

- . use of new display systems and improved visualization of control panels (verbal command, miniaturization of view finders, multi-functional screens);
- . progressive integration of piloting functions and navigation and the development of new high speed transmission architectures; and
- . development of electronic control of non-electronic engine systems and circuits.

The expanding costs of avionic systems, which have risen along with those of other products, have caused companies active in the industry to either merge or form consortia with their counterparts in other countries. This has allowed groups of companies to bid for specific contracts on major new ventures, such as the European Fighter Aircraft (EFA) and the Airbus A330 and A340 airliners.

The European aerospace industry abilities in the area of technological development can be summarized briefly. European companies have played a leading role in the technological innovation of civil aircraft. Europe produced the first jet, the first supersonic aircraft, and the first short range/wide body aircraft. Currently, European civilian aircraft manufacturers are making use of more advanced technologies than their competitors in, for example, cockpit computerization and in active control and fly-by-wire technologies.

### Research and Development

The ability to compete in an industry focused on technological development depends on effective R & D spending. In Europe, aerospace industry research and development spending accounts for more than 16 per cent of revenues and is financed in a proportion of 40 and 60 per cent respectively by the industry and governments.<sup>33</sup> Public financing of R & D in Europe has not followed the same pattern as in the U.S.; however, it has been compensated by increased R & D expenditures by the companies themselves (see Table 7 in Appendix A). All in all, the European aerospace industry's research expenditures represent only one-third of those of their American counterpart.

To summarize, the European aerospace industry is establishing itself as a world-class force in the

growing international market. It seems to be in an excellent position to exploit the evolution of world markets in the 1990s, which should be characterized by a decline in military demand and growth in the civilian sector.

### European Space Industry

The space portion of the European aerospace industry still holds only a small share of overall production. Nevertheless, EC space industry companies, like their American and Japanese counterparts, but unlike Canadian companies, have access to a larger internal market, which assures them a solid market base and enables them to realize economies of scale.

More than 180 European companies now play a direct part in European space activities. As a result, Europe has built significant technological and industrial capabilities in the fields of development and production. These capabilities, applicable to the spacecraft and launching vehicle sectors, are the result of national space research programs, European countries' international collaboration via the European Space Agency (ESA), and the EC's international industry consortia. These European companies (a large number of them state controlled) sell their products to ESA<sup>34</sup> programs and to national administrations. It should be noted that most of the member states of ESA maintain a national program that is generally aimed at maintaining a capability to participate in ESA programs. The governments of the U.K., the Federal Republic of Germany, France and Italy, for example, participate in industry space programs.

ESA is fundamentally an R & D organization and, in defining its program products, is more influenced by the search for technical excellence than by the possibility of commercial success. Canada participates in ESA and contributes to its operating budget. It is also entitled to participate in optional programs of the ESA to an extent that is commensurate with its financial contribution in these programs. It should be noted that some European countries have policies that restrict access to non-European companies in fields in which European companies are active.

European launch vehicle production is one field in which the capabilities of European companies are