was assault on a citizen. "Such assaults," says Dr. Reiss, "were rarely in response to physical aggression by the citizen and never necessary to sustain an arrest." In Chicago, 7.3 percent of the officers were observed using excessive force on citizens. In Boston, 6.1 percent and in Washington 5.2 percent were guilty of assault.

The second most common felony was theft from a burglarized establishment. The third most common crime was extortion or shake-down of citizens in the acceptance of gratuities as bribes. The rates for these crimes were not as high as for assault, but Dr. Reiss points out that all findings in this study are minimal due to the presence of the observer.

Violations of department rules by patrol officers on duty were also recorded. Drinking on duty (more than three shots of whiskey) was as high as 17 percent in Washington. As many as 20 percent of those observed in Chicago slept while on duty. In Boston 18.4 percent of the policemen were guilty of neglect of duty, and 2.7 percent of the Chicago police falsified reports.

These rates of felony would not be alarming in a civilian population, but they are high for a group of men who are enforcers of the law. Dr. Reiss acknowledges that most policemen are not offenders but he still regards the problem as serious. "Police departments will remain vulnerable to internal and external subversion until we gain both internal and external systems of accountability that are workable," he says. The best protection for our policemen, he feels, are stronger quality control systems within the system and stricter evaluation from outside. □

ASTRA funded

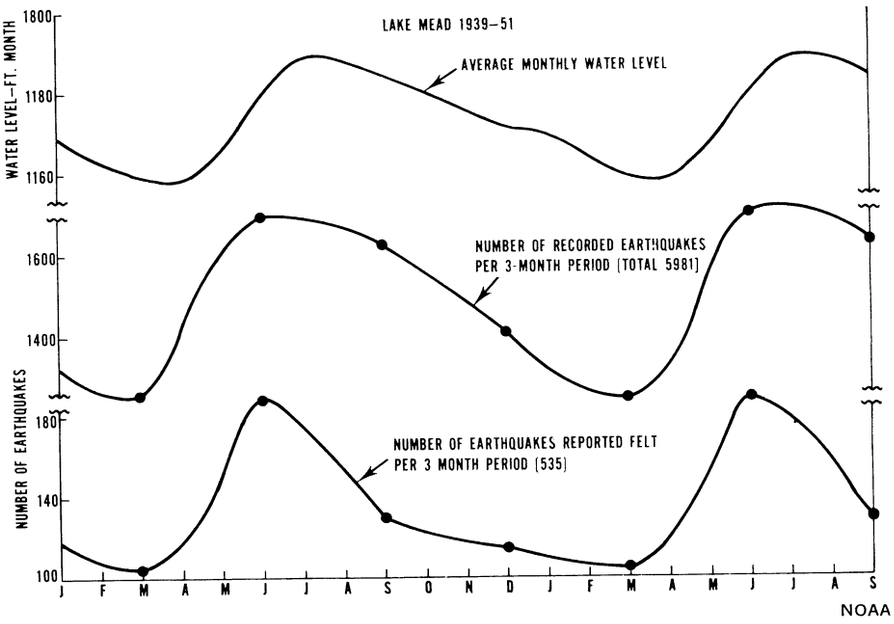
Project ASTRA (SN: 10/10/70, p. 300), the University of Washington's creative project to use astronomical techniques and telescopes to study the earth's atmosphere, received a $113,281 grant from the National Science Foundation last week. The money is for one year's experimentation with the concept. By studying atmospheric interference lines on photographic film plates kept during the last 50 years, scientists can make comparative studies of the increases and types of pollution throughout the world.

INTELSAT agreement

Negotiations between the United States and some 80 nations over the INTELSAT (the international satellite system) ended last week with an agreement to place the management of INTELSAT under the control of a "Director General" instead of COMSAT (Communications Satellite Corp.).

FIVE DAM STUDY

Reservoir loading and earthquakes



Lake Mead: Correlation between seasonal water level and seismic activity.

Terra firma is somewhat less solid than it seems. A number of manmade disturbances, such as nuclear explosions, fluid injections at oil fields and the filling of reservoirs, appear to be able to perturb its crust enough to cause earth tremors. Recently, however, man has begun to realize that these same events may also have a stabilizing influence.

Now Wendell V. Mickey, a seismologist with the Department of Commerce's National Ocean Survey, reports that in some cases the filling of reservoirs has been followed by a decrease in seismic activity in the surrounding area.

Mickey has compared seismological data from five areas of the United States where large water impoundments exist or are planned: Glen Canyon, Arizona; Flaming Gorge, Utah; Lake Mead, Nevada; and San Luis and Cedar Springs, California. In areas surrounding the Glen Canyon and Flaming Gorge reservoirs, he told a symposium on manmade lakes in Knoxville, the number of earthquakes, especially within 40 kilometers of the dams, actually decreased as the lakes were filled. At Flaming Gorge, filled to operating level by November 1962, there were 701 earthquakes in 1961, 669 in 1962, 665 in 1963, 258 in 1964, 85 in 1965 and 215 in 1968. The Glen Canyon reservoir was filled by May 1963. At this site, there were 170 earthquakes in 1961, 149 in 1962, 173 in 1963, 62 in 1964, 50 in 1965, and 109 in 1968. The seismic activity at these locations, Mickey points out, would normally display some periodicity, but the correlation between the filling of the reservoirs and the decreases in seismicity could be significant.

At Lake Mead, Mickey found the most dramatic evidence to date of the direct effects of water loading. Lake Mead, created by Hoover Dam, contains about 44.1 billion tons of water. Effects of reservoir loading at this site have been studied since 1938, when the U.S. Coast and Geodetic Survey (now National Ocean Survey) established a seismometer at the dam site. Seismic records for the period from 1939 to 1951, Mickey has found, show a clear correlation between the number of earthquakes and seasonal changes in water level, with the fewest earthquakes in March, when the water level was lowest. The peak in both earthquakes and water level came in June and July. This periodicity disappeared when the Glen Canyon and Flaming Gorge reservoirs were built, as these reservoirs, located upstream from Lake Mead, control the amount of water flowing into it. The rate of earthquake occurrence at Lake Mead decreased by 50 percent.

At the fourth site, San Luis, located within 13 miles of a major fault system, water loading behind the dam apparently had no influence on seismic activity. The last site, at Cedar Springs, is about 50 miles east of Los Angeles near the San Andreas Fault. A large dam is planned for this spot, and as it is filled, seismic activity will be monitored to uncover any correlation with variations in the weight of the water. □