Renovating American Infrastructure, Step 1: Transportation

Defeating soul-deadening gridlock, monster potholes and dangerous road ice

By Adam M. Bright  Posted 01.28.2010 at 2:16 pm

Chicago road crews are scrambling to fill 67,000 potholes a month. Communities in Pennsylvania rely on 100-year-old water pipes made of wood. Squirrels still cause widespread blackouts. The country's 600,000 bridges, four million miles of roads, and 30,000 wastewater plants desperately need attention. The solution isn't patches, it's an overhaul. Soon roads and power lines will fix themselves, and we'll mine energy from sewage. America's 21st-century tune-up won't happen overnight, but we could start reaping the benefits (faster broadband! cleaner water!) within the next few years.

Cars that Report Potholes

Task: Fix the third of major roads that are in poor shape

Status: Three years to a prototype

In a new system developed at Northeastern University, vehicles that cover lots of asphalt—taxis, buses, garbage trucks—will be outfitted with acoustic wave sensors to detect potholes before the human eye can see them. Sound waves probe the top three feet of the road for telltale air pockets and small cracks, while ground-penetrating radar looks inside bridge decks for corrosion and lasers scan the road surface. A cellular data connection sends data to control centers, where it can be assembled into maps of trouble spots.

Roads that De-Ice Themselves

Task: Reduce the 1,300 road deaths a year from snowy and icy winter conditions

Status: In testing by more than 20 state departments of transportation

A new road coating called SafeLane not only gives tires more traction, it actually helps prevent the accumulation of ice and snow by holding on to de-icing salts, allowing road crews to scatter salt a couple of days before a blizzard rather than waiting until the snow is already on the ground. SafeLane consists of layers of epoxy mixed with dolomitic limestone. The epoxy/layer is snowplow-proof, lasts up to 15 years, and helps seal the pavement to keep corrosive salts from leaching down to steel bars in sensitive bridge decks. Anecdotal results from its first five years in the field show up to a 70 percent decrease in winter accidents.

Bridges that Flex on the Fly

Task: Upgrade the 26 percent of decrepit bridges

Status: Pedestrian versions exist; traffic bridges in 10 years

Regular bridges are fairly rigid structures that break down over time from stress. “Tensegrity” structures disperse load over a nest of tensed cables and compressed struts that allow them to be both flexible and structurally rigid. Now the University of California at San Diego is developing traffic-bearing tensegrity bridges with feedback sensors to guide subtle adjustments in cable length, which could alleviate the shifting stresses of an overladen truck, counteract the vibration frequency of an earthquake, or disperse the load of a severed cable.

Concrete that Senses Cracks and Heals on its Own

Task: Replace miles of concrete highways with smarter versions

Status: Field-testing for self-sensing concrete in progress

Carbon nanotubes are prized for both their strength and their piezoresistance—they change their electrical resistance as they're stressed. Xun Yu, a mechanical-engineering professor at the University of Minnesota–Duluth, is cooking up a concrete mix that contains 0.1 percent carbon nanotubes, making it harder to crack than traditional concrete, and smart too. By embedding electrodes into it as it sets, Yu can measure changes in electrical resistance to detect compression from passing cars. Future versions will better...
calculate speed and vehicle weight on the go for a real-time view of the road’s stress. Meanwhile, a new concrete mix developed by Victor Li, a professor of civil and environmental engineering at the University of Michigan, contains unhydrated cement grains that are activated when exposed to carbon dioxide in air and water from rain—exactly what you’d find in a small crack in the road. The reaction produces a calcium carbonate seal, restoring the slab to its normal load-bearing capacity.

**Trackless Elevated Trains**

*Task:* Add urban railways for a third the cost of conventional light rail

*Status:* Texas A&M University’s Texas Transportation Institute has offered free land for a two-mile test track

To save the multibillion-dollar cost of clearing 24-foot-wide swaths for new track, trainmaker Tubular Rail wants to shoot trains up to 150 mph over existing infrastructure through a series of elevated rings 100 feet apart. As it passes through each ring, the 400-foot-long carbon-fiber car is pushed along by electrically powered steel rollers. To save juice, the motors gear up only as a train approaches; up to 90 percent of the kinetic energy of the train can be recaptured as the rollers wind down.

Read the rest of PopSci’s plan to rebuild America [here](#).
Life would be better and more efficient if we got rid of cars and gave
everyone there own personal 8 person or so pod that would run on
tracks throughout cities. There would be NO CAR ACCIDENTS or
TRAFFIC JAMS because the system would be smart and avoid clogging
the track. ETAs would be correct because the pods would run the same
speed everywhere so if the ETA is 10 min ur there in 10 min
even tho alot of jobs would be lost it would give rise to engeneering jobs
because with all the use of the pods the tracks would be repaired often
unlike unstable bridges and roads.

asm1120
01/28/10 at 10:21 pm
facticious
why make a new mode of transportation that doesn't run on a scarce
resource when we can make the old ones run on less and less of that
eventual extinct resource?
just an example. although i bet there are more in your favor. haaaa. flavor.

EG6supermachine
01/28/10 at 10:24 pm
Crackdown on the DMV. They allow everybody to drive and then some.:)

old-scratch
01/28/10 at 10:43 pm
Before anyone gets excited. .None of this is going to happen. Not here. This country is circling the drain. Its all down hill from here. Suburbia is
going to have to relocate to the ghettos and trailer parks

Le Tamer
01/28/10 at 10:46 pm
All of these ideas would be very great and would help our planetets
growth and competition with ET life planets out there.
Bilderberg, you say that the U.S is behind in technology, thats why we
have about 8% of the worlds population but make more then 40% of the
inventions.
We are some of the smartest people out their.

old-scratch
01/29/10 at 1:41 am
Le Tamer...Did you see any of those tea bag protests? Most Americans
view of scientists is they are a bunch of satanist spreading lies against
god. Being raised in the south I know this is the vast majority of that entire
region of the country. The American take on nature is "god did it and thats
all we need to know...now go to church and pray or you'll go to hell"

dolbydigital2
01/29/10 at 9:57 am
Why not a hovercraft system of transportation, that relies on cosmic
energy battery packs? What, too far fetched? Not for POSCI!

wc.16
01/29/10 at 10:36 am
Evidently old-scratch hasn't seen any of the tea party protests either
because they are about liberty which is threatened by an ever growing
government that is bankrupting all of us.
Until our country learns to manage its finances we'll never be able to
afford any new, groundbreaking infrastructure.

Tank75
01/29/10 at 10:47 am
I agree with facticious that the biggest problem we have is a political one,
unfortunately our elected representative take their sweet time to do
anything if they ever do it at all. And as for Stuntman14, yes your replace
cars with "pods" would work fine in cities, however not all of use live in
cities.
They just put a metro rail commuter train where I live. Believe it or not cost of fuel and maintenance for my truck is lower than mass transit. With that said I can't justify using mass transit. Keep in mind I get about 17 MPG and can say that. The only cost that puts my personal vehicle over that budget is insurance. This is also based on an average of 80+ miles per day.

01/31/10 at 3:50 pm
My apologies. not 80 +miles per day. It is 40... I doubled the wrong number in my head or doubled it twice... two trips around 20-25 miles per day.

02/15/10 at 8:50 am
Perhaps it is time to resurrect an old idea who's time must eventually come anyway. The biggest energy drain on present day transportation is air resistance. Take that away and transport can be quicker, quieter, weather immune, cheaper and kinder to the environment. I'm talking of course about ETT (evacuated tube transportation) One tenth of the steel annually scrapped from old automobiles in USA would provide enough steel for two tubes 1000Kilometers long every year. City centre to city centre systems could be built and operated for less than the high speed train systems on offer, and would out perform them in every significant department. Popular science looked at this a few years ago but concentrated on extreme versions with the ambition to cross oceans. Look up vactrain on wiki and follow the links.