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COVER: Part of the southern hemisphere of Jupiter's moon Io (centered near 68°S, 272°) shows complex graben (fault-bounded depression) and complex scarps in this photo taken by the Voyager 1 spacecraft. Some Voyager researchers believe that some process may be eroding away the edges of the upper scarps, though evidence for such a process is scant. Such details are part of preliminary maps of the major Jovian satellites, based on Voyager 1's striking photos. See p. 396. (Photo: Jet Propulsion Laboratory/NASA)

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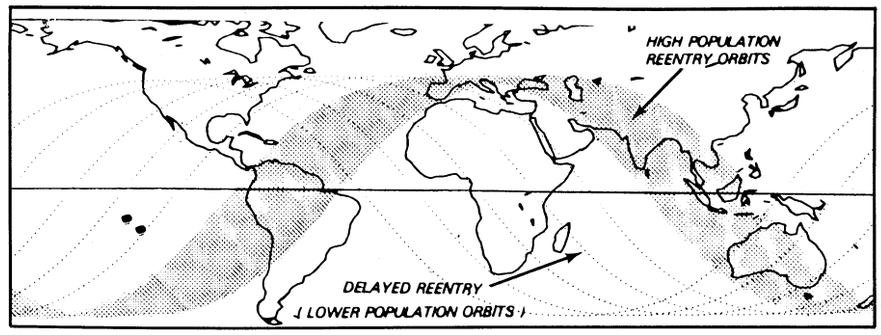
SCIENCE NEWS OF THE WEEK

Skylab: Seeking a Handle



The population under Skylab's shifting orbit varies from 5 million to 158 million.

Each time the Skylab space station crosses the equator from north to south, it passes over a point on the earth's surface that is more than 2,600 kilometers west of the crossing point one orbit before. Successive orbits therefore cover very different territory, and with Skylab expected to crash to earth in perhaps 500 pieces next month, the difference could be very important. An "orbit risk analysis" carried out by the National Aeronautics and Space Administration has revealed that the number of people living under Skylab's orbital path at any given time varies from as few as five million to as many as 158 million. Thus the potential risk from the space station's falling parts, which may spread over a "footprint" covering more than 6,000 km along the orbit's ground track, can vary by a factor of more than 30, depending on the location of the final orbit.

It is this wide variation that has prompted NASA to plan an attempt at selecting the orbit during which Skylab finally does go down. The object's orbital motion cannot be appreciably modified, but there are slim hopes that, by reorienting the facility to increase or decrease the amount of atmospheric drag, it can be made to descend a few orbits later or earlier, should a less-populated ground track be within reach.

This week, flight controllers at NASA's Johnson Space Center in Houston were preparing for the essential first step in the agency's main plan, which one official admits is "a less than even shot." Perhaps on June 18 or 19, the controllers would attempt to maneuver Skylab into a position in which it is relatively stable against the growing aerodynamic and gravitational forces that act on it. It is also an orientation with high atmospheric drag, somewhat hastening the object's descent. The hope is that, with perhaps 12 hours remaining before the end and the final orbit reasonably predictable (though not the location of the impact footprint), it will be possible to judge whether a less-populous ground track exists one to three orbits later, and to shift Skylab back into a low-drag position that will delay its fall that long. (About two orbits in the low-drag position, officials calculate, should be worth about one orbit's additional time aloft.)

If next week's shift to the stable, high-drag position fails, NASA cites only one other hope: There is a faint chance, now being evaluated, that about 8 to 10 hours before impact, Skylab may naturally reach a stable, *low*-drag position. If time and tracking-station coverage permit, it may be possible to start the station tumbling, with resultant higher drag that might enable the final descent to be moved one or two orbits earlier. □

Tapping heavy crude: A forgotten resource

The good news is that we're really not running out of oil. The bad news is that "cheap" oil is gone forever and what is left can probably never be pumped up and refined quickly enough to "end" the energy crisis. This view is directing the research and investments of most petroleum producers and refiners. Hence their interest in the First International Conference on the Future of Heavy Crude Oil and Tar Sands, a nine-day meeting in Edmonton (Alberta), Canada, that ended this week. Sponsored by the United Nations Institute for Training and Research (UNITAR), the U.S. Department of Energy and the Province of Alberta, the meeting's 300 invited delegates represented 35 nations and roughly every major petroleum producer, including OPEC (Organization of Petroleum Exporting Countries).

Texas gushers, symbolizing the heyday of American oil exploration, contained light-crude oil. Light oil, generally thin and fluid, pours like warm maple syrup even when cold. In contrast, heavy oils are thick and viscous, with the consistency of molasses or tar, depending on their makeup and temperature. They don't gush, and many won't even pour (much less flow through pipelines) unless heated substan-