PICAV
A new concept of electric vehicle for personal urban mobility

Rezia Molfino
Università di Genova

molfino@dimec.unige.it
www.picav.eu
PICAV Goal and Motivations

• new mobility concept for passengers ensuring accessibility for all in urban pedestrian environments
• new transport system that integrates a fleet of PICAV units
• some of PICAV features are specifically designed for people whose mobility is restricted for different reasons
• a radical move towards clean energy efficient, safe and intelligent personal vehicles

• PICAV system usefully integrates the existing public transport system to make it become more accessible for older and disabled people by acting as a smooth link between walking, bicycle and conventional public transport
The main drivers of PICAV design are:

- ergonomics,
- comfort also for weak or mobility hampered people,
- stability,
- small size,
- agility: tight radius turning, step overcoming,
- on-board intelligence,
- assisted driving,
- eco-sustainability,
- parking in narrow places and main doors,
- vehicle/infrastructures intelligent networking.
Small Sized

- For a single person or person child
- Suitable to be linked in a platoon chain
- Width between 700-900 mm, for very tight roads of historical centres.
- Variable smart height for stability control and access
- Accessible over smaller streets for tight turning radius
RIDE Comfort and Control

- Dynamic model based and intelligent controlled shifting of centre of gravity in different positions of the car for stability, ride comfort, safety and accessibility
- Vehicle dynamics including newer suspension design (based on kinematics/dynamics)
- Handling and control
  - Through 4 motor control of the wheels for added traction control
Structure

• Vast use of eco-sustainable metals and plastics (including composites), dependent on the final cost for the vehicle
• Flexible aluminium frame and adaptable compartment for lightweight design
• Structural design for rigidity, safety and a unique locking system for when the PICAV is not in use.
• Rugged yet soft fabrics for inside seats and components with human interaction
• Design around RE-USABLE components.
  – Parts of the vehicles to be interchangeable.
  – Modular design for conversion between uses.
• Possible use of magneto-rheological and smart materials for brakes and suspension / actuation systems.
Ergonomics

- Design for a reconfigurable seat for varying levels of ergonomic support for different types of passengers
- Human – vehicle intuitive interface
- Required extensive study on Ergonomics of Elderly for the design of a smart seat conformable with easy controls that could lead to newer concepts
Utility

- Modular compartments for baggage and attachments.
- Mobility locomotion system design with a modular platform to be able to use the design over a vast range of applications and for other designs.
- The specifications of the Inner city accessibility requirements (small steps, narrow roads, manoeuvrability) will address other applications (hospitals, airports or indigenous driven robots).
Power Generation

• Power systems. Including easier innovative fuelling (battery charging systems)
• Electric motors
  – Up to 4 for wheels
  – Motors for actuation of links
  – Battery powered system with hidden battery compartments
  – Look into hybrid technologies
  – Easy accessible charging systems
Networking

- GPS systems for:
  - Location of the PICAVs
  - Security purposes
- RADIO Linkup, GSM, Blue tooth networked
  - For contact between various vehicles of the fleet and the main control system
  - For sending out distress signals in case of failed battery, broken down components etc.
  - Customer help and support, perhaps through voice over IP or two way radios embedded in vehicles
- Networking control and traffic control system for the vehicles. Wireless interfaces, system interface etc.
Sensors

Multi-sensorial system for:

- Collision detection
- Automatic parking
- Ride stability and control
- Driver recognition to ensure only eligible personnel are able to access the PICAV. Such as the elderly disabled and maintenance crew through personal ID tags or keys etc.

• Security systems
  - Automatic locking when detecting vandalism
  - Locking mechanism when in storage mode
PICAV first Concept Design

by Aazir Khan
PICAV Project

- 7th FRAMEWORK PROGRAM
- Collaborative Project: Small or medium-scale focused research project
- THEME [SST], [SST-2008-RTD-1]
- PICAV Personal Intelligent City Accessible Vehicle System
- Starting date 1st August 2009
PICAV Partnerships

• DIMEC–University of Genova– Coordinator
• INRIA-National Institute for Research in Computer Science and Control
• University College London
• University of Pisa
• Servicos Municipalizados de Transportes Colectivos do Barreiro
• ZTS-VVU Vyskumno-vyvojovy ustav Kosice
• Mazel Ingenieros
Interest Group

• During the demonstration phase the interest group will be actively involved
• New public and private institutions and companies can join free of charge the interest group, upon acceptance from the PICAV management board
• Already registered:
  – Progetto Sanpierdarena
  – Mestskácast Košice-barca, Abovská24, 040 17 Košice-barca
  – Comune di Genova
  – Comune di Santa Margherita
  – Regione Marche
  – Regione Liguria
  – CEREMH (Centre de Ressources et d’innovation Mobilité Handicap)
  – Urad Kosickeho Samospravneho Kraja
• Registration open at www.picav.eu