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Oxygen Liquefying Equipment and Containers
in the USSR and Eastern European
Communist Countries

I. Oxygen Liquefying Equipment (1L1101)

A. USSR

The USSR now is believed to have two models of gas liquefying equipment with respective capacities for production of 5,000 and 6,000 kilograms of liquid oxygen per hour. It has not been possible, however, to establish whether these models are in series production. Previously identified Soviet liquefying equipment ranged in capacity from 18 kilograms per hour to 1,600 kilograms per hour.

Soviet requirements for liquid oxygen probably are increasing despite decreased requirements for this product in strategic missiles. It should be noted, however, that the USSR may have been negotiating in 1967 for purchase of a 25 ton/day liquid oxygen/nitrogen plant developed in the US and formerly used by the Air Force to produce liquid oxygen for liquid-fueled missiles

The Soviet requirement for liquid oxygen for space missions probably will remain fairly constant. Industrial requirements for oxygen are increasing in the USSR and presumably will be met in part by increased output of liquid oxygen because of the greater economy resulting from shipment of oxygen in liquid form. According to a Soviet article published in 1967, oxygen for blast furnaces was then still in short supply.

The USSR is believed to be competent in the area of liquefaction technology, although it may experience difficulty in series manufacture of some models incorporating advanced technology. Some of the more advanced liquefaction equipment is made at institutes on a one-of-a-kind basis.

As noted, the present military/strategic applications for liquid oxygen in the USSR are believed to be fairly limited. Presumably liquid oxygen will be of even less strategic importance as manufacture of large solid propellant missiles is expanded.

B. East European Communist Countries

East Germany is the only major producer of oxygen liquefying equipment among the East European Communist countries. A chemical plant at Wurzen manufactures liquid oxygen units that have a capacity for production of 400 kilograms per hour. Oxygen liquefying equipment also is produced in East Germany at Rudisleben, but capacities of the units currently manufactured are not known. Earlier information (1959-60) had indicated that the output of the Rudisleben plant included some mobile oxygen units.

Inasmuch as domestic output is insufficient to satisfy requirements, some of the East European countries have purchased oxygen equipment and/or technology from Free World countries or have conducted negotiations for such purchases. In 1967 Rumania purchased an air separation unit from the UK that may have included oxygen liquefying equipment. Czechoslovakia currently is negotiating with

France for purchase of oxygen liquefying equipment and transport tanks. East Germany has requested technical data for the design and construction of air separation plants, including data for production of liquid oxygen.

II. Containers for Storage and Transport of Liquefied Gases (1L1145)

Among the Communist countries, the USSR is the chief producer of containers for liquid oxygen, East Germany being the only other significant producer. Soviet tankage identified previously has included containers with a storage capacity for 1,300 kilograms of liquid oxygen and tank cars carrying 32 tons. Both types are insulated with urea-formaldehyde foam and evaporation losses reportedly amount to 8 percent per day for the containers and 3 to 5 percent per day for the tank cars. In 1962, the USSR revealed the development of an improved liquid oxygen tank, the ARZK-1, that utilized a vacuum jacket and powder insulation claimed to reduce evaporation losses to 0.7 percent per day. This unit, a skid-mounted tank for use at airfields, has a capacity for storage of 6.5 tons of liquid oxygen. Details of other Soviet models of storage equipment for liquid oxygen and liquid nitrogen are described in the attached translation of a Soviet article published in December 1967. The article indicates that substantial development of new models is underway, although we believe that series production of at least some of the types described has not yet been attained. For example, recent evidence that the USSR has resorted to auxiliary coolers for liquid oxygen transport vessels suggests that

vessels using improved multi-layer insulation are not yet available in sufficient quantity to meet requirements. Moreover, some of the Soviet containers for liquid nitrogen are said to include provision for storage of biological products, yet a number of the East European countries have attempted to purchase such units from Free World countries for refrigeration and storage of cattle semen. The latest such requests were by Bulgaria and Hungary in early 1968. A Soviet article indicates that liquid nitrogen is also used in blood transfusion stations, in testing electronic circuits, and in heat-treatment in the machine building industry.