DEPARTMENT OF TRANSPORTATION | NEWS

URBAN MASS TRANSPORTATION ADMINISTRATION

WASHINGTON, D. C. 20591

FOR SUNDAY RELEASE
September 13, 1970

DOT -- 18990
Phone: (202) 426-4023

The initial technical reviews and baseline definitions have been published on the Urban Mass Transportation Administration's New Systems Program, a research project aimed at seeking to develop new modes of urban transit vehicles, UMTA Administrator Carlos C. Villarreal announced today.

The technical reviews, published by the John Hopkins University Applied Physics Laboratory (APL) of Silver Spring, Maryland, are evaluations of written definitions of 10 separate systems. The 10 systems evaluated were selected from 110 different proposed systems, all aimed at improving access to and movement through congested urban areas. The work was performed under a $500,000 UMTA grant to APL.

The proposed systems range from small, 6- to 30-passenger vehicles designed for flexible operation in dense urban cores, to larger vehicles designed for station-to-station speeds in excess of 100 miles per hour.

Administrator Villarreal said of the program's progress to date, "Our cities are in great need of new forms of urban mass transit, especially small, personal transportation vehicles which would be competitive with the private automobile. The New Systems Program was begun to develop just such vehicles as well as other, innovative forms of mass transit.

- more -

"However, although some models of these new systems have been built, none of the proposed systems exists as an operating reality; the full operational characteristics of each exist only on paper. Prototypical development is planned, and UMTA is considering sites at which to test certain of the smaller, low-speed systems.

"Rudimentary models of certain of the proposed systems have been constructed. But these basic working models differ sharply from their respective baseline definitions in that no computerized elements have been developed to operate the systems in actual urban settings.

"Our next step in the program is engineering--prototypical development and testing, to be carried out parallel with perfection of the written definitions, especially as these difinitions pertain to operational characteristics and command-and-control functions.

"We are considering at least three of these systems for further development, and we shall shortly announce the first development-evaluation site for at least one personal transit vehicle system.

"We are definitely going to move on development of new systems. But it is now time to move on engineering, to start ironing out problems in operating situations."

Dr. Robert A. Hemmes, UMTA Assistant Administrator for Program Demonstrations, elaborated on the findings: "In addition to operational problems, there is the cost factor. It will cost in excess of $3 million to get the one system built and running on a basic test scale, and upwards of $20 million to get one operating on a full-time but small-scale basis in an urban environment.

"Taking developmental and economical factors together, then, it could be 20 years before these systems are in full operation in an urban environment. This estimate is based on a normal pattern of evolutationary development. Naturally, the time frame could be considerably shortened--perhaps by as much as 10 or even 15 years-if some community chooses to invest the technology and money--especially the latter--in a crash development-implementation program.

"For the time being, however, 'tomorrow's transportation' is still for tomorrow."

Ten "baseline definitions" written under sub-contract to APL by the system developer-manufacturers describe the systems' operations and physical features.

Two additional volumes evaluate the systems individually, and one provides a summary review of the state of the art of new transportation system and component development. These three reports were prepared by APL.

The reports neither compare the systems with one another nor recommend construction at particular locations, but rather assess the technological maturity of each system, identify technical problems of each and recommend paths for further development.

No consideration is given in these reports to continuous or "moving way" systems such as moving sidewalks and continuous-loading vehicles, generally much simpler in concept and structure and providing a far different type of service than is contemplated by the 10 vehicle systems.

Parallel work within the UMTA's New Systems Program is being conducted in the development of these moving way devices.

Two generic types of New Systems are reported on: Fast Transit Link (FTL) Systems and Circulation and Distribution (C&D) Systems. The FLTs are high-speed and high-capacity vehicles designed for service between major activity centers or population concentrations. They are similar to present rail rapid transit systems in their operating modes, but are meant to be superior in level of service provided, speed, comfort and operating flexibility.

The C&D Systems, on the other hand, are designed to carry passengers at somewhat lower speeds over shorter distances within dense urban areas, where individual origins and destinations may be randomly scattered. A chief design characteristic of the C&D Systems is their short headways (time spacing between vehicles), making possible movement of large numbers of people with little-to-no waiting at stations.

Further work needs to be done before any of these systems can be installed in a city such as:

-Design of reliable, reasonably priced control systems, especially for operation under close headways.

-Design of automatic communications and control systems which are not sensitive to electrical noise.

-Development of "hybrid" versions of C&D systems which can operate both on set schedules and on "on-call" demand-activated routing, depending on time of day and overall service demands.

-More careful analysis of vehicle-guideway dynamics. Ride quality is very dependent on how the guideway flexes, bends and twists as vehicles travel over it.

-Establishment of switching systems compatible with the short headways between vehicles.

-Refinement of the linear induction motor (LIM) as a propulsive device.

The LIM is a unique electric motor in which electro-magnetic forces act between a coil in the vehicle and a fixed secondary conductor in the guideway (or vice-versa) which allows vehicles to be lighter and less complex. The motor propels the vehicle without mechanical traction, thus eliminating conventional gear-boxes, drive shafts, and so forth. It is also noiseless and largely pollution-free.

The FTL Systems and their evaluations include:

-- Aerial Transit System, by Aerial Transit Systems, Inc., of Torrence, California. A pneumatic-tired vehicle suspended below a flexible I-beam, the I-beam in turn being connected to a series of pylons. The system has a design speed of 120 miles per hour. Two versions have capacities of 50 and 80 persons per vehicle. Unlike the other systems, ATS would employ a driver/operator in the first simple installations.

The APL technical evaluation of Aerial Transit noted several development requirements, particularly vehicle-guideway dynamics and ride stability, aerodynamics, switch capability, esthetics (the system resembles high-tension towers and lines) and maneuverability through crowded areas such as between skyscrapers. Aerial Transit Systems, Inc. is engaged in an engineering study for a prototype.

-- Aerial Transport System, by General Electric Co., of Erie, Pennsylvania. A pneumatic-tired vehicle suspended from double trucks running inside an inverted U-channel, with a design speed of 75 miles per hour and capacity of 55 persons. It evolved from the French Safege Monorail system.

The technical evaluation noted that the system is within state-of-the-art in mass transit capability and should present no major problems in implementation "other than those normally involved in the introduction of new equipment." The report said that high electrical noise could cause communications interference and also questioned aesthetics, noting it was in essence an elevated train.

-- Scherer Monobeam System, by Scherer Monobeam Co., of Studio City, California. A tubular vehicle suspended from the side of an elevated box-beam, with a design speed of 75 miles per hour and capacity of 106 persons.

The technical evaluation noted that the concept of side-suspension was unique, allowing such advantages as a low design profile and attachment to the side of buildings. Weaknesses noted included limited entry and exit (one side only), need for load-leveling devices

The FTL Systems and their evaluations include:

-- Aerial Transit System, by Aerial Transit Systems, Inc., of Torrence, California. A pneumatic-tired vehicle suspended below a flexible I-beam, the I-beam in turn being connected to a series of pylons. The system has a design speed of 120 miles per hour. Two versions have capacities of 50 and 80 persons per vehicle. Unlike the other systems, ATS would employ a driver/operator in the first simple installations.

The APL technical evaluation of Aerial Transit noted several development requirements, particularly vehicle-guideway dynamics and ride stability, aerodynamics, switch capability, esthetics (the system resembles high-tension towers and lines) and maneuverability through crowded areas such as between skyscrapers. Aerial Transit Systems, Inc. is engaged in an engineering study for a prototype.

-- Aerial Transport System, by General Electric Co., of Erie, Pennsylvania. A pneumatic-tired vehicle suspended from double trucks running inside an inverted U-channel, with a design speed of 75 miles per hour and capacity of 55 persons. It evolved from the French Safege Monorail system.

The technical evaluation noted that the system is within state-of-the-art in mass transit capability and should present no major problems in implementation "other than those normally involved in the introduction of new equipment." The report said that high electrical noise could cause communications interference and also questioned aesthetics, noting it was in essence an elevated train.

-- Scherer Monobeam System, by Scherer Monobeam Co., of Studio City, California. A tubular vehicle suspended from the side of an elevated box-beam, with a design speed of 75 miles per hour and capacity of 106 persons.

The technical evaluation noted that the concept of side-suspension was unique, allowing such advantages as a low design profile and attachment to the side of buildings. Weaknesses noted included limited entry and exit (one side only), need for load-leveling devices

in both the vertical and horizontal directions, switching limitation to one direction and increased loading friction and wear. The report suggested construction of a scale model prototype to test overall system dynamics.

-- Gravity Vacuum Transit (GVT) System, by Tube Transit Corp., of Palo Alto, California. A highly-unusual concept, a cylindrical "train" traveling on rails powered and braked by a combination of gravity and pneumatic pressure in evacuated tubes, either underground or above, with a design speed of up to 250 miles per hour, vehicle capacity of 80 persons (trains could carry up to 1600 people) and minimum headways of from one to three minutes.

The technical evaluation noted that while the GVT was technically feasible, there were several major problems, including the control system, wheel-rail interaction, suspension dynamics and rail alignment. The report especially singled out the severe engineering tolerances (only an inch-and-a-half clearance between inner tube wall and outer train skin) inherent in any construction.

This tight clearance would necessitate extremely tight wheel-rail adhesion, with virtually no "play." Tube Transit's own definition noted that track smoothness would have to be 10 times greater than on Japan's famed Tokaido rail line, built from the ground up and carefully maintained to be the smoothest railroad in the world.

The C&D Systems and their evaluations include:

-- Varo Monocab System, by Varo, Inc., of Garland, Texas. A six-passenger vehicle suspended from above by rubber tires riding in an inverted U-channel, with a cruise speed of 34 miles per hour, top speed of 68 and headways of from three to seven seconds. The Varo system is one of the "people movers" under testing for the Dallas-Fort Worth Regional Airport.

The APL technical review noted development requirements in the unit's command and control system, vehicle-guideway dynamics and on-board switching (unique, in that an "arm" in the vehicle reaches out to a new track to effect change of direction, rather than a switch mechanism in the guideway moving the vehicle to a new track).

The primary problem cited was vehicle control. Varo envisaged a series of simplified blocks, similar but on a smaller scale to railroad block systems, with each vehicle automatically slowing when its headway, measured in blocks, decreased, then accelerating when the headway increased.

The review said this would cause too much "pulsing" (deceleration-acceleration) with headways of just a few seconds, and suggested that Varo either refine the system or develop a different control method. A redesign has been undertaken by Varo.

-- Vehicle Distribution System (VDS), by Westinghouse Electric Corp., of Pittsburgh (similar to Pittsburgh's Transit Expressway "Skybus" system). A 45-mile-per-hour vehicle riding on rubber tires over a concrete guideway, with a capacity of from 25 to 35 persons and headways of 40 to 60 seconds.

No major problems were noted other than potential communications interference resulting from electrical noise generated by propulsion and power collection equipment.

-- Transtech System, by Transportation Technology, Inc. (TTI), of Madison Heights, Michigan. A six to twelve passenger, 20 to 60 mile-per-hour tracked air cushion system with headways of 3 to 10 seconds. It is the only system among the 10 designed to operate with the linear induction motor and air cushions. Working prototypes of this system have been demonstrated as low speed 6- and 12-passenger models.

The technical review stressed the use of the LIM propulsion concept (noting such power plants are especially suitable to such low-speed urban vehicles) and the air cushion concept. The review also cited TTI's "docking" technique at stations, in which individual cars move laterally off and onto the main line at designated stops. Cars can move at will to and from stations -- providing "random access" to system-routes-- limited only by the number of available "docks" and not by presence of other vehicles in a station.

The review noted that additional computer software development is necessary before the system can be operational. Considerable

The primary problem cited was vehicle control. Varo envisaged a series of simplified blocks, similar but on a smaller scale to railroad block systems, with each vehicle automatically slowing when its headway, measured in blocks, decreased, then accelerating when the headway increased.

The review said this would cause too much "pulsing" (deceleration-acceleration) with headways of just a few seconds, and suggested that Varo either refine the system or develop a different control method. A redesign has been undertaken by Varo.

-- Vehicle Distribution System (VDS), by Westinghouse Electric Corp., of Pittsburgh (similar to Pittsburgh's Transit Expressway "Skybus" system). A 45-mile-per-hour vehicle riding on rubber tires over a concrete guideway, with a capacity of from 25 to 35 persons and headways of 40 to 60 seconds.

No major problems were noted other than potential communications interference resulting from electrical noise generated by propulsion and power collection equipment.

-- Transtech System, by Transportation Technology, Inc. (TTI), of Madison Heights, Michigan. A six to twelve passenger, 20 to 60 mile-per-hour tracked air cushion system with headways of 3 to 10 seconds. It is the only system among the 10 designed to operate with the linear induction motor and air cushions. Working prototypes of this system have been demonstrated as low speed 6- and 12-passenger models.

The technical review stressed the use of the LIM propulsion concept (noting such power plants are especially suitable to such low-speed urban vehicles) and the air cushion concept. The review also cited TTI's "docking" technique at stations, in which individual cars move laterally off and onto the main line at designated stops. Cars can move at will to and from stations -- providing "random access" to system-routes-- limited only by the number of available "docks" and not by presence of other vehicles in a station.

The review noted that additional computer software development is necessary before the system can be operational. Considerable

developmental effort on the advanced component technologies is also cited as prerequisite to practical implementation.

-- Sky-Kar Transivator System, by Sky-Kar Corp., of Fort Worth, Texas. A pneumatically-tired vehicle suspended from a steel I-beam, with a cruising speed of 15 miles per hour (maximum: 60) and 12-passenger capacity operating on 5-second headways.

The technical review found several development requirements in the system, including communications and control facilities, lateral stress, resistance of the guideway and supporting pylons (as to crosswinds and centrifugal forces), and switching time under the short headways.

The review recommended that operational strategy be further developed.

-- Alden Capsule Transit System, by Alden Self-Transit System Corp., of Bedford, Massachusetts. A rubber-tired vehicle operating in a tracked guideway at cruise speeds of 15-40 miles per hour and maximum speed of 60, capacity of 15 persons and operating headways of 1.6 seconds. At 15 miles per hour it is designed as a "demand-responsive" system.

The technical review found the system's main problem to be lack of sufficient computer software programming for system management and control, and recommended that such software be developed and tested.

-- Dashaveyor System, by Dashaveyor Co., of Los Angeles, California. A pneumatic-tired system designed to operate on a dual-rail guideway at speeds of 30 miles per hour, with capacities of from 30 persons at headways of 35 seconds. It is presently undergoing extensive redesign, centering upon vehicle control, suspension and the propulsion subsystem. Dashaveyor is also under consideration for the Dallas-Fort Worth Regional Airport transit application.

For simple shuttle applications, the technical review found Dashaveyor to be essentially state-of-the-art, offering no major

technical problems other than those normally associated with the introduction of new equipment.

The baseline definitions and technical reviews, published in 13 separate volumes, are available at $3.00 per bound copy or 65 cents per microfiche copy from the Clearinghouse of Federal Scientific & Technical Information, Springfield, Virginia 22121. Volume ordering numbers and titles are:

(Baseline Definitions) PB 192-727, Sky-Kar Transivator System; PB 192-728, The Varo Monocab System; PB 192-734, Dashaveyor Transit and Cargo Systems; PB 192-737, Alden Capsule Transit System Control Subsystem; PB 192-738, A Westinghouse Vehicle System for Major Activity Centers; PB 192-739, Transportation Technology Distribution System for a High Density Urban Area; PB 192-729, Scherer Monobeam Suspension Concept of Mass Transportation; PB 192-730, Urban Gravity-Vacuum Transit System; Mark 4B and 3B Baseline System Definitions; PB 192-736, Gravity-Vacuum Transit System; Baseline Definition of Airport Access and Corridor Systems; PB 192-732, General Electric Aerial Transport System; PB 192-733, Baseline System Definition: The Aerial Transit System.

(Technical Evaluations) PB 192-731, Technical Evaluation of Advanced Urban Transportation Systems: Summary Report; PB 192-758, Fast Transit Link Systems: Technical Review of Four Baseline Definitions; PB 192-759, Collection and Distribution Systems: Technical Reviews of Six Baseline Definitions.

Also relevant and available: PB 188-984, Parametric Analysis of General Urban Transit Systems; PB 190-402, Acceleration and Comfort in Public Ground Transportation; PB 192-257, Human Sensitivity to Whole-Body Vibration in Urban Transportation Systems: A Literature Review.

For further information, contact:

Mr. Franz Gimmler, Project Director
New Systems Program
Urban Mass Transportation Administration
U.S. Department of Transportation
Washington, D.C. 20590

#####

technical problems other than those normally associated with the introduction of new equipment.

The baseline definitions and technical reviews, published in 13 separate volumes, are available at $3.00 per bound copy or 65 cents per microfiche copy from the Clearinghouse of Federal Scientific & Technical Information, Springfield, Virginia 22121. Volume ordering numbers and titles are:

(Baseline Definitions) PB 192-727, Sky-Kar Transivator System; PB 192-728, The Varo Monocab System; PB 192-734, Dashaveyor Transit and Cargo Systems; PB 192-737, Alden Capsule Transit System Control Subsystem; PB 192-738, A Westinghouse Vehicle System for Major Activity Centers; PB 192-739, Transportation Technology Distribution System for a High Density Urban Area; PB 192-729, Scherer Monobeam Suspension Concept of Mass Transportation; PB 192-730, Urban Gravity-Vacuum Transit System; Mark 4B and 3B Baseline System Definitions; PB 192-736, Gravity-Vacuum Transit System; Baseline Definition of Airport Access and Corridor Systems; PB 192-732, General Electric Aerial Transport System; PB 192-733, Baseline System Definition: The Aerial Transit System.

(Technical Evaluations) PB 192-731, Technical Evaluation of Advanced Urban Transportation Systems: Summary Report; PB 192-758, Fast Transit Link Systems: Technical Review of Four Baseline Definitions; PB 192-759, Collection and Distribution Systems: Technical Reviews of Six Baseline Definitions.

Also relevant and available: PB 188-984, Parametric Analysis of General Urban Transit Systems; PB 190-402, Acceleration and Comfort in Public Ground Transportation; PB 192-257, Human Sensitivity to Whole-Body Vibration in Urban Transportation Systems: A Literature Review.

For further information, contact:

Mr. Franz Gimmler, Project Director
New Systems Program
Urban Mass Transportation Administration
U.S. Department of Transportation
Washington, D.C. 20590

#####