US non-proliferation policy

Pact with China almost ratified

Washington

THE US Senate voted last week to approve President Reagan's controversial nuclear cooperation agreement with China, adding only some less-than-onerous certification requirements the President must meet to ensure that the agreement does not contribute to the spread of nuclear weapons. The Senate's approval is expected to be echoed shortly by the House of Representatives.

Opponents of the agreement have denounced it as a step backwards for the cause of nuclear non-proliferation: intelligence reports have been cited to support the claim that Chinese nuclear engineers have helped Pakistan to achieve a suspected nuclear weapons capability, and there have been reports of nuclear dealings with Argentina, South Africa and Iran. The agreement as signed by the President includes no formal non-proliferation safeguards, and critics say that this will encourage other countries to refuse to submit to non-proliferation safeguards.

The administration's answer is that China need not submit to safeguards because it is already a nuclear weapons state. The administration says that China has provided verbal assurances of its commitment to non-proliferation, but these have not been sufficient to quell anxieties in Congress. As recently as 1978, a Chinese leader publicly stated that all nations had the right to "nuclear strength".

More recently, China's position has changed: it has joined the International Atomic Energy Agency (IAEA) and in September announced for the first time that it would voluntarily open some of its civil nuclear facilities to IAEA inspectors. It will also apply IAEA non-proliferation provisions to its own exports.

Nevertheless, both the Office of Technology Assessment and the Nuclear Regulatory Commission have raised doubts about the agreement since it was introduced to Congress in July. Does it, for example, provide sufficient guarantees in the event of a serious deterioration of relations between the two countries? Although it specifies that prior mutual agreement would be needed before any US-derived nuclear fuel could be reprocessed or further enriched, many question how effective this would be if China wanted to process for weapons use stocks of nuclear fuel already on hand. And the agreement includes no clear US veto rights over exports of weapons-grade plutonium made from US fuel.

The sudden climb-down last week by opponents of the agreement seems to represent a simple recognition of political realities: to demand a substantially changed agreement that would require new negotiations with China would have needed an unlikely two-thirds majority in

Congress. Furthermore, any action would have had to be taken before 11 December, when the agreement is due to come into effect.

The modest requirements attached to Congress's approval are that the President must certify that nuclear technology and materials supplied to China will be used solely for their intended peaceful purpose, and that China will provide unspecified

"additional information" on its non-proliferation policy. In addition, the President must certify that US domestic law will be observed, and that requests for reprocessing approval can be granted or denied individually. The administration has cooperated with legislators on the wording of the certification requirements and is content with them; the way appears now to be open for US nuclear construction companies to compete with their European counterparts for contracts in the Chinese nuclear power programme.

Tim Beardsley

Television technology

Picture compression in sight

Princeton, New Jersey

SQUEEZING more television channels into a given bandwidth, every communication company's objective, is also high on the list of RCA's objectives. The company's research laboratories here are designing a novel electronic test unit that will double the number of television channels that can be carried by a satellite transponder.

The computer-controlled unit will show how well imperfect television signals, with some picture frames entirely missing, can be regenerated at the receiving end. To begin with, the tests will be conducted omitting every second frame of a complete television transmission. They will then be extended to see whether the system will work when more than half the signal is not transmitted.

The technique, called Motion Adaptive Interpolation, relies on a computer algorithm to reconstruct the missing frames. A less refined version of the system has been operating since 1983 on the telecommunications satellite, Satcom V, built by RCA to carry television signals to Alaska. Signals at the receiving end are regenerated from signals from which half the frames are missing, but the quality is poor. RCA considers that substantial improvements would be needed if the system were to be used for television traffic within the mainland United States.

RCA now operates five telecommunications satellites, and plans to launch two more by the end of the year. Roughly half the traffic consists of television transmissions between the major television networks and their affiliated stations and between programme suppliers and cable networks.

Predictably, processing television signals from which every other frame is missing imparts a jerky motion to moving objects. The machine on which RCA is working would store successive frames in such a transmitted signal and then, by interpolation between the positions of moving objects, reconstruct the missing intermediate frame.

If the development proves successful, RCA plan to use the system on its video-conferencing links and would also expect

suitable computing machinery to be installed at the head-ends of cable television networks, at the points where signals are received from linking satellites for onward transmission through the network.

Another spur to these developments is the general concern for the design of television receivers for the 1990s, on which several manufacturers are working. One likely development is that of digital transmission of the information required for each picture element (pixel), which among other advantages, will allow colour and luminance information to be transmitted separately, allowing greater control of picture quality.

Part of the development now under way is psychologically based; RCA wants to know how the human eye perceives motion in a sequence of two-dimensional images. The research group has provisionally worked out a scheme whereby it is not necessary to compare entire television frames to detect motion in one relative to the other. Instead, a sequence of progressively more rudimentary frames is constructed by omitting alternate rows and columns of pixels from a frame; the hope is that it will be possible to identify significant motion in the most rudimentary of these digital pictures, thus reducing the amount of data to be handled by the computers. It may then be feasible to incorporate enough processing capacity into individual television sets.

The same principle of data compression is being used in the development of a "smart" camera which may be used as a means of detecting only significant movement within its field of view.

Used as an automatic surveillance system, the camera is controlled by a modest microprocessor whose limited capacity is nevertheless able to detect movement in the most rudimentary of the sequence of collapsed frames and then to arrange to inspect a more informative frame in the hierarchy on the succeeding cycle of operation. RCA hopes that the US National Aeronautics and Space Administration will use the system as a motion detector in the gravity-free environment of the space cabin.

Bill Johnstone