Shuttle flight #3: Branching out

The third of the space shuttle Columbia's four scheduled test flights, still holding to its scheduled March 22 launching, will take a significant step toward widening the range of people with access to space. The main goal of the mission, of course, will be to continue the twice-tried craft's shakedown evaluation, but its diverse payload will also include a three-foot-long cylinder designed to analyze the environment awaiting the National Aeronautics and Space Administration's so-called "Getaway Specials." The specials offer interested users a chance to send payloads of up to five cubic feet and 200 pounds on a days-long orbital journey for $10,000. Well over 300 individuals and organizations ranging from filmmaker Stephen Spielberg to student contest-winners in various fields already hold reservations to place cargoes (some yet unspecified) on subsequent shuttle flights.

One student project, in fact, though not a Getaway Special, will be riding on the upcoming flight. Todd E. Nelson, a high school senior from Adams, Minn., won the privilege as one of 10 finalists (out of 1,500 proposals submitted) in the first national "Space Shuttle Student Involvement Project," a joint venture of NASA and the National Science Teachers Association. Nelson's experiment is to study the effects of weightlessness on the flight of insects, in this case a pair each of velvetbean caterpillar moths and drone honeybees, chosen for their differing ratios of body mass to wing area. An astronaut will film the insects in flight through the walls of their container. A second contest in the student series is already underway, and nearly twice as many entries for it have been received.

The shuttle flight will also include extended tests of the vehicle's remote maneuvering arm, as well as a host of investigations of the surrounding space environment and the shuttle's effect on it. One such device will measure the electric, ionic and magnetic fields surrounding the orbiter, while another will focus on the numbers, chemistry and density of micrometeorites in the vicinity. A third will monitor the shuttle's tendency to build up electrical charges in the earth's natural plasma environment, while a separate instrument package measures the tiny amounts of contamination produced by particles and gases given off by the craft's surfaces, and an additional device measures the flux of solar X-rays during the flight. Together, the collected results will become part of a data bank about just how "clean" a ride the shuttle will be able to offer sensitive scientific instruments and other payloads likely to be riding on the craft in the future.

Also aboard will be a repeat of an experiment designed to determine the optimum amount of soil moisture needed for some plant-growth studies scheduled for the European Spacelab research module when it is carried by a later shuttle flight. The preliminary experiment was to have compared the relative growth of a group of dwarf sunflower sprouts during the shuttle's second mission last year, but its results were rendered virtually useless when that flight was cut short due to a malfunctioning fuel cell.

The shuttle's fourth and last scheduled test flight, carrying a payload for the Department of Defense, is so far targeted for early July. The week-long mission is to be flown by astronauts Thomas K. Mattingly and Henry W. Hartsfield, who have already trained as the backup crew for flight #3. For their own mission, however, they will be the first NASA astronaut team to have no officially designated backup. "A pool of experienced shuttle pilots now exists," says NASA, "and a crewman could be replaced with minimal impact to crew training and scheduling."

With the test series successfully completed, the shuttle will begin its role as an "operational" vehicle, deploying communications satellites and carrying out other tasks. The first operational flight, tentatively aimed at mid-November, will also be the first time the craft carries a crew of more than two people, including a pair of "mission specialists" in addition to the regular commander and pilot. The following mission, targeted so far at January 1983, is to be the maiden voyage of "Challenger," the second shuttlecraft, as NASA's "Space Transportation System" finally becomes a fleet. —*J. Eberhart*

Code breach blamed for hotel disaster

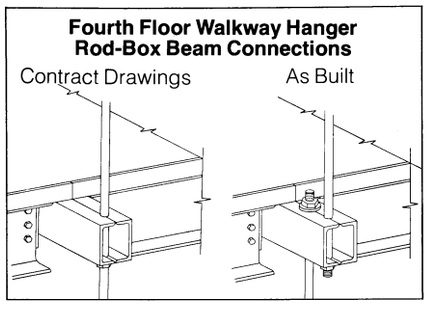
After months of intense investigation, National Bureau of Standards researchers report they have pinpointed the most probable reasons for the collapse last summer in Kansas City of two Hyatt Regency Hotel suspended walkways (SN: 9/26/81, p. 196). The highly suspected reasons for that disaster—which left 113 persons dead and 186 others injured — recently were detailed at a press conference held at NBS in Gaithersburg, Md.

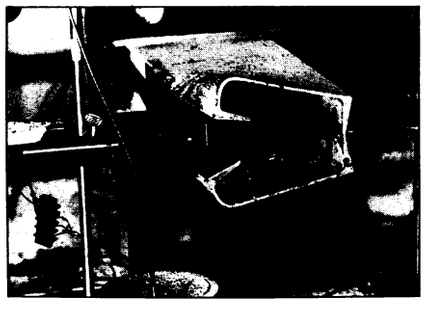
Two factors related to the design of connections between certain walkway beams and hanger rods "were critical in causing the collapse," reported Edward O. Pfrang at the press conference. First, said Pfrang, who headed the NBS investigation, even the box beam-hanger rod connections as originally designed and approved for construction would have supported a load far below the capacity required by the Kansas City Building Code. Second, Pfrang reported, this situation was further aggravated when a different box beam-hanger rod arrangement was substituted for the one in the original design. The resulting connections not only violated the city's building code, but also rendered the hotel "skywalks" barely capable of resisting their own weight.

In the original skywalk design, plans called for a single set of hanger rods to pass from the roof framing to the fourth-floor box beams and on through the second-floor box beams—welded pairs of bracket-shaped steel pieces that rested on hanger-rod washers and nuts below the walkways (see diagram). "Under this arrangement, each box beam would separately transfer its load directly into the hanger rods," Pfrang reported. During construction, however, those plans were scrapped in favor of a design in which the second-floor walkway hung from the fourth-floor walkway. Professional stamps on shop drawings for this change from a continuous to an interrupted set of hanger rods indicate that they were reviewed by the contractor, structural engineer and architect, Pfrang reported. That change, he said, "essentially doubled the load to be transferred by the fourth-floor box beam-hanger rod connections."

At the time of collapse, the maximum load on any one of those critical fourth-floor hanger rod connections was 21,400 pounds, NBS researchers concluded. After conducting various structural tests, the researchers also determined that the average, ultimate capacity of each of those connections was just 18,600 pounds. Had those same connections been designed according to the Kansas City Building Code, their ultimate capacity would have been at least 68,000 pounds each.

—*L. Garmon*





Researchers measured the pressure "breaking point" of a box beam from the undamaged third-floor walkway, which was not connected to the collapsed ones.

Illustrations: NBS