SPACEFLIGHT

which enables a number of
visual system requirements to
be met, ranging from full
colour daylight to simple
monochromatic displays for
head-up symbology.
An interesting display of
Tepigen's capabilities was
seen during a low level "flight"
through Dovey Valley, Wales,
in a BAe Hawk. Only a real-
tively small area has so far
been modelled, using a
number of generic features—
larger areas being dependent
on radar mapping data.
Marconi is spending a lot of
time finding out how much
realism is needed in such
depictions, in order to produce
a system that is both realistic
and affordable. Periodic vali-
dating features such as trees
and houses clearly have to be
present, but only in minimum
detail for the fast jet applica-
tion at which Tepigen is
currently aimed.

For the Harrier GR.5 appli-
cation, Marconi believes that
the "area of interest" concept
is the best way of answering
the RAF's tough field of view
and resolution specifications.
The company has no inten-
tion of developing a wide-
angle display-type system
from scratch, and does not in
any case feel that this would
provide adequate resolution.
Instead, it is working with
CAE on a display slaved in-
timately to eye movement, in
which the instantaneous field
of view can be highly detailed,
the peripheral FOV less so.

CAE's fibre optic helmet-
mounted display has been
under development for three
years under a US Air Force-
funded programme based at
Williams Air Force base. A
prototype has been built and
the engineering model phase
is underway. A number of
other visual systems of similar
type are being developed, but
CAE claims that its use of
fibre optics to feed the display
to the pilot's eyes is unique.
The company has also
pioneered the idea of a 25°
overlap between the displays
to give a binocular effect.
The deal between Marconi
and CAE allows for the pair to
compete together for contracts
on a programme-by-pro-
gramme basis. The arrange-
ment is seen as mutually
beneficial since CAE does not
manufacture its own image
generator and Marconi needs
the marketing opportunities
available to an established
simulator manufacturer.

Advanced

shuttle

studied
WASHINGTON D.C.

President Reagan has
initiated a Nasa/US Air Force
study to assess US national
commercial and military
launcher requirements into
the next century. At the same
time the President has
approved Department of
Defence procurement from
Martin-Marietta of ten
uprated Titan 34D-7

expendable launch vehicles
(ELVs) worth an estimated
$2,100 million.
The ELVs will augment
Shuttle flights starting in
1988 at the rate of two
launches a year. The Titan
34D-7 is equipped with two
solid-rocket boosters and is
capable of placing a 10,0001b
satellite into geostationary
orbit.

The future launcher study
could lead to development in
the late 1990s of a second-
generation space shuttle and a
new large expendable launch
vehicle, possibly derived from
existing Shuttle components
such as the solid-rocket boost-
ers.

The shorter-term possi-
bility of a fifth Shuttle Orbiter
"is unlikely in the next fiscal
year", says a National Secu-
rity Council spokesman.
Rockwell has told Nasa that it
could deliver a new Orbiter in
1992, given a go-ahead in
1986. The company argues
that additional Orbits will be
required to support the US
Space Station when it
becomes operational in 1993.

The present fleet of four
orbiters (the fourth, Atlantis,
is delivered in June) will cost
about $6,000 million to oper-
ate over 20 years, Rockwell
estimates. A fifth vehicle
would cost a further $2,000
million. The current Orbiter
is designed for 100 missions,
or 15 years of life, but this
could be extended, Rockwell
believes, by upgrading system
components starting in the
1990s. As a first step, the
company has a Nasa contract
to replace Orbiter computers
starting in 1988.
Rockwell still sees the need
for ten Orbiters to meet
projected military and
commercial launch require-

ments, including those to
build and resupply the Space
Station. After handing over
Atlantis this summer, Rock-
well hopes to retain the capa-
bility to build one Orbiter
every five years.
A second-generation shut-
tle would be able to lift
100,0001b into equatorial orbit
and 75,0001b into polar orbit,
compared with 65,0001b and
40,0001b respectively for the
existing Shuttle. The new
vehicle would also be able to
land at most US airports.

Processing
Navstar

KENNEDY S.C.

Rockwell's Navstar process-
ing facility at Kennedy Space
Centre, Florida, is scheduled
to be completed in June. The
first satellite to be handled
will be GPS-13, a qual-
ification test vehicle for the
larger Block 2 production
versions of the global posi-
tioning system (GPS) space-
craft.

The Rockwell facility will
test the Navstar craft after
their delivery and mate them
to PAM-D2 upper stages
before shipping them to the
Shuttle payload integration
facility.
The first Block 2 flight will
involve GPS-13, which is
scheduled to arrive at the
Cape in June 1986 for a
Shuttle flight two months
later.

TDRS keeps
its secret
WHITE SANDS ~

Technical details of the
timing circuit problem experi-
enced with the TDRS track-
ing and data relay satellite
will not be revealed for secu-
rity reasons, says Nasa.
The TRW-built TDRS
spacecraft have encryption
devices installed which
protect the system switches
involved from interfering
signals. According to Nasa it
is impossible to be more
specific about the problem
without exposing the nature
of this protection system.

During tests of TDRS 1,
now in geostationary orbit,

Spacecom, which operates the
spacecraft on behalf of Nasa,
discovered that under certain
conditions timing circuits
could cause errors in system
switching sequences. While
operating procedures have
been developed to run TDRS
1 satisfactorily, this approach
"is not acceptable for multiple
spacecraft operations", says
Nasa.

The fault was confirmed in
tests conducted on February
27 and 28, just days before the
Shuttle Challenger was due to
lift off carrying a second
TDRS. Nasa decided to cancel
the mission, 51E, and to
remove and repair TDRS B.
When TDRS B and C are,
on station it is planned to
place TDRS 1 in a spare
location. In an operation last-
ing 58 days this satellite was
raised to geostationary orbit
in June 1983 using its
attitude-control thrusters
after its upper stage had
malfunctioned.

Astronomers

observe Pluto
LONDON ~

A once-in-124-years event in
the solar system is presenting
astronomers with a unique
opportunity to observe the
planet Pluto and its onfcy-
known satellite, Charon.
Charon and Pluto will be
eclipsing each other for the
next five years, during an
alignment that takes place
only twice during Pluto's orbit
around the Sun.
Charon was discovered in
1978 and Pluto-which will be
nearer than Neptune to the
Sun until 1999 in its highly
elliptical orbit—was first
detected in 1930.

Slick 6 OK
VANDENBERG AFB

Facility verification checks
using the non-flying Space
Shuttle orbiter Enterprise on
the SLC 6 "Slick 6" launch
pad at Vandenberg Air Force
Base, California, have been
successfully completed in
preparation for a maiden
launch on January 29,1986, at
the earliest. Enterprise was
mated to an external tank and
inert solid-rocket booster, and
was used to verify launch
support structures on the pad.

16 FLIGHT International, 23 March 1985