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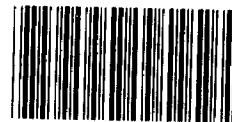
UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,  
AND ECONOMIC DEVELOPMENT  
DIVISION

MARCH 8, 1983

B-210543

The Honorable John W. Warner  
Chairman, Subcommittee on Energy  
and Mineral Resources  
Committee on Energy and Natural  
Resources  
United States Senate



120940

Dear Mr. Chairman:

Subject: Surface Oxidation of Cobalt Acquired for the  
National Defense Stockpile Does Not Adversely  
Affect Its Use (GAO/RCED-83-101)

During a June 29, 1982, hearing before your subcommittee, you asked us to examine the basis of a statement by a former commissioner of the General Services Administration's (GSA's) Federal Property Resources Service concerning oxidation <sup>1/</sup> of cobalt purchased from Zaire in 1981 for the National Defense Stockpile. It was reported that, at the June 1982 assembly of the Tantalum Producers International Study Center, the former commissioner stated that the cobalt met the purchase specifications in manufacturing, but oxidized by the time it arrived in the United States, implying that the cobalt no longer met the purchase specifications.

Cobalt is a strategic and critical mineral. It is used as a raw material in a variety of applications, the leading ones being jet engines, chemicals, and tools. Production is concentrated in a small number of countries and is generally a byproduct of other mining and refining operations.

The objective of our review was to determine the cobalt's quality, the manner in which the specification had been set, and whether industries needing the cobalt for national defense production could use it. We interviewed GSA and industry officials and reviewed GSA records regarding purchasing and testing for this acquisition.

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<sup>1/</sup>Oxidation is the chemical process whereby a material combines with oxygen. In this instance, the cobalt gathered oxygen from the air, similar to the way iron rusts.

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We found that, between production and delivery, the surface of the cobalt had oxidized. Cobalt is susceptible to oxidation at a variable rate, depending on such factors as temperature, humidity, and porosity. 1/ Furthermore, the cobalt had been acquired in a form which made surface oxidation likely.

An industry study showed, however, that surface oxidation should not adversely affect cobalt's use in the manufacturing of defense-related superalloys, including moving parts such as turbine blades and discs in the hot end of aircraft engines. Surface oxidation presents no problem as long as the high-temperature alloy producers know of its presence in advance. Therefore, the former GSA commissioner's remarks were apparently misinterpreted regarding the possible acceptance of inferior quality cobalt for the National Defense Stockpile.

#### BACKGROUND

The United States cannot produce certain strategic and critical materials in sufficient amounts to support its requirements during periods of national emergency. To prevent what could be a dangerous and costly dependence on foreign supply sources during these crises, the United States maintains a National Defense Stockpile of materials.

Stockpile goals represent the estimated material requirements for the first 3 years of a conventional war, above those which could be expected to be available from domestic production and reliable imports. In 1976 and again in 1980, the Federal Emergency Management Agency (FEMA), which determines stockpile policy and goals, set the stockpile cobalt goal at 85.4 million pounds. However, in December 1980, the stockpile contained only 40.8 million pounds of cobalt.

On March 13, 1981, when the President announced the beginning of a major stockpile acquisition program, the first commodity scheduled to be acquired was cobalt. Solicitation for proposals was first issued by GSA on that date, using a February 1, 1980, specification published by the Department of Commerce with FEMA approval. The specification was prepared after coordination with concerned industry representatives.

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1/Porosity is how porous a substance is. It indicates, for cobalt, in part, how easily oxygen can enter and combine with the metal.

Subsequently, GSA officials concluded that the specification was overly restrictive, effectively limiting negotiations to Zaire and Zambia. They believed that this might be perceived as a violation of a well-established principle of Federal contract law that solicitations may not contain unreasonable or unduly restrictive specifications having the deliberate effect of eliminating or reducing competition. Therefore, on March 27, 1981, the specification was revised at GSA's request, and on April 2, 1981, amendment to the solicitation issued, again after coordination with industry. The revised specification permitted the solicitation for proposal to be issued to all producing countries and corporations.

Sixteen proposals were received by the amended May 4, 1981, due date. Six proposals were eliminated because they did not meet the solicitation specification. Four others were eliminated because they did not consist of identifiable homogeneous production lots suitable for sample testing. <sup>1/</sup> Of the remaining six proposals, Societe Zairoise de Commercialisation des Minerais (SOZACOM), the national mining corporation of Zaire, was selected by GSA on the basis of its good record of performance, acceptable quality assurance, satisfactory delivery schedule, and lowest price.

Under the terms of a July 10, 1981, contract, GSA purchased 5.2 million pounds of cobalt at \$15 per pound, for a total of \$78 million. The price included all transportation costs to GSA storage depots. Delivery of the cobalt began in November 1981, with acceptance of the final four lots by GSA completed in December 1982.

REVISED OXYGEN CONTENT  
MEETS INDUSTRY STANDARDS

Both the February 1, 1980, and March 27, 1981, specifications required the oxygen content level of each lot <sup>2/</sup> to be a maximum of 0.007 percent (70 parts per million). However, 16 of the first 18 lots delivered were rejected because the maximum acceptable oxygen content level was exceeded by from 2 to 6 parts per million.

SOZACOM protested to GSA that the quality of material in the lots being provided was the same as that of the material already

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<sup>1/</sup>Homogeneous means composed of parts all of the same kind. In this case the cobalt was to come in lots from the same mine source to make testing uncomplicated and reliable.

<sup>2/</sup>A lot normally contained 120 drums, containing about 66,000 pounds of cobalt.

being provided to the very industries for which the stockpile is intended. SOZACOM stated that the oxygen content came from ordinary surface oxidation, which most metals experience.

GSA responded by contacting the Specialty Steel Industry of the United States (SSIUS), 1/ an organization representing specialty steel manufacturers, including cobalt superalloy producers. Although not all cobalt users are members of this organization, the SSIUS subcommittee on critical raw materials contacted member and nonmember cobalt users to ascertain acceptable oxygen levels. The subcommittee found that they were indeed using cobalt of similar quality, including oxygen content, to that being received by GSA.

In a January 20, 1982, letter to GSA, SSIUS stated that its company members can use the acquired form of cobalt, with oxygen levels up to 200 parts per million (0.020 percent) for the manufacturing of aircraft superalloys, if they know in advance of its presence at that level. In the manufacturing process used, special precautions can be taken until the oxygen level is lowered.

On January 21, 1982, GSA recommended to FEMA that a deviation be granted for an oxygen content level of 0.015 percent based on a preliminary SSIUS determination that high-temperature alloy producers can use such cobalt without altering their manufacturing process. On January 27, 1982, FEMA granted a deviation, and the contract was subsequently modified to raise the maximum oxygen content level to 0.015 percent. GSA was then able to accept all the lots previously rejected because they were within the revised maximum oxygen content level.

Industry officials we contacted stated that the cobalt is suitable for the manufacturing of aircraft superalloys. For example, SSIUS officials informed us that GSA received high-quality cobalt and that GSA did a thoroughly professional job acquiring the cobalt. Similarly, officials of Cabot Industries, which is not a SSIUS member, stated that the cobalt could be used for their highest demand aerospace superalloys, including those used for engine parts.

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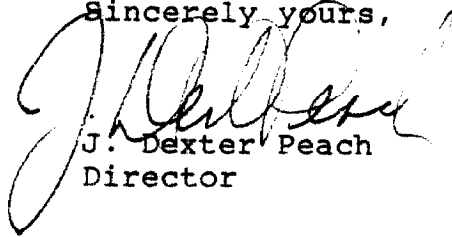
1/Previously named the Tool and Stainless Steel Industry Committee (TSSIC).

We discussed this report with GSA officials; they agreed with our findings.

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We are sending copies of this report to appropriate congressional, agency, and industry officials, including the Administrator of General Services. We will make copies available to other interested parties upon request.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "J. Dexter Peach".

J. Dexter Peach  
Director