In November 1983, NASA flew a nine-day Space Shuttle mission that marked the initial use of the Spacelab orbital laboratory and several other “firsts.” Little noticed in reports of that highly successful flight was another first: the space debut of a remarkable high performance navigation monitoring computer known to NASA as SPOC, for Shuttle Portable On-board Computer. SPOC’s debut was as successful as the rest of the mission and the small but highly capable computer is now used regularly on Shuttle flights. The photo at left shows a part of the Orbiter Columbia’s flight deck with SPOC in use by astronaut John W. Young, commander of the Shuttle/Spacelab 1 mission.

SPOC was not a specially-developed system but an adaptation of a commercial computer called GRID Compass, produced by GRiD Systems Corporation, Mountain View, California. Hardware had to be modified and new software developed to meet space requirements, which led to changes in commercial models that benefited the company’s competitive position.

Since the Shuttle Orbiter’s primary computers must handle a multitude of processing functions, NASA wanted a separate computer to provide reliable monitoring of the spacecraft’s orbital path and a visual display of the Orbiter’s position at any time. Since weight and space are vital considerations in Shuttle operations, the computer had to be small and light; nonetheless, it had to have graphic display capability, a large memory storage capacity, high processing speed and a degree of ruggedness sufficient to withstand launch vibration. After evaluating a number of small computers, NASA selected GRiD Compass.

The principal modification needed was a fan to cool the computer; GRiD computers are normally cooled by convection, or heat transfer by circulation, but that process does not work in weightless space. NASA also
wanted a larger electroluminescent screen and an
improvement—for failsafe operation—to the lithium
battery that powers the important internal clock. The
power cord was modified to tap the Orbiter’s power
supply and Velcro strips were added to keep SPOC
from floating. The fan was later incorporated into the
larger screen models of the new Compass II line.

In Shuttle operations, SPOC automatically computes
and displays the Orbiter’s ground position, predicts
the paths of the next two orbits, identifies locations
where the Orbiter has line-of-sight communication
with Earth stations, determines points for certain
location-dependent Earth observations and
continuously displays mission elapsed time. These
demanding requirements necessitated a highly
sophisticated operating and control system, one of the
major considerations in NASA’s selection of the GRiD
Compass. Nonetheless, NASA and GRiD software
engineers had to spend many hours writing, testing,
and rewriting source code. This process, the company
reports, ultimately benefited GRiD and its commercial
clients, since it helped fine tune the GRiD Operating
System and common code documentation.

Shown at left, the GRiD Compass computer weighs
only 10 pounds, measures 15 inches in its longest
dimension and is two inches thick when the screen is
folded down; it slips easily into a standard briefcase.
GRiD computers are manufactured in nine models
using 17 integrated software packages. Widely used
for office (above) and conference (upper right) work,
the computers can also be used, with an optional
battery pack for power, for field work (lower right);
they have found special application among oil and
natural gas companies for on-site drilling and
production calculations, offering time and monetary
savings over sending information gathered at a wellsite
back to headquarters for computer analysis. For
similar reasons, GRiD equipment is used by the U.S.
Army as part of a field communications system. It is
also used by AT&T Communications and Bell
operating companies for on-site development of the
detailed equipment layout plans for new or existing
telephone buildings. Although the company is only
five years old, it has already built a strong market
base; GRiD Systems reports installations in more than
25 percent of the Fortune 1000 companies and in
many government agencies. In addition, the GRiD
computer’s role in space flight is growing as NASA
continues to expand the functions of SPOC.