, via a fixed-guideway network. Vehicles, which travel on the fixed guideway, are fully automated and accommodate a small group of people (typically one to six passengers). Personal rapid transit increases passenger comfort, convenience, and security, increases service performance, and reduces operating costs. It may be implemented incrementally. Like most of the monitor concepts, personal rapid transit systems have not been widely implemented. A personal rapid transit system could serve as a feeder/distributor system in the Tysons Corner area, the Reston/Herndon area, and the Route 28 Corridor, and serve as a link to the I-66 Corridor.
- **Automated Highway/Rail System** – Automates driving functions (enables "hands-off" operation of a vehicle). For example, this concept provides fully automated operation of private vehicles on freeways and fully automated operation of trains. This technology eliminates incidents due to driver error. It also greatly increases capacity. However, technological and societal issues exist. The technology is immature and travelers may not support a system that takes over full control of a vehicle. The system is likely to be opposed by transit drivers. Advanced vehicle longitudinal and lateral controls are prerequisite technologies.
- **Pre-crash Restraint** – Determines the probability of a collision and, if determined that a collision is within a certain degree of certainty, deploys a pre-crash restraint mechanism to protect the driver and passengers against the collision. A simple example is vehicle air bags. Pre-crash restraint improves safety and saves lives. However, a more sophisticated system than vehicle air bags is currently unavailable.

Technology is developing at a rapid pace these days. For ITS, what may currently be the state of the art may be obsolete in five to ten years. Also, what is not reliable or proven today may be commonplace in the next decade. The market is a major driving force for this. A technology that can provide greater benefits at a reasonable price will tend to be more popular. Take AVL for example. Several technologies can be used to provide AVL and have been around for a while (e.g., ground-based radio, signpost and odometer, dead reckoning). Each has its advantages and disadvantages. However, GPS became the preferred technology after it was fully developed because it was less expensive and provided greater flexibility. Because of some weaknesses (urban canyon effects), however, it is often coupled with another AVL technology (e.g., dead reckoning).

Developing technologies tend to be costly. Research and development costs are recouped during the initial years of implementation. Over time, the cost tends to go down as the market for the technology increases and its use becomes widespread. In addition, cutting edge technologies may be more costly to operate and maintain than proven technologies. New technologies may need tweaking or may need to be repaired more frequently than technologies that have been fully developed.

It is for these reasons that the above ITS concepts should be monitored during the life of the project and beyond. They have great potential and can provide significant benefits, and their cost will more than likely come down as they become mainstreamed.