Continued from P 102
and air entering the
intakes from above
and behind has to
turn through 180'.
The inlet's unusual
design is largely due
to the aerodynamic
challenge of achieving
this turn without flow
separation, particu-
larly with a lip
shaped for low drag
in a low-supersonic
flow field. To cope
with the airflow de-
mand, auxiliary inlets
have been fitted and,
althoug h normall y
open for take-off, are
closed soon after.
The unusual hard-
ware aspects of B-2 engineering are not echoed by the aircraft's rela-tively standard avionics. Founded on the 1553B multiplex digital data-bus, the system uses an architecture frozen early to allow the avionics to be hardened against the electro-magnetic pulse effects of nuclear explosions.
Dual-redundant flight mission
control processors provide overall management of the system. Cockpit controls and four 15cm-square colour displays per pilot are man-aged by four display processors. Quadruple-redundant digital flight-
control computers also manage Total range

A LE -36-(^

7 6

Range comparison

>^ ^ High altitude
^^»w ^ (unrefueled)

(Si 3 5

A\,0.
Low altitude " ^k
(unrefueled) ^ v

5 4

Aspect ratio

50-

®5C T

I
3

60"

1
2

flying as well as per-
forming elements of
the low-observable test
programme. "Stealth"
testing accounts for
25% of the planned
3,600 hours of tests.
Northrop says only
that "...initial testing
results show we are
meeting predictions".
On handling,
Hansen reports: "The
aerodynamic perform-
ance characteristics
from initial flight test-
ing, including drag
and fuel-flow figures,
generally met or bet-
tered expectations.
The longitudinal sta-
bility levels were
higher than predicted and control effectiveness levels were also higher, resulting in faster roll performance." Hansen adds that "...a welcome
area of disagreement with windtun-nel results was in ground effect. Ground-board tests in the tunnel indicated the aircraft would ex-perience a significant floating ten-dency on landing." Northrop had devised control-system equations for this contingency but these were not
implemented as the YB-49 had not
experienced such a problem.
Just to make sure, Northrop in-
vited YB-49 test pilot Max Stanley to
fly the B-2 simulator. Stanley said
processing for the stealth air-data Top: Reducing aspect ratio had little effect at low level, but a dramatic floating had also been predicte system and attitude-motion sensor effect at higher altitude. Above: The B-2 is designed for two crew the YB-49 but had not occurre set. The latter is a self-contained
inertial reference system and allows the
flight control system to operate even if all
air-data information is lost.
The air-vehicle interface processor con-
trols systems such as the radios and radar altimeter. Others cover terrain following and terrain avoidance, navigation, and de-fence and stores management. The naviga-tion processor integrates astro-inertial, iner-tial and global positioning inputs.
A stores management processor handles the aircraft's 22,730kg weapons load. In the nuclear role this can comprise 16 AGM-69A SRAM or AGM-131A SRAM II short-range attack missiles, or 20 B-61. or 16 B-83 free-fall nuclear bombs. For conventional missions, the aircraft's rotary launchers can carry up to 80 bombs.
A separate processor controls the Hughes APQ-181 synthetic-aperture radar and its input to the display processor. The Ku-band radar has 21 operational modes, including high-resolution ground mapping.
Much of the system has already been tested in a ground-based avionics integra-tion laboratory and a Boeing C-135 flying testbed. Although the latter has completed

basic avionics tests, Northrop is now con-sidering its continued use in the programme as a cost-saving measure.
The B-2 radar and navigation systems, including star-tracker optics, were tested in 305 C-135 missions. More than 1,000 hours were devoted to testing the radar and around 650 to the navigation system. Northrop says the radar tests achieved "...successful map making at maximum operational range resolution, power man-agement of the map mode and tower detection during terrain-following mode". Hansen says: "Since we have been testing the 'actual' avionics of the B-2, both in the ground and in the air, we are not expecting any surprises when we begin testing of the avionics in the third B-2 this summer".

FLIGHT TESTING

Flight-test evaluation is still proceeding, with the first two aircraft having amassed around 200 hours of flight time on over 50 flights. A third aircraft, the first to be equipped with the full mission avionics fit, is due to fly soon and will be used for avionics and weapon-system integration test

Hansen says: "The B-2 lands very
nicely, although stick forces in the flare are very light. With no flare — merely holding attitude through touchdown — the aero-plane makes a smooth landing any pilot would be proud of." Stopping distance is reduced by strong brakes — "just some-thing else!"
Northrop says flaps were considered but rejected after simulated trials showed reduc-tions of only 3% in landing and take-off distance. Hansen, who has experience of large types ranging from the B-52 and KC-135 to the Boeing 757, says the B-2 feels "like a DC-10" — agile despite its size. Some of the only unexpected results from flight testing so far include a slight fore/aft pitch motion in low-level flight and some differential heating on the "aft deck" area around the engine exhausts.
Flight-test results, plus the initial suppor-tability trials, gives Northrop confidence for the future despite the uncertainty over
funding. Hansen says: "The high correlation
with our predictions provides confidence in
meeting not only the remaining objectives
of the test programme, but our operational
requirements as well." •

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