NEW EQUIPMENT FOR MINE SAFETY

Advanced machinery for underground coal mining highlights technology transfers in the field of public safety

Anthropometry is the study of the size, shape and motion characteristics of the human body. It is fundamental to successful design of clothing, equipment and workplaces in flight vehicles, and both NASA and the military services have long been engaged in research to improve the interface between man and the airplane cockpit. The advent of manned spacecraft complicated the design job by introducing such new influences as weightlessness and the need for more complex protective equipment.

In planning for the Space Shuttle, NASA encountered a number of additional considerations: the spacecraft would be the largest ever built and would carry more people than prior spacecraft; missions would involve more motion within and without the spacecraft, including transfers from pressurized to non-pressurized areas; the types of work to be performed would differ from earlier manned space operations; and crew members would include persons of both sexes, many of them non-pilots and most of a different age bracket than earlier astronauts. These and other factors affected design criteria for astronaut clothing, equipment, workspace layouts, habitability areas and life support hardware in both the Shuttle Orbiter and the Spacelab module.

Johnson Space Center (JSC) felt that these multiple design considerations demanded a larger anthropometric data base. Accordingly, JSC undertook to assemble the information available worldwide and to produce a centralized collection of anthropometric knowledge. It was built and would carry more people intended for use not only by NASA, the military and aerospace contractors, but for such non-aerospace designers of clothing, equipment and workplaces as engineers, architects and the garment industry. JSC contracted with Webb Associates, Yellow

Above, engineers of The Bendix Corporation are working on the design of a system that would permit an operator to remain outside a danger zone while controlling his coal mining machine remotely. The artist's concept at right shows the operator's cab, connected by cable to the cutting machine, which is working out of sight under an unsupported roof. The two TV screens in the cab show the machine in operation and allow the operator to guide its movement.
In low seam coal mining operations, machines called continuous miners and their operators’ cabs must negotiate passageways frequently less than four feet high. This multiple exposure shows how the seat, canopy and control column of the Bendix cab can be adjusted to changing tunnel heights.

Standing work stations under the unsupported roof. With the Bendix system, the operator would sit in a cab, located under secured roofing and protected from rock fall by a strong metal canopy, while using “hands off” automatic drilling and bolt tightening equipment.

Bendix engineers used the Anthropometric Source Book in determining optimal dimensions of the operator cab and in placement of controls. The controls allow the operator to work his machinery more efficiently and to raise or lower his cab seat or cab roof for maximum comfort as the height of the tunnel ceiling changes. Assessment of anthropometric factors was particularly important in determining the operator’s proper eye height for best visibility, and in designing an adjustable seat for such a restricted and dynamic workplace. Bendix has built prototypes of both vehicles, which are undergoing evaluation by USBM; if approved by the Bureau, they will be demonstrated to representatives of the mining industry and mining equipment manufacturers.

Companion to the continuous miner cab is this cab for the operator of a roof bolting system. Located outside of unsafe areas and protected from rock fall by a strong canopy, the remote operator remains in his cab while using automatic equipment to secure mine roofs to solid rock.