

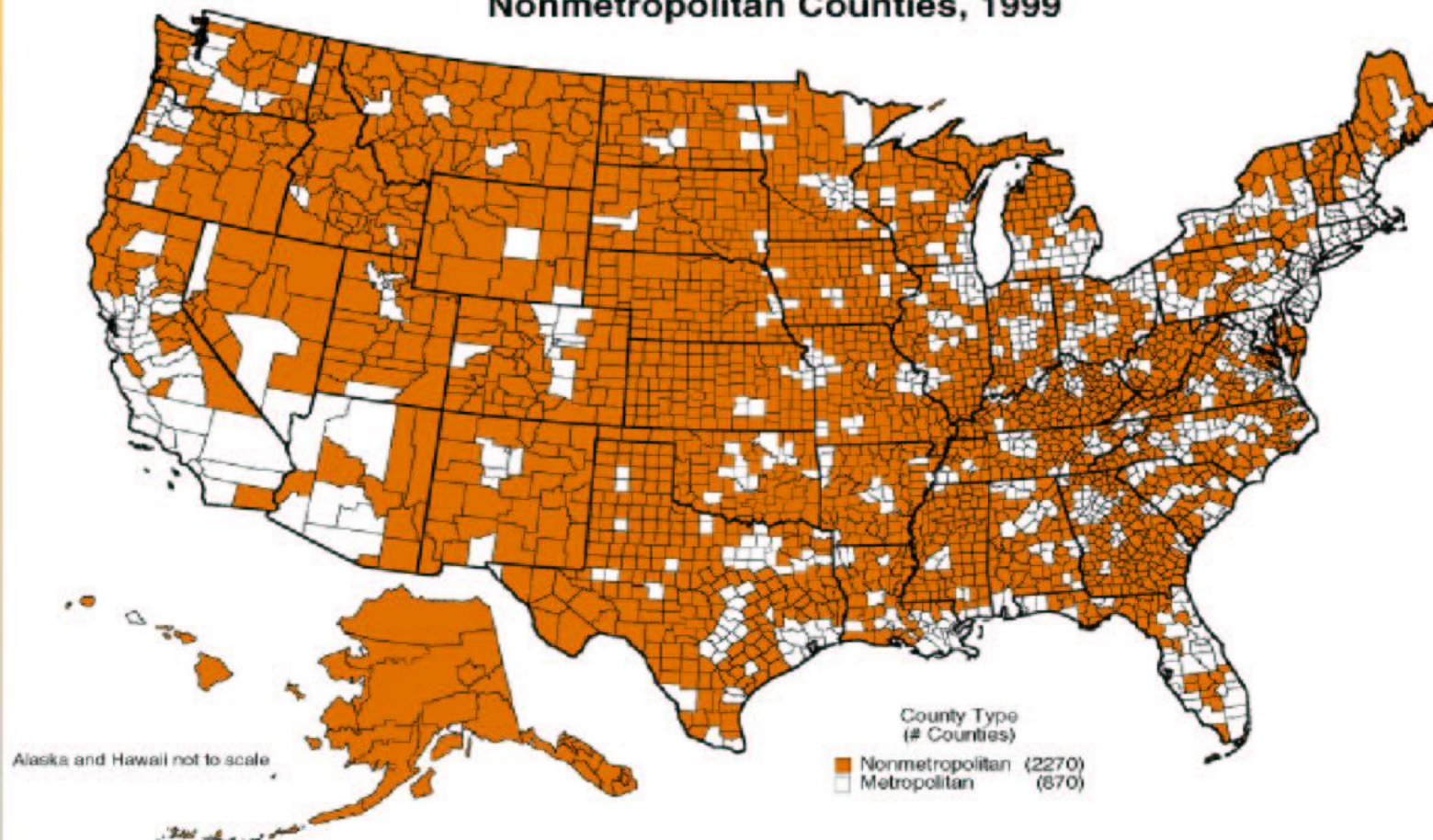
# A New Vehicle Concept for the Enhancement of Rural Healthcare

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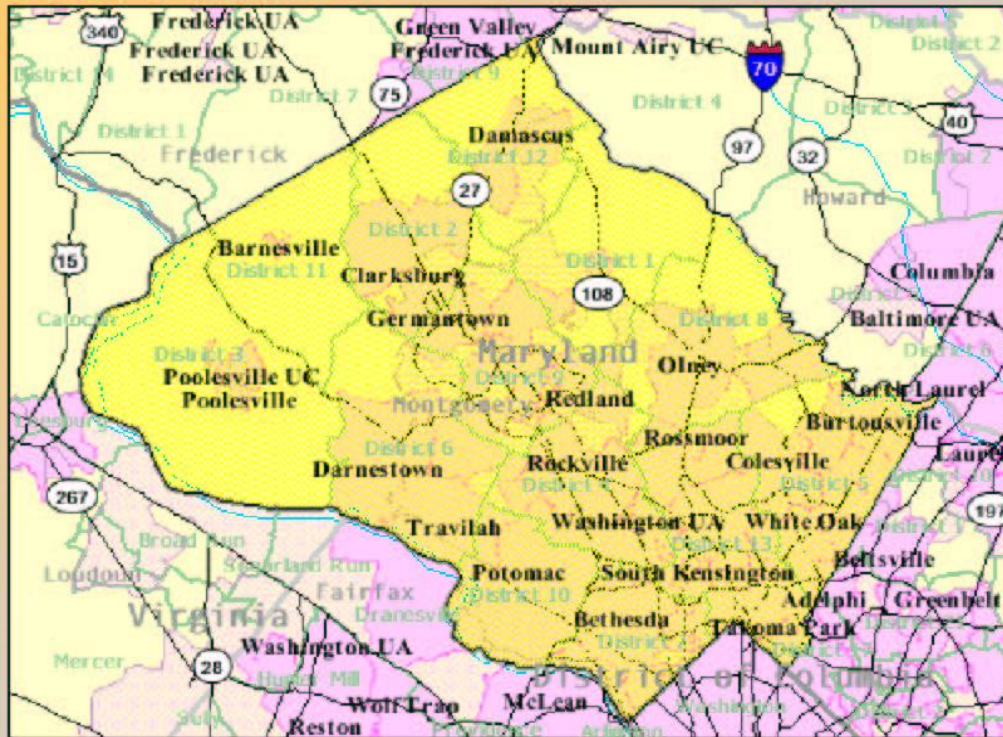
# What is Rural?

## Nonmetropolitan Counties, 1999



Source: US Bureau of the Census: Office of Management and Budget, 1999.  
Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research,  
University of North Carolina at Chapel Hill.

# Population Density

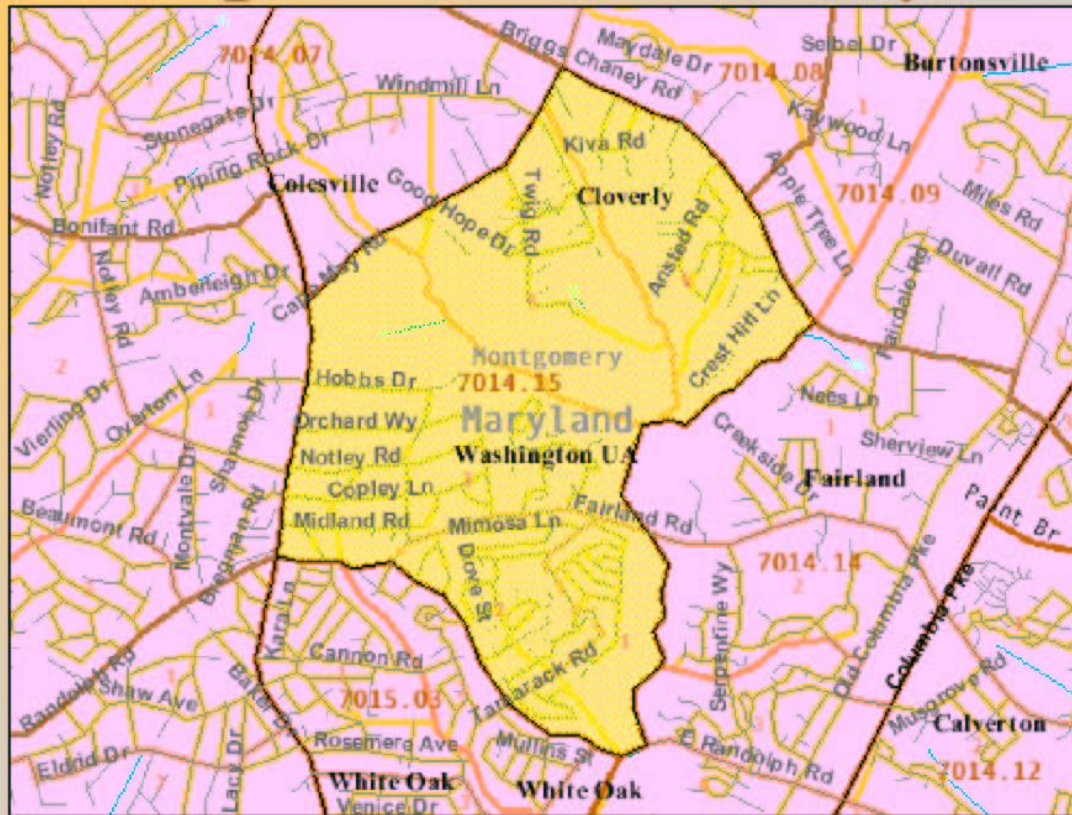


★ Montgomery County, MD

★ Population=873,341 Density per sq. mile=1,762



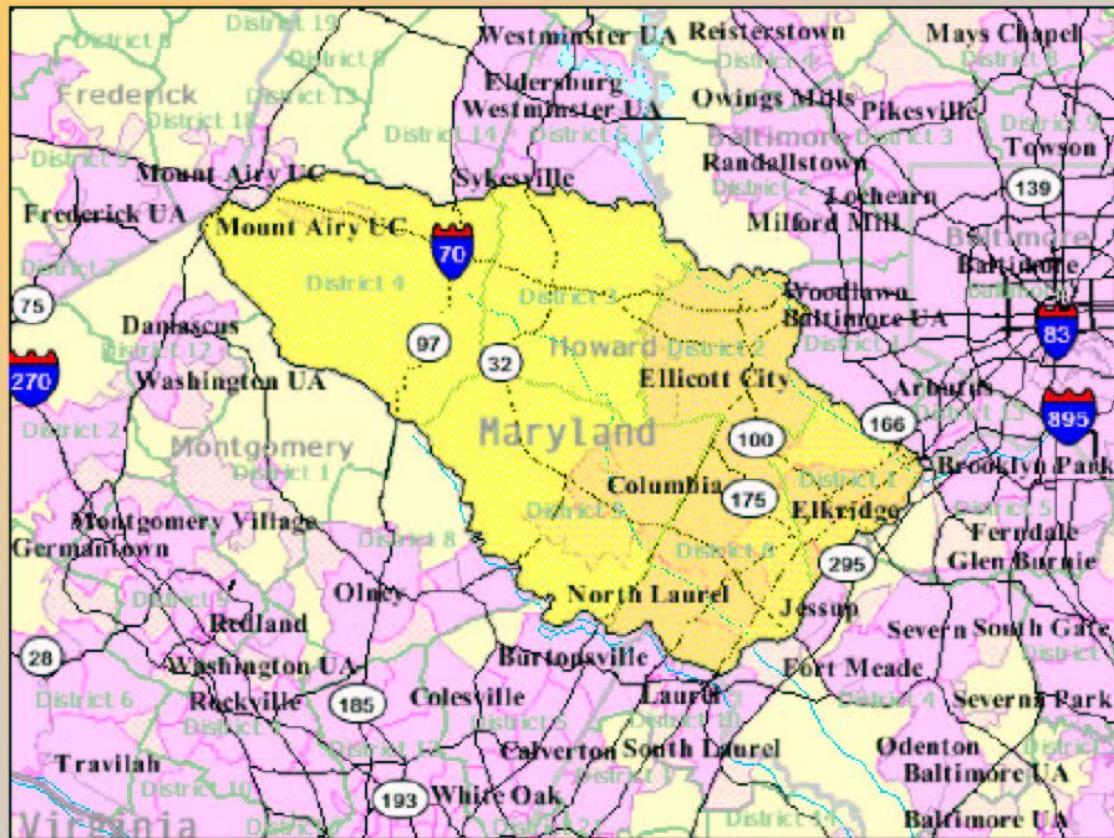
# Population Density



★ Census Tract 7014.15

★ Population=7,588    Density per sq. mile=2,756

# Population Density

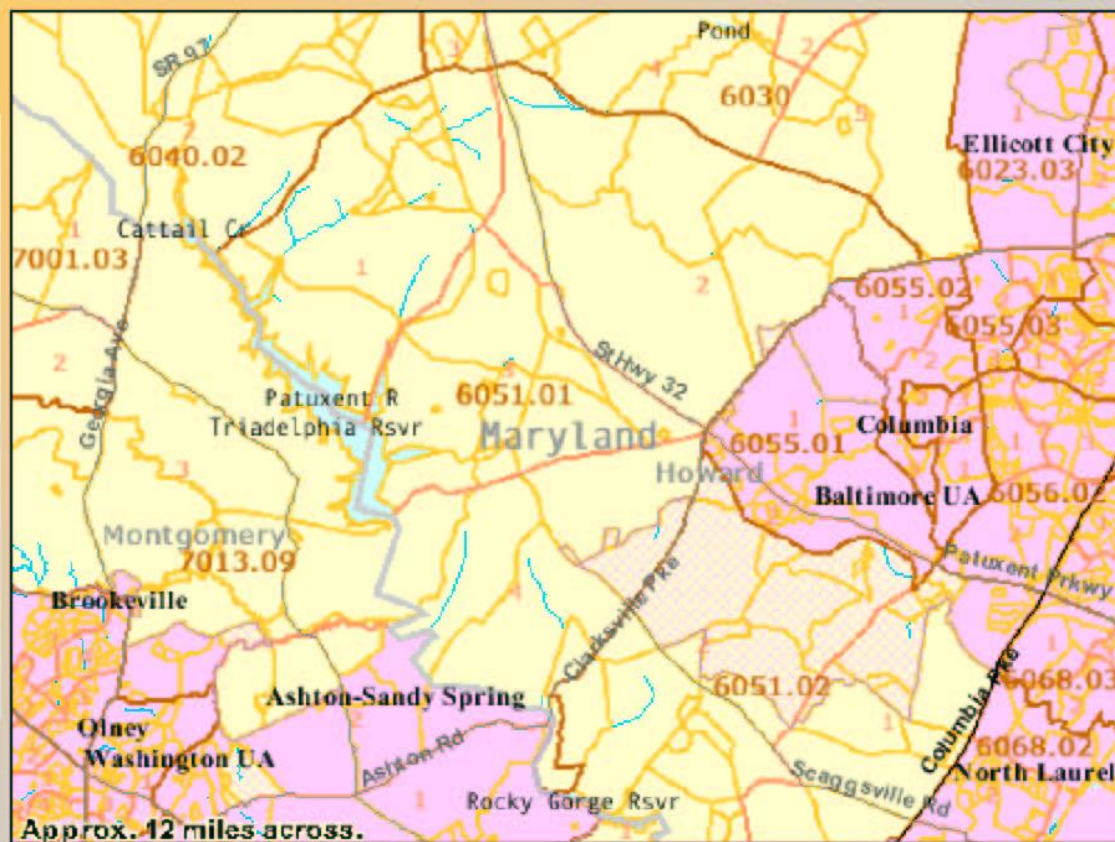
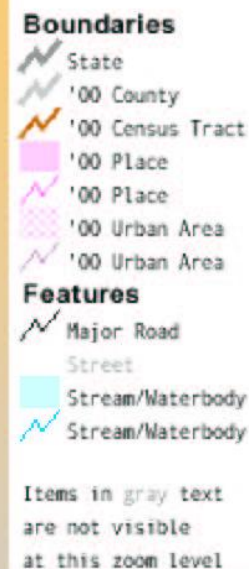


★ Howard County, MD

★ Population=247,842 Density per sq. mile=983



# Population Density



★ Census Tract 6051.01

★ Population=8,318 Density per sq. mile=300

# Rural Impact on Health is Complex

- Critical characteristics of rurality typically not accounted for...
  - relative isolation
  - some areas higher rates of illness and mortality

# Number?

- About 59 million rural (2000 Census)
  - Total US Population 281 Million (thus 19.7%)
    - Down slightly from 1990 census
- Greater than United Kingdom, Spain, France, and Italy
- Rural is between 20% and 25% of the nation's population (depending upon definition)



# Rurality

- What is it?
- Census Bureau and OMB
- Census: Population size and residential population density....2500 or more...not classified as rural...farm and non-farm
- OMB: metropolitan and non-metropolitan...census data and census definitions....commuting patterns, and business activity

# Rurality vs. Isolation

- What is isolation?
- Is it bad or good? Why?
- Role of transportation
- Highway system
- Physical obstacles
- Willingness

# Distribution Demography

- South, Appalachia and Great Plains
- Higher levels of economic development are characterized by declining birth and death rates



# Health Status

- Role of poverty
- Chronic diseases and infant mortality
- Injuries
- Trauma

# Immigration

- What part of immigration patterns are affected by population? Employment?
- Migrant Farm Workers issues
- Need for services

# Rural Access Issues

- Poorer
- Older
- Less insured (those under 65)
- Self-reported poorer health
- Higher injury-related mortality
- Higher number of days lost



# Starr County, Texas

- The 2006 estimated U.S. Census Bureau population was 61,780, with 97.4% Hispanic; 2.1% White/Non-Hispanic; and 0.5% Black or African American. the Median Household Income (MHI) was \$16,504.
- Per Capita Income (PCI) for the county was \$7,069, compared to the national PCI of \$21,587.
- 2008 unemployment rate for Starr County was 12.7%, compared to 4.6% for Texas and 4.9% for the U.S. 35% of residents over 25 years of age have a high school education (76% nationally) and 7% have a bachelor's degree or higher (23% nationally).
- 91% of the residents report speaking a language other than English at home.
- 45% of Starr County lived in rural, isolated colonias. Colonias, which are unincorporated areas lacking adequate infrastructure such as paved streets, sidewalks, storm drainage, sewers, electricity, potable water, U.S. postal service, and telephone lines.

# Summary: Rural Population

- Roughly 20 percent US population rural
- Varies by region—west, w/ large counties ensure large numbers in urban counties that reside far from urban resources
- Age structure older as urbanization decreases
- Ethnicity varies by region as well

# Health Care Access and Use

- Insurance—highest in fringe counties, lowest in central and most rural counties
- Provider availability
  - Physician—FP & GP increase some in rural
  - All others decrease markedly as urbanization decreases
- Dental access lower in rural settings
- Hospital discharge rates higher in rural settings
- Substance abuse admissions higher in small city and non-metro counties with 10,000 city center



# The Challenge

- Evacuation of patients in un-developed areas with poor emergency medical services
- And high-traffic congestion and poor road conditions.
  - <http://www.youtube.com/watch?v=zZfAdN8fjLI>

# On Road - Solutions

- In developed areas with adequate roads and funding, air evacuation and 4-wheel ambulance are standard.
- In undeveloped areas, inexpensive solutions are needed to handle non-emergency transports as well as emergency transports.
- Currently bikes with trailers and motorcycles with sidecars are being used.

# Bikes and Motorcycles



# Challenges with Current Solutions

- Trailers and bikes are a poor combination for modern roads and motorized vehicular traffic.
  - This eliminates them from consideration in modern areas that suffer from congestion including much of Africa and many cities in Europe.
- Motorcycle side cars struggle with a width (almost equal to a car) and poor handling due to patient position (weight to one side).



# Off-Road Solutions

- Helicopters – expensive and impractical in many urban areas due to buildings and overhead lines.
- Animals – used but impractical for deployment
- ATV's and Snowmobiles
  - Limited to off-road use by the nature of the design so secondary transfer is necessary

# Off Road Examples



# Rural and Urban Motorcycle Medics (Dr. Wilke on Medical transports in US)



<http://www.cbsnews.com/stories/2004/07/21/eveningnews/main631100.shtml>

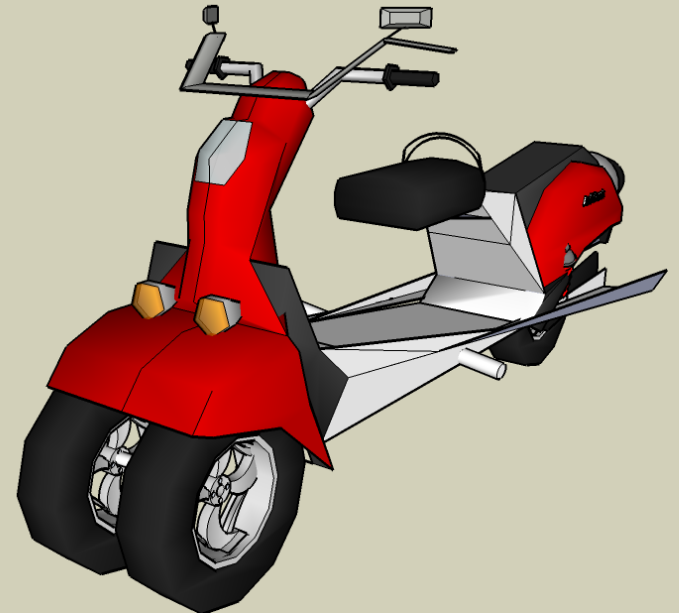
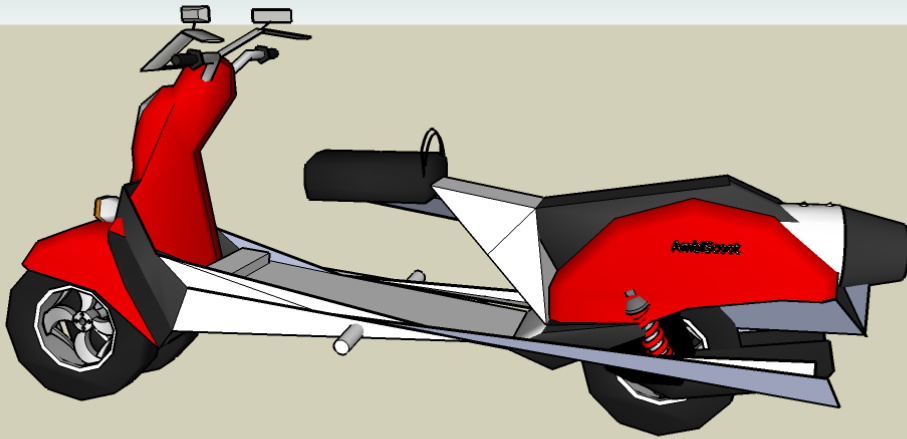
# A new vehicle concept is needed...

Enter the AmbiCycle™

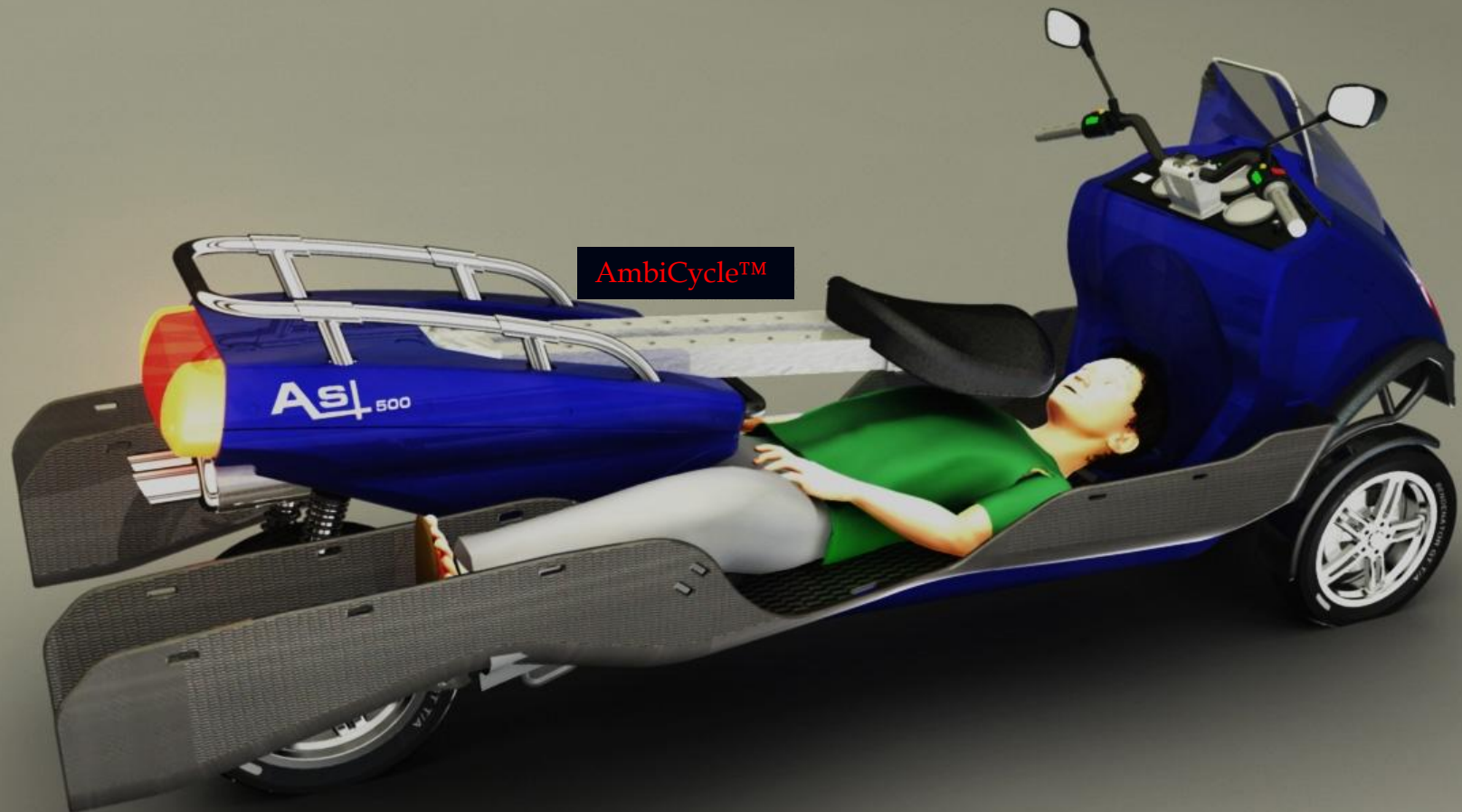
- Patient and Driver are in one plane
- Constant visual contact is maintained by driver and patient
- Shorter than trailers
- Same width as a standard motorcycle
- Easy to learn controls (no shifting) due to CVT transmissions.
- Inexpensive mesh transport litter for load/unload
- Low retail cost
- Low operating cost (50mpg or more)



# AmbiCycle™ - Early 3-D Models



# Rural Patient Transport Device – AmbiCycle™



US Patent Pending Jan 09  
Dr. Mark E. Benden CPE

Insert video

[Shortcut to 03-15-2009 Transitions.mov.lnk](#)

# Rural Patient Transport Device – AmbiCycle™



US Patent Pending Jan 09  
Dr. Mark E. Benden CPE  
Dr. Eric Wilke

# Ambi-Cycle Development

- Initial patent searches completed
- Provisional Patent Filing Jan 2009
- Current product options being explored and funding options pursued.
- Construction/Testing of Non-motorized version of Ambi-Scoot completed
- Currently testing converted Scooter split/half backboard and mesh loading litter.



# First Generation - Non-motorized, 3 Wheel, Ambi-Cycle™



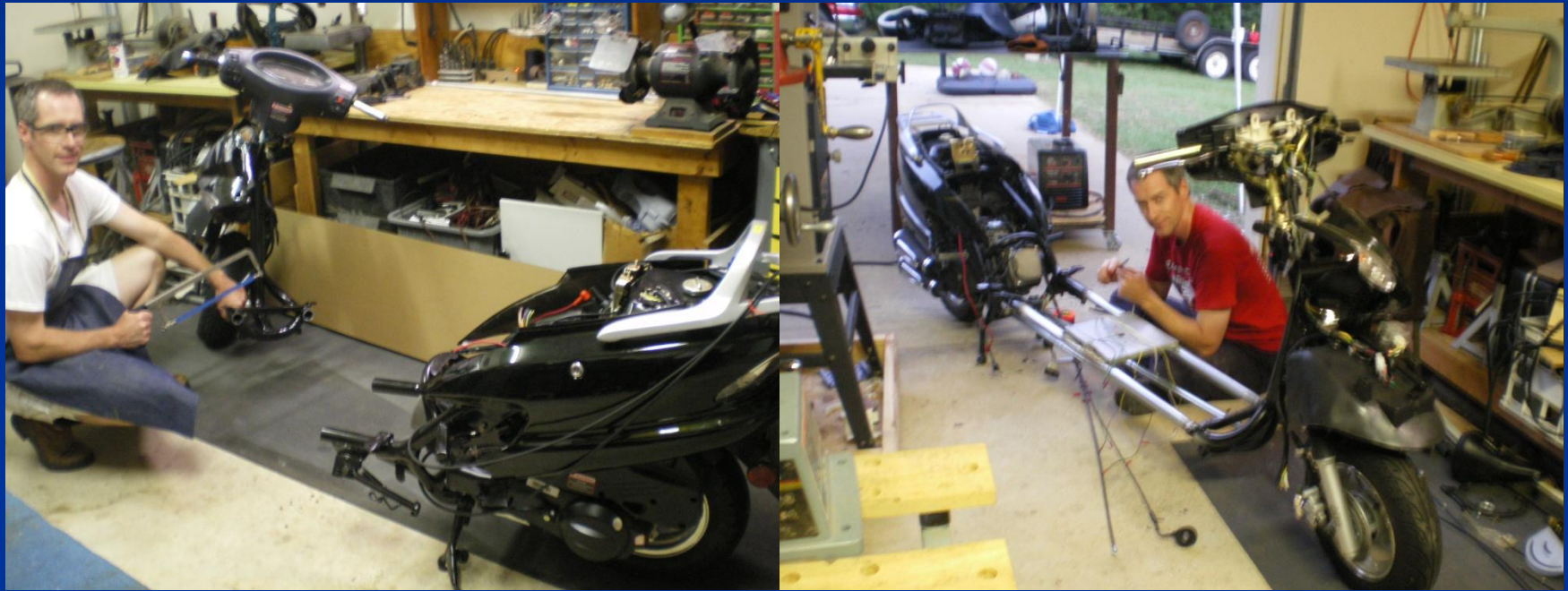


# Current production version of 3 - Wheel Scooter



- Balanced by hydraulics in the front end
- Stable and safe handling for any size or experience user
- No – shifting (short learning curve)
- Available in 2010 as a 150mpg hybrid

# Prototype development of 2 - wheel Ambi-Cycle™



# Current 2- Wheel Prototype

In Drive mode with seat over patient



In Load mode with seat retracted





# Market Segments

- Rural Patient Transport (East and Western version)
- Urban Patient & Medic Transport (East/West)
- Military wounded soldier transport (US and World)
- Commercial property market for airports, stadiums, oil fields, plants, refinery, etc.

# Wrap-up and Questions

