

THE ARTICULATED BUS

by FF Harry J. Oster, L-49

As the population of New York City continues to grow, MTA-NYCT buses have become a popular choice for people to move about the city. The MTA estimates that its buses currently average 1.5 million riders daily. Due to the large ridership and to help reduce overcrowding, the MTA introduced the articulated bus as a pilot program in November 1995. The pilot program was well-received and in March 1997, a fleet of 70 New Flyer D60HF (diesel/60-foot/hi-floor) articulated buses became the standard bus on the Bronx 1, 2 and 55 lines.

These buses occasionally are used on the Bronx 5, 9 and 41 lines, as well as the Manhattan 100 line. They are housed and serviced at the Kingsbridge Depot, located at 4065 Tenth Avenue, Manhattan. The new buses offer a superior tracking quality, which is an important safety concern of the MTA. This kind of bus is used nationally in the transit industry and can hold 145 customers, seated and standing. (The MTA has contracted for 260 new articulated buses, with delivery to begin in October 1999 and be completed in September 2000. At this time, the lines to which they will be assigned are unconfirmed.)

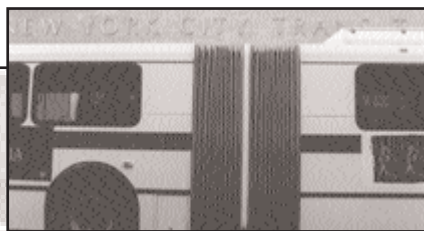
The "module" sections and distinctive-looking bellows

The two sections of the bus are referred to as "modules." The front module (30 seats, including two spaces for wheelchairs) can be referred to as the "leader" and the second module (28 seats) as the "trailer." There are also four seats located within the articulated joint area. The two modules are joined together employing a turntable principle, which allows the bus to pivot during use.

Enclosing the sides, top and bottom of the two modules is the distinc-



The MTA articulated bus, currently used in the Bronx and Manhattan. (Top inset) A close-up view of the articulated bellows. Note the carrier axle of the leader module. (Right inset) Blind spots can pose a problem for FDNY members operating at an incident that involves an articulated bus stopped on a turn. Consider posting a handie-talkie-equipped member to warn of oncoming traffic.



tive-looking, gray bellows or "accordion," which is made from a two-ply, vulcanized polyester that is about 1/32" (0.020") thick. The "pleats" of the bellows are reinforced with metal ply wire strands. If the bellows needs to be cut to gain access into the bus, a clean cut using a sharp knife can be made at any "fold" in the bellows. The folds are not reinforced with metal ply strands of wire. Measuring 60 feet long, 102 inches wide, 10 feet, eight inches high and weighing 41,000 pounds (which is distributed over the three axles), this bus requires a shorter turning radius when compared to the regular dual-axle bus.

Engine, fuel and axles

These buses are powered by a diesel engine and have no provisions for alternative fuels. For weight distribution, the 200-gallon fuel tank is located underneath the trailer module, just in front of the rear exit door. The tank spans the entire width of the bus and, therefore, also acts as a ballast. The tank is approximately 85 inches wide, 12 inches high and 42 inches from front to back.

The middle axle, located near the rear of the leader module, is referred to as the "carrier" axle. Its primary function is to support the weight of the bus in this area. The rear axle--located in the trailer module--serves as the drive axle for the bus.

Electrical systems

The bus has two electrical systems which, according to MTA authorities, contain no PCBs. One 12-volt system powers the exterior lights, while the second--a 24-volt system--provides power to all other electric controls and functions of the bus. Two 12-volt batteries are incorporated into the electrical system. For customer safety, the batteries are located in a compartment on the roadside center area of the trailer module.

To shut down these electrical systems in an emergency--which also will shut down the fuel supply, there are two electrical shut-off switches located within the battery compartment. A square "T" key carried by the MTA road crew is required to open this and other compartments on the bus. The operator does not carry this square "T" key and, therefore, does not have access to these switches. They are reserved for use by the MTA's road truck personnel upon their

all photos by Harry J. Oster

arrival. The battery compartment can be opened by FDNY personnel without the special "T" key simply by inserting a large slotted blade screwdriver into the key slot and turning the screwdriver about a quarter turn.

The operator, as well as members of the FDNY, easily can operate the singular starter cut-off switch, which is located behind the round "Engine Hours" gauge in an exterior compartment above the radiator door on the roadside of the trailer module. The small hinged door of this compartment currently does not require the use of any kind of key to open the door which, when opened, will allow access to the starter cut-off switch. This switch will not shut off the engine, but prevents the bus from being started.

Fire extinguishment, communication, emergency notification devices and other safety devices onboard

Fire safety equipment aboard the bus includes a five-pound dry chemical extinguisher located behind the operator's compartment and two heat sensors located in the engine compartment. If any one of the two sensors is activated, a warning device on the operator's console will light up and emit an audible sound. When this happens, the operator will pull the bus over to the side of the road, notify the MTA's command center (located in East NY) of the situation via the two-way radio onboard the bus and then discharge the customers from the bus.

If the operator is threatened or senses a customer disturbance aboard the bus, a flip of a finger switch from the operator's compartment activates a "silent" alarm to the command center. Once the signal is received at the command center, the police are notified for assistance. A "hoodlum" switch also can be activated via a foot switch, which will trigger the designation signs in the front, side and rear to flash "Emergency" and "Call Police or Cops" and will cause the front circular marker lights to flash. This will alert other bus operators and the police in the area that there is



(Top left) A view of the trailer's curbside door, compartment door for the fuel tank, accordion bellows. The raised portion of the roof is the area for the air conditioning condensing coil--not to be confused with the raised emergency roof hatches, which are much smaller.



(Bottom left) The operator's compartment. Note the five-pound dry chemical extinguisher behind the seat. The red seat belt under the seat is used to secure a wheelchair for the ride.

MTA Bus Glossary	
Articulated	To make a whole item via parts united by a flexible joint.
Bellows	The accordion material that encloses the sides, top and bottom of the module.
Carrier Axle	The middle, non-drive axle in the leader module used for support purposes.
Customer Curbside	A passenger. The right side of the bus, if sitting in the operator's seat.
Folds Hoodlum Switch	Creases in the bellows. A foot-activated switch which, when depressed by the operator, will cause the destination signs in the front, side and rear to flash "Emergency" and "Call Police" or "Cops." It also will cause the front circular marker lights to flash. This will alert other buses and the PD that there is trouble aboard the bus.
Leader Module	The front section (module) of the bus.
Operator Operator's Compartment	A section of the bus. Driver. The immediate area surrounding the driver's seat.
Pleats	Flat portions of the accordion bellows, which are reinforced with wire metal strands.
Roadside	The left side of the bus, if sitting in the operator's seat.
Trailer	The rear section (module) of the bus.

trouble aboard the bus and assistance is required.

If an emergency incident arises where a mass customer exit from inside the bus is warranted or any one or both of the two normal means of egress from the bus is not possible, customers can exit the bus through any one of the side windows. Exceptions to this are the one curbside window, which is blocked by the destination sign, the raised roof hatch located near the articulated joint of the leader module or the one raised roof hatch located in the trailer module. The leader module has two raised roof hatches. The first raised roof hatch, located toward the front, is for ventilation purposes only. Currently, there is no airbag for the operator nor any hydraulic impact bumpers on this bus.

Wheelchair lift and doors

Because of the hi-floor design, a wheelchair lift is required. The wheelchair lift is controlled by the bus operator from the operator's compartment via electronic switches and is integrated as part of the leader module's "curbside" door, opposed to being located in the rear curbside door on the regular buses. A manual wheelchair lift override switch is available for use by the MTA's road crew--not the operator.

The bus has a second door, which also is located on the curbside of the bus toward the center of the trailer module. A sophisticated safety interlock has built-in redundancy systems that will prohibit the bus from moving if the door in the trailer module is ajar. Only the operator physically monitors the door of the leader module for safety. However, both doors consist of two panels that open outward and to the side.

Air conditioning system on the bus

This system is rated at 16 tons and contains a total of 35 pounds of R-22 refrigerant. The high side pressure in the system can range from 190 to 230 psi @ 70 degrees Fahrenheit. The receiver contains the bulk of the refrigerant (in liquid form), has a pressure of 250 psi on all sides and is located at the condenser above the engine in the rear of the bus. The large raised portion of the roof on both sections of the bus contains the condensing coils for the system.

R-22 refrigerant (chlorodifluoromethane) is a colorless, liquefied, compressed, non-flammable gas. R-22 is relatively stable and non-hazardous when used as designed and in controlled situations; i.e., air conditioning systems. However, R-22 does become hazardous when the contents of a container or system are subjected to rupture or spillage under fire conditions.

If a person is exposed to and inhales the vapors of R-22 in high concentrations, potential harmful health effects may result. These effects may include heart irregularities, difficulty breathing, unconsciousness or death. Additionally, R-22 may cause frostbite if the skin is exposed to a direct spray. OSHA hazard communication rule (29CFR1910.1200) states that R-22 is considered to be a hazardous chemical.

As haz-mat refresher reference points, the NFPA hazard classification for R-22 is: Health (1), Flammability (0), Reactivity (1). DOT transportation information for R-22--Shipping Name: Chlorodifluoromethane; Hazard Class: 2.2; UN No.: 1018; and DOT/IMO labeled: nonflammable gas.

Operational considerations

The FDNY responded to one such incident on January 4, 1998, on the Grand Concourse at 151st Street in The Bronx. If the FDNY is called to another incident that involves an articulated bus, remember:

- Location of the batteries, fuel tank and the three switches (which will shut down the electrical systems of the bus and prevent the bus from being re-started).
- Consider the possibility of posting a handie-talkie-equipped member between the battery compartment and at the starter cut-off switch location to prevent any accidental movement of the electrical switches at these locations during an incident.
- If conditions warrant cutting the bellows (of the accordion joint), make the cut on a fold (crease) for a smooth cut, as opposed to cutting through a metal reinforced pleat, which generally will produce a rough, jagged cut.
- Be alert to the flashing destination sign and front circular marker lights, which indicate trouble aboard the bus. Approach the bus with due caution and relay this information to the fire department dispatcher.
- Because of the length of the bus, consideration should be given to posting a handie-talkie-equipped member at the rear of the trailer module to warn the operating members of any oncoming traffic. This is critical at an incident where the bus is positioned or is in the process of making a turn, which creates a blind spot just past the bellows.
- If the affected area involves the air conditioning compartment in the rear of the bus, operate in this area with caution,

due to the pressure and material in the system. Wear full bunker gear with eyeshields down. Also, note that on Material Safety Data Sheet (MSDS) # 2403, under firefighting measures, it states: "The use of an SCBA is recommended if containers rupture and contents are spilled under fire conditions."



(Top) Looking inside reveals the floor section of the articulated joint area, which contains four seats. (Above) Close-up view of the two switches inside the battery compartment. A flip of the switch to the right cuts the power. The switch on the left (red wires) is for the 24-volt system. The switch on the right (blue wires) is for the 12-volt system.

Conclusions

It is undetermined at this time when or what other lines or boroughs will place the articulated bus in service. Based on its performance, however, it appears that this bus will be around for a long time. When--and if--additional buses are purchased, it is still uncertain whether they will be powered by an alternate fuel, possibly including electric, or if they will contain any added safety features, such as an air bag for the operator or hydraulic impact bumpers.

Because these buses are new to firefighters, when arriving on the scene of an incident, members should perform a size-up and notice the different features this bus presents. This size-up can enable members to enhance operations, both during the current incident, as well as for the next time we are called upon to respond to an incident that involves an articulated bus.

Note: The writer's views do not necessarily reflect the views of other members of the FDNY nor other official agencies. It is equally important to note that this text is meant for informational purposes only. The writer thanks all MTA-NYCT staff members for their support with this article.

About the Author...

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