NEW FLYER

xcelsior AV™

Our SAE Level 4 automated bus.

New technologies are changing the way we move and paving the way for cities that are smarter and safer.

What is Xcelsior AV™?

Xcelsior AV™ is a Society of Automotive Engineers ("SAE") Standard J3016 Level 4 automated heavy-duty transit bus.

It uses advanced driver assistance systems (ADAS) technology, incorporating a distinct combination of high-performing AV technologies and sensors including LIDAR, RADAR, and cameras.

Xcelsior AV™ technology can be integrated with battery-electric and fuel cell-electric propulsions.

High Automation

SAE J3016 Level 4 is defined as high automation where the vehicle performs all driving tasks while actively monitoring the driving environment. The automated features will drive the vehicle under its defined Operational Design Domain ("ODD") and will not operate unless all requirement conditions are met.

First in North America

Xcelsior AV - Our SAE Level 4 automated bus is the first SAE Level 4 bus in motion in North America.

Robotic Research

New Flyer announced their partnership with Robotic Research in May 2019 with the goal of advancing automated bus technology through development and deployment of advanced driver-assistance systems ("ADAS") in heavy-duty transit bus applications.

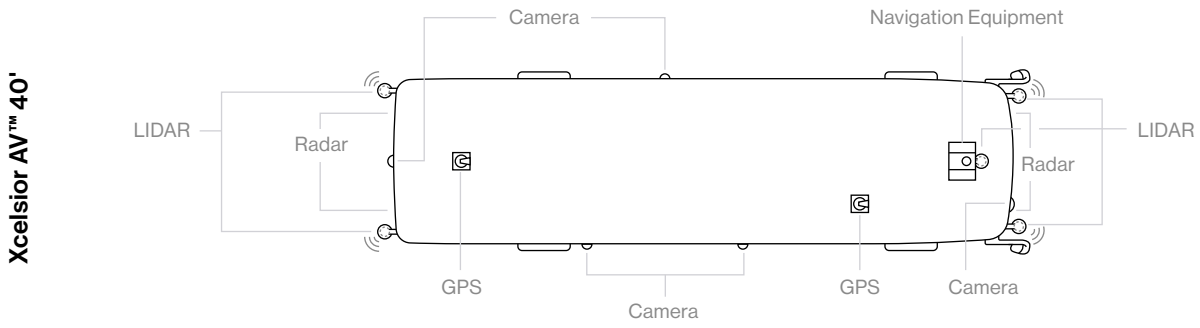
How it works.

Xcelsior AV™ capabilities are made possible by two primary technologies: AutoDrive® and AutoDrive ByWire™. Both technologies are supported by sensors, including LIDAR, RADAR, cameras, and localization.

AutoDrive®

The AutoDrive® system serves as the "eyes and brain" of the bus. It uses software, sensors and computers to process the world surrounding the bus, mapping the environment while making decisions that allow it to successfully navigate its defined route.

AutoDrive® includes four LIDARs and radars for 360-degree coverage and one LIDAR and radar for longer range sensing.



Location of components subject to change

AV technology.

Radar

RADAR is a detection system that uses radio waves to determine the range, bearing and velocity of objects such as oncoming traffic, cross traffic and over taking vehicles during lane merging.

LIDAR

LIDAR is a method for measuring distances (ranging) by illuminating the target with laser light and measuring the reflection with a sensor to make digital 3-D representations of the target.

Cameras

Detects real-time images of the surroundings such as traffic signs and lights.

Localization

Uses data from various sensors to ensure redundant, robust positioning for accurate real-time navigation, even in degraded/ denied GPS environments.

AutoDrive byWire™.

This can be considered the muscles and peripheral nervous system of the bus, serving as the "hands and feet" of the automated system. Hardware and software control the steering, brake, parking brake, accelerator, and other controls and actuators of the bus, ultimately operating bus movement on its route.

Using the human-machine interface, the safety attendant has full overview and command of automated operation along route, enabling the safety attendant to seamlessly switch from manual to robotic control.

Benefits.

Safety

In addition to providing enhanced situational awareness, Xcelsior AV™ systems can reduce the risk of accidents caused by human factors such as driver distraction or fatigue.

***94%** of serious crashes are due to human error according to NHTSA – and Level 4 ADAS technologies provide operation and monitoring that can significantly reduce the risk of collision.

**NHTSA Benefits of Automation*

Xcelsior AV™ systems all work together to constantly assess the surroundings and respond quickly.

Capabilities of automation include:

- Parking and docking assist
- Blind spot warning (side, rear)
- Lane departure warning
- Collision warning (vehicle, pedestrian) and collision mitigation braking

Improves Accessibility

Precision docking will minimize platform gaps, ensure boarding is Americans with Disabilities Act ("ADA") compliant, and will help increase accessibility for all passengers.

Smart transportation solutions.

It's smart city capable through connectivity, analytics, navigation, and performance.

Lends Efficiency

Precision docking and greater operating accuracy can reduce damage to buses and surrounding infrastructure, potentially decreasing repair and maintenance costs, and decreasing downtime needed to repair buses and/or infrastructure.

Testing is still underway, but it is believed automated controls could increase regenerative energy from braking and thereby increase fuel efficiency.

Pickup and departure procedures to the road.

Reduces Traffic Congestion

Roads filled with automated vehicles could smooth traffic flow and reduce traffic congestion, freeing up to 50 minutes per day of non-driving.

According to the National Highway Traffic Safety Administration (NHTSA)

Simplifies Operation

Route planning

Timely informational rider announcements

Pickup and departure procedures

Robotic Research is one of America's artificial intelligence and automation leaders, with the proven ability to develop and deploy advanced robotic technology.

Built from decades of experience with the U.S. Department of Defense, its AutoDrive® autonomy kit was designed to tackle the industry's greatest challenges, from GPS-denied environments to mixed-traffic and unpaved roads. Partnering with Robotic Research furthers New Flyer's commitment to developing technology with the best expertise available.

Standards development.

Through the partnership with Robotic Research, New Flyer continues to collaborate with and support regulators and stakeholders on standards development and test protocols that integrate automated vehicles safely into the existing transportation system.

Looking to the Future

One day, fleets of automated buses like Xcelsior AV™ could not only improve road safety, they could improve commute times, increase energy efficiency and reduce congestion. Explore more of what AV technology can offer your city and learn what you can do now to plan for a safer future.

Visit newflyer.com/AV to learn more.

NEW FLYER

xcelsior AV™

newflyer.com/AV

VIC | VEHICLE INNOVATION CENTER

Learn more about this technology at the Vehicle Innovation Center
newflyer.com/vic