Free Executive Summary

Trends and Challenges in Aerospace Offsets

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The granting of offsets to promote exports of major aircraft systems has been a source of significant controversy. Critics believe that offsets undermine the U.S. manufacturing base; lead to the transfer of commercial technology, possibly affecting national security; and result in the loss of high-wage jobs. Defenders of the practice argue that offsets are a fact of commercial life and can result in net U.S. job gains. In an effort to focus the offsets debate on analytical issues, the White House National Economic Council asked the National Research Council to convene expert academicians, representatives from the aerospace industry, and top government officials to discuss the impact of offsets on the U.S. economy. To ensure a rigorous discussion encompassing all points of view, the conference included a series of papers outlining the positions of key participants. This resulting volume offers a comprehensive and up-to-date analysis of the impact of aerospace offsets.

I

INTRODUCTION

Introduction

The granting of offsets to support international exports of major aircraft systems has been a source of significant controversy. Critics of this practice believe that offsets undermine the U.S. manufacturing base, risk transferring commercial technology, some of which may also have national security implications, and result in the loss of high-value, high-wage jobs. Defenders of the practice argue that U.S. aerospace firms are driven by international competition to grant offsets. Suppliers must meet the demands of public or quasi-public purchasers for offsets which are normally a condition of increasingly important export sales. The practitioners also argue that they are exceedingly cautious in the types of commercially sensitive technology they transfer, not least because it is in their long-term self-interest to exercise such caution. They also suggest that the potential national security consequences are overstated and, in any event, subject to the rigorous U.S. export control system. With respect to the impact of offsets on employment, the firms responsible for implementing offsets agreements insist that U.S. domestic employment in the aerospace sector has been maintained—and indeed is growing again—precisely because they are able to strategically employ offsets to obtain sales in fiercely competitive global markets for major aerospace systems.

These markets are in fact large, and by general consensus, represent an essential source of sales for the U.S. aerospace industry. Aerospace itself has long been considered a strategic industry in terms of the sector's economic importance, military implications, and technological spillover. According to the Aerospace Industries Association (AIA), total U.S. aerospace sales in 1997 reached $130 billion, or about three percent of all U.S. industrial manufacturing activity. This figure includes some $50 billion in defense sales, of which $9.4 billion was exported. Overall, exports for the sector were quite significant. In 1997, the

AIA estimates exports at $50 billion, with imports of aerospace products reaching $16 billion. In 1997, both sales and employment were on the increase, with aerospace employment rising to approximately 870,000. The industry workforce has nonetheless declined substantially from its peak a decade ago when industry employment reached 1.35 million. Moreover, in late 1998, as this volume went to press, Boeing announced substantial cutbacks in its workforce.[1]

Information in support of the claims about the impact of offsets is difficult to obtain. Even though aerospace is considered a key U.S. industry, research on the impact of offsets is limited.[2] This symposium was designed to address the research gap while also ensuring that a wide range of viewpoints were considered. The summary of the symposium presentations and the vigorous discussion which accompanied them are supported by an exceptional series of commissioned papers. In addition to distinguished academic experts, representatives of labor and industry were asked to present their views for review and discussion. Together, the papers and proceedings offer a valuable opportunity to improve our understanding of current offset practices and associated policy issues.

The first challenge in any attempt to address the issues associated with offsets is definitional. As David Mowery notes in his introductory paper, "the definition of an offset is often very difficult . . ." not least because the "central defining characteristic of an offset is often in the eye of the beholder rather than in objective data or other indicators." Mowery adds that "another difficult issue in measurement of the magnitude and economic effects of offsets is the distinction between 'direct' and 'indirect' offsets." He defines direct offsets as transactions related to the specific product being exported, such as government to government coproduction agreements, licensed production offshore, or acquisition of components from suppliers in the purchasing country. Indirect offsets involve commitments by the exporter to either purchase products unrelated to the system being sold or to provide other forms of technical or commercial assistance to firms in the purchasing nation that are valued as some percentage of the export sale. Moreover, as Gordon Healey's presentation makes clear, the valuation of offsets

[1]The Boeing Company, which accounts for approximately 28 percent of the industry's employment, announced layoffs in December, 1998 on the order of 48,000, perhaps as high as 53,000, from a 1998 employment base of approximately 238,000. The cutbacks are attributed mainly to the effect of the Asian crisis on demand for Boeing aircraft. The cumulative impact of the Boeing cutbacks will be much larger, triggering substantial reductions in employment for the industry as a whole. Some analysts, such as EPI's Robert Scott, estimate the cumulative impact could be two additional aerospace job losses for each job eliminated at Boeing. Other participants in the symposium would point out, however, that the ability of U.S. firms to reduce employment in response to market forces is a competitive advantage for the U.S. economy. See "Boeing Raises Layoff Target to 53,000," by Elizabeth Douglass and Jeff Leeds, in *Los Angeles Times*, Wednesday, December 2, 1998.

[2]The bibliography in the Annex of this volume lists relevant work identified in the course of this project. The Bureau of Export Administration in the Department of Commerce maintains an active interest in the topic.

is itself an arbitrary process resulting from the perceived needs of the importing nation and the negotiating skill of the U.S. supplier. Consequently the measure and analysis of direct offsets is difficult. This difficulty is compounded in the case of indirect offsets.

Importantly, both representatives of aerospace labor and industry, as well as reputable analysts, recognize that offsets can result in loss of employment in some parts of the aerospace industry. For example, Mowery notes that anecdotal evidence suggests that there are negative consequences from offsets and similar transactions among the U.S. firms that supply the prime contractors. However, Mowery and other analysts emphasize that the impact of offsets is dwarfed by the much more significant consequences of the end of the Cold War and the concomitant restructuring of the industry. Moreover, representatives of industry would affirm that, from a national perspective, the sales made possible by offsets generate jobs or at least maintain employment throughout the U.S. aerospace supply chain. Representatives of labor and analysts such as the Economic Policy Institute's Robert Scott accept that offsets can contribute to maintaining employment among prime contractors but argue that offsets have also contributed to employment losses among the second- and third-tier of suppliers. Moreover, Scott is concerned that the long-term trends in U.S. aerospace employment are not positive. In his view, the combination of offsets, increased foreign competition, productivity growth, and other factors will all contribute to a decline in U.S. aerospace employment.

To meet this challenge and the challenge to the aerospace sector as a whole, Scott calls for a series of policy measures to restore and maintain the international competitiveness of the U.S. aerospace industry. Institutionally, this program would encompass an integrated, interagency task force lodged in the National Economic Council. Specific measures called for include regulatory reform, programs to stimulate aerospace research and products, and renewed efforts to negotiate improved international agreements with the European Union and to bring China into compliance with the GATT code. Scott emphasizes that the United States has in place a wide range of policies with direct impact on the aerospace industry but, unlike its competitors, the United States has yet to develop and implement "conscious and coherent" national policies for the aerospace industry.

Focusing on military offsets, Ken Flamm's analysis emphasizes the importance of understanding the economics of the aerospace sector, in particular the economies of scale required to absorb the large development costs characteristic of major weapons systems. With the post-Cold War decline in defense spending, exports have become critical, especially in Europe where national markets are smaller and defense procurement budgets have declined even further than in the United States. As a result, Flamm argues the European producers have a "driving need" to export, a need which they seek to meet by exporting systems with greater military capabilities. Ironically, these enhanced capabilities are themselves often

acquired through U.S. cooperation with allies to develop capable, inter-operable weapons systems able to meet the requirements of coalition warfare. To meet this "capabilities competition," U.S. producers face strong incentives to provide similar capabilities, or see them acquired from a competing producer. The result Flamm suggests, is a situation where the United States cooperates technologically with its allies while competing with them for sales.

Flamm sees this dynamic leading either to a higher level of defense spending for the U.S., as it seeks to counter the enhanced foreign capabilities generated by export sales, or a more unsafe world for the United States. The preferable third option, he notes, would be to preserve cooperation on weapons development, while seeking international agreement to moderate the intense competition for defense sales.

From this perspective, the rationale for government interest in offset agreements turns on the asymmetry between the single purchaser (normally a foreign government) and the private companies supplying the aerospace products. Offsets are a means for the purchasing government to insert itself into private transactions for the benefit of national firms or to achieve other policy objectives. Flamm suggests there is a further complication in that foreign governments seek to encourage private U.S. firms to transfer technology often developed with U.S. taxpayer support. Flamm also points out that aerospace sales benefit from U.S. government support in other forms such as export licensing, government advocacy, and various financial subsidies, e.g., waivers of R&D recoupment. While these considerations are most evident with military sales, Flamm reminds us that these transactions represent a significant share of total aerospace sales. Moreover, even in the post-Cold War period, military R&D continues to play a "very important role" in, for example, the development of new jet engines. Flamm also differs with some analysts in finding that military cooperation has in fact had an impact in some countries, e.g. Japan, on the development of commercial aerospace technologies.

In his essay, Joel Johnson, the Vice President of the Aerospace Industries Association, agrees that many countries view aerospace both as a prestige industry and as a "technology driver" for the aerospace sector and for other leading high technology sectors such as electronics, advanced materials, and sensors. Moreover, because military aerospace acquisitions are made by governments with public funds, as are, de facto, many commercial acquisitions, there is a strong desire on the part of the purchasing government to link such acquisitions to domestic job creation and a strengthened national capability in aerospace and defense. Interestingly, the granting of offsets has the same rationale.

Despite these pressures, and the general trend toward internationalization, Johnson reminds the reader that U.S. exports of aerospace products remains strong. As noted in 1997, the U.S. exported $50 billion in aerospace products against $16 billion in imports, a performance which Johnson compares favorably with other U.S. high technology industries. Moreover, Johnson suggests that

offsets must be seen in the context of market "internationalization," in which U.S. manufacturers seek to acquire more favorable financial participation, obtain new, improved technologies at lower risk and cost, and win better access to markets.

Notwithstanding the technological and export success of U.S. aerospace companies, Johnson joins several of the analysts here in recognizing the growing challenge posed to U.S. industry by Airbus and its would-be imitators on the commercial side and the increasingly stark competition for military markets. He sees the existing zero sum competition between U.S., European and Russian producers as being exacerbated by the desire of industrializing countries to capture a share of international military sales for their national economies.

Against this broader policy perspective, we add Todd Watkins' detailed review of the impact of strategic international sourcing in aircraft manufacturing on a U.S. aerospace supplier. Put in the context of the ongoing restructuring of the aircraft industry supply base, Watkins examines both the impact of demands for additional manufacturing responsibilities and risk sharing, and the encouragement of the internationalization of the supply base. The anonymous Generic Aircraft Manufacturing Company (GAMC) is a first-tier supplier to the major aircraft assemblers and a supplier of complex integrated assemblies. As such, GAMC must manage a network of more than 700 suppliers to which it increasingly delegates responsibility for a design, quality control, risk sharing and supplier management. Watkins suggests that the combination of increasing importance of foreign commercial markets and the implementation of collaborative supplier relationships poses significant dilemmas for major structural subcontractors such as GAMC and perhaps for all suppliers in the U.S. aircraft industry. In his view, the combination of market globalization and lean supplier development strategies encourages major subcontractors to outsource to the strongest foreign firms. Many of these firms have the strategy of acquiring technology abroad with the goal of independent production, a policy supported by the industrial policies of governments intent on developing their own aerospace industries.

While mindful of the limitations of a case study, Watkins concludes that the upper supplier tiers of the U.S. aircraft industry are being squeezed between the push towards lean practices and the pressures resulting from global sourcing on one hand and offset initiatives of top-tier companies on the other. He suggests that these pressures in combination with the developmental practices of a growing number of countries may pose serious challenges to the crucial middle-tier of the U.S. aircraft industry.

The essay by Owen Herrnstadt of the International Association of Machinists and Aerospace Workers, focuses on employment consequences of offsets. He argues that offset practices are increasing and that the government must play a central role in developing policies to address their negative impacts on U.S. aerospace workers. He joins Scott in observing that other aerospace nations have a coordinating body "charged with nurturing and advancing domestic aerospace

manufacturing, technology acquisition and, of course, employment." To this end, he recommends the establishment of a formal commission to bring together representatives from industry, labor, government, and academia to facilitate the development of a national policy to foster the U.S. aerospace industry. Specifically, he recommends the commission should review the transfer of technology and employment, research and development, trade negotiations, export sales and financing, license production and co-production agreements, subcontractor production, countertrade, foreign investment, and labor adjustment programs. The commission could also serve as a means to better understand the competitive environment faced by U.S. companies and their workers, including offset requirements, and advise the government on appropriate policies.

The last paper in the volume by Gordon Healey, of the Defense Industry Offset Association, was made available after the meeting and therefore did not benefit from the same vigorous discussion as the other papers. It is, however, included in the annex because it provides an especially valuable perspective from the offset practitioner's point of view. Healey describes some of the definitional complexities surrounding aerospace offsets and adds support to Mowery's observation that the value of an offset is often in the eye of the beholder. He also emphasizes that U.S. aerospace companies do not voluntarily offer offsets to their customers. They see offsets as expensive, time consuming, difficult to manage, and politically unpalatable at home. Yet he sees offsets as a fact of life in the fierce competition for export sales, arguing that aerospace companies offer offsets with one goal, to win sales, and submits that without offsets, U.S. companies will lose sales.

From his practitioners' perspective, Healey suggests that solutions are likely to emerge only slowly as the industry evolves. In the meantime, the DIOA urges that no unilateral action be taken by the U.S. government, but does advocate improved data collection and multilateral discussions to limit offsets where possible. At the same time, he supports maintaining a domestic dialogue among concerned parties while urging that the impact of offsets be kept in perspective in light of the industry's performance.

Despite the complexity of the issues taken up by the symposium, it is our hope that the papers and discussions presented here will contribute to resolving questions concerning the definition, rationale, and consequences of offsets. At the same time, the analysis and discussion raise other questions concerning the future impact of offsets on the U.S. aerospace industry and its workers and, more broadly, the adequacy of current U.S. policy for the aerospace sector in an increasingly competitive global marketplace.

Charles W. Wessner

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Proceedings and Papers

CHARLES W. WESSNER, *Editor*

Board on Science, Technology, and Economic Policy

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Contents

Preface

This volume is derived directly from the February 1997 request by the White House National Economic Council (NEC) to the National Research Council Board on Science, Technology and Economic Policy (STEP) to examine the impact of offsets on the U.S. aerospace industry. Specifically, the NEC asked that STEP organize a major workshop to examine the pressures facing U.S. companies to grant offsets in the increasingly competitive global aerospace markets for both defense and commercial aircraft and related products.[1] Although cognizant of the definitional and analytical challenges associated with this subject, the STEP Board accepted the NEC's request.

In accepting this task, the STEP Board's principal concern was that, in the time frame required for this initial effort, the Board would not be able to work through the analytical difficulties and overcome the data limitations associated with offsets. Consequently, the Board agreed to organize a comprehensive workshop and prepare a summary report of the workshop that would not, however, include recommendations or findings. The workshop was held at the National Academy of Sciences on June 9, 1997 and the

[1]The chapter entitled "Offsets" in: Trade Promotion Coordinating Committee, *National Export Strategy: Toward the Next American Century: A U.S. Strategic Response to Foreign Competitive Practices*. U.S. Government Printing Office, Washington, D.C., October 1996, describes offsets as compensation packages that are part of contract negotiations for large purchases such as aircraft. This description is elaborated in the issues paper in the appendix of the *National Export Strategy* report. However, it is important to keep in mind that different views on offsets sometimes lead to different definitions.

report, entitled *Policy Issues in Aerospace Offsets*, was published on June 30, 1997.[2]

The overarching objective of this first workshop was to provide a forum in which the various parties with an interest in aerospace offsets could come together to express their views on the practices, rationale, and current or future impact of offsets on U.S. national security, the competitiveness of the U.S. economy, especially the aerospace sector, and domestic employment in the aerospace industry. In his concluding remarks, Ambassador Alan Wm. Wolff, the workshop chair, observed that effective U.S. policy would require a broad consensus on the nature of the problems faced by the industry. This could lead to agreement on measures to maintain the domestic strength and international competitiveness of the U.S. aerospace sector. Continuing the dialogue would be a first step toward a consensus.

In an effort to maintain and deepen the dialogue opened at the first workshop, the responsible agencies agreed, in conjunction with representatives of aerospace labor and industry, to ask the STEP Board to convene a second meeting. In addition to continuing the dialog, this second meeting would also provide an opportunity for the STEP Board to have the interested parties review the papers it had commissioned to explore more rigorously the issues identified in the course of the first workshop.

Accordingly, a symposium was held at the National Academy of Sciences on January 14, 1998. Participants in the "Symposium on Trends and Challenges in Aerospace Offsets" considered the gathering a success, in part because the first workshop had encouraged the frank presentation of differing views and encouraged participants to take into account alternative perspectives, even if agreement was not reached on key points. At this symposium, the use of papers as a basis for discussion added nuance and texture to the presentations and helped identify points of broad agreement as well as issues that could benefit from further exploration.

Perhaps one of the most positive developments that emerged in the course of the 1998 symposium was the expansion of the terms of the debate beyond the scope, nature, and impact of offsets per se to broader issues of trade and investment and to policy issues such as streamlining adjustment assistance to displaced workers. Indeed, with regard to this latter point, many participants mentioned the need to simplify adjustment assistance programs for displaced workers. Other specific topics that emerged in the course of the symposium included calls for additional analysis of subsidies issues, for example, launch aids and export finance (including the adequacy of U.S. export finance), an assessment of the efficacy of the Multilateral Aircraft Agreement and the US-EU Bilateral Aircraft agreement and a range

[2]See Charles W. Wessner and Alan Wm. Wolff, eds., *Policy Issues in Aerospace Offsets* (National Academy Press, 1997).

of issues associated with market access. In addition there were several references to the need to review the adequacy of the U.S. investment in aerospace infrastructure, such as wind tunnels. Although these topics involve a broad range of policy questions, they do reflect recognition of the need to look at the U.S. aerospace industry, associated government policies, and the impact of foreign government policies as a whole.

As with the June 1997 workshop, the discussion recorded at the symposium did not address a cluster of issues sometimes associated with offsets. For example, domestic or foreign outsourcing decisions taken on the basis of commercial considerations remained outside the purview of the symposium, as were, at the other end of the spectrum, issues of arms control and proliferation. The focus of both meetings was commercial and military offsets, both direct and indirect, that companies are required to grant to complete sales of large systems. Several papers directed specific attention to the impact of offsets on key suppliers, sub-tier producers, and employment in this important part of the U.S. industrial base. This broad area of inquiry again proved to be more than adequate for the deliberations of a single meeting.

In sum, this symposium sought to achieve several interlocking objectives. Our first goal was to bring together a relatively small group of senior representatives from aerospace industry and labor in conjunction with academic experts to deepen our understanding of the offsets phenomenon and its consequences for the U.S. aerospace industry. Second, we sought to facilitate this discussion and ensure its rigor by presenting some of the best current analysis concerning the origins, causes, and current impact of offsets as well as future trends. Third, despite the different views expressed in the discussion, we sought to identify areas in which all parties agreed or partially agreed and to garner a wide range of potential policy recommendations to address the issues identified by participants. Last, in the course of the discussion every effort was made to place the offsets issue in the context of other developments and policy challenges having a major impact on the U.S. aerospace industry.

The presentations of speakers and participants were a challenge to summarize. Every effort has been made to capture the main points and supporting arguments of each speaker within the limitations of a summary report. We apologize in advance for any inadvertent errors or omissions in the summaries of the participants' presentations. However, the papers necessarily provide closer argumentation and include data and source material that has often been lacking in discussions of offsets. This and the willingness of the participants to expand the framework of the discussion, mark a significant advance in the national dialogue on aerospace offsets.

Charles W. Wessner

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A number of individuals deserve recognition for their willingness to review this report. These individuals were chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their participation in the review process: Gerald Dinneen, the review coordinator; William J. Spencer, SEMATECH; Ruben Mettler, TRW, Inc.; Robert Scott, Economic

Policy Institute; Todd Watkins, Lehigh University; Joel Johnson, Aerospace Industries Association; Kenneth Flamm, the University of Texas at Austin and the Brookings Institution, and; John Mather, the National Academy of Sciences. Although these individuals have provided constructive comments and suggestions, it must be emphasized that responsibility for the final content of this report rests entirely with the STEP Board and the NRC.