Research Trends

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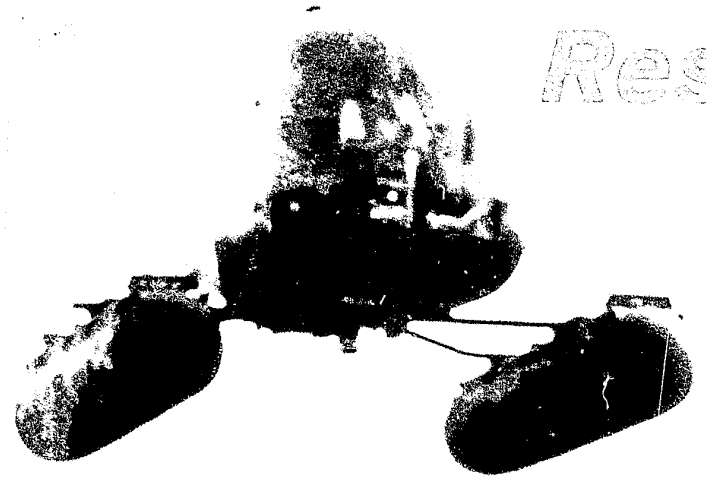
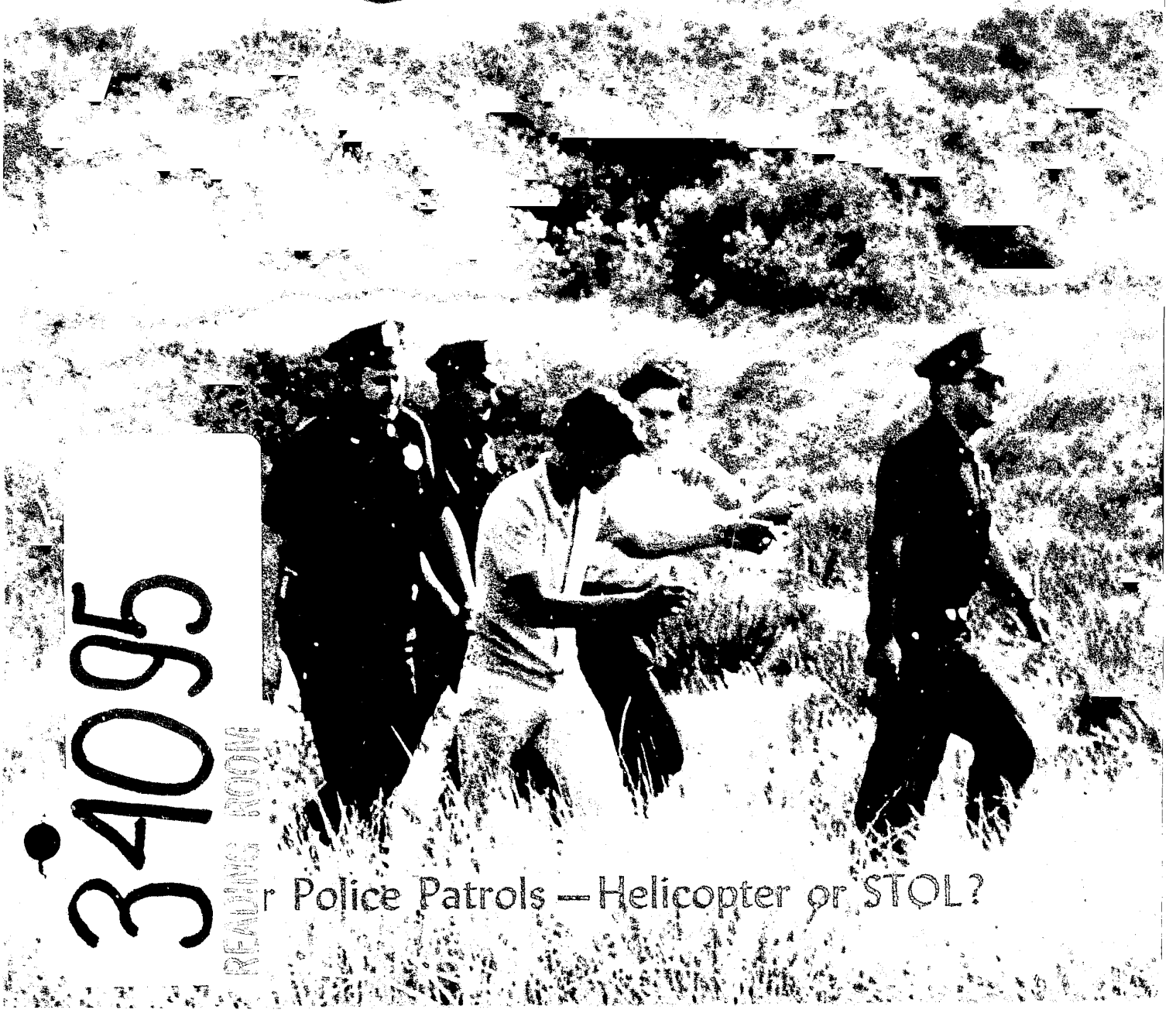
Autumn 1971





r Police Patrols — Helicopter or STOL?

Experiment Compares Use of

THE COVER—A pair of theft suspects, handcuffed together, are led by three New York City policemen from their hiding place in a game refuge. They had been spotted from a police department helicopter, a Bell 47J-2A.

One of the chopper's crew joined with two ground patrolmen in making the arrest while the ship hovered above the flushed-out youths.

(N. Y. Daily News photo)

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In suburban Miami, three gunmen held up two food stores in quick succession the night of July 6, 1970. Escaping with more than $400, they sped south in a red Mustang. On Route 1 through Perrine, they managed to duck around a hastily improvised roadblock.

Minutes later, however, a powerful searchlight from the sky beamed down on the fleeing Mustang. The bandits made futile attempts to shake off the sky surveillance. Finally, in desperation, they ditched the car and fled toward a wooded area.

The skybeam kept one of the robbers illuminated until Deputies A. Clark and H. Ross, from a pursuing patrol car, were able to make the capture in an open field. Artie Coley was booked on charges of armed robbery, auto theft, and assault on a police officer with intent to commit murder.

Coley's nemesis—the aircraft which kept him in its light beam—was not the conventional police aircraft, a helicopter. Instead, it was a STOL (Short Takeoff and Landing) plane—a Helio Super-Courier being operated by the Metropolitan Dade County Public Safety Department in a one-year experiment to determine the usefulness in police work of such aircraft.

The Helio Super-Courier used in the experiment is a single-engine six-place light aircraft. It can land, or take off over a 50-foot obstacle, in only 610 feet. Its top speed is 165 mph, but its special wing configuration permits it to be flown under complete control as slow as 30 mph.

The one-year project was partially funded by the Law Enforcement Assistance Administration (LEAA), an agency of the U. S. Department of Justice. Increasingly, police jurisdictions are applying to the Federal government for financial assistance in purchasing aircraft. Usually these are helicopters, but LEAA raised the question as to which missions a STOL craft could perform as well or better than a helicopter, and how cost-effective the STOL would be.

When the Dade County experiment began, CAL was already engaged in a related study of helicopter utilization by police for the National Institute of Law Enforcement & Criminal Justice, which is part of LEAA. The Laboratory's role in Dade County was to design the test plan and document and evaluate the preliminary results for the Institute. From this and other data, the Lab has helped the Institute develop preliminary guidelines for the best uses of police aircraft; these guidelines will in turn assist the Federal government in deciding which applicants should receive grants for police aircraft and whether these aircraft should be helicopters, STOLs, or some mix of the two.

Dade County's Public Safety Department will issue an extensive report covering the full year of their experience with the STOL. In the meantime, the Laboratory has released (CAL Report VY-2901-G-2) its 165-page evaluation covering an intensive period of comparative flight operations during a four-week period in June-July 1970.

The comparison aircraft was a Bell 47G-2 helicopter which the Dade County police had been using for 10 years. Both the STOL and the helicopter were assigned to fly 10 different types of patrols, including general surveillance; special patrols over the waterfront, rooftops, vacant land, parks and other recreational areas, and rural areas; fire detection, and search for stolen vehicles.

Even before the official schedule could go into effect, however, a major civil disturbance broke out in Miami involving uncontrolled crowds. This provided an

Helicopters and STOLs In Police Patrolling

unexpected opportunity for evaluating both aircraft in a critical situation.

"The helicopter and the STOL, working as a team, were used to provide illumination, surveillance and command-and-control in the civil disturbance area," Allen R. Kidder and Sigmund P. Zobel, project director, observe in the CAL Report.

"Both the helicopter and the STOL were used to report to ground units the location of fires, firebombers, snipers, looters and crowd gatherings. The STOL assisted in the arrest of at least three firebombing suspects, while the helicopter assisted in the arrests of at least 10 fire-bombers, looters and snipers."

The helicopter dropped many tear gas canisters to disband crowds and flush fugitives from dense vegetation; the STOL could not be used for this because its speed and its minimum altitude of 1,000 feet (required by FAA regulations over densely populated areas) made canister delivery inaccurate.

SOURCES FOR THIS ARTICLE

Mr. Kidder

Dr. Zobel

Both aircraft were equally effective in illuminating trouble spots at the request of ground units. The STOL, which was equipped with a wing-mounted searchlight rated at 3.8 million candlepower, provided satisfactory illumination from 1,000 feet. The helicopter's "homemade" system—consisting of three aircraft-type landing lights—wasn't as bright, but the helicopter compensated by flying at an altitude of 300 to 600 feet.

"The number of requests for illumination," says the Report, "grew noticeably each night as ground units became increasingly aware of the availability and effectiveness of airborne observation and illumination." On one occasion, following an accidental shooting on a rooftop, the helicopter lit the scene so victims could be lowered on stretchers.

Both aircraft were of special value in their role as aerial observation platforms from which the police could look down on areas invisible to ground patrols —rooftops, interior wells of buildings, backyards, areas masked from view by fences or trees or vegetation. During the final night of the disturbances, when a community meeting was being held to arrange peace, all police units (except for a special task force) were withdrawn from ground patrol within the disturbance area; complete reliance was placed on the aircraft for surveillance and control.

Following restoration of civil order, the two aircraft undertook the test schedule set for them by CAL. The STOL flew 63 patrols totaling 126 hours by the end of the test period; the helicopter (with one of its two

Airborne police have excellent capabilities for spotting and overtaking stolen cars. (Hughes Tool Co. photo)

regular pilots unavailable) flew 50 patrols totaling 71 hours.

The Report, in its assessment of the Dade County experience, concludes: "For general surveillance, it appears that the STOL is a suitable vehicle, although the helicopter may be somewhat more effective." In comparing relative effectiveness of the two vehicle types, the Report suggests that allowance be made for the fact that Dade County's helicopter pilots had a big edge in experience—each had been serving as an airborne policeman for ten years, whereas the STOL pilots, although experienced and well qualified both as police officers and as private pilots, were relatively inexperienced in combining these roles as law enforcement pilots. Another important consideration is that the two vehicles employed in the testing are particular designs, each with its own characteristics and limitations, in the helicopter and STOL classes; thus, they cannot be taken as exemplifying the full spectrum of helicopter and STOL aircraft available for possible police use.

The helicopter during its 50 missions assisted in at least 24 arrests. Its crew discovered more than 15 fires, 10 automobile accidents, 9 stolen or abandoned automobiles, and two areas where narcotic plants were growing, and assisted at the scene of two drownings. The helicopter also provided illumination to assist in night rescue operations after a stolen car, pursued by a police ground unit, plunged into a canal in a rural area.

The STOL during 63 missions assisted in at least 8 arrests. Its crew discovered 11 fires or more, 8 stolen or abandoned automobiles, and two auto accidents; at one major fire it dispersed the crowd by using its high-intensity searchlight.

Helicopters are preferable, the analysts found, when missions are no longer than two hours, the jurisdiction is compact in area, and there is need for low-altitude search, pursuit, or photography, or a need for hovering as during rescue, evacuation, crowd control, or delivery of tear gas.

The STOL is preferable to a small piston-engined helicopter

THE DADE COUNTY AIRCRAFT

Sgt. William Elliott, left, and Sgt. Robert Riggs piloted the Bell 47G-2 helicopter for Dade County.

The Helio Super-Courier six-place airplane can fly from 30 to 165 mph, take off over 50 foot obstacle in 610 feet.

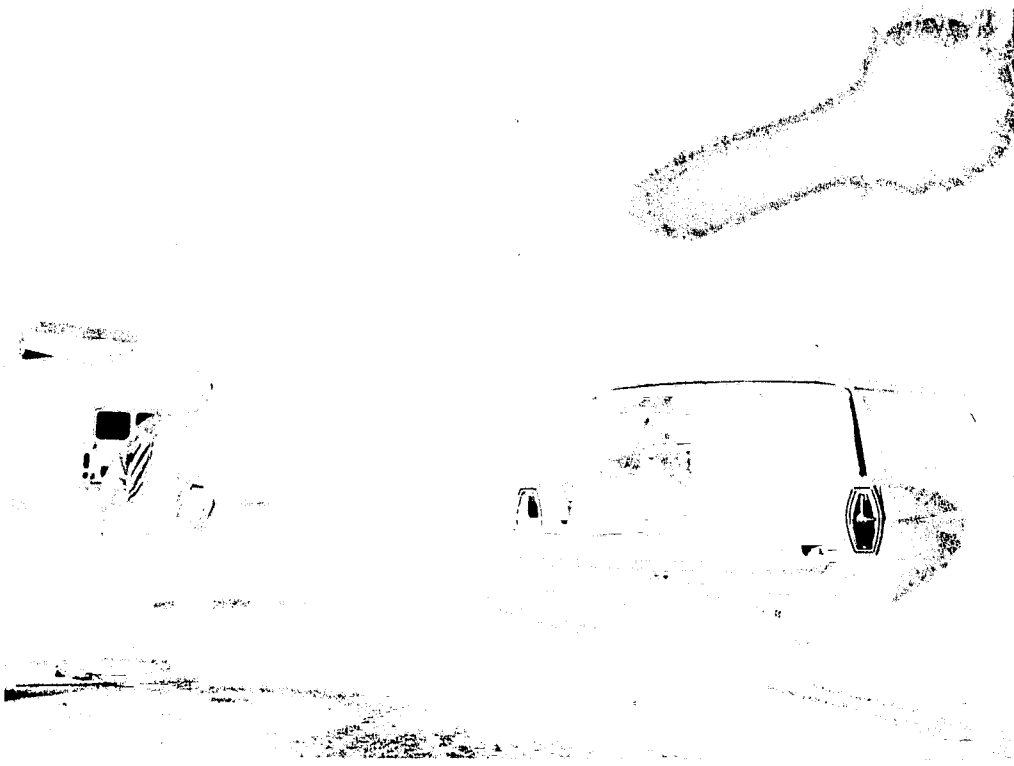
when the area to be patrolled is large or is distant, requiring a flight of more than 5 or 10 minutes to arrive on station; when anticipated missions are longer than 2 hours, and when the required payload may be large in terms of personnel and/or equipment, as in evacuating victims of a big accident. In the Dade County experience, the STOL had a marked edge in its ability to remain aloft; the STOL could fly continuously for 8 to 10 hours, compared with a maximum of about 2 hours 20 minutes for the piston-engined helicopter which the Dade County police have. This endurance gives the STOL an advantage as an aerial command post directing ground forces during a prolonged civil disturbance.

The ability to land in a restricted space is a plus for the helicopter, but not as large a one as might be thought. "Because of the danger of striking unseen objects such as wires," the Report notes, "the helicopter would not make off-airport night landings unless the pilot was very familiar with the obstructions surrounding the landing areas." There is even greater reluctance, of course, to land in a civil disturbance area.

The landings which helicopters do make often are in connection with recovery of vehicles and patrols of vacant, recreational and rural areas. If the airborne officer spots a suspicious auto, or illegal dumping, or what appears to be a patch of marijuana, he can land his helicopter and make an arrest or take other appropriate action; the pilot of a STOL craft, in the same situation, would have to radio for a ground unit.

On traffic patrol, the STOL has the advantage, because of its higher speed, of being able to cover more miles of highway during a given time period.

In addition to the patrols originally planned, both the STOL and the helicopter searched for pollution violations; six warrants were issued on the basis of the photographs which the crews took. "The pollution control official," says the Report, "stated that in the four hours of flying in the two aircraft, he accomplished what otherwise takes an entire month to perform."



Spotlight-equipped aircraft can surprise criminals, cover industrial districts and rooftops. Hughes Tool Co. photo.

Cost Effectiveness

One of the major reasons for evaluating STOL aircraft for police use is that certain STOLs are considerably cheaper to operate than many of the helicopters now used by police agencies. During the test period, fixed and direct expenses came to $16.99 per flight hour for Dade County's STOL and $28.94 per flight hour for its helicopter.

One way of evaluating costs is against "significant discoveries" —events discovered from the aircraft and requiring police action (events to which the aircraft responds by direction of the dispatcher are excluded). The helicopter made approximately 48 such discoveries, at a cost—giving each discovery equal weight—of about $30 each; the STOL made 32, at a cost of about $41 each.

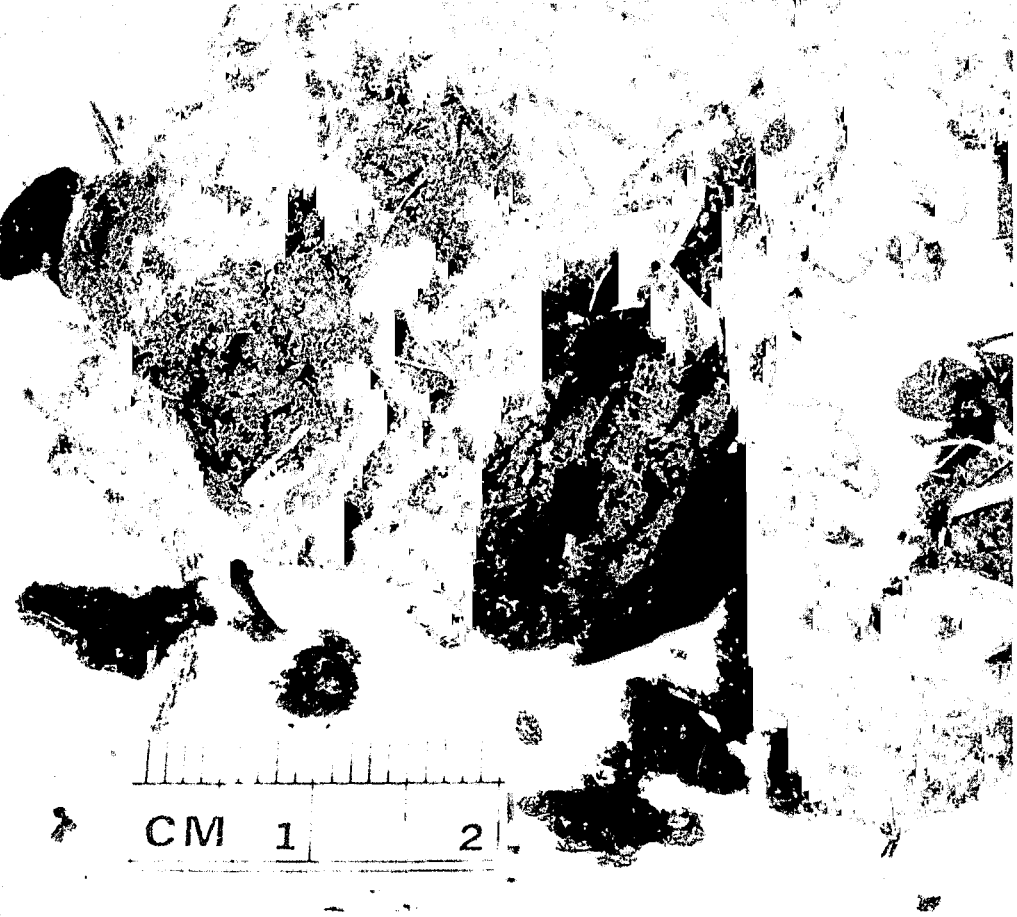
As an alternative, if direct costs are divided among arrests —again giving each discovery equal weight—the helicopter's 24 arrests can be considered to have cost about $59 apiece and the STOL's eight to have cost approximately $160 apiece.

On the basis of their respective performances in Dade County, the helicopter would appear to have been more cost effective. The Report warns, however, that this must not be considered a conclusive result because of the differences in pilot experience, the brevity of the test period, the single sample from each vehicle type, and the tendency to assign the STOL (because of its longer range) to rural and wilderness areas.

Coverage from the air will never replace squad cars. The cost of providing around-the-clock patrol for a year, by a two-man police car, has been estimated at $100,000. On that basis the Dade County STOL cost about 3.7 times as much as a patrol car, per hour of patrol, and the small helicopter cost about 4.4 times as much.

Partly offsetting this higher cost is the fact that the air vehicles cover a much greater area. The big difference, however, is that the air vehicle and the patrol car accomplish *different types of tasks:* police aircraft serve as aerial platforms to supplement and enhance the effectiveness of ground units.

How Sewag



Each 1,000 gallons of liquid sewage produces about 3.3 pounds of dried sludge like this. Usually it's disposed of by incineration. Burning a pound of sludge releases about 5,000 BTUs.

Many communities have considered proposals for converting their sewage into something useful, like fertilizer. Some municipalities have actually built fertilizer plants. To their sorrow, they've discovered there's not much profit in the operation: processing is expensive, and so is transportation to the ultimate user.

So in most communities, since no alternative use is known, disposition of sewage follows quite conventional lines: the residue from the filtration beds and settlement tanks is dried and the cake then incinerated or buried.

The same unproductive fate awaits the great volume of solid waste which urban areas produce. Much of it is burned in incinerators to reduce volume. The residue—or, in some communities, the untreated original waste—is buried as landfill, building up low-lying areas to a level where they can be surfaced with soil for eventual use as park land.

Today the growing concern with preservation of the earth's resources has renewed the search for practical—and economically feasible—alternatives for recycling municipal wastes.

Researchers at CAL have devised a multi-path system for handling both solid wastes (such as paper, glass bottles, old bricks, power plant fly ash, and garbage) and also liquid sewage. For some of the optional processes shown in the flow diagram on page 57, inputs would also include such primary raw materials as coke dust and metal ore. From the output end of the system—depending on the processing selected—would come clean water and/or such useful products as activated carbon, sintered iron ore, and aggregates potentially useful for building highways and commercial structures.

Some lab experimentation and field testing has been carried out to determine that the proposed processes *do* work. At the present time, however, the system remains largely in the conceptual stage. It has been brought to this point in its development by expenditure of the Laboratory's own funds; additional work is required to refine the processes, perform detailed economic analysis, and set design parameters for a pilot plant.

The system proposed by CAL is one of the first to consider the streams of solid waste and sewage waste together, in terms of combining waste treatment and waste recycling. The gain in efficiency is obvious: the heat released by the incineration of solid waste, for example, can be used in processing the liquid waste instead of being exhausted into the atmosphere. One reason such steps have not been taken in the past is historical—responsibility for solid waste has usually been assigned to one governmental agency (a sanitation department) and responsibility for liquid waste to another (a sewer authority).

The waste treatment/recycling system is envisioned by CAL as applicable in urban areas with a minimum population of 100,000. The typical daily output from a community of that size is about 500,000 pounds of solid waste and about 10 million gallons of liquid sewage, which is equivalent to 33,000 pounds of dried sewage sludge (a product roughly comparable, in appearance, to peat moss).

Not all the processes shown in the chart on page 57 titled "Options For Urban Waste Treatment/Recycling System" need be designed into the system for a particular city. The choices made might depend, for instance, on

END

7 illustrations