

Next-Generation Vehicles

Daniel Sperling, James Kelley, Frank Cihak, Annemarie Chenoweth, and Jack Kerrebrock, *Cochairs*

Participants of this breakout session split into small subgroups to discuss personal motor vehicles, aerospace vehicles, trucks, buses, and rail vehicles. The full group did not have time to discuss the findings of each subgroup; therefore, the following comments should be considered as individual remarks rather than a consensus of the full group.

PERSONAL MOTOR VEHICLES

Personal motor vehicles were defined by the group as light-duty vehicles weighing up to 8500 lb. The discussion focused on the National Science and Technology Council (NSTC) draft Strategic Implementation Plan. Members of the personal motor vehicle group noted that the draft seems to focus exclusively on the Partnership for a New Generation of Vehicles (PNGV). Questions were raised about whether this is appropriate and whether the plan should be broadened. The group used the argument that the plan should at least specify long-term research, beyond the 10-year horizon of PNGV.

The draft Strategic Implementation Plan overlooks energy storage technology areas and omits PNGV Goal 2: to implement commercially viable innovation from ongoing research on conventional vehicles. This goal should be included.

An automobile industry representative noted that, with industry leadership, PNGV, by focusing existing research and development (R&D) of several agencies on a central set of goals, is connecting industry to areas of government research that industry had not been aware of, such as material characterization tools. Another participant noted that the nation can expect PNGV to produce spin-off technologies that benefit conventional vehicles and other sectors of the economy, as did the Apollo space program.

The need for federal government involvement in R&D was discussed. The federal government's primary role is to facilitate the development of technologies that will address such societal issues as reducing (a) fuel consumption and thus carbon dioxide production, (b) global warming, (c) pollution, and (d) dependence on foreign oil—while providing the

market features of size and range, as well as safety and affordability, to ensure sufficient demand for the technology.

Opportunities for universities and small businesses were discussed. It was noted that the U.S. Department of Commerce has published a report addressing this subject. (The report, *Inventions Needed for PNGV*, is available from the Government PNGV Secretariat, U.S. Department of Commerce, Herbert Clarke Hoover Building, Room 7064, 14th Street and Constitution Avenue, NW, Washington, DC 20230.)

In summary, the personal motor vehicle group recommended the following changes to the draft Strategic Implementation Plan:

- Add PNGV Goal 2 for incremental improvements;
- Add the need for long-range R&D; and
- Include energy storage technologies.

AEROSPACE

The aerospace group also focused its discussion on the draft Strategic Implementation Plan, agreeing that the plan, in general, represents a valid statement of objectives for aerospace R&D. Nonetheless, the group believed that the plan lacks sufficient specifics, making the title "implementation plan" inappropriate. In particular, the group noted deficiencies in the following areas:

- The plan does not include any requirement for the development of new wind tunnel facilities, which are essential to the continued viability of the U.S. commercial aircraft industry.
- The plan does not place sufficient emphasis on the need to maintain aerospace R&D programs during the current economic downturn and in light of the downsizing of aerospace organizations.
- The plan does not sufficiently emphasize air traffic control, particularly the need for constant coordination among all players, including the Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), aerospace manufacturers, and the airline industry.

The aerospace subgroup made two overall comments on implementation:

- The current and projected Department of Defense funding levels for improved expendable launch vehicles are not adequate to meet the objectives set forth in the draft Strategic Implementation Plan.
- NASA's expectation that industry will fund development of a next-generation reusable launch vehicle is unrealistic, unless the federal government guarantees a substantial market for the vehicles.

The aerospace industry has a practical, time-tested, and well-established process for participating in FAA and NASA R&D planning activities. The process can serve as a good example of industry/government cooperation and focus.

TRUCKS AND BUSES

According to the trucks and buses group, these vehicles play significantly different roles in the transportation system and thus should not be grouped together for discussion or R&D activities. Within each of the two categories, significant differences also exist; for example, R&D requirements for public transit buses differ from those for over-the-road coaches operated by private companies.

The group stated that the draft Strategic Implementation Plan does not adequately discuss buses or trucks. The federal government does have a legitimate role in R&D for trucks and buses for the following reasons:

- Safety;
- Efficiency of public transportation;
- Environmental concerns (e.g., clean air); and
- Standards, especially in the area of electronic data transmission (e.g., route guidance) and architecture.

For buses, and specifically those in public transit, R&D activities should be focused on lightweight construction, because conventional buses in use today are too heavy, resulting in high fuel consumption and undermining efforts to use electric-drive technologies. There is a synergy between lightweight technology being developed for cars, rail, trucks, and buses, as well as for the aerospace industry. The cost dimensions, however, do differ significantly for buses and aerospace vehicles; likewise, even production methods for cars differ significantly from those for buses because of the quantities involved. Therefore, the bus industry requires targeted R&D, specifically with regard to designing lightweight vehicles using aerospace materials. Lightweight bus technology will yield the following benefits:

- Increased fuel efficiency with conventional and alternative fuels;
- Lower emissions;
- Lower operating and maintenance costs;
- Reduced costs for downsized components;
- Reduced costs and improved performance with electric-drive technologies (i.e., batteries, hybrids, and fuel cells);
- Reduced wear and tear on roads and bridges; and
- Improved access for people with disabilities at a lower cost, when coupled with low-floor designs.

The cost of several components used in U.S. buses needs to be addressed. These components include engines that meet future emission standards, transmissions, axle assemblies, and air conditioning units. The economies of scale are not yet there for these components. The trucks and buses group recommended that ways be found to increase the market for these components or to use components from larger markets. The modifications required by U.S. environmental, liability, and access regulations increase the cost of buses manufactured in the United States and thus limits their potential for export to countries that do not have these regulations.

The group emphasized that the highest priority in freight and passenger movement is always safety. Public transportation also can play an important role in reducing air pollution and congestion and improving the efficiency of energy use—roles that should be emphasized and supported.

Because of the intermodal freight linkages among truck, rail, and marine modes, the group recognized the need for an intermodal operating organization or committee focused on freight operations.

RAIL VEHICLES

Passenger railcars are closely linked to the infrastructure, more so than road vehicles; therefore, these railcars must be considered part of a system. Signal equipment on board a railcar, for example, must be compatible with wayside equipment. Signal/control technology is changing rapidly.

Railcar weight is always a concern as the rail industry strives to improve fuel efficiency without compromising safety. The rail vehicles group sees opportunities for reducing the weight of railcars' bodies, wheels, and truck assemblies.

Overall, rail safety, for passengers and freight, is excellent, but grade crossings continue to be a problem. The group recommended that reducing, eliminating, or protecting grade crossings be emphasized in the R&D program.

The use of alternative fuels in locomotives and electrification offers great opportunities for energy and air quality improvements. In addition, use of improved operating practices to increase capacity via technology (i.e., computers) is important.

The heavy-haul freight and intermodal container areas are growing and require R&D attention. The group recommended establishment of a national intermodal research committee.