North American wins the big prize

The Space Division of North American Rockwell Corp., Downey, Calif., won the big aerospace contract plum last week—the space shuttle. With a low bid of $2.6 billion, NR won out over other contenders, Grumman, Lockheed and McDonnell-Douglas.

Under the contract, NR will be responsible for design, development and production of the orbiter vehicle and for integration of all elements of the space shuttle system. Two orbiters will be built. NR's Rocketdyne Division received the $450 million contract for 36 orbiter engines.

The shuttle development will be national in scope. NR chairman and chief executive officer Willard F. Rockwell Jr. said as many as 10,000 subcontractors throughout the country will receive more than 50 percent of the multi-billion-dollar contract.

While the goodies may be spread around—with presumably healthy subcontracts going to Grumman, Lockheed and McDonnell-Douglas, NR is undoubtedly the big winner, and the repercussions on the other companies are sure to be substantial. (NR was also the "sole source" contractor for the docking module to be used in the joint U.S.-Soviet mission in 1975.) Now with NR getting most of NASA's big cheese, it could, some speculate, become *the* space contractor for the future. Not so, say others. But the contract will allow NR to maintain expertise (or even get a leg up) for the next generation supersonic and hypersonic aircraft. Although NR developed the X-15, the XB-70 and is now working on the B-1 bomber, Grumman has built the F-14, McDonnell-Douglas the F-15, and Lockheed the F-104 and the SR-71.

The shuttle contract will also allow NR to keep a cadre of space engineering talent, which has been dwindling since the Apollo heyday. Robert Anderson, president and chief operating officer of NR, predicts a gradual buildup of employment at NR that will peak in 1976 with 9,000 persons working directly on the orbiter integration program. Horizontal test flights of the orbiter are scheduled to begin in 1976 at Vandenberg Air Force Base. Manned orbital tests will begin in 1978.

Still remaining in the shuttle package to be doled out by NASA are the external tank and the solid rocket booster contracts. They will be procured when the engineering of the space shuttle systems has progressed far enough. In announcing the shuttle contract award, NASA also announced that its Michoud assembly plant at New Orleans would be used for the assembly of the shuttle tanks.

Hoyle and Narlikar 'consider the muon'

For some time Fred Hoyle and J. V. Narlikar of the Institute for Theoretical Astronomy at the University of Cambridge have been working out a cosmology and physical theory based on the principle that no body is an island. In the Hoyle-Narlikar theory the properties (especially the mass) of anything from a neutrino to a galaxy are not fixed arbitrarily and independently of all else, as other theories tend to believe, but are determined by the composition and structure of the rest of the universe.

Hoyle and Narlikar have been publishing their theory chapter by chapter. A report about a year ago (SN: 9/25/71, p. 203) dealt with its application to gravity and the large-scale problems of the universe that are bothering cosmologists nowadays. The latest report, in the July 14 NATURE, addresses itself to an outstanding mystery of the domain of particle physics, the difference in mass between the electron and the muon.

The electron and the muon are almost the same particle. Both are leptons, that is, particles that respond to the so-called weak subatomic force but not the strong force that binds atomic nuclei together. In physical properties, so far as has been experimentally measured, the two particles are identical except that the muon is about 207 times as massive as the electron.

In a universe where electrons already exist, the question arises: Why should there be a muon? (Since the electron has a well known and important function in the structure of atoms, and the muon does not, the electron is considered primary). I. I. Rabi once started a lecture with the words: "Consider the muon. Who ever ordered that?" Ordered or not, it is there, and Hoyle and Narlikar present the qualitative beginning of an explanation.

The explanation depends on one other difference between electron and muon: The muon is unstable; the electron stable. Muons decay radioactively, and in so doing produce electrons. Thus from muons eventually come electrons, but the reverse does not happen. If the universe started off with equal numbers of electrons and muons, there would come to be more electrons as time passed. As this occurred, interaction with the rest of the cosmos according to the Hoyle-Narlikar theory leads individual muons to become heavier than electrons, compensating, so to speak, for their lesser number.

The theory does not come out with the correct present mass ratio between the two particles. Although the authors explain the failure on the grounds that electromagnetic interactions of the particles with themselves (not included in this theory) contribute to the observed masses, this is the point where critics are most likely to bite. Nor does the theory give a metaphysical explanation of the muon's existence. It does give a qualitative argument why the mass difference should exist in a universe containing both particles.

Furthermore the present achievement represents a significant advance for Hoyle and Narlikar in the making of physical theory. In the words of one commentator: "They show how to combine their ideas about long range interaction in gravity and electrodynamics and their ideas about quantum mechanics." This combination has been a serious stumbling block for many theoretical formulations. That Hoyle and Narlikar have gotten by it (assuming the result stands up to criticism) may in the long run be more important than the question of the muon mass. □

Education funds restored in NSF bill

Earlier this year, the House passed bills authorizing more funds for the National Science Foundation for fiscal 1973 than requested in the Administration budget. The increases were to go to education (SN: 5/6/72, p. 296). But though five Senators introduced a bill granting even greater increases to NSF's education programs, the Senate ultimately voted to cut the programs back to the levels requested by the Administration.

Now House-Senate conference committees have restored the increase. The appropriations bill, which must now be passed by both Houses, adds a total of $34.8 million to NSF's education programs by setting minimum expenditures. The minimum for institutional grants is $18 million, with $71 million for science education improvement and $20 million for graduate student support. These were the only items for which expenditures were specified, but since the total NSF appropriation recommended last week is $619 million, less than the requested $646 million, the difference will come out of other programs. □