

Bold endeavour

Assembly of the International Space Station is scheduled to begin on 7 December

TIM FURNISS/LONDON

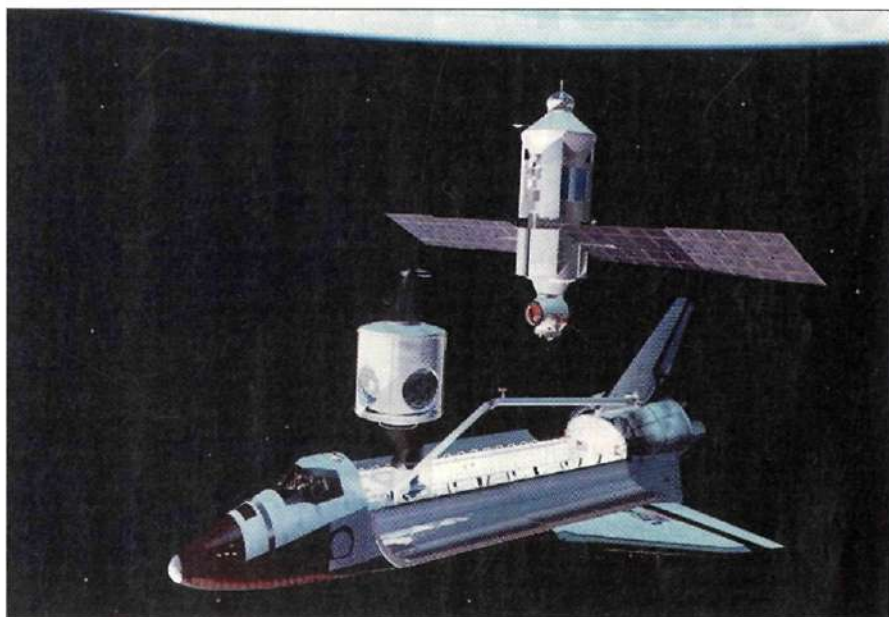
RUSSIA HAS DONE its bit, now it's NASA's turn. The Russian Zarya control module is in its planned orbit, ready and waiting. NASA's space shuttle Endeavour/STS 88 is poised on launch pad 39A at the Kennedy Space Center (KSC) in Florida to embark on the first mission to begin assembly of the International Space Station (ISS).

The Endeavour is to join the US Node attachment module, called Unity, to the Zarya, in preparation for a sequence of over 40 flights, mainly by the Shuttle, to complete assembly of the ISS by 2004. The complexity and intensive nature of the busy 11-day Endeavour mission, which includes three spacewalks to connect power and data lines between the two elements and to install other hardware, illustrates the challenge facing NASA, Russia and its international partners, Canada, Europe and Japan, to assemble the 400t orbital space base.

The Endeavour and its crew of six – commander Bob Cabana, pilot Rick Sturckow and mission specialists Nancy Currie, Jerry Ross, Jim Newman and Russian Sergei Krikalev (a late addition to the crew) – are scheduled to be launched at 03.59 local time on 3 December on what is known officially as ISS flight 2A.

Once in orbit, the crew will check out the Shuttle remote manipulator system robot arm, its television cameras and associated space vision system alignment aids. The first critical event will occur on flight day 3, when Currie uses the robot arm to lift the Unity out of the Endeavour's payload bay and docks it vertically to the Orbiter Docking System.

The following day, 7 December, the



The Zarya is mated to the Unity

Endeavour will rendezvous with the Zarya. The robot arm will capture the Russian module and mate it to the Unity. That is the easy part. The first spacewalk by Ross and Newman on flight day five is to last 6h 30min. It will feature cable and umbilical connections and the installation of a system for equipment transfer.

This will be followed by pressurising the mating adaptor which connects the Unity with the Zarya. An orbital manoeuvring system engine firing may also be made on the flight day six to refine the orbit, if required. A second 6h 30min spacewalk is planned on flight day seven to

install external cabling, equipment and antennas for early communications with the station and to deploy a sun shade and covers on the Unity. Finally, on flight day eight, the crew will enter the Unity-Zarya combination. Work will continue to install the communication and transfer hardware. The crew will leave the station the following day.

A final 6h 30min spacewalk is scheduled for flight day 10, and this is designed to allow the crew to catch up on any work that may not have been performed on the other two EVAs and to "get ahead" on tasks for future missions. The schedule calls for the transfer of a tool bag, the installation of a handrail on Zarya and a test of the production-model Safer manned manoeuvring unit backpack. This is a smaller version of the "flying armchair" used on earlier Shuttle missions and is a safety device to ensure that if an astronaut were to come loose from his or her safety harnesses while assembling or working outside the operational ISS, a simple manoeuvre with the Safer would ensure a return to base and avoidance of a "lost in space" incident. Endeavour will undock from the ISS on flight day 11, but work will continue with the deployment of a small Argentinean satellite called SAC-A and a US Air Force small research spacecraft, the MightySat-1. □

SPACE STATION CONTROL

AS RUSSIA'S Zarya module zoomed into orbit on 20 November, on the second floor of a nondescript building at NASA's Johnson Space Center, Houston, Texas, the International Space Station Mission Control Center was inaugurated.

From here, US flight controllers will coordinate with Russian flight controllers – at the Korolyev centre in Kaliningrad, near Moscow – to oversee assembly and operation of the orbital laboratory. Once the first space station crew takes up residence in January 2000, teams of 12 flight controllers will monitor everything about the ISS, from its communications to its air supply. One reason for having separate control rooms is that the ISS systems are controlled with different software from that which controls the Shuttle systems and because there will be times when both the station and one of the Shuttles are in orbit. Some Shuttle flights will not be related to the ISS – including the next flight, scheduled for March 1999, to deploy the Advanced X-Ray Astrophysics Facility.