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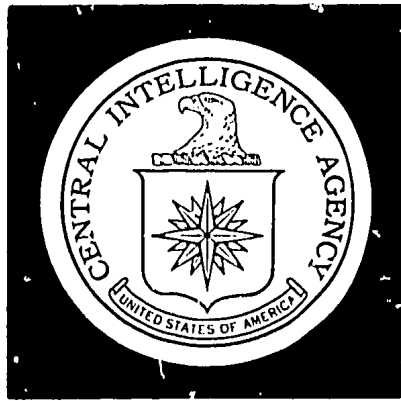
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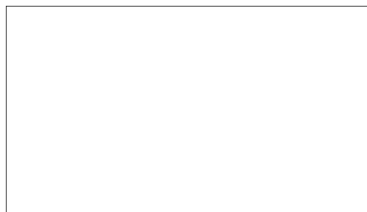
DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Communist China: Progress In Copper

*OFFICE OF THE DIRECTOR
JULY 1971*

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
July 1971

INTELLIGENCE MEMORANDUM

COMMUNIST CHINA: PROGRESS IN COPPER

Summary

1. Communist China has made impressive strides in building up the productive capacity and output of copper, a key material in hundreds of industrial and military uses. Domestic production of refined copper is estimated at 280,000 tons in 1970, or about one-seventh of US production, one-fourth of Soviet production, and two-fifths of Japanese production. Domestic production is supplemented by annual imports of more than 100,000 tons, mainly from Zambia and Chile. Continued progress in the technology of alloying copper and fabricating copper products has resulted from the accumulation of domestic experience and from the import of Western materials and technology.

2. In any industrializing nation, the demand for copper increases at a much faster pace than general economic activity. In China, the importance of the electrification and modern weapons programs intensify this pressure on copper supplies. Campaigns for the careful recovery of copper scrap and the substitution of other materials for copper are two indicators of a marked tightness in supply, which the large increases in production and imports have not eliminated. Prospects for 1971-75 are for further substantial increases in domestic capacity and output of copper and for increases in imports depending on the general availability of foreign exchange. Demands by users almost certainly will continue to press against the increased supply.

Note: This memorandum was prepared by the Office of Economic Research and coordinated within CIA.

Introduction

3. Communist China is experiencing the disproportionate demand for copper typical of newly industrializing, newly electrifying nations. This demand is further intensified by China's vigorous efforts to build a modern military establishment. The result has been a rapid increase of both domestic production and imports of copper in the 1960s. Long-term projects for the construction of mining, smelting, and refining facilities were initiated and carried on even during the Cultural Revolution. With the return of more systematic planning in 1970 and the announcement of a new economic plan for 1971-75, investment in the copper industry is being pushed even more strongly to meet ever rising industrial and military demands.

4. This memorandum presents estimates of China's total copper supply in 1952-70, including domestic production and imports. It describes the allocation pattern for China's supplies of copper and copper alloys and attempts to project the supply situation for 1971-75. The memorandum

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indicates a considerably larger increase in China's supply of copper than was judged in previous estimates.

Discussion

Copper as a Key Industrial Material

5. Copper must be judged an indispensable material to an industrialized society. Of all commercial metals, only silver has a greater ability to carry electric current. And copper's outstanding thermal conductivity renders it difficult to replace in heat exchangers for heating, cooling, and refrigeration systems. It is unaffected by a magnetic environment and highly resistant to damage by corrosion. An exposed copper surface quickly oxidizes forming a thin tarnish which protects the metal from deeper damage, an important property for a material used in ships or plumbing. Copper's strength and machinability make it the best choice in many structural applications, especially those requiring precision in shaping, as in gears for wristwatches or valves for fuel systems.

6. These inherent properties of copper have been enhanced by alloying copper with other metals. One alloy, free-cutting brass, has been chosen as the standard for machinability while certain other alloys of copper are stronger than some steels. Other characteristics that prompt industry

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to use copper and its alloys include resistance to fatigue, abrasion, and wear; workability; ease of joining and finishing; and superior properties at cryogenic (ultra-low) temperatures.

7. Copper's distinguishing properties thus make it the first choice for many important industrial uses. Yet it does not have a monopoly on these properties. Substitutes can be found for most copper products if allowances are made for losses in technical efficiency, costs, and quality. For example, aluminum has 63% of copper's electrical conductivity per cross-sectional area so that, where bulk is not an inhibiting factor, large aluminum wires can be used instead of smaller copper ones. On the other hand, electric motors and generators require copper wire in large quantities and substitution of other metals has not yet proven practical. Even though much substitution for copper has taken place in the manufacture of ammunition, large quantities will continue to be considered a necessary input. Other metals are seldom substituted for copper in the conductors used in electronic equipment because the amount of copper required is not great (heavy currents are seldom employed in electronics), its cost is low compared with the value of the end item, and the facility with which small copper conductors can be bent, joined, and plated is superior to that of other metals. Also one of the most widely used materials for heat exchangers, copper is difficult to replace in many of its applications.

China's Ore Reserves

8. Total known reserves of copper ore in Communist China are estimated to be in excess of 6 million tons of recoverable copper. Copper occurs widely throughout China. The most important known deposits lie in Yunnan Province in the southwest, Anhwei and Hupeh Provinces in the Yangtse River Basin, Kansu Province in the northeast, and Kirin and Liaoning Provinces in Manchuria. The ores being mined range from 0.5% to 5% copper, with most under 1.0%. Small quantities of silver and gold often occur with the copper and are recovered in the processing of the ores.

Production Facilities

9. China's productive capacity in the copper industry has been built in the last 20 years with the exception of 13,000 to 15,000 tons of capacity inherited from the pre-Communist era.

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Copper Production

11. Production of refined copper in Communist China has expanded nearly thirtyfold over the small 1952 base and now amounts to more than one-quarter of a million tons

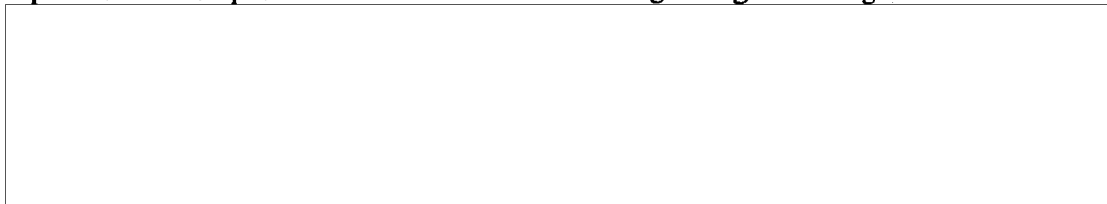


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Imports

12. Imports of copper rose steeply during the Great Leap Forward (1958-60), only to fall back to inconsequential amounts in the post-Leap retrenchment (see the table). In the late 1960s, imports revived with the biggest jump occurring in 1967-68, a time of falling domestic production and a new stockpiling program. Imports have subsequently leveled off at roughly 100,000 tons presumably because the government's policy is to push domestic production hard while conserving foreign exchange resources.



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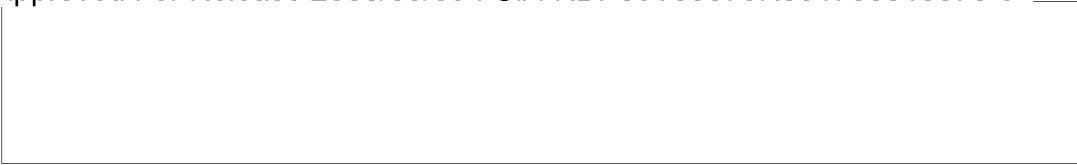
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producers in the future, but such purchases will not alter China's overall ability to procure copper. As for exports, China does not export significant quantities of either refined copper or copper ores.

Allocation of Copper

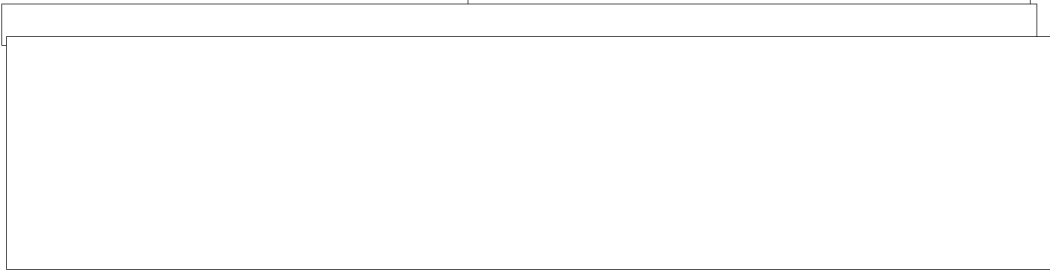
15. In spite of the substantial increases in domestic production and imports, indications are that copper is in unusually tight supply in China. Copper is one of the leading targets in the public campaigns to collect more scrap. And several examples of the substitution of other metals for copper have come to light. For example, small arms ammunition produced in China will often have cartridge cases of steel whereas normally brass would be used, and electrical transformers are being made of aluminum.

16. The supply situation has been further tightened by stockpiling. The growing Soviet threat seems to have led to a national strategic stockpiling program in 1967-68.

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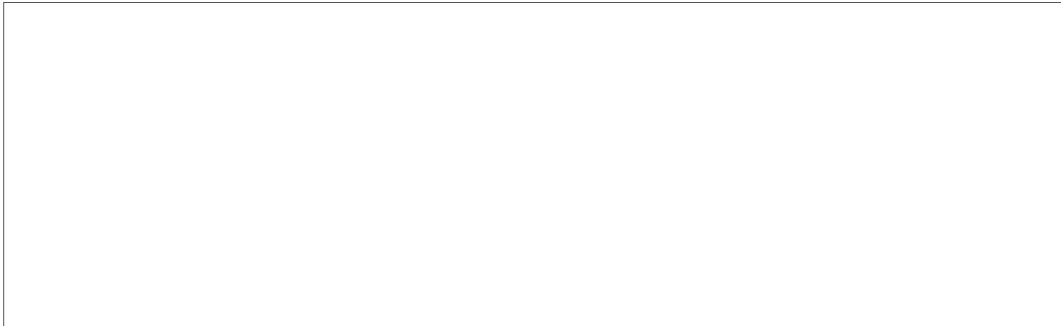
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17. From the beginning the government has identified copper as one of the materials that are critical for industrialization and therefore must be strictly controlled at the center. The structure of control is similar to that employed in the USSR, the USSR having helped the Chinese Communists set up their "command economy" in the 1950s. A Central Ministry for the Allocation of Materials controls the flows of key materials. Imports of these materials are brought into the pattern via the Ministry of Foreign Trade, which has a shopping list based on the need for various materials. The level of these imports is constrained by the general availability of foreign exchange.

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Technological Level

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[Redacted] Even though a few of the copper mines may have up-to-date equipment and methods, most of the newspaper stories on copper mines imply that the typical mine employs large gangs of workers with little modern equipment. This squares with the philosophy Premier Chou En-lai recently expressed to a visiting Japanese delegation, "In China we have enough hands."

Copper in 1971-75

20. By 1975, domestic production of copper probably will be 100,000 to 150,000 tons above the 1970 level of 280,000 tons. An advance of 100,000 tons could be achieved by the re-activating of the old 10,000-ton refinery at K'un-ming, the pressing of more output out of existing facilities, and the commissioning of one new large refinery. [Redacted]

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21. For the Chinese to raise output by 150,000 tons by 1975, a second large refinery would seem to be required. The minimum time for construction of a copper refinery is three years so that a new project would have to be under way, or about to be launched, if it is to contribute to production in 1975. [Redacted]

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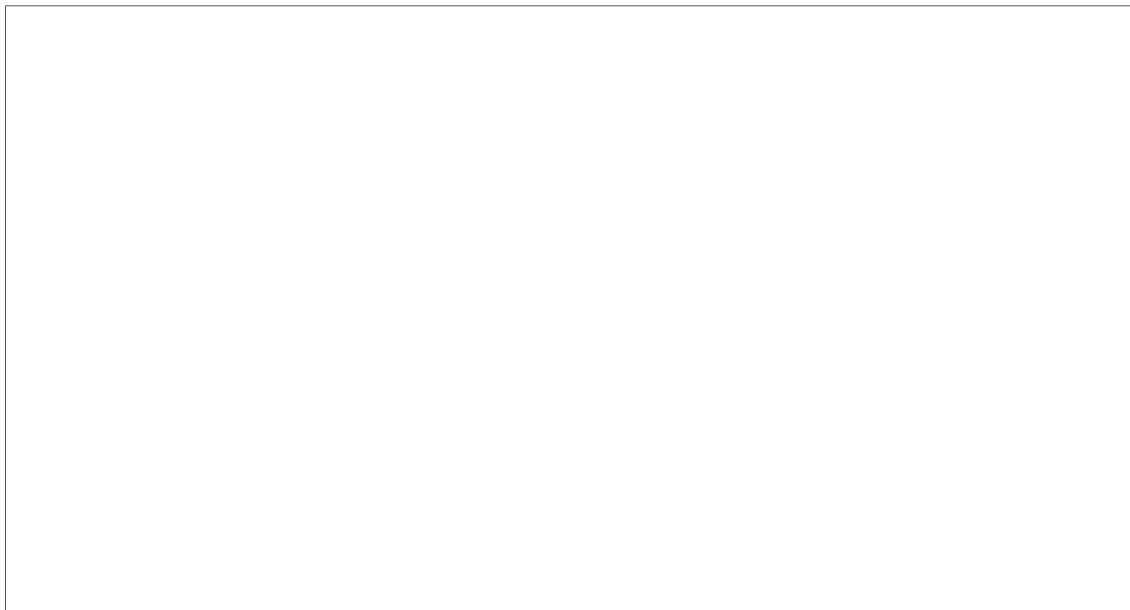


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22. Another consideration in estimating the rate of increase in domestic production is the relation between the total requirements for copper and the prospects for imports for copper. Over the next five years, the government almost certainly will want to hold down imports of copper as close to the present 100,000-ton level as possible. Increases in exports -- which are the *sine qua non* of increases in imports so long as the regime takes a puritannical attitude toward incurring foreign debts -- are not likely to grow rapidly since agriculture is doing well just to feed the additional population let alone supply more export goods. Moreover, the government is serious about its emphasis on self-reliance and self-sufficiency in industrial raw materials, machinery, and technology.



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