HELP ATRA ADVANCE IN 2015

transit pulse

Automated Transportation Networks www.advancedtransit.org www.podcar.org Produced by Trans.21

News of Advanced Transit

ATRA is an organization of members who are encouraged to invite friends, neighbors and colleagues to join ATRA and may share a copy of TransitPulse on a one-time basis.

November/December 2014

FUND RAISING TIME FOR ATRA

by Stan Young, President

It has been another active year for Advanced Transit. From the Automated Transit Network front, PodCarCity 8 exhibited current capability and explored more robust use with ride-sharing for increased capacity. Discussion and application studies are at an all time high. The synergism with automated vehicles was discussed and explored at length at the Automated Road Vehicle Symposium in San Francisco, catching the attention of the 'traditional car makers', and initiating a discussion to broaden the thinking of the automotive world.

This was strengthened at the ITS World Congress in the fall, with many automated concept vehicles looking like, and operating similar to Pod vehicles. Princeton has announced a research center at Fort Monmouth dedicated to harnessing automated vehicle technology for public mobility and plans to tackle issues beyond technology, issues that require the coordination of multiple players to set policy, standards, and commercial business models into action.

Contribute to a Better 2015

ATRA has been an active and vital player in all these. We look forward to 2015 to continue to help shepherd automation into public mobility. We will continue with traditional activities, starting with the Technix meeting on Saturday January 10 at the University of Maryland CATT facility, conveniently accessible by metro. Technix will be lively as well as informative, managed by Reuben Juster. Our annual business meeting will take place Sunday evening, January 11, likely at UMd.

ATRA plans to make TransitPulse more electronic and sharable in 2015. Submission of articles or announcements for publication by ATRA members and their friends are welcome. In general, ATRA will emphasize, as it has since its founding in 1976, a broad scope of Advanced Transit to include ATN, APMs, driverless metros, and automated vehicles as public mobility.

IN THIS ISSUE

ATRA Treasurer Tony Newkirk was re-inspired by PCC8 and the demo vehicle at the Ice-Breaker, and smiles at prospects for 2015 if we have ample funds.

ATRA needs your support for all these activities in 2015. Be sure to renew your membership promptly, and consider a donation. Stan Young and Alain Kornhauser have each pledged to match your donations (up to $500 on their part.). Donations received prior to Dec 31, 2014 are eligible for tax deduction to a charitable (501C3) organization in the US.

Help make 2015 yet another high-water year for automated transit.

176 OPERATING APMs

As 2014 comes to a close, the number of APMs in service around the world jumped six to 176. These projects reflect a global diversity in which, sadly, the US plays a peripheral role. Only one of the seven new projects (another stopped service, bringing the net gain to 6) is on American soil - in Oakland, California, shrouded in controversy and high costs.

In 2014 APM ridership jumped nineteen percent from 8.8 to 10.5 million passengers. In this statistic too, the US is a minor player. The 2014 APM databases are available to ATRA members as excel files upon request. Email *lfabian21@gmail.com*.

The Class of 2014 includes exotic propulsion in airport districts — maglev in Korea, pneumatic in Brazil, and monorail in Italy. These airfront applications now provide dependable and efficient APM service on the landside of airports — links to parking, rail and airport-dependent commerce such as parking, car rentals, hotels, convention and show facilities, and related office and logistics space.

One of the new APMs links rail to the airport in Porto Alegre, Brazil.

Driverless Metro Expansions

Another three of the 2014 APMs are driverless metros — a sector that has gained a global momentum all its own. The English-speaking transit world is late to catch on — but London wants to retrofit its Tubes. In an art that the French have mastered, driverless metros are happening all over the world, increasingly with Chinese accents. It is even happening quietly in off-shore America in what may someday be called Honolulu's *Obama Line*.

It was not an impressive year for PRT. No new services started. Nor are new projects underway. The robocar service in La Rochelle, France, stopped but an expande demo will start next year. A cable-drawn APM by Austrian Doppelmayr began service in a neighborhood of Caracas, Venezuela.

Airfront Diversity

The airfront APMs are a varied trio. The 5km link between the San Francisco Bay Area Transit to Oakland Airport to a BART regional rail station is one. This controversially expensive project has faced strong union protests. Fares too will be high. The hardware by Doppelmayr was not overly expensive, but projects costs were high. The 4km airfront APM in Brazil uses *Aeromovel* pneumatic propulsion developed by elevator company Coester. The third is a 6.1km maglev by Hyundai-Rotem at Incheon Airport in South Korea. Two landside APMs in Italy are being supplied by Swiss supplier Intamin (Bologna, 5km) and Italian supplier Leitner (Pisa, 1.9km).

TECHNIX 2015

Next year's Technix — the annual mini-conference before the annual Business Meeting — will take place on Saturday, January 10 at the University of Maryland's CATT facility, located a short but confusing walk from the College Park metro station. Registration for current ATRA members is $35. For non-members it is $60. Visit *www.advancedtransit.org*.

Doors will open at 9:30am. The program of interesting news from advanced transit advocates, professionals and enthusiasts starts at 10am. Lunch and beverages are included in the registration. Dinner plans usually happen spontaneously.

President Stan Young will open at 10 am sharp with a welcome to get things started on time and keep them on track. Program Director Reuben Juster is organizing a day full of interesting ATRA stuff. If you would like a time slot, email him at *rmjcar@gmail.com*.

What will ATRA Chair Alain Kornhauser have to say at Technix 2015?

PARLEZ-VOUS 'PODCAR'?

The world of advanced mobility spoke Swedish-accented English early last September at PCC8 at Arlanda Airport. Where were the metro-loving, transit-exporting French in these exchanges?

By Lawrence J. Fabian

ATRA was a major presence at the 8th *Podcar City* conference in Stockholm (Sept 3-5), which emitted strong signs that PRT (*aka* ATN, podcars, GRT and perhaps dual-mode systems) is now a serious contender for urban transit implementations. The numbers at the event were small, but the interactions were intense. PRT seems on the verge of getting long overdue public support and private funds.

The huge Green activist march in New York City on Sept 21 — timed just before a UN Summit on Climate Change — further fertilized the ground in which PRT interest can grow. Seeking ways to reduce carbon emissions, PCC8 was themed as *To the next level!*, and indeed, podcar discussions were at a high analytic and political level. Bravo to chairman Magnus Hunhammar, director of the Institute for Sustainable Transportation (IST) and to Hans Lindqvist, chair of the association of Swedish municipalities moving to embrace PRT solutions known as Kompass!

Modest Implementations Within Reach

One PCC8 session dealt with the newly released assessment of the Automated Transit Network *industry* by San Jose State University's Mineta Transportation Institute. The USDOT report was internally and externally reviewed, and affirms that ten-station PRT projects are within technological reach. A live hook-up to San Jose with three of the research team who were at PCC8 made this clear. The report is available at *http://transweb.sjsu.edu/project/1227.html*.

PRT developers *Ultra* and *Vectus* were also actively present in Stockholm's Arlanda gathering in early September, along with Chinese newcomers to the podcar scene. *Tubenet* impressed all with their future-embracing outlook and Asia-scoped plans and strategies. Swedish consultant and ATRA vice president Ingmar Andreasson wowed the largely Swedish-US gathering with quantitative analysis indicating that

PRT capacities can be boosted to levels more comfortable for transit officials.

Tubenet's designs use quite small vehicles that can operate at three "tiers" — 40, 60 and 80 km/hr — coming from a country where transit is in boom mode. *Tubenet* vehicles are suspended from overhead guiderails that have solar collectors atop. The plan includes a 4km, 12-station test line running in 3 years based on existing vehicle and guideway prototypes. A metro-wide 446km network has been simulated for the ancient city of Xian (population. 4m).

Hans Lindqvist (left) listed to a comment from Ron Swenson (middle) as Peter Muller (right) ponders the Ice-Breaker at PCC8.

No one from France participated in PCC8. Podcar visionary Christer Lindstrom, whose French mother taught him the *belle langue*, was perhaps the closest thing. France prides itself on innovative transport and earns lots of foreign currency planning, building and operation metros and bus systems. How *triste* (sad in French, German, Swedish, etc. from Latin) that no one from France or Germany is paying attention to PRT potentialities.

Political Questions and Challenges

The Swedish Transportation Administration's Chief Strategist Bo Olsson took an objective standpoint, and advised that taxi-sized vehicles as typically envisioned for PRT are not necessarily optimal for urban mobility needs. Larger vehicles make good sense in thinking out our future modal priorities. Olsson also cautioned that PRT guideways are a negative due to their costs and aesthetics.

The venue for PCC8 near Stockholm's Arlanda Airport.

Clear at Arlanda was that the mainstream transit world - engineers, planners, contractors and operators - is still largely dismissive of PRT. None of them were at PCC8. They are busy with the world-wide metro boom which is increasingly driverless. Many Swedish civic leaders think of PRT as "science fiction". Their European and American counterparts do too. The big difference is that in Sweden, officials have a qualitative and quantitative grasp of what PRT is. In the US, by and large, they haven't a clue.

Crystallizing Interest

Sweden's sophistication with PRT is based on elaborations of analysis and simulations. Goran Tegner is a major leader in such work, and he pointed out that despite massive subsidies, the share of conventional rail and bus transit is stagnant. Andreasson's new research mentioned earlier indicates that PRT capacities can be boosted by use of coupled, larger vehicles, each trip scheduled to 2 or 3 stations during peak hours. For a California city, a 48 km, 50-station network can distribute 13,400 in an hour from a regional rail station (link capacity 6000pphpd).

Dozens of Swedish municipalities and institutions are working to advance PRT visions. Two new ones popped in at PCC8 — Stockholm suburbs Sundyberg and Botkyrka. The plan for Uppsala that was "frozen" last year, is not dead. EU officials have asked why an application for funds has not been submitted. Meanwhile this university town of 200,000 residents is studying streetcar options.

PCC8 ended with a clear proclamation that public officials can plan and implement better mobility options with confidence. The ATRA contingent and MTI report support this in a American context. Will the message echo in France?

ATRA ACADEMICS

Several years ago ATRA formed an Academic Research Committee. In 2014 this effort is moving forward as an Academic Council (AC). Its vision, mission and membership fees and benefits are listed below. If you are an educator or have an affiliation with an institution, you are urged to join AC and its activities seeking new paths forward for automated mobility in our society.

If not, pass it on to a friend of colleague, or neighbor who is.

AC Activities

At the generous behest of the the family of Martin Lowson, a student paper award has been established. AC is administering this. Stay tuned for request for papers. For more information, visit *http://www.advancedtransit.org/library/news/first-annual-martin-lowson-paper-award/*.

In 2014, AC encouraged ATRA to donate $2,000 to the students at San Jose State Univ. taking their *Super Solarway* thinking and designs into mockups. AC has participated in all three of the annual TRB/AUVSI Automated Vehicles symposia, organizing transit and shared mobility breakout sessions. This past summer AC added transit themes to many breakout sessions.AC also contributed to a workshop organized by UCDavis and others with a focus on MPOs need relative to new automated technologies.

The general goal of the AC is to be an active, worldwide forum of researchers interested in the study and development of automated transit. AC hopes to issue problem statements, generate proposals, pursue grants, and conduct research. Depending on member contributions, AC may also write critical reviews of academic articles, experiments and tests, and data collection and analysis.

In the long run, AC could establish a research center for experimentation, analysis, testing, and documentation with a library of ATN literature.

Charter Members

University of Maryland, United StatesPrinceton University, United StatesUniversity of Bologna, ItalyMineta Transportation Institute, United StatesSouthern Illinois University, United States.

Students at San Jose State University received $2000 from ATRA (and $1000 from CPRT) to support their solar PRT research.

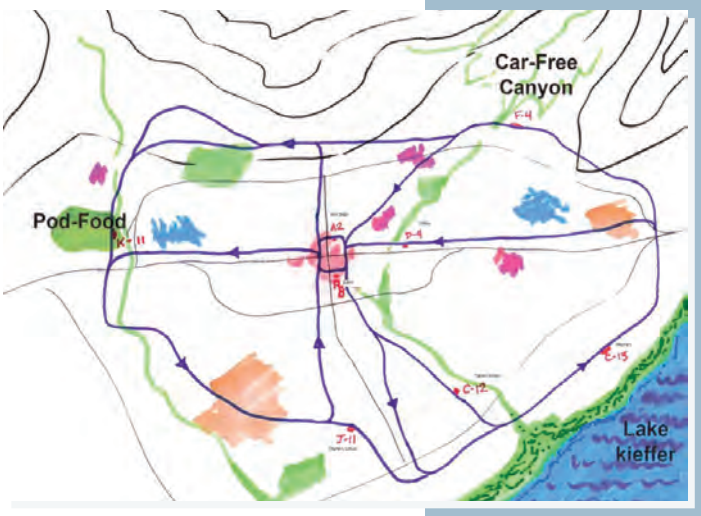
The fee is $500 per year, which includes five individual ATRA memberships (faculty and staff, plus students), worth $250. The benefits of individual ATRA membership ($50/year) are:

— issues of *TransitPulse* - perhaps as a monthly ATRA Pulse in 201
— discounted fees at ATRA events, such as Technix, and other
— discounts on subscriptions to the ***J. of Adv Transportation***
— access to ATRA papers, documents, studies, and website
— friendship and camaraderie with like-minded people
— satisfaction in helping advance urban transit and life

If you would like to join or already are a member of ATRA and interested in joining AC, please email *smcdonald@siu.edu*.

THERE IS NO PLANET B!

American tree-hugger Bill McKibben can take pride in the "landmark" global climate wakeup call that he and countless others put on September 21 in New York City. The message was loud and clear: it is time to put the burning of fossil fuel into our past! The establishment media gave almost no coverage to the March before the event. It reminded many of the disconnect between that same "establishment" and anti-war protests over Vietnam before ATRA was formed in 1976.



Green lifestyles centered on advanced transit can reduce carbon emissions and slow global warming.

Global Political Attention

The high-level September 23 UN Summit on Climate Change was attended by Secretary Ban Ki-Moon. President Obama and scores of other heads of state from every continent. The Summit identified three areas needing immediate attention for consideration in a treaty to be finalized and signed next fall in Paris. In the US, it would then need Congressional ratification and ink on paper. Preservation of tropical forest and better ways to grow and prepare food are two of them.

The third priority deals directly with transportation. Perhaps disappointing to many PRT promoters, it does not call for R&D to demonstrate podcars or ATN or whatever label you prefer. It calls for electric vehicles - 30 percent of those sold by 2030 - and undefined public transport improvements.

The moneyed Rockefeller Foundation got almost as much attention from New York media when it announced just before the Climate March its decision to dump stocks in companies that pollute to peddle fossil fuels. Vermont and many universities are moving in that direction. The long-term goal is to sever the future from those who make profit on fossil fuels. That will lead to a better future with all electric transport, much of it on guideways that are really long electric plugs.

Planet A, We Love You!

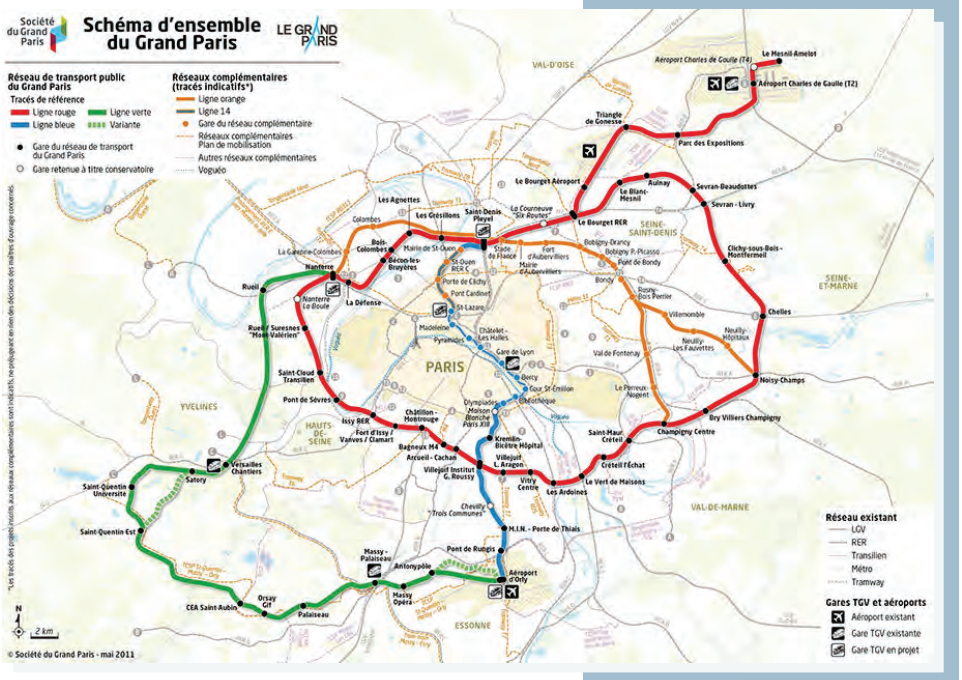
ATRA has always focused on Planet A. Our work is cut out for us. The immediate focus in Washington is on shoring up the Highway Trust Fund ($206 billion over four years, with $72 billion for transit and $19 billion for HSR) in the yet to be

enacted Green America Act proposed by the White House. Where are ped/bike and ride-sharing projects? What promises are there for *advanced transit* programs?

Raising the gas tax is an obvious remedy that makes sense to economists but not to politicians. In the long run, we all know that Planet A gets lots of sunshine. Electric transport without the awkward need for batteries has a role to play. ATRA - it's time to mobilize.

LONDON'S GREAT CATCH-UP

Transit leaders in Paris can brag that they cut staff needed to run Line 1 from 250 when it was in classic mode with drivers (or operators or conductors) aboard each train. The driverless metro needs a staff of only 40 now that it has been retrofitted with full automation — UTO - or Level-4 CBTC. In London unions are kicking and groaning about an order of new Tube cars that are capable of unmanned operation, maybe by 2030.



In London, leaders are excited about *CrossRail* — a mega-project to create express east-west service for Greater London.The numbers are big and stations may well turn out architecturally superb. Paris did this thirty years ago with the first RER line. There are now three *lignes* of the *Reseau Expres Regional* (regional express network) elaborated with several branches.

Feeding Metros

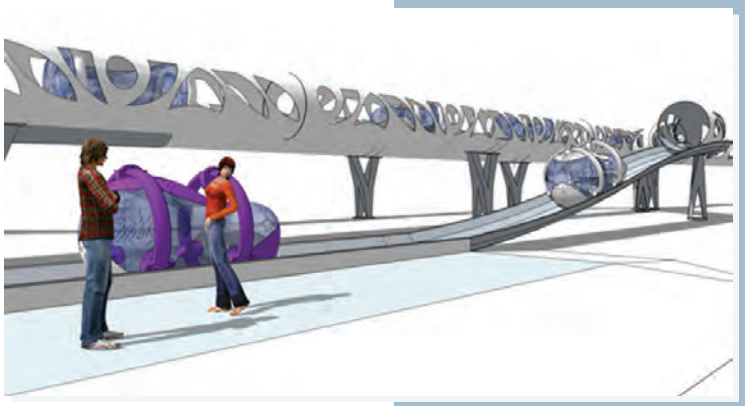
London can rightly boast an outstanding advanced transit network in the Docklands. Known as the DLR, this highly automated service has grown in synch with major office towers and residential districts in the former port district. One wonders why there isn't more attention to DLR-like projects elsewhere around the English capital, maybe some with *Ultra* PRTs.

Paris, meanwhile, is charting out a grand transit-oriented future diversified by a driverless metro ring (and more) known as Grand Paris - usable in both French and English. Actually, it is a bit better in English. In French it means Big Paris, while in English is conveys a tone of grandeur.

Maybe in thirty years, Greater London will start building a circumferential rail around its core, and maybe even be bold enough to make it driverless. Aspiring transit professionals might do well to pass up $5000 "degrees" by London-based purveyors of 20th century expertise. They can get $3000 equivalents with better food in Paris or Lyon!

A PEEK AT SUNCHEON

At PCC8 last September in Stockholm, Johan Englund of Noventus, gave a peek at the Vectus PRT that is now in service in a nature preserve in Suncheon, South Korea. Noventus is the Swedish firm that developed the controls for Posco, parent of Vectus, which is now apparently inactive, even — according to an outside source — disbanded.



Suncheon may not be as sexy as in the Suyzer design shown here, but it is in service.

England had a video-laden powerpoint and spoke with great intelligence. But also with great caution due to the complications of multi-cultural undertakings. The vehicles look surprising tiny, and slug along rather slowly over the oven stretch of wetlands at speeds of up to 40km/hr — about 25mph. Link capacity was given as 2000-3000 passengers per hour. The Suncheon PRT is not a network: instead a long shuttle with two stations. An average of twenty vehicles is in use. To date there was only one vehicle breakdown.

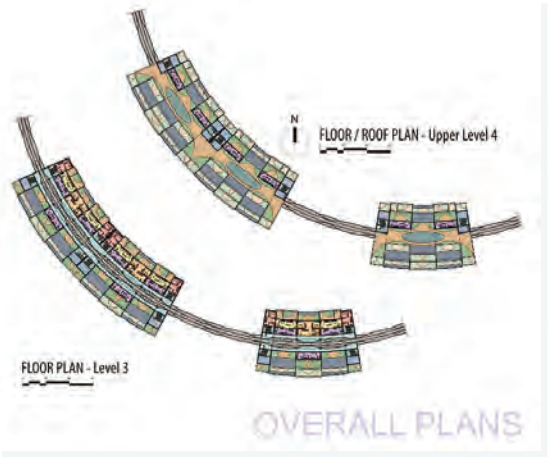
Vehicle bogies and electronics were designed, assembled and integrated in Sweden. They shipped to Korea in February, 2013. Englund declined to comment on this article, or to add more.

CRAFTING TOMORROW'S AIRFRONT

SIU Masters Students and Arlanda's Drive Lab District

In the spring of 2014, Southern Illinois University Masters of Architecture students took on Swedish challenges with urban and architectural designs as part of a studio project. They focused on the DriveLab area near Stockholm's Arlanda Airport as part of a larger look at airfront development strategies. This was done in close collaboration with Magnus Hunhammar, director of INIST (International Institute of Sustainable Transportation), who provided documents, photographs and participated in several critiques of the students work throughout the semester via Adobe connect.

The SIU student work was also reviewed by professional architects in Saint Louis. The concepts for Arland'a DriveLab area were well received. One student, Adnan Omerigic won a $4,000.00 scholarship from the St. Louis AIA Chapter. Their designs were also presented by Shannon McDonald at PCC8. The student work was being included in a report being prepared by Hunhammer.



Channeling Airfront Development

Airport expansion plans included six off-airport areas designed to relate better to economic development opportunities present because of proximity to Arlanda. DriveLab was chosen as an interesting research area for future mobility, located near a future train station. It is midway between the town of Marista and Arlanda. How new mobility could be implemented in a new urban district focused on sustainability was much discussed and explored. Each student was asked to design a housing, hotel, or research lab building that fit into their team master plan.

The master plans ranged from a campus concept to an entirely movable city focused on solar energy, but most addressed issues of public spaces and architecture relative to ATNs. The images give but a few examples of their results.

AMBITIOUS MTI REPORT A 'TREASURE TROVE'

By Chris Fry, MIT Media Lab

The Mineta ATN Industry Assessment was a huge undertaking. It covered ATN history, many different systems, and financial aspects.

I quickly read through most of it and it was a real chore! I can understand having a gloomy perspective on PRT after going through that. It's just plain old complex. To cover so much territory in one document is daunting.

There is a wealth of information in thist document, but any reader will be overwhelmed, as I was, and I'm pretty familiar with the field. Anyone not familiar with the field, I'm afraid, will give up in disgust. This is NOT the fault of the writers. It's the fault of the attempted scope of the document. Nonetheless, I personally think it is quite worthwhile having a document with this scope. I just have a hard time imagining how it can do more good than harm given who might attempt to read it. Of those who start, few if any will finish.

Will the MTI report published by USDOT help make this Jpod vision for Secaucus NJ real?

Financing Should Be Self-Evident

From what the document TRIED to do, I have one complaint. I believe that PRT, if implemented well, can easily pay for itself off of rider fares that are significantly lower per passenger mile than any other motorized urban/suburban transportation system. It is probably the case that most of the PRT technologies represented in the document couldn't pull this off, but I'm not interested in most, just the best. If you form an opinion on the whole industry by the average actor, yes, you'd conclude PRT was doomed. But we don't have to accept the specs of the average actor as condemning the whole industry.

Thus the answer to the question "where does the money come from?" is simple: It's where the money is now coming from for transportation, only we need less of it: less

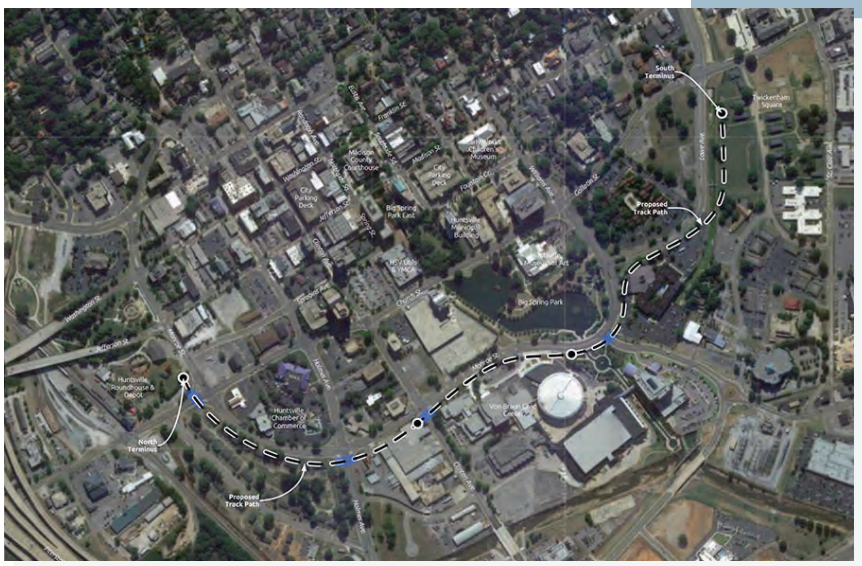
from government (all levels), less from industry, less from riders, less from citizens. How we divide up the savings from PRT doesn't matter so much, but my first cut is, make riders pay all (and taxpayers pay none).

Also, because PRT will have fewer externalities, we need less from our environment and future as well. In a sense, automobiles are "subsidized" because they are allowed to pollute air for free, thus
raising health care costs, etc. all without bills to automobile owners, but that is another topic. The Mineta report is a useful compilation for many users -- public and private infrastructure planners, architects and zoning officials, policy analysts, land use managers and developers, and more. It's an assessment of the industry, not the technology. It is a treasure trove.

ATRA TIDBITS

Alain Kornhauser unveiled his plans to PAVE America and fill some de-commissioned buildings along New Jersey's storm-matter coast. It will test automated road vehicles with emphasis on buses of all sorts and public vehicles, arguing that the savings in lives, injuries, car damage and highway bottlenecks is enormous.

Having suggested that Terrapinn's conferences & courses might do well to include 21st century options, Larry Fabian was rejected by London-based Simon Crompton-Reid, who has since been let go. Fabian may organize a workshop at Mideast Rail in Dubai next March.



Will this APM vision for down-town Huntsville AL move forward?

The widow of the late Martin Lowson has endowed an annual cash award for accomplishments in advancing modern transit interests.

The ATRA contingent at the 2014 ITS World Stan Young, Reuben Juster, and Kartil Kaushik. They saw demos of smart cars by Honda, the Southwest Research Institute, and Induct (the "only truly automated" vehicle there in Detroit, Sept 7-11. The auto industry is being pulled into a "game-changing connected world" with vehicle-to-vehicle and vehicle-to-infrastructure communication.

MIT's Chris Fry has submitted to USDOT to fund a test track program for advanced transit. No comments so far.

DOUBLE LOSS TO ADVANCED TRANSIT

The too familiar ravages of cancer have taken two lives that contributed energy and perspective to advanced transit. One is skyTran CEO, Chris Perkins, who passed away October 9, 2014. Chris was a foundation stone of the company, often incomparable. His calm demeanor, wise counsel, and positive outlook were joys to his colleagues and friends.

Born in 1953, Perkins was a graduate of the UC- Santa Cruz with a masters from USC. His work dealth with mechanized, elevated transportation systems using cutting-edge optical technology and manufacturing systems.

The second is Bill Wilde, who died peacefully in his home in Denver on Saturday, July 26, 2014, due to complications from prostate cancer.

Bill Wilde

Bill was born June 16, 1939, in New Orleans LA to William Henry Wilde and Elizabeth Evva (Owens) Wilde. He was raised in Atlanta GA. In 1963 he earned a Bachelor's Degree in Mechanical Engineering from the Georgia Institute of Technology. He then served two years in the US Army in Germany as a second lieutenant in the Army Ordinance Corps. A lifelong passion for a new form of transportation, personal rapid transit (PRT), led him to earn a Master's Degree in Civil Engineering in1972 from the University of Maryland. In the late 1960s, Bill was employed by Boeing, Lockheed, and Cape Canaveral. This experience fostered a lifelong interest in aviation.

Bill moved to Denver in 1973 and began a forty-year career in transportation engineering. He worked for the Regional Transportation District where he was project engineer for the Denver 16th Street Transit Mall project. He also worked with the consulting firms of Carter Burgess and CRSS. Bill retired early but continued consulting on transportation engineering projects such as PRT and the elevated pedestrian bridges in Las Vegas NV.

JAPAN'S NEW TEST CENTER

Details of a Japanese rail testing facility near Hiroshima are not available. This seems to be significant developed, but veiled in the secrecy of Japanese doings. Construction of the Mihara Test Center was announced by one branch of Mitsubishi Heavy Industries (MHI) in March of 2013. Focused on railroad communications, the center will be able to verify rail vehicles of two different gauges —1067 and 1435mm — but also have facilities for AGT and "people-mover" cars, high speed systems and maglevs.

It sounds like a candy shop for APM kids. The Japanese say the Mihara Center is being built in response to robust rail markets.

Dr. Yang of China's PRT developer listens through his translator (left) to Kjell Dahlstrom at PCC8.

AIRPORTS

Atlanta, Georgia: The LED signage on vehicles of underground, airside Bombardier APM at Hartfield has been replaced with 350 LCD signs with high resolution and audio by NC-based Advanced Application Designs. For info, contact Barry Vaughn at (315) 491-9094.

Doha, Qatar: Opening of a 700m Doppelmayr APM at Hamad Airport appears to be slipping into next year. It was designed as a stylish and futuristic element inside the New Doha terminal (similar to the Otis system at Detroit). In 2009, opening was foreseen by 2012. Construction has slipped. Last January a phased opening was announced in begin mid-year. Meanwhile, the old complex is being improved to handle high traffic levels in this oil-based and militarily active region.

London, England: The *Ultra* shuttle with one forked end is reporting impressive 99.72% availability so far this year. BAA is getting substantial revenues from advertising, currently by Marriott bringing in about $1m/yr. Parking numbers are up. The Thistle Hotel asked to open a gate for easy access for their clients, and a $8 charge (oneway) to their tab. About 2000 guests use this amenity every month. Another UK airport is considering an *Ultra* installation.

Ultra rolls out good numbers and extra revenues for Heathrow Airport.

Oakland, California: In the misty politics of the Bay Area, the Oakland Connector is about to replace cheap bus service with $6 service on a 5.1km elevated APM supplied by Austria's Doppelmayr. Although system cost were about $100m - or $20m/km — project cost came in officially at $484m — up 86% from 2006 estimates of $260m. Unions tried to kill the project, and will probably kick again when it opens scheduled by year end. Their pressure led to a $2 concession price for airport workers. Testing is underway.