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International Trade Commission



INDUSTRY TRADE AND TECHNOLOGY REVIEW

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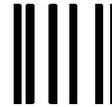
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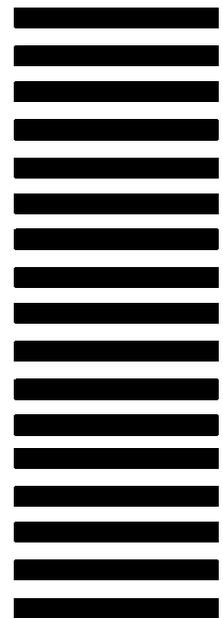
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Dyeing and Finishing of Apparel Fabrics

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In connection with legislation affecting the dyeing and finishing of apparel fabrics in the Caribbean Basin, this article presents a brief overview of dyeing and finishing as these processes relate to apparel fabrics. It highlights the major dyeing and finishing processes, recent developments in the dyeing and finishing segment of the U.S. textile industry, the relative importance of dyeing and finishing costs in fabric and apparel production, and dyeing and finishing capabilities in CBERA countries.²

Legislation Affecting Dyeing and Finishing of Apparel Fabrics in Caribbean Basin

The United States-Caribbean Basin Trade Partnership Act (CBTPA), enacted as Title II of the Trade and Development Act of 2000, amended the Caribbean Basin Economic Recovery Act (CBERA) to authorize the President to extend additional trade benefits to eligible CBERA beneficiary countries.³ In part, the legislation grants duty-free and quota-free treatment to imports of qualifying apparel articles assembled in CBERA countries from “fabrics wholly formed in the United States” of U.S. yarns, whether the fabrics were cut to shape in the United States or CBERA countries.⁴

The legislation does not define “fabrics wholly formed in the United States,” raising the question of whether the fabrics must be dyed and finished in the United States or whether they can also be dyed and finished in CBERA countries. The interim regulations issued by the U.S. Customs Service to implement the trade benefit provisions of the CBTPA do not specifically address the dyeing and finishing issue.⁵ In the absence of a specific statutory

¹ The views expressed in this article are those of the authors, and are not the views of the U.S. International Trade Commission as a whole or of any individual Commissioner.

² This article draws on information compiled by Commission staff from a review of the available literature on the issue, and in-person and telephone interviews with U.S. and CBERA textile and apparel industry representatives.

³ The CBTPA provides for duty-free and quota-free treatment for imports of qualifying textile and apparel articles from CBERA beneficiary countries during a transition period beginning on October 1, 2000, and ending on the earlier of September 30, 2008, or on the date on which the Free Trade Area of the Americas or a comparable free-trade agreement between the United States and CBERA countries enters into force.

⁴ If the fabrics are cut to shape in CBERA countries, the garments must be sewn with U.S. thread.

⁵ In the interim regulations (published in the *Federal Register* of October 5, 2000 (65 F.R. 59650)), which went into effect on October 1, 2000, Customs defined “wholly formed,” when used with reference to fabrics, as “all of the production processes, starting with polymers, fibers, filaments, textile strips, yarns, twine, cordage, rope, or strips of fabric and ending with a fabric by a weaving, knitting, needling, tufting, felting, entangling or other process, [that] took place in a single country.”

requirement or regulation, preferential treatment currently is being granted to imports of qualifying apparel articles assembled in CBERA countries from U.S.-formed fabrics, regardless of whether the fabrics were dyed or finished in the United States or CBERA countries.

U.S. Textile Industry Concerns

The U.S. textile industry has expressed concern that these interim regulations effectively grant preferential treatment to apparel assembled in CBERA countries from fabrics made in the United States, but dyed and finished in CBERA countries. According to the domestic industry, the apparel trade benefits for CBERA countries are for the assembly of apparel only, and the legislation does not “state or imply that the beneficiary countries will be permitted to engage in textile manufacturing or finishing operations,” other than for a limited exception for fabric knitted in the Caribbean.⁶

Dyeing and Finishing: An Overview

Dyeing and finishing are critical and integral parts of the fabric production process, because a large part of the selling power of an apparel fabric depends on the attributes imparted by dyeing and finishing. Fabrics made for apparel generally come off the weaving loom or knitting machine in a “grey” or unfinished state.⁷ As such, the fabrics generally must undergo treatments collectively referred to as “dyeing and finishing” before the fabrics can be cut into garment parts for assembly.⁸ For practical and aesthetic reasons, dyeing and finishing generally cannot be done after the fabric is cut into garment parts.⁹

The aesthetic value of apparel fabrics depends mainly on the colors, patterns, and feel of the fabric, characteristics that are largely imparted by the dyeing and finishing of the grey fabrics. These fabrics may undergo bleaching, dyeing, and/or printing to impart the desired color or design. The fabrics may undergo other finishing treatments that change the character of the fabric, such as to add water-repellent or washable properties or to achieve desired fabric shrinkage and stiffness levels, fabric surface effects, and fabric widths. In some cases, the grey fabric may undergo as many as 50 different finishing operations before it is ready for use in apparel.

⁶ Carlos Moore, Executive Vice President, American Textile Manufacturers Institute, letter to the U.S. Customs Service dated December 4, 2000, providing comment on Customs’ interim regulations.

⁷ Some fabrics are made of colored yarns (e.g., yarn-dyed fabrics) and require few finishing treatments.

⁸ Among the treatments that can be applied to fabrics are bleaching, dyeing, printing, stonewashing, and other mechanical finishing, such as preshrinking, shrinking, sponging, calendaring, mercerizing, and napping.

⁹ Some dyeing and finishing processes occur after apparel assembly, but such processes differ from those under consideration. Following assembly, a garment may be subject to such operations as garment dyeing, printing of designs or logos, or stonewashing.

Dyeing and Finishing Industry in the United States

U.S. producers of apparel fabrics dye and finish their fabrics to differentiate their goods in the marketplace from those of their competitors, whether domestic or foreign. Entry costs in the dyeing and finishing segment of the textile industry can be high, given the significant capital requirements and the fact that dyeing and finishing are highly knowledge-intensive operations. An official of the American Textile Manufacturers Institute estimates that a new dyeing and finishing plant in the United States would require a minimum investment of \$50 million. Because of the high fixed capital costs and the large scale of many dyeing and finishing operations, integrated mills need to continuously feed large volumes of fabric from a number of different mills through their dyeing and finishing facilities to maintain economies of scale and, in turn, cost-efficient production.

Firms that dye and finish apparel fabrics include the “vertically integrated mills” and the “fabric finishing mills.” The integrated firms tend to be large in size, make a wide range of goods, use multiple plants, and are vertically integrated from yarn spinning through fabric production, dyeing and finishing, and, in some cases, even production of end-use goods. The smaller integrated firms usually are vertically integrated from fabric production through dyeing and finishing. The integrated firms typically finish their own fabrics, although they may have them finished on contract by others, for example, during busy periods or for specialized applications. Some integrated firms also dye and finish fabrics on contract for others as a regular activity or during lulls in their own operations.

The fabric finishing mills are smaller in size but larger in number than the integrated firms. They include mills that specialize in dyeing and finishing purchased fabrics (domestic or imported) and “commission finishers” that dye and finish fabrics on contract for others. Also included are the “converters,” which usually do not own plants and equipment, but instead buy grey fabrics from domestic and foreign sources, have them finished on contract, and sell the fabrics at wholesale.

Industry sources have indicated that the integrated firms generally focus more on “basic” fabrics, while the independent finishers tend to dye and finish “semi-basic” and fashion fabrics and novelties. The converters usually have greater flexibility than the integrated firms in the types of fabrics they market, owing to their more limited fixed capital costs. Industry sources indicated that converters tend to respond more quickly to fashion trends and are able to provide apparel companies with smaller runs of fabrics for the latest fashions.

The integrated firms reportedly account for as much as 70 percent of all the fabric dyed and finished domestically. However, these firms usually dye and finish the fabrics in plants that are separate from those in which they make the fabrics. According to the U.S. Census Bureau’s *Annual Survey of Manufactures* for 1999, about 75 percent of U.S. producers’ shipments of finished broadwoven fabrics by value were finished in such separate plants. Because of the high fixed costs of a dyeing and finishing facility, the integrated firms often send grey fabrics from their weaving plants to one central dyeing and finishing facility. For knit fabrics, by contrast, more than half the U.S. shipments of finished fabrics were made and finished in the same plant.

The domestic dyeing and finishing segment, like the textile industry overall, has been declining in size in recent years. The value of shipments of all finished knit and woven fabrics fell 14 percent during 1997-99 (table 1), with the largest decline occurring in shipments of fabrics that were finished in weaving mills. According to the Census Bureau's *County Business Patterns* for 1999, the number of finishing mills (excluding finishing that occurs in weaving or knitting mills) fell 5 percent from the 1998 level, to 6,044 establishments, while employment fell 14 percent to about 70,000 employees (also includes some workers involved in the dyeing and finishing of non-fabric textiles, such as yarn). The dyeing and finishing segment likely has continued to decline since then. For example, according to U.S. Bureau of Labor Statistics data, seasonally adjusted employment for textile finishing fell 6 percent in 2000 and by an estimated 11 percent in 2001.

Table 1
Finished fabrics: Value of shipments, 1997-99

(Million dollars)

Item	1997	1998	1999
Broadwoven fabrics finished in weaving mills	3,155	2,927	2,631
Broadwoven fabrics finished other than in weaving mills	9,107	8,484	7,817
Knit fabrics finished in knitting mills	3,072	2,841	2,684
Knit fabrics finished other than in knitting mills ¹	2,510	2,235	2,232
Total	17,844	16,488	15,363

¹ Estimated, based on data from the U.S. Census Bureau 1997 Economic Census.

Source: U.S. Census Bureau, *Annual Survey of Manufactures*.

Relative Importance of Dyeing and Finishing

Dyeing and finishing of fabrics can be quite complex, and can represent a significant portion of the total cost of producing the finished fabric, depending on the type of finishing treatment; the type, weight, and color of the fabric; and apparel application. For example, industry sources noted that printing a design on a fabric generally adds more value to the fabric than dyeing it in a single color. One mill noted that the printing of designs on grey fabrics can add as much as \$3 of value for every \$1 worth of grey fabric being processed.

In terms of the cost of manufacturing an apparel fabric, industry sources stated that dyeing and finishing generally account for at least 35 percent of the total cost and can reach as much as 70 to 75 percent of the total. One firm estimated that dyeing and finishing account for about 50 to 54 percent of the total value of woven apparel fabrics and as much as 71 to 78 percent for some knit fabrics, such as dyed knit fabrics for T-shirts and polo shirts.

In terms of the cost of making a garment, the relative importance of dyeing and finishing the grey fabric varies widely, depending on the type of fabric, finishing, and garment. For a garment made from a printed woven fabric, data from one firm show that, on average, the cost of printing and finishing the fabric accounts for 29 percent of the total cost of making the garment. The data also show that the cost of garment assembly accounts for 63 percent of the total garment cost, while the cost of making (weaving) the grey fabric accounts for 8 percent.

For many knitwear articles such as knit tops, dyeing and finishing reportedly account for 8 to 10 percent of the total cost of making the garment. In general, designs are printed on knit tops after the garment has been assembled, rather than before the garment-manufacturing stage. As such, the printing of knit tops is less affected by the dyeing and finishing issue than, for example, shirts and blouses made from woven fabrics, in which the designs are generally printed on the fabrics before the garment-manufacturing stage.

Dyeing and Finishing in CBERA Countries¹⁰

Several U.S. textile and apparel industry sources have indicated that only small amounts of U.S. fabrics being exported to CBERA countries for cutting and sewing into garments are actually being dyed and finished there. Although U.S. industry sources have noted that many of the Asian-based firms currently producing apparel in CBERA countries for export to the United States have access to financial resources that would enable them to invest in dyeing and finishing facilities in CBERA countries, Asian firms have yet to make such investments.

The production of textiles from yarns to fabrics, including fabric dyeing and finishing, occurs in the major apparel-exporting CBERA countries, including Costa Rica, the Dominican Republic, El Salvador, Guatemala, and Honduras, according to a textile association official in El Salvador. Reportedly, the textile manufacturing facilities in most of these countries date back to the 1960s; however, many of them have been upgraded and modernized over the years. The CBTPA reportedly has prompted new investment in cutting, stonewashing, and dyeing equipment in several countries, particularly the Dominican Republic and Guatemala.¹¹

CBERA textile mills reportedly import cotton or manmade fibers primarily from the United States, spin the fibers into yarns, and process the yarns into woven or knitted fabrics. The fabrics are dyed and finished locally, and are sold primarily for local consumption and also for export. According to the textile association official in El Salvador, the average annual installed capacity in El Salvador is estimated at 300 million square meter equivalents (SMEs) of finished knit fabric and 200 million SMEs of finished woven fabric.¹² The El Salvador official estimated that Guatemala's installed capacity is about 20 percent larger than that in El Salvador. Among the textile mills in the CBERA region having dyeing and finishing capabilities are Listex, a large mill in Guatemala; IUSA, a Japanese firm with plants in El Salvador and Costa Rica; and Grupo M in Honduras. ■

¹⁰ This section summarizes the limited amount of information that was available to Commission staff on dyeing and finishing operations in CBERA countries. Commission staff was unable to verify the accuracy of the information presented here.

¹¹ Officials of two Dominican apparel producers, interviews by Commission staff, Santo Domingo, June 6, 2001.

¹² The United States shipped 3.1 billion SMEs of cut garment parts to CBERA countries for assembly in 2000, based on imports of apparel from CBERA countries that entered under U.S. production-sharing provision 9802 (formerly the "807" provision).

WTO Agricultural Trade Negotiations: A Second Update

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Two recent ITTR articles about multilateral trade negotiations for agriculture² discussed (1) the major differences about policy among World Trade Organization (WTO) members, (2) the issues associated especially with the Seattle Ministerial in December 1999, and (3) the status of negotiations during the first 9 months of the new Round. Despite the unsuccessful effort to launch a new comprehensive round of WTO trade negotiations in Seattle, WTO agricultural negotiations began in January 2000, as mandated by Article 20 of the Uruguay Round Agreement on Agriculture (URAA). This article reviews the current status of these agriculture negotiations; the outcome of the Fourth Ministerial in Doha, Qatar, in November 2001; and the prospects for agriculture negotiations in the coming year. A glossary of referenced agriculture and trade terms appears at the end of the article.

Article 20 of the Uruguay Round Agreement on Agriculture (URAA) required World Trade Organization (WTO) members to continue negotiations toward further reducing agriculture support and protection at least 1 year prior to the end of the URAA implementation period. In early February 2000, the WTO General Council decided that agricultural negotiations should be held in special sessions of the WTO Agriculture Committee. It also decided that the initial agricultural negotiations should proceed in phases.

The first phase of the talks (January 2000-March 2001) consisted of six special sessions of the agriculture committee, held in March, June, September, and November 2000; February 2001; and a final “stock-taking” meeting in March 2001. In phase 1, countries submitted proposals based on their initial negotiating positions which covered the major elements of the URAA negotiations and specific new topics (table 1).³ In all, 45 initial proposals and 3 technical documents were submitted by 126 member governments (89 percent of the then

¹ The views expressed in this article are those of the authors, and are not the views of the U.S. International Trade Commission (USITC) as a whole or of any individual Commissioner.

² See “Agriculture in the WTO: The Seattle Ministerial and Beyond,” *Industry Trade and Technology Review*, USITC publication 3293, Mar. 2000, pp. 21-45; and, “WTO Agricultural Trade Negotiations: An Update,” *Industry Trade and Technology Review*, USITC publication 3363, Oct. 2000, pp. 1-6. Both articles can be found on the USITC website at <http://www.usitc.gov>.

³ WTO Agriculture Committee (AC), “Agricultural negotiations: Background. Introduction,” found at http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd05_intro_e.htm, retrieved, Jan. 22, 2002.

Table 1
Proposals submitted in phase 1 of agricultural negotiations¹

Scope/topic	Countries/country groups (see glossary)
Comprehensive	United States, European Union, Japan, Switzerland, Mauritius, Small-island developing states, Republic of Korea, Mali, Norway, India, Poland, Morocco, Turkey, Egypt, Nigeria, Democratic Republic of the Congo, Kenya, Senegal, Mexico, Jordan, group of African countries, Namibia, Burkina Faso, Croatia
Export competition	Cairns Group, European Union, Mercosur
Export restrictions, taxes	Cairns Group
Export credits	Mercosur, Bolivia, Chile, Costa Rica, Guatemala, India, and Malaysia
State trading enterprises	Mercosur
Domestic (internal) support	Cairns Group, United States, Canada
Blue box policies	European Union
Green box policies	Group of developing countries
Transition issues	Transition economies
Market access	Canada, Cairns Group, group of developing countries, transition economies, Caricom
Food quality	European Union
Tariff-rate quota	United States
Special and differential treatment for small developing countries	Group of developing countries
Nontrade concerns	(²)
Animal welfare	European Union

¹ As noted, countries or country groups may have submitted proposals that were comprehensive, covering all areas of negotiations, and/or proposals that may have addressed specific topics or certain issues.

² Countries or country groups generally addressed nontrade concerns as part of comprehensive proposals rather than as separate topics.

Source: WTO AC, "Agricultural negotiations: Backgrounder. In a nutshell," found at http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd01_nutshell_e.htm, retrieved Jan. 22, 2002.

142 WTO members).⁴ The proposals and other documents expressed wide-ranging views on all major negotiating objectives.⁵ Many proposals, such as those submitted by the United States, the European Union (EU), Japan, and India, were "comprehensive," covering all areas of negotiation. Other countries addressed specific topics, such as the Cairns Group proposal on export restrictions and the EU proposal on food quality.⁶

A work program for phase 2 of the agricultural negotiations was agreed upon at the March 2001 meeting of the Agriculture Committee. Six sessions were scheduled for May, July, September, and December 2001; February 2002; and a final session in March 2002 to

⁴ WTO AC, "Agricultural negotiations: Backgrounder. In a nutshell," found at http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd01_nutshell_e.htm, retrieved Jan. 22, 2002.

⁵ Chairperson's statement on the 'first phase': Committee on Agriculture Special Session, Mar. 26–28, 2001, found at http://www.wto.org/english/tratop_e/agric_e/agneg6_e.htm, retrieved Jan. 22, 2002.

⁶ WTO AC, "Agricultural negotiations: Backgrounder. In a nutshell," found at http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd01_nutshell_e.htm, retrieved Jan. 22, 2002.

review progress. Although meetings in the first phase primarily focused on submitted proposals, the second phase of discussions involved technical details of specific topics (table 2). The stated purpose of phase 2 meetings was to allow members to address specific issues and to reach consensus on changes to the modalities (*see glossary*) for a new agreement on agriculture. The work program also explicitly provides for special and differential treatment for developing countries, which are considered “an integral part of all elements of the negotiations.”⁷

Table 2
Elaborated proposals and other informal papers submitted to Special Sessions of the Agriculture Committee in phase 2 of agricultural negotiations

Topic	Countries/country groups
Tariff rate quota administration	Australia, European Union, Japan, Switzerland, Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nicaragua, Nigeria, Pakistan, Sri Lanka, Tanzania, Zimbabwe
Tariffs	Australia, Japan, Mercosur
Amber box policies	Australia, European Union, Japan
Green box policies	Argentina, Cyprus, European Union, Japan, Namibia, Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nicaragua, Pakistan, Sri Lanka, Zimbabwe
Blue box policies	Cairns Group, Japan
Special and differential treatment	Cuba, Dominican Republic, El Salvador, Honduras, Indonesia, Kenya, Nicaragua, Nigeria, Pakistan, the Philippines, Sri Lanka, Tanzania, Venezuela, Zimbabwe
Export subsidies	Cairns Group, Israel, Japan, Switzerland, Antigua and Barbuda, Barbados, Belize, the Commonwealth of Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Vincent and the Grenadines, Republic of Trinidad and Tobago, Suriname, Nicaragua, Pakistan, Panama, Peru, Venezuela, Zimbabwe
Export credits	Australia, European Union, Japan, United States
State trading enterprises (STEs)	Japan, United States
Export restrictions	Japan, United States
Food security	Japan, United States, Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nicaragua, Nigeria, Pakistan, Peru, Sri Lanka, Venezuela, Zimbabwe
Food safety	European Union, Japan
Rural development	Japan, Norway, Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nicaragua, Pakistan, Sri Lanka, Zimbabwe
Geographical indications	European Union, Japan, Switzerland, United States
Special safeguards	United States, Argentina, Bolivia, Paraguay, the Philippines, Thailand, Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nicaragua, Pakistan, Senegal, Sri Lanka, Zimbabwe, Japan, Namibia, Switzerland

Source: WTO, 28 September 2001: Chairman’s Report to General Council, found at http://www.wto.org/english/tratop_e/agric_e/agneg8ch_e.htm, retrieved Jan. 22, 2002.

⁷ WTO AC, “Agricultural negotiations: Backgrounder. Introduction,” found at http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd05_intro_e.htm, retrieved Jan. 22, 2002.

Current Negotiating Positions of Major Participants

By midpoint of phase 2 negotiations, wide gaps reportedly existed between various country positions on agriculture. Faced with the increasing intransigence of members, trade officials called for the launch of a comprehensive round of talks at the Ministerial scheduled in Doha. They hoped for countries in time to shift their positions, especially regarding cuts in farm subsidies.⁸ As reported by various sources, the negotiating positions on key issues affecting agriculture, by country/country group, are summarized in table 3.

Table 3
Overview of key negotiating objectives of major participants in WTO agricultural negotiations, January 2002

Issue	United States	Cairns Group	European Union	Japan	Developing countries ¹
Export competition:					
Classic export subsidies	Completely eliminate	Completely eliminate	Reductions	Reductions	Eliminate with special treatment for LDCs
Export credits and guarantees	Introduce limited disciplines within OECD	Introduce WTO disciplines	Introduce WTO disciplines	Introduce WTO disciplines	Position unstated
Food aid	Exempt from disciplines recognizing its importance to food security	Introduce WTO disciplines	Introduce WTO disciplines	Exempt from disciplines	Introduce WTO disciplines
Export restrictions	Introduce WTO disciplines	Introduce WTO disciplines	Introduce WTO disciplines	Introduce WTO disciplines	Introduce WTO disciplines
Market access:					
Tariffs	Bind and lower tariffs; substantially reduce/eliminate tariff disparities, tariff escalation	Deeper cuts, curtail tariff peaks and tariff escalation	More modest and balanced reductions	More modest and balanced reductions considering nontrade concerns and food security	Lower tariffs on agricultural products of interest to LDCs
TRQs	Increase TRQ quantities; reduce over-quota tariffs; eliminate in-quota duties	Increase TRQ quantities; reduce over-quota tariffs	Limit major TRQ quantity increases	Limit major TRQ quantity increases	Increase TRQ quantities Reduce over-quota tariffs
TRQ administration	Reform and simplify	Reform and simplify	Reform and simplify	Reform and simplify	Reform and simplify
Special safeguards	Eliminate	Eliminate; preservation only for use by developing countries	Continue	Continue; introduce new safe guard for seasonal and perishable agriculture products	Eliminate on agricultural products of interest to LDCs; preservation only for use by developing countries

See footnotes at end of table.

⁸ "WTO talks running out of steam," *Agra Europe Weekly*, July 27, 2001.

Table 3—Continued
Overview of negotiating objectives of major participants in WTO agricultural negotiations, January 2002

Issue	United States	Cairns Group	European Union	Japan	Developing countries ¹
Internal supports:					
Amber box	Change to 'nonexempt' category; substantially reduce trade-distorting supports starting from final bound AMS level	Phase in elimination	More modest reductions in trade-distorting supports	More modest reductions in trade-distorting supports	More substantial reductions with special treatment for LDCs
Green box	Continue as 'exempt' category; special consideration for LDCs	Review definition of non-trade distorting policies; enhance provisions for LDCs	Re-open to account for nontrade concerns	Re-open to account for nontrade concerns	Reduce; create 'development box' within green box only for LDCs
Blue box	Eliminate; shift to 'nonexempt' category	Phase in elimination	Continue	Continue	More substantial reductions
Peace clause	Position unstated	Eliminate	Continue	Continue	Continue only for LDCs
SPS Agreement	Do not re-open	Do not re-open	Re-open to account for precautionary principle	Re-open to account for precautionary principle	Provide technical assistance to LDCs in meeting requirements
Biotechnology	Make rules transparent and predictable	Make rules transparent and predictable	Allow restrictions on GMOs based on precautionary principle	Allow restrictions on GMOs based on precautionary principle	Make rules transparent and predictable
State trading enterprises	Introduce disciplines on monopoly STEs; increase transparency	Disciplines, if introduced, should also apply to private firms	Introduce disciplines on monopoly STEs; increase transparency	Introduce disciplines on monopoly STEs; increase transparency	Introduce disciplines on monopoly STEs; increase transparency
Preferential treatment for developing countries	Continue and strengthen	Continue and strengthen	Continue and strengthen	Continue and strengthen	Continue and strengthen
Nontrade concerns	Should not be addressed in future agreement	Should not be addressed in future agreement	Should be addressed in future agreement	Should be addressed in future agreement	Should be addressed in future agreement

¹ This represents the broad consensus of developing country objectives and may not necessarily reflect the objectives of every developing country on every issue.

Source: Compiled from various government, industry, and trade sources.

United States

The United States submitted its comprehensive proposal in June 2000.⁹ Additional submissions have been presented on domestic (internal) support reform¹⁰ and tariff-rate quota (TRQ) reform.¹¹ Regarding market access, the United States proposal (June 2000) calls for substantial reductions of all tariffs (including in-quota duties) and tariff peaks, with no product exemptions. The proposal also calls for eliminating special safeguards, increasing TRQ amounts, and introducing new disciplines on TRQ administration such as trigger mechanisms for quota underfills. In addition, the United States proposes the development of disciplines covering trade in products developed through new technologies (such as trade in genetically modified agricultural products), and supports sectoral negotiations such as “zero-for-zero” initiatives (*see glossary*).

The U.S. proposal details a simplification of rules for domestic support that would establish two categories of subsidies: one for exempt measures, which would be targeted, transparent, and minimally trade distorting; and another for nonexempt measures, which would be subject to reduction commitments. This would effectively eliminate blue box policies¹² and establish a ceiling on all support considered to be trade distorting. In addition, the U.S. proposal contends that the Aggregate Measure of Support (AMS)¹³ should be reduced from the final bound URAA AMS level to a final bound level equal to a fixed percentage (for example, 10 percent) of the value of agricultural production in a base period.¹⁴ The fixed percentage would be the same for all countries, thus requiring greater cuts by those countries with higher levels of domestic support.¹⁵

⁹ WTO Committee on Agriculture Special Session (CASS), Proposal for Comprehensive Long-Term Agricultural Trade Reform, Submission from the United States, G/AG/NG/W/15, June 23, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw15_e.doc.

¹⁰ WTO CASS, Note on Domestic Support Reform, Submission from the United States, G/AG/NG/W/16, June 23, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw16_e.doc.

¹¹ WTO CASS, Proposal for Tariff Rate Quota Reform, Submission from the United States, G/AG/NG/W/58, Nov. 14, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw58_e.doc.

¹² Under the URAA, domestic supports were put into categories (often called “boxes”) using a traffic light analogy of “red” for stop, “green” for go, and “amber” for proceed cautiously. From this analogy negotiators have, on occasion, created additional “color” boxes to indicate other policy categories. See glossary at end of article for explanation of the various support categories.

¹³ AMS provides an estimate of the expenditure on trade-distorting programs that must be reduced under provisions of the URAA.

¹⁴ “U.S. declares war on CAP direct aids,” *Agra Europe Weekly*, June 30, 2000.

¹⁵ For example, take the case of two countries each with a production value of \$200 billion in a base period (1997-99, for example)—one with a final URAA AMS of \$80 billion and the other with only \$20 billion. Assuming it was agreed in the new round that the AMS of each country had to be reduced to 10 percent of the production value by the end of the implementation period, both countries would have to reduce supports to \$20 billion (10 percent of \$200 billion); however, one country would have to cut supports by \$60 billion, while the other would have to make no cuts at all.

Regarding export competition, the U.S. proposal supports the elimination of export subsidies over a fixed period of time and also proposes restrictions on state trading enterprises (STEs).¹⁶ The United States proposes that discussions that took place in the Organization for Economic Cooperation and Development (OECD) on disciplines for export credits and guarantees¹⁷ provide guidance to potential WTO negotiations on export credits. The United States views the most trade-distorting measures overall to be export subsidies, domestic support payments, high tariffs, and unjustified restrictions on products of new technologies.¹⁸

Cairns Group

The Cairns Group (*see glossary*) has not submitted a comprehensive proposal but has offered proposals on export competition,¹⁹ domestic support,²⁰ market access,²¹ and export restrictions and taxes.²² The Cairns Group is committed to aggressive reforms in each of these areas. However, several subgroups of developing-country members of the Cairns Group have submitted their own, separate proposals on particular topics, which express views at odds with some of the developed-country members of the group. For example, several Latin American countries have called for disciplines on STEs despite the heavy reliance on STEs by other major Cairns Group members, Canada and Australia.²³

In their proposals, Cairns Group countries call for the elimination of export subsidies, beginning with a 50-percent reduction in the first year of implementation, followed by a complete phaseout over 3 years for developed countries and 6 years for developing countries. The group also seeks improved disciplines on export restrictions and export taxes

¹⁶ The United States reportedly would prefer establishing disciplines that would add transparency to the operation of export-oriented STEs by requiring them to notify the WTO on sales information, acquisition costs, and export pricing; and that would eliminate government financial support of such monopoly exporters.

¹⁷ In negotiations at the OECD, the United States has agreed to reduce this time period to 18 months (24 months for breeding cattle, grains, and oilseeds). (Currently, U.S. rules allow 3 years for repayment of state-guaranteed loans used to purchase U.S. agriculture products.) This falls short of the 12 months that Canada and Australia are advocating. Countries also disagree on whether STEs (such as the Canadian Wheat Board) should be required to report export credit terms. Because of the impasse on these issues, negotiations at the OECD have stalled. For more detail, see "OECD export credit talks stalled," *Feedstuffs*, Jan. 29, 2001.

¹⁸ WTO CASS, Proposal for Comprehensive Long-Term Agricultural Trade Reform, Submission from the United States, G/AG/NG/W/15, June 23, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw15_e.doc.

¹⁹ WTO CASS, Cairns Group Negotiating Proposal. Export Competition, G/AG/NG/W/11, June 26, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw11_e.doc.

²⁰ WTO CASS, Cairns Group Negotiating Proposal. Domestic Support, G/AG/NG/W/35, Sept. 22, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw35_e.doc.

²¹ WTO CASS, Cairns Group Negotiating Proposal. Market Access, G/AG/NG/W/54, Nov. 10, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw54_e.doc.

²² WTO CASS, Cairns Group Negotiating Proposal. Export Restrictions and Taxes, G/AG/NG/W/93, Dec. 21, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw93_e.doc.

²³ WTO CASS, State Trading Enterprises, Proposal by Argentina, Brazil, Paraguay, Uruguay, Chile, and Colombia, G/AG/NG/W/104, Jan. 23, 2001, found at http://www.wto.org/english/tratop_e/agric_e/ngw104_e.doc.

to provide increased certainty of supply for food-importing countries, and that tariff escalation (*see glossary*) be eliminated. The group's proposal advocates major reductions in domestic support, including support categorized as amber and blue box policies, and introduces the concept of a formula approach for the reduction of trade-distorting domestic supports, such as EU transfer payments and U.S. market loan deficiency payments. Cairns Group countries would also review green box policies to ensure that they are, at most, minimally trade distorting. Focusing attention on the special needs of developing countries, the group proposes longer implementation periods for tariff reduction and elimination of export subsidies for these countries. Developing countries would also benefit under the Cairns Group proposal from special green box provisions and enhanced technical assistance.

Canada opted out of the Cairns Group submission on market access in deference to its own market access proposal submitted earlier.²⁴ The Canadian proposal provides options for a targeted approach to tariff reduction for single-stage tariffs, two-stage tariffs, and tariff quotas. Single-stage tariffs would be reduced using a formula approach, and any tariffs that remained over a certain threshold would be reduced by converting them to TRQs with duty-free access within the quota. For existing TRQs, the in-quota rates would be eliminated and quota amounts increased. The proposal also endorses zero-for-zero sectoral initiatives not only for tariff elimination and export subsidies, but also for such measures as export taxes and trade-distorting domestic support. Canada also submitted a proposal on domestic support in December 2000,²⁵ that calls for an overall limit on support of all types, including that which currently falls in the green, blue, and amber box policies, and for a provision that green box policies be recognized as not countervailable.

European Union

The European Union (EU) comprehensive proposal was submitted in December 2000.²⁶ In addition, the EU submitted separate proposals in July 2001 on the precautionary principle, export credits, and food safety. Following the Doha Ministerial, the EU submitted three additional proposals in December 2001, on mandatory labeling for agriculture products, food aid, and tariff preferences for developing countries.

On export competition, the EU proposes that officially supported export credits be reduced in the same way as other forms of export subsidization. These proposals are aimed at the United States, which is the primary user of export credits and guarantees for agricultural products. The EU also targets the United States in the area of food aid, viewing much of this aid as disguised subsidized exports, and therefore necessary to be reined in by disciplines. The EU proposal calls for food aid to be provided to lower-income countries in the form of cash payments for purchases in local markets, and for actual food consignments to be provided only during humanitarian crises.

²⁴ WTO CASS, WTO Negotiations on Agriculture: Market Access, a negotiating proposal by Canada, G/AG/NG/W/12, June 19, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw12_e.doc.

²⁵ WTO CASS, WTO Negotiations on Agriculture: Domestic Support, proposal by Canada, G/AG/NG/W/92, Dec. 21, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw92_e.doc.

²⁶ WTO CASS, EC Comprehensive Negotiating Proposal, G/AG/NG/W/90, Dec. 14, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw90_e.doc.

On market access, the EU negotiating proposals call for lower trade barriers through modest and balanced tariff reductions, and for increased transparency in TRQ administration. The EU supports an overall average reduction of bound tariffs and a minimum reduction per tariff line using the approach followed in the Uruguay Round agricultural negotiations. The proposal cites the article 20 reference to “progressive” tariff reductions, which the EU interprets as allowing countries flexibility in lowering tariffs. Although the EU would not offer any product exclusions, the proposal endorses the right of individual countries to take into account the particular situation of certain sensitive agriculture sectors. The EU views improved market access as including the right to use geographical indications or designations of origin in order to ensure fair competition, asserting that discussions of geographical indications be addressed within the agricultural negotiations as well as under the WTO’s Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement.

For the EU, certain policy objectives, such as protecting the environment, sustaining the vitality of rural areas, and ensuring the humane treatment of animals, are considered justification for government financial assistance to agriculture. Therefore, the EU would maintain blue and green box support payments, and even expand them, while examining the criteria for these policies to ensure that measures for achieving the objectives of multifunctional agriculture are maintained. The EU proposal views countercyclical payments for products destined for export, however, as particularly trade distorting and would subject them to specific disciplines.

With respect to nontrade concerns, food safety is of particular interest to the EU. In its proposals, the EU notes that consumer interest in food safety has noticeably increased; consequently, the EU asserts that a reexamination of the WTO Agreement on Sanitary/Phytosanitary (SPS) Measures is necessary to clarify the relationship between precaution and WTO rules in the new round of negotiations.²⁷ The EU also calls for establishment of the right of countries to introduce mandatory labeling requirements that would not be considered technical barriers to trade. The specific guidelines laid out by the EU for use in implementing labeling schemes at the national level include the requirement that they be non-trade-distorting and transparent, and that they include information on process and production methods of a product as well as the ways animals or plants are raised or grown, or the modified properties of agricultural products.

Japan

Japan submitted a comprehensive proposal to the Agriculture Committee in December 2000.²⁸ Although currently implementing domestic policy reforms in agriculture, Japan’s proposal is characterized by one observer as cautious and defensive in its approach to

²⁷ In the EU view, WTO rules do allow for taking precaution into account in trade policy formation, but they suggest that a clearer framework for the use of precaution would promote open trade and reduce risk of trade disputes. They maintain that the use of precaution should be based on available pertinent information from qualified and respected sources but not necessarily that of the majority of the scientific community.

²⁸ WTO CASS, Negotiating Proposal By Japan On WTO Agricultural Negotiations, G/AG/NG/W/91, Dec. 21, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw91_e.doc.

agricultural trade negotiations.²⁹ The central themes of the Japanese proposal, reportedly consistent with its position in all aspects of the negotiations on agriculture to date, are the multifunctionality (*see glossary*) of agriculture and the notion of food security (that each government has the right to secure its own stable food supply and to provide for sustainable production within its own borders).

Japan's proposal maintains that increasing market access should proceed in a manner that provides flexibility to accommodate an individual country's current situation of production and consumption for each product. The proposal calls for slow, manageable reductions in tariffs and increases in TRQ levels, and considers the reduction of in-quota and overquota tariff rates inappropriate for all agricultural products. The proposal defends a country's right to practice tariff escalation, citing the justification to protect its domestic food industry. Japan's proposal does not support further sector-specific reductions in tariff levels (zero-for-zero), noting that such initiatives do not equally benefit both food-importing and food-exporting countries. Japan also calls for maintaining the special safeguard mechanism under the URAA and the introduction of a new safeguard mechanism for seasonal and perishable agricultural products. With regard to domestic support, the Japanese propose that green box policies be re-examined to allow for payments that support the concept of multifunctionality as well as serving as safety-net programs necessary for promoting market-oriented policy conversion. Japan's proposal suggests that only modest reductions in amber-box support payments should be negotiated, and supports the strengthening of export credit disciplines in light of the discussions being held on the subject in the OECD.

The Japanese comprehensive proposal also calls for STEs to notify WTO members of the amount and price of exports, as well as their procurement price on a quarterly basis, and for the prohibition of financial assistance from the government to the STE. On food safety, the Japanese proposal articulates the notion of precaution, indicating that providing safe food to the public may necessitate the restriction of genetically modified products, and supports reexamining the current SPS agreement to determine whether it can sufficiently respond to new food safety issues.

Developing Countries

Throughout the negotiations on agriculture, developing countries, which form a majority of the WTO membership, reportedly have displayed a determination to influence the discussions and to redress what they consider as deficiencies of previous negotiating Rounds. Overall, proposals by these countries seek improved access for products they supply to world markets, namely textiles and agriculture products. Developing countries have submitted proposals as part of the Cairns Group, as part of Mercosur, and as part of other informal groupings of countries. The emphasis of these varied submissions can be generally summarized by the need for special and differential treatment for developing countries.³⁰

²⁹ Miner, W. M., "An overview of the issues and position of the major countries in the WTO negotiations," *Estey Centre Journal of International Law and Trade Policy*, Vol. 2, No. 1, 2001.

³⁰ For example, WTO CASS, Special and Differential Treatment for Developing Countries in World Agricultural Trade, Proposal by ASEAN Countries, G/AG/NG/W/55, Nov. 10, 2000, found at http://www.wto.org/english/tratop_e/agric_e/ngw55_e.doc

In terms of market access, some developing countries stress the need to address tariff peaks and tariff escalation that they believe particularly impede market access for developing-country goods.³¹ Others highlight the need for technical assistance in meeting SPS requirements.³² Some Latin American developing countries belonging to the Cairns Group submitted a proposal calling for new disciplines on STEs, despite the fact that fellow Cairns Group members Canada and Australia defend their use of STEs.³³ A group of small-island nations in the Caribbean is proposing that they retain preferential access for their exports, mainly sugar and bananas, and that they be exempt from the WTO requirement that free-trade agreements cover substantially all trade.³⁴ Likewise, developing countries in Latin America that also produce sugar and bananas are pushing for the reduction of trade barriers on these items.³⁵

With respect to domestic support, developing nations generally view the green box policies as serving developed nations at the expense of developing countries. To remedy this, a group of nine developing countries (including Pakistan, Kenya, Cuba, and Zimbabwe) propose a development box of support payments within the green box which would apply only to developing countries.³⁶ Taking the opposite view, Argentina calls for scaling back support in the green box and removing provisions for (1) direct producer payments, (2) decoupled income support (*see glossary*), and (3) income insurance.³⁷ Despite the disparate proposals on green box support payments, developing countries generally agree that even if individual green box measures are not trade distorting, their cumulative effect is considered damaging.

A detailed proposal submitted by India is believed by observers to be fairly indicative of where the positions of developing countries might be headed in future negotiations; this submission conditions any tariff reductions by developing countries on substantial reductions of developed nations' trade-distorting domestic support and on elimination of export subsidies.³⁸ India's proposal calls on developed countries to reduce their high tariffs

³¹ For example, WTO CASS, Legitimate Non-Trade Concerns, Technical submission by Argentina, G/AG/NG/W/88, Jan. 25, 2002, found at http://wto.org/english/tratrop_e/agric_e/ngw88_e.doc

³² For example, WTO CASS, Negotiating proposal by Mauritius, G/AG/NG/W/96, Jan. 25, 2002, found at http://wto.org/english/tratrop_e/agric_e/ngw96_e.doc

³³ WTO CASS, State Trading Enterprises, Proposal by Argentina, Brazil, Paraguay, Uruguay, Chile and Columbia, G/AG/NG/W/104, Jan. 23, 2001, found at http://www.wto.org/english/tratrop_e/agric_e/ngw104_e.doc.

³⁴ WTO CASS., Proposals by small-island developing states (SIDS), Barbados, Cuba, Dominica, Jamaica, Mauritius, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago, G/AG/NG/W/97, Jan. 25, 2002, found at http://wto.org/english/tratrop_e/agric_e/ngw97_e.doc

³⁵ WTO CASS., Market Access, Proposal by Caricom, G/AG/NG/W/100, January 25, 2002, found at http://wto.org/english/tratrop_e/agric_e/ngw100_e.doc

³⁶ WTO CASS., Special and Differential Treatment and a Development Box, Proposal by Cuba, Dominican Republic, Honduras, Pakistan, Haiti, Nicaragua, Kenya, Uganda, Zimbabwe, Sri Lanka, and El Salvador, G/AG/NG/W/13, June 23, 2000, found at http://www.wto.org/english/tratrop_e/agric_e/ngw13_e.doc

³⁷ WTO CASS, Green box measures: approach for a work program, off-the-record "non-paper," Proposal by Argentina.

³⁸ WTO CASS, Proposal by India on Areas of (i) Food Security, (ii) Market Access, (iii) Domestic Support, and (iv) Export Competition, G/AG/NG/W/102, Jan. 15, 2001, found at http://www.wto.org/english/tratrop_e/agric_e/ngw102_e.doc

on certain developing-country exports such as dairy, sugar, and rice; and to reduce all domestic support by one-half in 2001 and to 5 percent of the value of production by 2004. According to India's submission, developing countries would have 5 years to lower some green box support, such as income safety-net programs and income insurance, to 10 percent of production value.

The Doha Ministerial

According to the WTO, the main purpose of the Doha Ministerial (November 2001) was to launch a new comprehensive round of trade negotiations, covering a wide range of topics including agriculture, industrial products, services, environmental issues, so-called Singapore issues (investment, competition, trade facilitation, and transparency in government procurement), implementation of WTO agreements, rules (including antidumping/subsidies and regional pacts), and intellectual property. Agreement on a broad agenda for future trade talks was seen by agriculture interests as crucial for progress because it would allow concessions gained in agriculture to offset benefits achieved in other areas. A successful outcome of the meeting, according to WTO officials, would involve unanimous agreement on a Ministerial declaration—a document outlining the scope and timing a new round of trade negotiations.

The run-up to Doha

As indicated by the foregoing discussion, the negotiating positions of several key WTO members remained far apart in the few months prior to the Doha meeting. A U.S. Government official expressed concern that a second failure to launch a new round could deliver a severe blow to the credibility of the WTO as an institution and to the feasibility of multilateral trade negotiations, given the many unresolved issues on the table and the many countries participating.³⁹ In spite of existing differences, a draft Ministerial declaration was put forward by the WTO General Council chairman, Ambassador Stuart Harbinson, of Hong Kong, in late October 2001. The Harbinson draft (box 1) contains few specifics, while attempting to balance the conflicting views of all WTO members; reportedly, most countries both liked and disliked aspects of the text. The general view on the draft was summed up by Canadian Ambassador Sergio Marchi who noted "I don't think anybody is fully happy, but I think it is a good basis for further discussion."

The EU reportedly voiced concern that the Harbinson text on agriculture went too far in the direction of trade liberalization, especially in calling for the elimination of export subsidies; the stated position of the EU had always been that a text calling for the elimination of export subsidies would not be accepted.⁴⁰ The EU, as well as Japan, also noted the draft was too weak on how nontrade concerns (such as animal welfare, food security, environmental protection, and rural development) should be treated in future negotiations; for example, the EU expressed the need for clearer language indicating that nontrade concerns would be

³⁹ Ann Veneman, U.S. Secretary of Agriculture, in speech to National Association of Farm Broadcasters, Washington, D.C., Nov. 16, 2001, found at <http://www.usda.gov/news/releases/2001/11/0236.htm>, retrieved Jan. 10, 2002.

⁴⁰ Pascal Lamy, EU Trade Commissioner, in comments following EU trade Ministers' meeting, Brussels, Sept. 7, 2001.

Box 1

Draft Ministerial Declaration Text on Agriculture (Harbinson Text)

13. We recognize the work already undertaken in the negotiations initiated early in 2000 under Article 20 of the Agreement on Agriculture, including the large number of negotiating proposals submitted on behalf of 121 Members. We recall the long-term objective referred to in the Agreement to establish a fair and market-orientated trading system through a program of fundamental reform encompassing strengthening rules and specific commitments on support and protection in order to correct and prevent restrictions and distortions in world agricultural markets. We reconfirm our commitment to this program. Building on the work carried out to date, we commit ourselves to comprehensive negotiations aimed at: substantial improvements in market access; reduction of, with a view to phasing out, all forms of export subsidies; and substantial reductions in trade-distorting domestic support. We agree that special and differential treatment for developing countries shall be an integral part of all elements of the negotiations and shall be embodied in the Schedules of concessions and commitments and as appropriate in the rules and disciplines to be negotiated, so as to be operationally effective and to enable developing countries to effectively take account of their development needs, including food security and rural development. We take note of the non-trade concerns reflected in the negotiating proposals submitted by Members and confirm that non-trade concerns will be taken into account in the negotiations as provided for in the Agreement on Agriculture.

14. Modalities for the further commitments, including provisions for special and differential treatment, shall be established no later than ... Participants shall submit their comprehensive draft Schedules based on these modalities no later than ... The negotiations, including with respect to rules and disciplines and related legal texts, shall be concluded as part and at the date of conclusion of the negotiating agenda as a whole.

Source: WTO, General Council Preparations for the Fourth Session of the Ministerial Conference, Draft Ministerial Declaration, Revision, Job(01)/140/Rev.1, Oct. 27, 2001.

respected and that the process of trade negotiations would not prejudice its ability to meet such concerns.⁴¹ The EU reportedly also wanted the text to contain a commitment for negotiations on environmental issues.

Meanwhile, the Cairns Group expressed the view that the text did not go far enough in the direction of trade liberalization, and desired specific language requiring deep cuts in tariffs, curtailment of tariff peaks, substantial increases in all tariff quota volumes, strengthened rules on TRQ administration, and elimination of nontariff barriers.⁴² The Cairns Group reportedly pushed for text proposing substantial reductions, leading to elimination, of trade- and production-distorting domestic support. In addition, several developing countries wanted the draft to more adequately reflect their push for greater exemptions from agricultural trade disciplines and for the elimination of tariff peaks (typically those above 25 percent), tariff escalation (higher tariffs on more processed products), and nontariff barriers.

⁴¹ Franz Fischler, EU Commissioner for Agriculture, in briefing for trade journalists, Brussels, Oct. 18, 2001.

⁴² "No flesh on the agriculture bones in WTO's Doha draft," *Agra Europe Weekly*, Sept. 28, 2001.

Concern by U.S. negotiators over the Harbinson draft centered mainly on issues other than agriculture; in particular, the draft language which could limit the use of U.S. antidumping and countervailing duty laws. For several months prior to the Ministerial, the administration had come under increasing pressure from lawmakers in Congress not to bring these issues into the negotiations.⁴³ U.S. negotiators also raised concerns about draft language regarding negotiations on market access for nonagricultural products, which called for the reduction or elimination of tariff peaks, high tariffs, and tariff escalation. These provisions, according to certain U.S. manufacturers, could potentially lead to a substantial influx of textile and apparel imports from developing countries.⁴⁴

Negotiations

In spite of concerns about security and the ability of countries to focus on trade issues following the events of September 11, the Fourth WTO Ministerial began in Doha, Qatar, on November 9, 2001, as scheduled. After 6 days of intensive talks, the WTO members unanimously adopted a Ministerial declaration (the Doha Development Agenda, or DDA) which launches a new comprehensive round of trade negotiations. The Ministerial was universally viewed as a success by member countries, not only in terms of paving the way for opening world trade in goods and services, but also in salvaging the credibility of the WTO as an institution. For agriculture, countries consented to negotiations that will further liberalize trade and lower domestic support, with an ambitious timetable for a new agreement to be in place by January 1, 2005.

Part of the success attributed to the Ministerial in Doha resulted from how negotiation sessions were structured, in contrast to the failure in Seattle that largely has been attributed to institutional procedures that were seen to be nontransparent and exclusionary.⁴⁵ In response, conference organizers at Doha established six working groups—agriculture, implementation (developing countries' concerns about difficulties in implementing current WTO agreements), environment, rules issues (mainly involving antidumping/subsidy negotiations and regional trade agreements), Singapore issues and intellectual property—which reported back to all members. In order to ensure openness and transparency, the chairperson of each working group reported back to the heads of each country delegation, and any country was welcome to be part of the working group meetings.

The agriculture discussions were chaired by Singapore's Trade and Industry Minister, George Yeo, who served the same role in Seattle. Midway through the Doha Ministerial, final agreement had not been reached on agriculture. Chairmen Yeo reportedly described the agricultural text as a "house of cards," suggesting that the entire negotiation could collapse with the slightest change in position of any of the parties. According to observers, some participants at Doha desired a declaration stating stronger concessions in favor of developing

⁴³ "Zoellick's Trade Concession Wins WTO Talks But Could Cost Bush Fast-Track Authority," *Wall Street Journal*, Nov. 16, 2001.

⁴⁴ American Textile Manufacturers Institute in letter to United States Trade Representative Robert Zoellick and Commerce Secretary Don Evans, Nov. 1, 2001.

⁴⁵ For example, one procedure that received considerable criticism following the talks was the so-called Green Room process which typically involves negotiations among roughly the same 25 major trading countries aimed at resolving issues of disagreement prior to wider discussion among all members. Developing countries, in particular, claimed that this process marginalized and excluded them from discussing issues of vital importance to them. "WTO negotiators push towards deal," *Agra Europe Weekly*, Dec. 3, 1999.

countries, while others desired more specific language on nontrade concerns. However, the key impasse reportedly occurred over the treatment of export subsidies in the Harbinson draft of the Ministerial declaration. At issue was the EU concern about the text “reduction of, with a view to phasing out, all forms of export subsidies” (see box 1, line 8) which, according to French officials, was a “deal breaker.”⁴⁶ Concerned about political pressure at home, the French and Irish delegations reportedly were adamant that the EU should not commit to the eventual elimination of export subsidies even before negotiations started, and that future changes to policy on EU export subsidies should be made in the context of Common Agricultural Policy (CAP) reform rather than in response to WTO commitments. Observers note that agreement was eventually reached when U.S. and Canadian officials suggested the following text (italics added for emphasis) dealing with market access, export subsidies, and domestic support: “Building on the work carried out to date, *and without prejudging the outcome of the negotiations*, we commit ourselves to comprehensive negotiations aimed at: substantial improvements in market access; reduction of, with a view to phasing out, all forms of export subsidies; and substantial reductions in trade-distorting domestic support.” According to a U.S. official, the additional wording provided a solution giving EU politicians cover from criticism by agricultural interests, while in practice, not giving any extra latitude on subsidies.⁴⁷ The modified Harbinson agriculture text was carried over to the final Ministerial declaration.⁴⁸

The final Ministerial declaration establishes an ambitious timetable for completing the agricultural negotiations as set forth in paragraph 14 of the final text: “Modalities for the further commitments, including provisions for special and differential treatment, shall be established no later than March 31, 2003. Participants shall submit their comprehensive draft Schedules based on these modalities no later than the date of the Fifth Session of the Ministerial Conference.” (To be held in autumn 2003.) “The negotiations, including with respect to rules and disciplines and related legal texts, shall be concluded as part and at the date of conclusion of the negotiating agenda as a whole.” (January 1, 2005). WTO members also decided that the negotiations will be a “single undertaking,” meaning that individual parts of the negotiations cannot be finalized until agreement is reached on all parts of the agenda.

The Outcome

Although all sides put the result of the Doha meeting in a positive light, observers indicate that the outcome reflected considerable compromise by all parties. On the outcome of the Doha Ministerial, U.S. Agriculture Secretary Veneman commented “just absolutely a great victory, that we were able to come away from with the launch of a round, and it's a great victory for America's farmers and ranchers.”⁴⁹ The United States reportedly achieved most of its objectives with respect to agriculture going into the meetings; most importantly, a commitment by the EU to negotiate the eventual phaseout of export subsidies, as well as agreement for substantial improvements in market access and reductions in domestic

⁴⁶ “Real work for WTO to begin in 2002,” *Feedstuffs*, Nov 19, 2001.

⁴⁷ Ann Veneman, U.S. Secretary of Agriculture, in comments to journalists, Doha, Qatar, Nov. 14, 2001.

⁴⁸ The complete text of the DDA can be found on the WTO website, at http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm.

⁴⁹ Ann Veneman, U.S. Secretary of Agriculture, in speech to National Association of Farm Broadcasters, Washington, D.C., Nov. 16, 2001, found at <http://www.usda.gov/news/releases/2001/11/0236.htm>, retrieved Jan. 10, 2002.

supports. In addition, the United States was pleased with general language addressing nontrade concerns, that environmental issues were not widely included in negotiations, and that the agreement on SPS measures was left untouched.

To gain these commitments, U.S. negotiators agreed to text calling for the phaseout of all forms of export subsidies. This is expected to lead to negotiating disciplines on export credits and food aid within the WTO, something long resisted by the United States.⁵⁰ U.S. concessions were also made in areas beyond agriculture. In particular, the DDA calls for negotiations on antidumping and subsidy provisions, which, according to some U.S. interests, may weaken U.S. trade laws.⁵¹ The final text covering market access for nonagricultural products also requires negotiations to reduce or eliminate tariff peaks. U.S. tariffs are high for some of its import-sensitive sectors, such as textiles and apparel. At the start of the Ministerial, the United States had objected to this language on tariff peaks.

Meanwhile, the EU Agriculture Commissioner Franz Fischler, commenting on the outcome of the Doha Ministerial, noted “good news not only for Europe, but for all the members of the WTO. A new trade round is a slap in the face for isolationism.”⁵² The EU has claimed benefits on several fronts. For example, the agricultural text requires that nontrade concerns be taken into account in future negotiations.⁵³ Also, with the Ministerial declaration requiring negotiations covering all forms of export subsidy, the EU sees an opportunity to introduce disciplines on U.S. export credits and food aid, as well as the subsidy element of the STEs that some Cairns Group countries employ.⁵⁴ The EU has also welcomed the opportunity to negotiate protection of “geographical indications” (*see glossary*) for wine and spirits under the TRIPS Agreement. The EU supported the text dealing with trade and the environment that required negotiations on the relationship between existing WTO rules and specific trade obligations set out in multilateral environmental agreements (MEAs). The United States, going into the Ministerial, had opposed negotiations between WTO rules and MEAs. However, the EU left Doha having clearly made several concessions of its own. The revised Harbinson text requiring the phaseout of export subsidies (despite the added language not to prejudice the outcome of negotiations) reportedly was not to the EU’s liking. The EU also expressed a desire for the SPS agreement to be renegotiated in the next round and for more clarity on how nontrade concerns will play into future negotiations. Further, observers note that the final text also gives no basis for the EU to introduce the “precautionary principle” into the agricultural negotiations.

⁵⁰ Currently, export credit disciplines, both agricultural and nonagricultural, are being considered in discussions at the OECD.

⁵¹ John Sweeney, President of the AFL-CIO, in statement on WTO meeting in Doha, Nov. 14, 2001.

⁵² Franz Fischler, EU Agriculture Commissioner, in briefing to journalists, Doha, Nov. 14, 2001.

⁵³ The importance of nontrade concerns to the EU negotiating position is indicated by comments made by EU Agriculture Commissioner Franz Fischler. “Many countries share the [EU] view that agriculture is not an industry like any other. Producing milk is not the same as making ball bearings. Those who wish to reduce the WTO to a mere trade liberalization machine have not learned the lessons from Seattle. Those who criticize the EU for insisting that food safety or the environment be taken into account in the agriculture negotiations are not only ignoring the legitimate interests of our society, but have also failed to comprehend the Uruguay Round.” “Farming fairly in Europe. The EU has reformed its agricultural subsidies and will push forward with trade liberalization in Doha, says Franz Fischler,” *Financial Times*, Nov. 1, 2001.

⁵⁴ Franz Fischler, EU Agriculture Commissioner, in briefing to journalists, Doha, Nov. 14, 2001.

The outcome was welcomed by the Cairns Group, according to Australian Minister of Trade Mark Vaile, who stated “the Declaration’s strong language to phaseout export subsidies, achieve major reductions in domestic agricultural support levels and secure significant improvement in market access is a tremendous outcome for Australia. It will go a long way to ensuring agriculture and processed foods receive the long overdue attention they deserve in international trade negotiations.”⁵⁵ Going into Doha, the top priority of the group reportedly was to reach agreement to eliminate export subsidies, and the text addressing export subsidies was considered a key success. However, the text also calls for disciplines on all forms of export subsidies, which will include the subsidy element seen to exist in the operations of the STEs of some Cairns Group members.

For a period prior to the Ministerial, Japanese officials had stated serious reservations about agreeing to a text that was seen to threaten Japan’s farm sector. However, one official said that Japan considered the pre-Ministerial draft declaration a reasonable basis for negotiation but that its position on agriculture relates to the overall package that will emerge from Doha, particularly the language on antidumping. In the end, Japan did not insist on changing the agricultural text in Doha, reportedly leaving the EU isolated on several issues. Japanese Prime Minister Junichiro Koizumi noted that “Japan’s views have been reflected in the declaration for the most part, including on agriculture.”⁵⁶ The Japanese reportedly consider the requirement that negotiations take into account nontrade concerns as allowing them to protect their rice growers as a food security measure. Further, Japan achieved a key demand with the inclusion on the negotiation agenda of antidumping and countervailing duty laws.

Finally, the developing countries reportedly were generally pleased with the text on agriculture, particularly the inclusion of special and differential treatment for market access, domestic support, and export competition. Developing countries supported the commitment to phaseout all forms of export subsidy and the text relating to implementation of the existing WTO agreements, especially in the areas of textiles and apparel, agriculture, SPS measures, subsidies and countervailing measures, and antidumping. The decision on implementation-related issues means that negotiations on unresolved implementation issues will be an integral part of the work program being established and will be addressed on a priority basis by the relevant WTO bodies.⁵⁷ Some developing countries, led by India, reached agreement to postpone negotiations of the Singapore issues until the next Ministerial conference in 2003, but only if all countries agree to undertake such negotiations. Prior to Doha, Japan and the EU had asserted that these issues must be part of the negotiating mandate. Developing countries also obtained a separate declaration on the TRIPS Agreement and public health in which WTO members agreed that the TRIPS Agreement does not and should not prevent members from taking measures to protect public health.

⁵⁵ Mark Vaile, Australian Trade Minister, in comments to journalists, Doha, Qatar, Nov. 15, 2001.

⁵⁶ Junichiro Koizumi, Japanese Prime Minister, in comments to journalists, Doha, Qatar, Nov. 15, 2001.

⁵⁷ See paragraph 12 of final text.

Looking Ahead

The Agricultural Negotiations

With the Doha Ministerial completed, countries are now focusing on transforming the DDA into action. A Trade Negotiations Committee (TNC) has been set up to guide the overall conduct of the negotiations under the authority of the General Council. The TNC met in late January, 2002 at which the structure and protocol for the negotiations were decided. The meeting also set a time frame for the talks. Each WTO member has a seat on the TNC, with decisions made by consensus of all members. Agricultural negotiations will take place under the current structure involving special sessions of the WTO Agriculture Committee.

Although all parties have claimed success in the outcome of Doha, industry observers consider the real work is still ahead.⁵⁸ The DDA for agriculture says very little in terms of specific modalities, leaving considerable room for different interpretations as to what countries are actually committed to implement.

Negotiations on export subsidies likely will be highly contentious. Countries agreed to reduce subsidies “with a view to phasing out.” For the United States, Cairns Group, and developing countries, this is a mandate for the elimination of export subsidies. According to the Australian Minister of Trade “this is the beginning of the end of export subsidies,”⁵⁹ while Canada's Minister of Agriculture noted that “inclusion (in the final text of the phrase “without prejudging the outcome”) gives France no additional negotiating latitude on export subsidies.”⁶⁰ Meanwhile, the EU Agriculture Commissioner emphasized “The final text refers to the objective of ultimately “phasing out” all forms of export subsidies, but this is neutralized by a statement that this is ‘without prejudice to the final outcome of the negotiations.’”⁶¹ The Commissioner pointed out that “the objective of the ministerial was to set the agenda for coming negotiations, not what their outcome should be. We wanted this to be clear, black on white in the text, that there was no intention to pre-judge the outcome. After a long struggle, we obtained this.” Similarly, French President Jacques Chirac noted “As far as agriculture is concerned, the French authorities have made sure that the tenets of the CAP will not be endangered.” His statement continued “It is the reform of the CAP which will determine what our position will be in the future negotiations.” Thus, the EU sees no requirement in the text for the elimination of subsidies.⁶² Also, countries will have to agree on what exactly is meant by “all forms of export subsidy.” Does this mean disciplines will be introduced on export credits, food aid, and STEs; and over what time period will reductions or phaseout take place?

Similarly, the DDA calls for negotiations aimed at substantial improvements in market access although what is meant by “substantial” is yet to be determined. Several low-tariff

⁵⁸ “Real work for WTO to begin in 2002,” *Feedstuffs*, Nov 19, 2001.

⁵⁹ Mark Vaile, Australian Trade Minister in comments to journalists, Doha, Qatar, Nov. 15, 2001.

⁶⁰ Lyle Vanclief, Canadian Minister of Agriculture, in comments to journalists, Doha, Qatar, Nov. 15, 2001.

⁶¹ Franz Fischler, EU Agriculture Commissioner, in comments to journalists, Doha, Qatar, Nov. 15, 2001.

⁶² EU dairy and sugar policies are based on export subsidies. “CAP under pressure as new WTO trade round launched,” *Agra Europe Weekly*, Nov. 16, 2001.

countries, including the United States, reportedly will likely argue against employing a straight-line formula (as used in the URAA) and that other formulas, such as the Swiss formula (*see glossary*), should be explored. There has also been discussion of establishing a maximum tariff (for example, 25 percent ad valorem) for all products, and then making future reductions from that level. Other issues to be resolved include whether special agricultural safeguards should be retained, by how much TRQ levels should be increased and over what time frame, and how TRQs should be administered.

Agreement among WTO members on substantial reductions in trade-distorting domestic support will also be highly contentious and open to interpretation. For example, should existing support categories be maintained; and if so, by how much should amber box policies be cut, over what period; with what base period, and should a straight percentage reduction in the AMS be continued? Also, should the blue box be abolished or preserved, and should the list of allowable (green box) policies be adjusted so that only truly trade-neutral policies are included?

The DDA also requires that special and differential treatment for developing countries be an integral part of all elements of the negotiations, and that negotiated rules and disciplines should enable developing countries to accommodate their development needs. However, the issue of how far the concessions should go remains unanswered.

Finally, the DDA calls for nontrade concerns, including those reflected in the negotiating proposals already submitted by members, to be taken into account in the negotiations. Again, this language is open to differing interpretations. Some observers see this language as providing the EU and Japan with an avenue to avoid agreeing to the substantial reforms in market access, domestic support, and export subsidies that others see called for in the DDA.⁶³ The DDA also requires that negotiations recognize the work already undertaken, initiated early in 2000 under Article 20, including the large number of negotiating proposals submitted by WTO members. The EU submitted several proposals involving nontrade concerns, including animal welfare; food safety; environmental issues; and the precautionary principle, including geographical indications in the agricultural negotiations,⁶⁴ which the EU will likely want to bring into the negotiating agenda. Similarly, issues of food security will likely be brought up by Japan in an effort to protect domestic rice growers. It is unclear exactly how taking into consideration nontrade concerns will impact the negotiation in the coming months, although the issue clearly has the potential to generate intense arguments in the months ahead.⁶⁵

Impact of Domestic Policy Reform

Debate on domestic farm and trade policy in the United States and EU will likely influence how WTO agricultural negotiations proceed in the coming years. Given a deadline of March 2003 for proposed modalities for a new agricultural agreement, progress in negotiations will have to occur in the WTO Agriculture Committee this year at the same time a new farm bill is being formulated in the United States and a major review of the CAP is being conducted

⁶³ "Doha. A qualified success," *Agra Europe Weekly*, Nov. 16, 2001.

⁶⁴ The DDA includes agreement to negotiate protections for geographical indications on wine and spirits by the end of 2003 under the WTO TRIPS Agreement.

⁶⁵ "CAP under pressure as new WTO trade round launched," *Agra Europe Weekly*, Nov. 16, 2001.

in the EU. Trade negotiators on both sides reportedly have committed to further trade liberalization through increases in market access and reductions in domestic support and export subsidies, which will influence reforms of domestic policy, particularly policies that provide price and income support. At the same time, new domestic farm policies will likely affect how far negotiators may be willing to go in making concessions to liberalize trade under a new WTO agriculture agreement.

The United States

The 1996 “Freedom to Farm” Act, the current U.S. farm bill, expires in September 2002. The House version of a new farm bill (Farm Security Act of 2001), passed by the U.S. House of Representatives in October 2001, proposes an increase in spending of \$73 billion on farm subsidies over the next 10 years.⁶⁶ The U.S. Senate approved comparable legislation (Agriculture, Conservation, and Rural Enhancement Act of 2002) in mid-February 2002.⁶⁷ Currently, the House and Senate versions of the farm bill are being reconciled in conference; both the House and Senate will need to approve a final conference report agreement before the final bill is sent to the President for signature. U.S. industry representatives have expressed concern about the overall message the legislation sends to trading partners with respect to the U.S. commitment to free and open trade in agriculture under the WTO.⁶⁸ The uncertainty regarding the administration’s success in securing Trade Promotion Authority (TPA) could also be seen as providing mixed signals about the U.S. commitment to a new WTO trade round (box 2).

The significant commitment of funding in the House and Senate versions of the farm bill reportedly has raised concerns among trade partners about the U.S. ability to keep within its WTO commitments on domestic support, even though both the House and Senate legislation contain provisions for the U.S. secretary of agriculture to reduce payments to avoid WTO violations. Under the URAA, the United States committed to keeping its expenditure on trade-distorting domestic supports to less than \$19.1 billion annually, and this limit likely will be progressively lowered under a new WTO agricultural agreement. Although the United States is still reviewing whether its commitments to the ceiling set in the WTO were met in 1999 and 2000,⁶⁹ a University of Missouri analysis of the Senate

⁶⁶ The House farm bill (H.R. 2646) which passed by a significant margin (291-120), sharply increases U.S. government payments to traditional farm groups. The bill keeps crop support at current levels, offers a larger guaranteed annual subsidy to farmers, and employs a target-price scheme.

⁶⁷ The Senate version raises support prices for grains and cotton; increases spending on land and water conservation; and provides supplemental subsidies to grain, cotton, and soybean growers when returns from sales and subsidies are below targets set by law.

⁶⁸ U.S. agriculture representatives have noted that while the United States relinquishes the high ground in trade liberalization talks with the current farm bill proposals, WTO disciplines should be enough to guide the 2002 farm bill debate. Industry officials point to the example of sugar as a case where WTO disciplines have been followed despite strong domestic opposition, noting that the United States probably would not be accepting any imports of sugar were it not for the minimum access commitments the United States made during the Uruguay Round.

⁶⁹ The United States met its commitments in its notification to the WTO for marketing years 1995 to 1998. Information for 1999 and 2000 is still being reviewed by the U.S. Government and has not yet been notified to the WTO. In the last 2 years, direct payments to producers in the form of larger loan-deficiency payments, marketing loan gains, and payments related to emergency programs for various commodities have increased significantly, due to low market prices. USDA

(continued...)

Box 2
Trade Promotion Authority

Trade Promotion Authority (TPA) legislation—previously referred to as “fast track” authority—was passed by the U.S. House of Representatives. A Senate bill approved by the Senate Finance Committee is not yet scheduled for action by the full U.S. Senate, although reported likely to be considered in April. If a Senate bill is passed, House /Senate conferees would need to work out differences for approval by the House and Senate if a final bill is to be passed in the current session of the U.S. Congress (scheduled to end on October 4, 2002). TPA grants Congress the authority to approve or reject a negotiated trade agreement within strict time limits and without amendments. This authority expired in 1994 and has not been renewed since then, mainly due to disagreements between the administration and the Congress over the handling of labor and environment issues.

Several provisions of the House-approved TPA legislation have been flagged by industry observers as possible impediments to trade liberalization. On import-sensitive agriculture products, the TPA bill requires that U.S. negotiators identify products targeted for market access talks and consult with the relevant congressional committees on how increased access for imports would affect U.S. industry. This concept of congressional prenotification is expanded in the Senate Finance Committee bill, which would require negotiators to consider whether a country potentially benefitting from increased market access maintains “export subsidies or other programs, policies, or practices that distort world trade in such products.”

According to the legislation, U.S. negotiators are to ensure that tariff cuts for import-sensitive products are provided with “reasonable” adjustment periods and that the negotiation is done “in close consultation with Congress on such products before initiating tariff reduction negotiations.” The list of potentially affected agriculture products covers hundreds of items that were considered import sensitive in the Uruguay Round negotiations. The bill also directs negotiators to maintain “bona fide food assistance programs and U.S. market development and export credit programs.”

Some trade partners have indicated that language in the bill regarding “import-sensitive” products will hamper negotiations on key agricultural products in international trade. Despite assurance from U.S. trade officials that the United States will have the authority to negotiate “fully and completely,” trade partners reportedly view this language as effectively excluding sensitive agricultural products from trade negotiations.

Source: USDA, FAS, “Trade Promotion Authority and Agriculture,” found at <http://www.fas.usda.gov/info/factsheets/TPA>, retrieved Jan 16, 2002.

⁶⁹ (...continued)

has noted that in light of the increase in noncommodity specific payments since 1998, the payment levels for 1999 and 2000 could potentially exceed the de minimis ceiling set in the WTO of 5 percent of the value of domestic production. As a result, the full value of the expenditures would have to be included in the U.S. calculation of AMS and would push the United States well above its WTO commitments. “Food and Agricultural Policy: Taking Stock for the New Century,” USDA, Sept. 2001, p. 57.

version of the farm bill predicted a 30-percent chance of breaking the WTO spending limit in 2002, and a higher probability in future years due to its countercyclical features that increase farm payments in times of low commodity prices.⁷⁰ The Economic Research Service of the USDA found that the continuation of current farm programs would keep U.S. support below its URAA-established ceiling, however, increases in support under new programs could push the United States above its commitments.⁷¹

Several WTO members have noted that the additional spending provided for in the House-passed farm bill undermines U.S. credibility as committed to trade liberalization in agriculture. For example, EU Agriculture Commissioner Fischler noted that the House bill is in stark contrast to what the United States is currently proposing in the WTO and questioned the current validity of the U.S. comprehensive negotiating proposal tabled in June 2000, which had the unanimous backing of the U.S. farm community and the U.S. Congress.⁷² Australian Agriculture Minister Truss added to the criticism by stating “It is obvious that the United States, which once proudly boasted it had the most efficient farmers in the world, has now degenerated to a situation where U.S. farmers are dependent upon the taxpayers for around half of their income.” Canadian Agriculture Minister Vanclief also observed that the United States would be hard pressed to defend internationally the level of farm subsidies included in the House legislation.⁷³ U.S. Agriculture Secretary Veneman states that much of the additional funds being proposed for U.S. agriculture could be spent in nontrade distorting ways and that the United States is fully committed to its obligations in the WTO made during the Uruguay Round.⁷⁴

The European Union

Reforms of the EU’s CAP under the Agenda 2000 (*see glossary*) are being implemented over the period 2000-06.⁷⁵ The Agenda 2000 called for the EU Commission to report on the implementation of the reform package and to provide proposals for adjustments if necessary in a “Midterm Review” (MTR) slated for June 2002. More specifically, the MTR reportedly will consist of a package of proposed reforms which will be presented by EU Agriculture Commissioner Fischler to the Council of Agriculture Ministers. The MTR proposals are likely to center around rural development and agroenvironmental issues, as well as several sector-specific support reforms (such as beef and rye). Some EU-member governments view the MTR as an opportunity to make profound changes to the CAP, including deep cuts in support for European agriculture sectors which would allow trade negotiators significant leverage in demanding corresponding disciplines in other areas of the WTO agriculture talks. The reactions of agriculture Ministers to the June review package should offer some insights into the EU stance in WTO agriculture negotiations as they go forward.

⁷⁰ “Analysis of the Agriculture, Conservation and Rural Enhancement Act of 2001, S. 1731,” Food and Policy Research Institute, University of Missouri, Nov. 2001.

⁷¹ “Aligning U.S. Farm Policy with World Trade Commitments,” Economic Research Service, *Agricultural Outlook*, Jan.-Feb. 2002.

⁷² “EU critical of U.S. farm bill,” *WTO Watch*, Oct. 12, 2001.

⁷³ “Other countries confused over Washington’s farm, trade bills,” *Feedstuffs*, Dec. 24, 2001.

⁷⁴ Ann Veneman, U.S. Secretary of Agriculture, on link between U.S. farm bill and WTO talks, Doha, Nov. 10, 2001, *WTO Watch*, Dec. 7, 2001.

⁷⁵ The CAP under Agenda 2000 costs \$35 billion annually, or about one-half of the EU’s total budget. “Seeds of Change,” *Financial Times*, Jan. 30, 2002.

Observers expect the concept of “compulsory modulation” to be featured in the proposals.⁷⁶ This involves transferring a portion of direct aid payments to fund rural development measures, which would be co-financed by national governments.⁷⁷ Since 90 percent of CAP funds currently go to traditional farm support measures and 10 percent to the rural sector, modulation is a way to increase the funds available for rural development. It also has implications in the WTO context, according to informal sources, because the money that is diverted for use in the rural sector would be applied to green box policies and, therefore, not be counted toward the AMS calculation. The introduction of decoupled, lump-sum payments to small farmers and stricter environmental preconditions for receiving farm aid are two other less trade distorting reforms that are likely to be included in the reform package.

Currently, the buildup of government stocks of certain commodities reportedly is threatening to push the EU above its WTO cap on domestic support. EU agriculture commissioner Fischler has identified the sectors most in need of reform in this area to be beef, rye, and durum wheat; beef stockpiles have occurred owing to the bovine spongiform encephelopathy (BSE) crisis;⁷⁸ and European rye has typically been less competitive than other grains. Wheat has been singled out as a commodity that currently benefits from a very generous subsidy program and, therefore, is a prime candidate for trimming.⁷⁹

The EU position in the new WTO agricultural talks may also be influenced by the negotiations on EU enlargement, scheduled to be completed by the end of 2002. Successful negotiations reportedly would lead to the addition of 10 more countries to EU membership. If a decision is made to support the agriculture sectors of Eastern European countries to the same extent current EU members are supported, the enlargement would put considerable pressure on CAP funds, as well as on EU WTO support limits. Some observers believe that Agriculture Commissioner Fischler will try to persuade the Council of Agriculture Ministers that a fundamental shift of resources in the CAP is the only way to deal with that pressure.⁸⁰

⁷⁶ “Fischler outlines vision for new EU rural policy,” *Agra Europe Weekly*, May 11, 2001.

⁷⁷ The concept was proposed during the Agenda 2000 reforms but ended up being approved as an optional measure. Since then, only France, the United Kingdom, and Portugal have actually chosen to put this into practice.

⁷⁸ Bovine Spongiform Encephelopathy (more commonly known as BSE or “mad-cow disease”) emerged in the United Kingdom in the late 1980s. BSE results in progressive degeneration of the nervous system and belongs to a family of diseases known as Creutzfeldt-Jakob Disease (CJD) and Gerstmann-Sträussler-Scheinker syndrome (GSS) in humans. The primary route of transmission among cattle has been identified as consumption of infected brain and nervous system tissue from one animal by another animal, typically in the form of meat and bone meal used as a protein source in ruminant feeds. In the 1990s, BSE was associated with New Variant CJD in humans. It is believed that BSE is transmitted from cows to humans through consumption of infected brain and nervous system tissue. This discovery, and the subsequent discovery that the disease had spread to other European countries, had a significant negative effect on both domestic and export demand for EU beef. Consequently, the EU has purchased significant quantities of beef and meat and bone meal to sustain internal prices. Much of this product has been deemed unsafe for human or animal consumption and is targeted for destruction. A substantial portion, however, is considered safe and is being stored and considered for later sale.

⁷⁹ “Fischler sets out stall for focused ‘mid-term review’” *Agra Europe Weekly*, Nov. 23, 2001.

⁸⁰ “2002: a year of quiet drama for the CAP?” *Agra Europe Weekly*, Jan. 11, 2002. U.S. agriculture industry representatives have noted that progress in the WTO agriculture negotiations depends mainly on the EU enlargement schedule, which necessitates an ambitious CAP reform. One U.S. industry representative stated that if the process proceeds rapidly, a 2005 date for completion of a comprehensive agreement in the WTO is realistic.

Fischler has recently indicated that successful enlargement will require that more resources be channeled into increased rural development programs and infrastructure aid for Eastern European countries instead of immediate direct-aid payments.⁸¹

Also potentially affecting the WTO agricultural negotiations are national elections to be held this year in France and Germany. Observers suggest that not only it is possible that national attitudes toward trade in agriculture may change in those countries, but the elections could also lead to a change in composition of the Council of Agriculture Ministers who will review the MTR package. The influence of the German “green alliance” reportedly has been strengthening over the last year and has exerted pressure to reform the CAP.⁸² The United Kingdom, the Netherlands, and Sweden have also called for more market-oriented reforms of the CAP. Resistance to a complete CAP overhaul reportedly has come mainly from France.

Recent statements attributed to Agriculture Commissioner Fischler indicate that the midterm review of the CAP will be limited.⁸³ According to industry sources, if resistance to CAP reforms by the majority of member governments eased, however, the EU position on export subsidies and domestic support could soften significantly in WTO talks. Until EU officials know what is politically feasible domestically with regards to CAP reform, they will not know how far they can go in making concessions on agriculture in the WTO.⁸⁴

Conclusion

The Doha Ministerial was a significant achievement. In the wake of September 11 and concern that a second failure to launch a new round would inflict a fatal wound to the WTO as an institution, member countries found a common purpose. The intransigence displayed at the Seattle Ministerial was averted and a new round of WTO trade negotiations was launched. Yet most agree the real work is still ahead. With few exceptions, the fundamental negotiating positions of the major participants have changed little from where they were prior to the Seattle Ministerial. Thus, the issues are sufficiently complex and differences sufficiently deep that the deadline of January 1, 2005, to complete the Round could be quite ambitious.

⁸¹ “Explaining Enlargement-A progress report on the communication strategy for enlargement,” EU Enlargement Directorate, Brussels, Mar. 2002, found at http://europa.eu.int/comm/enlargement/communication/pdf/explaining_enlargement.pdf, retrieved Jan. 20, 2002.

⁸² “2002: a year of quiet drama for the CAP?” *Agra Europe Weekly*, Jan. 11, 2002; and “Main German party embraces ‘green’ vision for CAP,” *Agra Europe Weekly*, Oct. 19, 2001.

⁸³ “Domestic ag issues likely will dominate for exporters in 2002,” *Feedstuffs*, Dec. 31, 2001.

⁸⁴ *Ibid.*

Glossary

Agenda 2000. A set of proposals put forth in July 1997 by the European Commission for the reform of existing EU policies, in particular the Common Agriculture Policy (CAP), the process of enlargement, and the financial framework for the period 2000-06. The proposals were adopted at the Berlin Summit in March 1999 and put into force new regulations concerning the arable crops, beef, milk, and wine sectors; the new rural development framework; the horizontal rules for direct support schemes; and the financing of the CAP.

Aggregate Measure of Support (AMS). A measure of the value of support for agriculture, aggregated across all commodities, that includes government payments and producer transfers from consumers. The measure was established under the Uruguay Round Agreement on Agriculture (URAA) and is the maximum countries can spend on amber box, trade-distorting support.

Amber box policies. In WTO terminology, domestic support policies considered to be trade distorting and subject to careful review and reductions over time under the URAA (e.g., commodity-specific market price supports, nonexempt direct payments to farmers, input subsidies, storage payments, interest subsidies, insurance price subsidies). Such policies are “actionable,” meaning other members may raise sanctions against them if they can prove they have sustained injury as a result.

Article 20. Text of the URAA required that a new round of talks should be initiated by the final year of the implementation period (January 1, 2000).

Blue box policies. In WTO terminology, domestic support policies that include direct payments under production-limiting programs and that are not subject to reduction commitments. A blue box designation, which typically benefits the United States and EU, indicates policies are excluded from the AMS reduction commitment during 1995-2000, but not from the 1986-88 base year AMS calculation. To be blue box policies, payments must be made on fixed area and yields on 85 percent or less of the base level of production, or on a fixed number of head (of livestock).

Bound tariffs. The maximum tariff that can be imposed on a product as established in the WTO commitment schedule of a country.

Cairns Group. Eighteen medium-sized agricultural-exporting countries with the shared goal of liberalizing global commodity markets. Members include Australia, Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Fiji, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, the Philippines, South Africa, Thailand, and Uruguay.

Caricom. Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

Common Agricultural Policy (CAP). The agriculture policy of the European Union. Established under Article 33 of the EC Treaty (formerly Article 39), its aims are to ensure reasonable prices for European consumers and fair incomes for farmers through common agricultural market organizations and by applying the principles of single prices, financial solidarity, and Community preference.

Compulsory modulation. The transfer of a portion of direct aid payments to fund rural development measures. The concept of modulation is currently being used by some EU member states under the

Common Agriculture Policy (CAP) but it is not mandatory. Since most CAP funds go to traditional farm support measures, modulation is a way to increase the funds available for rural development. The concept of making the transfer mandatory is likely to be part of the midterm review of the EU Agenda 2000.

Countervailing duties. A duty on imports applied when the government of an exporting country has been found to provide countervailable support to its domestic producers that materially injures producers in an importing country. The duty on the imported product can be up to the amount of the domestic subsidy.

Decoupled income support. Government support to farmers that is not linked to production.

Doha Development Agenda (DDA). The agenda for a new round of WTO trade negotiations launched in November 2001 as contained in the Doha Ministerial Declaration.

Domestic (internal) supports. Domestic support, determined by the Aggregate Measure of Support (AMS) that provides an estimation of expenditure on trade distorting programs, was reduced over a period of 6 years by 20 percent compared to the 1986-88 base period. Reductions are being made on support across all commodities, as opposed to a commodity-by-commodity basis as in the case of market access and export subsidy provisions. Policies considered non-trade-distorting and some forms of direct payments for production-limiting programs were excluded from the AMS calculation.

Export credits and guarantees. Credit with generous repayment schedules extended to a foreign buyer for the purchase of agricultural products. Guarantees are provided by the exporter, its bank, or by a government-funded export credit program.

Export restrictions. Restrictions on how much of a product can be exported from a country for the purpose of protecting a domestic industry or for national security. Restricting the export of a primary commodity assists the domestic processing industry for that commodity. Advanced technologies are also targets for export restrictions to prohibit rogue states from using the technology for the creation of weapons of mass destruction. Food embargoes due to sanctions are also another type of export restriction.

Export subsidies. Subsidies provided to encourage exports. In the WTO, over a 6-year implementation period (1995-2000), budget outlays for export subsidies are being reduced by 36 percent, and volume by 21 percent, compared with a 1986-90 base period average level. Products not receiving subsidy in the base period were made not eligible for future export subsidies.

Export taxes. Taxes on products exported, mostly as a means of raising government revenue or to discourage exports, assisting domestic users of the exported product.

Food safety. A concept used in negotiations to justify quarantine and inspection measures for agricultural products. The concept of food safety can involve mandatory labeling of products and the traceability of their ingredients and manufacturing processes.

Food security. A concept used in negotiations to describe a government's ability to ensure a stable food supply for its citizens. The concept, of particular importance to developing nations and other net food-importing countries, includes the assistance to countries with populations suffering from starvation and malnutrition.

Geographical indications. Nomenclature used in the description of foods and beverages that indicates the region in which they are made, such as Indian “Basmati” rice, Greek “Kalamata” olives, Italian “Parmigiano” cheese, and French “Champagne.” Protection extended to such products would prohibit the use of the descriptive term for similar products produced outside of the particular region.

Green box policies. In WTO terminology, domestic support policies considered non-trade-distorting and not subject to limitations (e.g., conservation programs, research and extension, marketing and promotion programs, inspection and grading policies, domestic food aid, disaster relief, revenue insurance programs, and direct payments not linked to production). Such policies are not “actionable,” meaning other members may not raise sanctions against them.

Implementation-related issues and concerns. Concerns that have been raised by developing countries about difficulties, due to a lack of financial, human, and institutional resources, in implementing present WTO agreements. Small countries maintain that they need increased technical assistance from other WTO members to participate fully in the negotiations. Developing countries also indicate that certain measures set in place during the Uruguay Round do not adequately reflect their interests and concerns, nor have they delivered the expected economic benefits and therefore need to be readdressed.

In-quota tariff. The tariff applied to imports up to the tariff-rate-quota quantity.

Mercosur. A customs union between Argentina, Brazil, Paraguay, and Uruguay, signed in December 1994, with Chile and Bolivia currently as associate members.

Midterm review. A package of adjustment proposals to the European Common Agriculture Policy Agenda 2000 (covering years 2000-06). The proposals for this review will be submitted to member states for discussion in June 2002 and are likely to deal with rural development, agroenvironmental issues, and sector-specific support reform.

Minimum access. Where imports into a country were already taking place, this level of access was preserved within the tariff quota. However, if import access was less than 3-percent of the market for each product (based on 1986-90 consumption), countries were required immediately to provide access of 3 percent. Minimum access is to be increased to 5 percent within 6 years.

Modalities. The formulas and procedures used to calculate various indicators and commitments for trade liberalization in agriculture. For example, the modalities for export subsidies in the URAA were: budget outlays must be reduced by 36 percent, and volume by 21 percent (compared with a 1986-90 base-period average level), during the period 1995-2000.

Multifunctionality. This is a term applied to the goods and services provided by primary agriculture which are difficult to quantify in monetary terms. Multifunctionality treats agriculture as an economic activity that not only produces food and fiber but also creates both tangible and intangible values important in different countries (e.g., see “nontrade concerns”). This is used as a justification for some forms of policy intervention in agriculture.

Multilateral environmental agreements (MEAs). Currently there are close to 200 international agreements that deal with environmental issues. Several MEAs include provisions that influence international trade, such as trade bans on certain products, or allowing countries to restrict trade in certain circumstances. Examples include the Montreal Protocol for the protection of the ozone layer, the Basel Convention on the trade or transportation of hazardous waste across international borders, and the Convention on International Trade in Endangered Species (CITES).

Nontariff barriers. Policies and regulations, excluding tariffs, that restrict trade. Examples include standards, labeling and licensing requirements, tariff-rate-quota administration, and embargoes.

Nontrade concerns. Issues related to agriculture's "multifunctionality" brought up in the negotiations that are tangentially related to international trade in goods and services, traditionally including food security, food safety, environmental concerns, resource conservation, and rural development. Some newer nontrade concerns proposed by WTO members are animal welfare, biotechnology, species preservation, safeguarding the landscape, poverty reduction, and preservation of rural culture.

Over-quota tariff. The tariff applied to imports beyond the tariff-rate-quota quantity.

Peace clause (or Due Restraint Article 13). Text of the URAA which states that nontrade-distorting policies, provided they do not directly contravene the provisions of the URAA, are not subject to General Agreement on Tariffs and Trade (GATT) challenges for up to 3 years beyond the 6-year duration of the URAA. This restricts the use of countervailing duties to counteract domestic support measures deemed to conform to the Agreement on Agriculture for the period that the peace clause is in effect. The clause is due to expire on January 1, 2003 and if it is not extended, some currently existing domestic support measures and export subsidies could be deemed countervailable.

Precautionary principle. A principle advocated mainly by the EU, which says that when risks are uncertain or science is incomplete, countries should exercise caution in accepting products developed by new technologies. Some countries have expressed concern that this position could provide the EU with justification to restrict imports of genetically modified organisms (GMOs).

Red box policies. In WTO terminology, a theoretical category for domestic support policies that are prohibited. Due to lack of agreement by WTO members during negotiations, no domestic supports fall into this category.

Rural development. A nontrade concern which involves the concept that a sustainable agriculture sector is dependent on economically viable rural communities. Rural development is enhanced by investing in infrastructure, promoting economic development, and providing technical assistance. It will also help to prevent the rural poor of some countries from migrating into already over-congested cities.

Sectoral initiatives. Approaches for increased trade liberalization in which specific sectors are targeted for greater multilateral access. Such initiatives can include the elimination of tariffs, export subsidies, export taxes, or trade-distorting domestic support for a specific range of products. Zero-for-zero is one such sectoral initiative.

Singapore issues. Investment, competition, trade facilitation, and transparency in government procurement.

Single-desk traders. A public or private entity that has sole authority to export or import a product.

Special and differential treatment (special concessions) for developing countries. Provisions which require developing countries to be subject to only two-thirds of the cuts in tariffs, domestic support, and export subsidies that developed countries are committed to over a 10-year period. Least developed countries are exempt from all reduction commitments, although they must bind tariffs and domestic supports.

Special safeguards. Provisions that enable countries to temporarily apply extra duties for products specified in their schedules of concessions if import prices should fall below a certain level or if the quantity of imports rises too quickly in relation to an average over the previous 3 years.

State trading enterprises. A body given rights by a government to influence the level of trade of the country in a particular sector.

Straight-line formula. A formula involving equal annual reductions in tariffs over the implementation period. This method was used in the URAA. Assuming a bound tariff of 50 percent and a final tariff of 25 percent and a 5-year implementation period, applying the straight-line formula would result in annual tariff reductions of 5 percent.

Swiss formula. A formula used for industrial tariff reduction in the Tokyo Round that reduced higher tariffs proportionally more than lower tariffs. Under the formula, the final tariff = (base tariff * technical factor) / (base tariff + technical factor). Assuming a technical factor (which is also the tariff ceiling) of 15, a base tariff of 10 percent would be reduced to 6 percent, whereas a base tariff of 60 percent would be reduced to 12 percent.

Tariffs. Border charges applied to imports. Tariffs can be either specific (dollar/unit), ad valorem (percent) or some combination of the two. In order to compare tariffs across commodities and countries, specific tariffs can be converted to their "ad valorem equivalents" by dividing the specific tariff by the unit value of the imported product. Bound tariffs specify the maximum tariff a country can impose on imports, but the tariff actually applied is often lower than the bound tariff.

Tariff escalation. The application of low tariffs on raw agricultural products and high tariffs on processed foods made from the raw products.

Tariff peaks. Tariffs that are substantially higher than average tariffs for other products (typically those above 25 percent).

Tariff-rate quota (TRQ). A two-tiered tariff structure in which a low (in-quota) tariff is applied to imports up to a quota level. Once the quota level is reached, additional imports are assessed a higher (over-quota) tariff.

Tariff-rate quota administration. The method by which quotas are allocated to importers. Methods include licensing; first-come, first-served; and auctioning.

Tariffication. The process by which nontariff barriers (such as quotas, embargoes, and licensing) are converted to tariffs. These tariffs, as well as preexisting tariffs, are being reduced over 6 years by a minimum of 15 percent and on average 36 percent (simple, unweighted average).

Trade preferences for developing countries. Preferential access for developing countries' exports, currently extended on a unilateral basis by many developed nations. Many developing countries depend on trade preferences because they are unable to become competitive in the world market. However, as tariff levels decrease across the board, the benefits of trade preferences will decrease.

Trade Promotion Authority (TPA). Legislation that must be passed by the U.S. Congress in order for the executive branch of government to negotiate international trade agreements with trade partners which are then ratified by the U.S. Congress with an up-or-down vote, within strict time limits and without amendments.

Transition economies. Albania, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kyrgyz Republic, Latvia, Lithuania, Mongolia, Slovak Republic, and Slovenia.

Uruguay Round Agreement on Agriculture (URAA). One portion of the legal text, dealing with trade in agriculture, which was the outcome of multilateral trade negotiations under the GATT launched in 1986 and concluded in April 1994.

WTO Agreement on Sanitary/Phytosanitary (SPS). An agreement which entered into force after the Uruguay Round in 1995 with the establishment of the World Trade Organization to limit technical barriers to trade for human health protection or animal- and plant-disease control. According to the agreement, countries are permitted to set their own food safety and animal- and plant-health standards, but they must be based on science.

WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). An agreement which entered into force after the Uruguay Round in 1995 with the establishment of the World Trade Organization to give adequate, harmonized protection and enforcement for intellectual property rights.

Zero-for-zero initiatives. These specific sectoral initiatives are agreements to liberalize trade in a specific range of products by eliminating all border measures, export subsidies, and trade-distorting domestic support for those particular products. ■

Aluminum Metal Matrix Composites Gaining Greater Market Acceptance

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Despite extensive research, product development, and rapid consumption growth during the past 10 years, the volume of metal matrix composites (MMCs) used in nonmilitary commercial applications² still remains modest. Such critical industries as automotive and aerospace have long been interested in the commercial applications of MMCs because they combine desirable physical properties of both metals and ceramic materials, and typically have greater stiffness, better wear resistance, lower density, and other advantages, compared to metal components. Progress in reducing the cost of MMC components would greatly accelerate their use, particularly in cost-sensitive industries such as transportation, where the relatively high cost of parts made from these materials has impeded widespread application of MMCs. This article describes attempts to improve the prospects for MMC commercialization over the last 10 years, examines the main current aluminum MMC markets and product applications, barriers to their further commercialization, private-industry and public-private initiatives to reduce some barriers to MMC use, and their likely future use.

MMCs are engineered materials composed of two separate phases. The primary phase is the matrix material, typically a metal alloy that establishes the general physical and mechanical properties of the MMC, and a secondary dispersed phase within the matrix, selected to alter and reinforce the matrix alloy properties.³ The properties of composite materials can usually be altered to achieve a particular balance of properties, depending on the specific application. The most commonly used MMCs are aluminum based because of the metal's light weight. In addition to their lightness, aluminum MMCs are finding greater acceptance because of—

- High strength-to-density and stiffness-to-density ratios;⁴

¹ The views expressed in this article are the author's, and are not the views of the U.S. International Trade Commission (USITC) as a whole or of any individual Commissioner.

² For more information on early application attempts, see David Lundy, "Metal Matrix Composites May Be Key to More Efficient Automobiles," *Industry Trade and Technology Review*, May 1993, pp. 1-4; and David Lundy, "U.S. Bicycle Industry Creates Innovative Products using Metal Matrix Composites," *Industry Trade and Technology Review*, May 1994, pp. 9-15.

³ D.R. Herling, G.J. Grant, and M.T. Smith, "Mechanical and Physical Property Evaluation of a 359/SiC/20p MMC Prepared by a Novel Rapid Mixing Technique," Pacific Northwest National Laboratory, 2001.

⁴ Stiffness refers to the amount of deflection of a material when a load is applied. The less a material deflects, the greater the stiffness and resistance to physical deformation. An MMC automobile driveshaft demonstrates the stiffness-to-density concept. To perform efficiently, a driveshaft must not twist excessively in response to loads from the automobile engine.

(continued...)

Aluminum MMCs

- High thermal and electrical conductivity;
- Low-coefficient of thermal expansion, which can be controlled to match adjoining components better by varying the volume of reinforcement;
- High mechanical stability, including high resistance to deformation under load (creep resistance) which can be controlled by varying the size of the reinforcement particles; and
- High fatigue and wear resistance.

Composites using other metals as a matrix material are also beginning to gain greater market acceptance. Titanium and magnesium (box 1) are the most promising, but copper, beryllium, and silver are also used because they have excellent electrical and thermal properties.

Typically, the dispersed phase in MMCs today tend to be of fine ceramic or intermetallic particles homogeneously distributed throughout the matrix alloy. These particles typically range from 10 to 70 percent by volume of the composite, whereas the size and distribution of the reinforcing particles can be altered to change the properties of the composite.⁵ The most widely used MMC casting alloy is composed of aluminum and silicon carbide particles. Most high-performance, high-value MMC applications, such as those for military uses, tend to require MMC reinforcement with continuous fibers. All other MMCs are reinforced with discontinuous, or chopped fibers.⁶ Discontinuous fiber MMCs are lower in cost than continuous fiber MMCs, but they are also inferior in terms of strength and processing requirements. However, discontinuous-fiber reinforced MMCs are adequate for most applications that require specific strength and stiffness characteristics and which experience material costs are a critical factor.

According to a recent study, worldwide 1999 sales of all MMCs reached \$103 million (2,495 metric tons), concentrated in transportation and aerospace applications, with projected average annual growth over the next 5 years of 14 percent to \$173 million in 2004.⁷ Growth of 17 percent annually is expected in the transportation sector alone during the next 5 years, due, in large part, to increased use of MMC components in lightweight, fuel-efficient vehicles.

⁴ (...continued)

Substituting an aluminum MMC in place of steel yields a driveshaft that is less dense compared to the density of steel driveshafts (the most common type), but within stiffness requirements for automobile applications. Density is the weight of a given volume of material, usually expressed in English units as pounds per cubic foot.

⁵ These particles alter the mechanical and physical properties of the matrix alloy by affecting material stiffness, strength, toughness, wear resistance, thermal conductivity, heat capacity, etc.

⁶ The cost of discontinuous fibers is significantly less than the use of continuous fibers, which must be carefully handled and oriented within the matrix during the layup and the MMC fabrication process.

⁷ Aluminum Metal Matrix Composites Consortium (ALMMC), "Aluminum Metal Matrix Composites Technology Roadmap," Jan. 2002, p. 7.

Box 1

Titanium and magnesium metal matrix composites (MMCs)

Titanium MMCs

Most titanium matrix composites today tend to be continuously reinforced with silicon carbide fibers and are increasingly viewed as a structural material option in advanced aerospace applications, particularly for use in high-performance gas-turbine engines. These composites possess high specific strength and stiffness at both room and elevated temperatures, enabling advanced compressor design with reduced component weight, thereby increasing significantly the performance-to-weight capability of the aircraft. However, the high melting temperature and work-hardening characteristics make some titanium alloys difficult to process as a composite, thereby limiting its application. In addition, because titanium is a highly reactive element it is somewhat difficult to handle and process at higher temperatures. Titanium MMCs have been used since 1998 in automotive valves in certain Toyota engines and are presently being considered for use in high-temperature applications in the National Aerospace Plane (NASP).¹

Magnesium MMCs

Die-cast magnesium alloys are attractive substitutes for steel and cast iron because of their light weight, particularly for use in automotive housings and frames of complex shapes, often permitting a weight savings of as much as 30 percent compared to an aluminum-based component. Despite these advantages, magnesium is still not widely used in high-volume applications because of insufficient strength and low wear and creep resistance. Magnesium MMCs are magnesium alloys selectively reinforced by silicon carbide particles, giving these materials high strengths at ambient temperatures and sufficient strengths at elevated temperatures to overcome the deficiencies of die-cast magnesium alloys. Magnesium MMCs can be produced using both powder metallurgy and casting methods.

¹ The NASP program, initiated by NASA and the Defense Department, proposes to design and develop an aircraft that is able to take off and land like a conventional aircraft and would be capable of accelerating directly into orbit.

Source: J. Kumpfert, "Titanium Matrix Composites," found at http://www.kp.dlr.de/WB-WF/e_mmc.htm, retrieved Jan. 10, 2002. Composite Materials Handbook: Volume 4: Metal Matrix Composites, *U.S. Department of Defense Handbook, 1999, p. 35*. K.U. Kainer and Barry L. Mordike, "High-Temperature and Thermal Stability of Particle Reinforced Magnesium-Matrix-Composites," found at http://www.iw.uni-hannover.de/sfb/sfb390/englischc2_e.html, retrieved Jan. 10, 2002.

Current Uses for Aluminum MMCs

The principal end-use markets for aluminum MMCs in terms of actual volumes sold and future potential are the automotive and aerospace markets.

Automotive Applications

Although MMCs have been used in the commercial production of automobiles for nearly 20 years, interest in these materials has accelerated in recent years because of their weight-savings characteristics. In 1999, the world market for MMCs in ground transport applications (automotive and railway) totaled nearly 1,600 metric tons, valued at over \$7 million, and accounted for nearly 62 percent of the total MMC world market by volume.⁸ In the near term, the most promising areas for aluminum MMC application will continue to be engine components, which are presently served by iron and steel, and brake system components. In the longer term, the automotive industry could potentially seek to replace steel and aluminum sheet with aluminum MMC sheet in applications requiring higher specific stiffness.⁹ Aluminum MMCs have been identified as a lightweight materials technology of interest to the Partnership for New Generation Vehicles (PNGV) program due to its weight-savings potential, particularly in brake and engine applications.¹⁰ Current aluminum MMC uses in automotive applications are shown in table 1.

The last decade has already witnessed significant increases in acceptance of MMC components in production vehicles. Performance benefits, including reduced weight and improved wear resistance, have overcome the added component cost. In the future, applications are likely to continue to grow because of the continuing pressures to reduce vehicle weight and to reduce levels of environmental emissions and increase fuel efficiency.¹¹

Aerospace Applications

The principal factor driving the aerospace industry search for advanced materials possessing enhanced properties is the goal of enhancing the performance of commercial and military aircraft, particularly in terms of weight and cost savings on aircraft structures.¹² In nearly all component applications to date, aluminum MMCs have been called upon to replace other material that had been originally specified.¹³ Significant advances in material and process development, design, manufacturing scale-up, and certification of materials have created important applications for MMCs in aerospace structural components and propulsion

⁸ Warren H. Hunt, Jr., and Daniel B. Miracle, "Automotive Applications of Metal-Matrix Composites," ASM Handbook, Vol. 21, *Composites*, 2001, p. 1029.

⁹ Aluminum Metal Matrix (ALMMC) Consortium, p. 10.

¹⁰ Nearly 17 pounds of aluminum MMC were projected for use in certain PNGV prototype vehicles originally scheduled for introduction in 2004.

¹¹ Hunt and Miracle, p. 1032.

¹² Venkatesan Sundararajan, "Aluminum Composites in Aerospace Applications," Aug. 1998, found at <http://home.att.net/~s-prasad/almmc.htm>, retrieved Jan. 7, 2002.

¹³ Daniel B. Miracle, "Aeronautical Applications of Metal-Matrix Composites," ASM Handbook, Volume 21, *Composites*, 2001, p. 1048.

Table 1
Aluminum metal matrix composite automotive applications

Application	Product uses	Advantage	Application in U.S. market
Engine			
Pistons	Selectively reinforced pistons in Toyota Motor Co. diesel engines for sale in Japan and Western Europe. First developed in 1983.	Resistance to severe dynamic thermal and mechanical environments with piston dome temperatures reaching 570 degrees F.	Not currently used in the U.S. market due to lower wear and fatigue requirements for U.S. diesel engines which are larger and operate at lower rotational speeds.
Cylinder liners	Aluminum MMC cylinder liners have been used in Honda Prelude 2.3-liter engine since 1990. Other uses include the Honda S2000 sports car, the Acura NSX, and the 2000 Toyota Celica.	Wear resistance is superior to cast iron with a 20-percent weight reduction of the engine block.	Products sold in the U.S. market.
Pushrods	Used in various high-performance overhead-valve racing engines.	Higher bending stiffness; double the damping capacity of competitive steel pushrods, thus allowing increased valve spring life; one-half the density of steel allowing an increase in engine RPM.	Products sold in the U.S. market.
Other systems			
Brake components	Aluminum MMC brake drums and rotors have been used in light-weight vehicles such as Lotus Elise (1996-98), Volkswagen Lupo 3L, Audi A2, and the Toyota hybrid car.	Weight savings of 50 to 60 percent, higher wear resistance, and higher thermal conductivity.	Specialty Plymouth Prowler, Ford Prodigy and General Motors Precept hybrid cars.
Driveshaft	MMC driveshafts were introduced in 1996 on the Chevrolet S-10 and GMC Sonoma pickup trucks. MMC driveshafts are now standard on Chevrolet Corvette and on "Police Interceptor" version of the Ford Crown Victoria.	Increased specific stiffness and elimination of need for 2-piece driveshafts.	Products sold in the U.S. market.

Source: Warren H. Hunt, Jr. and Daniel B. Miracle, "Automotive Applications of Metal-Matrix Composites," *ASM Handbook, Vol. 21, Composites*, 2001, p. 1029.

Aluminum MMCs

systems parts and subsystems.¹⁴ Although these applications are typically low in terms of volume, unit values of components tend to be high. Further aerospace use will depend greatly on the design of components with greatly enhanced performance characteristics. Increases in the durability and damage tolerance of aluminum MMCs could expand applications in aircraft structural parts, while increasing the higher temperature capabilities of these products would encourage substitution for titanium in engine applications, where the operating temperatures exceed 300^oF, the current limit for aluminum alloys.¹⁵ Table 2 describes the most significant aeronautical applications of MMCs.

Table 2
Aluminum metal matrix composite aerospace applications

Application	Product uses	Advantage
Ventral fin	Aluminum MMC sheet has replaced the aluminum alloy steel contained in the ventral fins of the F-16 aircraft.	The MMC sheet provides a 40- percent increase in specific stiffness, peak tip deflections have been reduced by 50 percent. Improvement in service life of 400 percent is expected, resulting in reduced maintenance, inspection, and downtime costs.
Fuel access door covers	The U.S. Air Force is replacing the 26 aluminum access doors in F-16 aircraft with aluminum MMC doors. Location of fuel access doors caused bending stresses to be concentrated in this area resulting in cracking of the fuselage skin.	U.S. Air Force tests have shown that peak and average skin stresses have been reduced by 38 percent and 10 percent, respectively, eliminating the cracking of the fuselage skin and extending the durability life of the plane fuselage to over 8,000 flight hours.
Helicopter blade sleeve	This component holds the rotor blade to the drive shaft and is considered a critical rotating component because failure would mean loss of the craft and passengers. Forged aluminum MMC has replaced the wrought titanium alloy component in Eurocopter France EC120 and N4 helicopters.	Reduction in rotating mass of the aircraft and the high cost associated with the original titanium component.
Fan exit guide vanes	The fan exit guide vanes on Pratt & Whitney 4084, 4090, and 4098 engines remove the swirling component of bypass air, thereby maximizing thrust obtained from air flow into engine. The first use of aluminum MMC to replace original graphite/epoxy vanes was in Boeing 777 aircraft and represented the first commercial aerospace application of aluminum MMC.	The original vanes suffered ballistic damage from foreign objects and susceptibility to erosion from airborne particulates and rain. Use of the MMC vanes has resulted in a sevenfold reduction in erosion rates and significant increases in resistance to ballistic damage, an overall increase in service life of 300 percent and reduced maintenance and repair costs.

Source: Daniel B. Miracle, "Aeronautical Applications of Metal-Matrix Composites," *ASM Handbook, Vol. 21, Composites*, 2000.

¹⁴ Ibid., p. 1043.

¹⁵ Daniel B. Miracle and Steven L. Donaldson, "Introduction to Composites," 2001, p. 16.

Barriers to Further Material Use

The principal barriers to substitution of MMCs for competitive materials already in use in major application areas are the following.¹⁶

High Costs of Production

Widespread application of MMCs for use primarily in the on-highway transport industry has been limited due to availability and cost, relative to competing materials. The two primary factors accounting for the high cost of MMCs are raw material cost, which includes both the aluminum matrix material and the ceramic reinforcement particles, and the high costs related to the “compositing” and mixing processes used to make the aluminum MMC materials. The most common methods for compositing MMCs are presented in table 3 by order of increasing production costs. In general, MMCs with higher production costs have better physical properties.

The cost disadvantage of aluminum MMCs is most apparent in a highly competitive end-user market such as the automotive industry, where parts suppliers are constantly pressured to keep their prices low. Cost is also a critical factor in aerospace applications where the high cost of aluminum MMCs have often put these materials at a competitive disadvantage relative to titanium alloys. The raw material cost of a cast iron or steel component is approximately \$0.25 per pound compared to the cost of a competitive discontinuously reinforced aluminum cast ingot of \$1.50-\$2.00 per pound.¹⁷ The cost of an aerospace-grade aluminum MMC billet ranges between \$16-\$60 per pound.¹⁸ Typically, aluminum MMCs contain a reinforcement particle phase that is more expensive than the aluminum alloy used in the matrix. In addition, the presence of the ceramic reinforcement produces a material that is often more difficult to machine than unreinforced aluminum, adding further to the cost of the final component. The industry is now weighing a number of processing technologies that can produce a range of product cost and performance characteristic improvements.

Concern about Material Availability and Depth of the Supply Chain

The principal aspect of aluminum MMCs that have attracted great interest among end-users is the ability of producers to tailor physical and mechanical properties through selection and manipulation of matrix and reinforcement characteristics. However, this feature has also led to a great number of specialty material formulations that apply only to particular niche applications and add to the cost of certifying new materials for product use. This is particularly true of composites manufactured for the aerospace industry where aluminum MMCs are often produced in limited quantities to address specific material needs. As a result, development of a physical infrastructure for producing limited volumes of multiple products has proven to be an expensive process, often not justified by the size of the

¹⁶ Miracle, p. 1048.

¹⁷ Because an aluminum MMC component weighs 45 percent less than steel, cost comparisons are actually narrower than apparent from the stated prices of ingot.

¹⁸ Mark R. van den Bergh, “Discontinuously Reinforced Aluminum (DRA)”, DWA Aluminum Composites, Nov. 2001.

Table 3
Common methods for compositing (forming) metal matrix composites (MMCs)

Method	Background and details of process
Vortex ("stir") casting	<p>A significant development in the commercial production of MMCs came with the development in the 1980s of a vortex casting process (referred to by Alcan USA as "stir casting"), that combined a relatively low-cost liquid metal-based casting process with a relatively inexpensive silicon carbide reinforcement material. Vortex casting techniques are currently the most commonly used method¹ to manufacture discontinuous MMC materials and are considered the most appropriate compositing method for high-volume automotive-related production of MMCs. Both engine cylinder liners and brake components use cast aluminum MMCs.²</p> <p>This method uses mechanical mixing of the reinforcement particulate into a molten metal bath, typically a heated crucible containing molten aluminum metal, with a motor located above the crucible to drive a mixing impeller that is submerged in the melt. The reinforcement material is poured into the crucible above the melt surface at a controlled rate to insure a smooth and continuous feed. Proper mixing techniques and impeller design are important to produce a homogeneous distribution of the reinforcement material throughout the matrix material. After mixing, the composite is cast into ingots and sold to foundries for remelting and casting.</p> <p>There have been few, if any, significant changes in vortex process technology for the production of large volumes of castings during the last 10 years. The sole manufacturer using this technology does not anticipate greatly expanded applications of aluminum MMCs beyond present application areas and feels that increased investment in new technology is not economically justified at present.³ As a result, the cost of producing cast aluminum MMCs for the automotive market has varied little during the last 10 years.</p>
Pressure ("squeeze") casting	<p>In this process, a fixed volume of molten metal alloy is introduced and is pressed by mechanical force into a ceramic preform. After solidification, the part is ejected from the mold and the process repeated. As pressure casting of MMCs is very rapid, it is suited for high-volume applications in the automotive industry, such as for the production of selectively-reinforced MMC pistons, which achieve production rates of more than 100,000 per month. The Toyota Motor Co. has used pressure-cast, selectively-reinforced MMC pistons since 1983.⁴</p> <p>The greatest factor currently limiting the use of squeeze casting technology tends to be its high cost. In recent years, the cost of producing squeeze cast components has declined somewhat due to improved quality and reduced costs of the ceramic preforms used in the process. In addition, improvements in press technology have resulted in reductions in the cost of presses, increases in production rates, and subsequent reductions in product unit costs.⁵ However, squeeze casting technology is still more widely used in Japan and Europe than in the United States. There is presently no U.S. production of aluminum composites using squeeze casting technology.</p>
Powder metallurgy	<p>Initial research efforts focused on the powder metallurgy process because this process tends to produce a material with superior chemical properties, more ideally suited to subsequent machining operations. Powder metallurgy techniques are used in the production of both continuous and discontinuous MMCs and involve blending metal and ceramic powders that are pressed and sintered to create a solid, dense form. Powder metallurgy methods offer the benefit of being able to produce unique MMC chemistries, with very fine particle reinforcement size distributions that are not possible with other compositing techniques. In addition, powder metallurgy has proven to be an effective process for forming precision net-shape metal components,⁶ thereby reducing scrap creation and elimination of costly secondary machining steps.</p>

See footnotes at end of table.

Table 3—Continued
Common methods for compositing (forming) metal matrix composites (MMCs)

Method	Background and details of process
Powder metallurgy— Continued	<p>Typically, powder metallurgy processes produce MMCs with the greatest combinations of properties suitable for use in high-performance applications, especially in the aerospace market.⁷ A more recently developed method for producing powder metallurgy billets is the <i>vacuum hot pressing process</i>⁸ which develops a composite with greater stiffness and wear resistance, as well as increased fatigue resistance and fracture toughness than through the conventional press and sinter process.⁹</p> <p>The principal areas where improvements in powder metallurgy processing are needed are the ability to produce thermally stable matrix alloys capable of performing under a wide range of temperatures, and the need for improved secondary and final fabrication processes to permit these composites to be economically extruded and machined.¹⁰ U.S. manufacturers are presently seeking to improve the material properties of powder metallurgy-produced components by varying the concentration and the shape of the reinforcement material; research indicates that these factors have a direct bearing on the quality of the composite, and improving the purity of the aluminum matrix by reducing the iron content, as the presence of iron contributes to the formation of cracks.¹¹</p>

¹ Nearly two-thirds of all aluminum MMCs are produced using vortex methods.

² Information on stir-casting is contained in D.R. Herling, G.J. Grant, and M.T. Smith, "Mechanical and Physical Property Evaluation of a 359/SiC/20p MMC Prepared by a Novel Rapid Mixing Technique," Pacific Northwest National Laboratory, 2001.

³ Industry representative, telephone interview by USITC staff, Feb. 4, 2002.

⁴ Daniel B. Miracle and Steven L. Donaldson, "Introduction to Composites," *ASM Handbook, Volume 21, Composites*, 2001, p. 12.

⁵ USITC staff interview with Robert Coleman, Saffo Corp., Mar. 11, 2002.

⁶ Warren H. Hunt, Jr. "Aluminum Metal Matrix Composites Today," *Materials Science Forum*, Vols. 331-337, p. 75, 2000.

⁷ Aluminum Metal Matrix (ALMMC) Consortium, "Aluminum Metal Matrix Composites Technology Roadmap," Jan. 2002, p. 32.

⁸ Vacuum hot pressing is a process developed by DWA Aluminum Composites Inc, Chatsworth, CA, the leading producer of aluminum MMCs for the aerospace industry.

⁹ Published interview with Warren H. Hunt, Jr., *The International Journal of Powder Metallurgy*, Volume 35, No. 2, 1999, p. 24.

¹⁰ Darrel R. Herling, Glenn J. Grant, and Warren Hunt, Jr., "Low-cost Aluminum Metal Matrix Composites," *Advanced Materials & Processes*, July 2001, p. 37.

¹¹ USITC staff interview with Mark R. van den Bergh, President and CEO, DWA Aluminum Composites Inc., Mar. 8, 2002.

prospective market.¹⁹ Finally, the lack of an extensive supply chain limits the amount of detailed information available to users and design engineers regarding material capability and limitations.²⁰

¹⁹ Aluminum Metal Matrix (ALMMC) Consortium, p. 9.

²⁰ Miracle p. 1048.

Material Property Databases Unavailable to Design Engineers

Material property databases are essential to providing engineers with the necessary data²¹ demonstrating the reliability of MMCs, as well as assurance that material properties can be consistently produced by a commercial-scale process.²² Thus far, the development of MIL-HNBK-5 (Military Handbook-5) data base for selected aluminum MMCs produced through powder metallurgy has been useful in accelerating the use of MMCs in some military applications. MIL-HDBK-5 publishes strength properties of metallic materials and elements widely used in military structures. The document also contains information on some of the more commonly used methods for calculating the strengths of various structural elements and components. Alcan has also developed a data base for automotive-related products using its stir-casting process. However, as yet there is not a systematic productwide database that relates material properties to processing parameters or between laboratory test data and actual performance.²³ When data are generated for an application, such data are often held as proprietary and not generally made available in an open forum for others to use.²⁴ In addition, product-testing standards and guidelines regarding acceptable structural performance of recognized MMC materials must also be furthered.²⁵ The goal of such efforts is to provide design engineers with the information necessary to design product applications incorporating MMCs.

High Costs of Finishing

A significant cost component, often accounting for nearly one-half of final product cost, occurs as the result of difficulties in finishing MMC parts. Because ceramic particles are much harder than typical tool steels or carbide tools used to machine them, they often cause premature tool wear. Harder, more expensive diamond tool material is often needed to machine metal composites, thereby adding to final product cost. Further adding to final cost is the fact that today's producers of metal composites produce in small lots and cannot take advantage of volume discounts offered by machine shops to steel or aluminum producers.

Major Private-Sector and Government Initiatives²⁶

MMC materials have been of interest to the aerospace and defense markets due to their potential to increase the stiffness and high-temperature strength of light-weight metals (such as aluminum and titanium). Therefore, they have been the focus of considerable industry and government research funding since the 1970s, to improve the compositing methods of

²¹ Such standardized data might include published results of fatigue, creep, and impact testing at various operating temperatures, as well as information on thermal expansion; wear resistance; compatibility with hydraulic fluids, fuels, and antifreeze; and corrosion characteristics.

²² Warren H. Hunt, Jr., and Benji Maruyama, "The World Still Won't Beat a Path to Your Door: Transitioning DRA to the Marketplace," *JOM (Journal of Metallurgy)*, Nov. 1999, p. 62.

²³ Aluminum Metal Matrix (ALMMC) Consortium, p. 15.

²⁴ E-mail communication from Daniel B. Miracle, Air Force Research Laboratory, Dayton, OH, Feb. 14, 2002

²⁵ Aluminum Metal Matrix (ALMMC) Consortium, p. 9.

²⁶ Information on some of the more prominent U.S. Government initiatives was provided by Manish Mehta, Director, Aluminum Metal Matrix Composites Consortium (ALMMC), in a telephone conversation with industry analyst, Dec. 18, 2001.

these materials. Inasmuch as the total market for aluminum MMCs remains small, processing technology for these materials is still evolving, and costs for all processing methods still relatively high. Highlights of efforts currently underway to reduce the cost of MMCs in the more promising areas are noted below.

Cast Aluminum MMCs

Both industry and government have devoted much effort into developing the *rapid mixing process*, an alternative compositing process aimed at addressing the need for low-cost, high-quality discontinuous aluminum MMC materials. Because the process is designed to produce large volumes at low cost, it is considered to be particularly well-suited to automotive-related MMC production.²⁷ Since 1997, the U.S. Department of Energy (USDOE) and a number of private firms and research institutions²⁸ have been funding a low-cost cast MMC Project to promote rapid mixing technology.²⁹ A key advantage of the rapid mixing process is its ability to quickly and efficiently integrate the ceramic reinforcement particles into the matrix material.³⁰ In addition to reductions in capital equipment costs associated with the elimination of the traditional vacuum system for mixing aluminum and reinforcement materials, utilization of a rapid mixing technique reportedly reduces the time required to cast aluminum MMC materials by nearly 80 percent, thus, helping to significantly reduce labor costs associated with MMC production. Initial cost estimates indicate that the process could enable aluminum MMC to be produced for nearly \$1 per pound.³¹ Another potential advantage of the rapid mixing process is that the process steps are sequenced, and can possibly be automated, resulting in a semicontinuous, or with certain modifications, a continuous process, considerably increasing output.³²

Because primary aluminum and its alloys are traded as commodities, their costs are not easily subject to control by users.³³ As a result, USDOE's Low-Cost Cast MMC Project has also concentrated on efforts to reduce the costs of reinforcement particles as a means to enable more widespread use of MMCs. Current cast aluminum MMCs typically use a F-500³⁴ grade of high-purity green silicon carbide as reinforcement particles. However, some research has suggested that use of a black silicon carbide particulate material that is 50-percent lower in cost than the F-500 type presently in use, for a cost saving of \$0.30 per

²⁷ The rapid mixing process has been used to produce prototype automotive brake rotors.

²⁸ These include MC-21 Inc., Visteon Corp., Aluminum Consultants Group, Pacific Northwest National Laboratory, and Rockwell Science Center.

²⁹ Other goals of the USDOE program are to (1) focus on cost-effective downstream processing and finishing methods; (2) develop powertrain component designs that exploit the properties of aluminum MMCs; and (3) engage leading automotive suppliers and foundries for transfer of technology.

³⁰ During rapid mixing, aluminum and reinforcement materials are mixed at near atmospheric conditions. Ambient air is used during the process, resulting in potentially lower capital-equipment costs by eliminating the need for the expensive vacuum system used in traditional stir-casting. Reinforcement material is metered into an area below the melt through a hollow mixing shaft. The mixing head attached to the end of the mixing shaft is designed to promote the breakup of particle agglomerations and effectively distribute the reinforcement throughout the melt. Herling, Grant, and Smith, "Mechanical and Physical Property Evaluation."

³¹ Ibid.

³² Ibid.

³³ Ibid.

³⁴ The F-500 designation refers to the sorting and classification of the silicon carbide particles.

pound for an aluminum MMC with 20 percent silicon carbide. This cost savings results from the lower sorting and pretreatment requirements of the lower cost material.³⁵

Aluminum MMC Powder

Since 1994, USDOE and private industry³⁶ have contributed funds under the Low-Cost Powder Metallurgy for Particle-Reinforced Aluminum Composites program to develop low-cost powder metallurgy manufacturing methods and machining technology for the production of light-weight, complex-shaped components, principally in the form of connecting rods, for the automotive industry.³⁷ The process technology used in the program consists of conventional compaction of aluminum alloy powder and silicon carbide particles into a preform shape, sintering of the preform to establish interparticle bonding, followed by hot forging and heat treatment to achieve a near-net shape.³⁸ Information generated from the program will be available to enable firms in the automotive industry to make commercialization decisions. It is anticipated that powder aluminum MMC will still remain more costly than currently used ferrous material. However, cost savings could result from reducing the weight of the drivetrain system and consequent fuel-efficiency improvements.³⁹ Preliminary project conclusions indicate that the use of aluminum MMC connecting rods in certain automobiles could eliminate the need for the balance shaft, further reducing engine weight and complexity.⁴⁰

DARPA⁴¹ Structural Amorphous Aluminum for Aerospace Applications Program

DARPA's new interdisciplinary program,⁴² Structural Amorphous Aluminum for Aerospace Applications Program, initiated in September 2001, involves university researchers, Boeing, and Pratt & Whitney, whose aim is to develop processing methods to produce quantities of aluminum MMCs on a scale to meet the requirements of targeted airframe and engine components. In addition, the program seeks to produce materials that would extend the high-temperature capabilities of aluminum composites and generate data on the properties of these materials that would be useful design engineers contemplating their use in aerospace applications. The DARPA effort is also intended to design, fabricate, and test actual

³⁵ Herling, Grant, and Smith, "Mechanical and Physical Property Evaluation."

³⁶ Industry participants include the three major U.S. automakers and also include Masco Technology Inc., Aluminum Consultants Group, Oak Ridge National Laboratory, and Ames Laboratory.

³⁷ Potential applications for both powder aluminum, powder aluminum MMCs, or intermetallic alloys include cylinder liners, pulley sprockets, camshaft bearing caps, valves, piston cap inserts, balance shaft gear sets, electronic base plates, rocker arms, oil pump gears, piston pins, and brackets.

³⁸ "Low-Cost Powder Metallurgy for Particle-Reinforced Aluminum Composites," *FY 2000 Progress Report*, U.S. Department of Energy, p.52, 2001.

³⁹ Information received from Russell Chernenkoff, Ford Motor Co., Feb. 11, 2002.

⁴⁰ "Low-Cost Powder Metallurgy for Particle-Reinforced Aluminum Composites," *FY 2000 Progress Report*, U.S. Department of Energy, p.54, 2001.

⁴¹ Defense Advanced Research Projects Agency of the U.S. Department of Defense.

⁴² The program is anticipated to expire in 2005, and the total budget is estimated at \$30 million.

prototype airframe and engine components to demonstrate the feasibility of the technology developed.⁴³

Future Uses

Although progress in the commercialization of aluminum MMCs has been rapid over the last 10 years, MMC use is still generally limited to a number of niche applications, primarily in the automotive and aerospace markets. Before these materials can find greater use in these industries, a number of economic and technical issues need to be addressed. Several development programs are currently in place that seek to address the cost disparity between composites versus steel, cast iron, and aluminum. Other obstacles include the need to develop a supplier base large enough to supply aluminum MMCs at a competitive price and the need to develop a data base to encourage design engineers to incorporate aluminum MMC components into their product designs. These obstacles will likely only be resolved over time as the industry evolves and both suppliers and users gain greater familiarity with the capabilities and limitations of these products and overcome their reluctance to share product data in an open forum. ■

⁴³ USITC staff interview with David Bowden, The Boeing Company, Mar. 11, 2002.

APPENDIX A

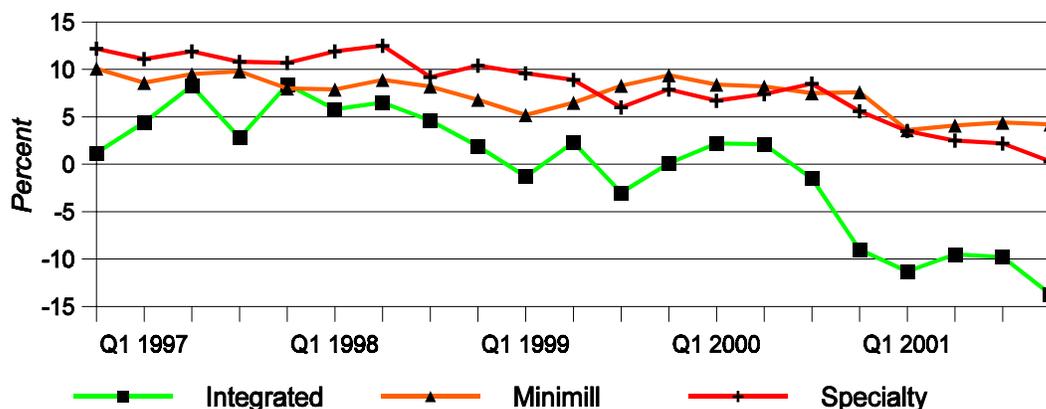
Key Performance Indicators of Selected Industries and Regions¹

Title	Author ¹	Page
Steel	Harry Lenchitz (202) 205-2737 <i>lenchitz@usitc.gov</i>	A-2 A-3
Automobiles	Laura A. Polly (202) 205-3408 <i>polly@usitc.gov</i>	A-4
Unwrought Aluminum	Judith-Anne Webster (202) 205-3489 <i>webster@usitc.gov</i>	A-5
Flat Glass	James Lukes (202) 205-3426 <i>luke@usitc.gov</i>	A-6
Services	Tsedale Assefa (202) 205-2374 <i>asefa@usitc.gov</i>	A-7
North American Trade	Ruben Mata (202) 205-3403 <i>mata@usitc.gov</i>	A-8 A-9

¹ The data and views presented for the following indicators are compiled from the industry sources noted and are those of the authors. They are not the views of the United States International Trade Commission as a whole or of any individual Commissioner. Nothing contained in this information based on published sources should be construed to indicate how the Commission would find in an investigation conducted under any statutory authority.

STEEL

Figure A-1
Minimills remain profitable while integrated and specialty producers feel effects of declining sales during fourth quarter 2001



¹Operating income as a percent of sales. Integrated group contains 4 firms. Minimill group contains 7 firms. Specialty group contains 4 firms.

Source: Individual company financial statements.

- Losses at integrated producers increased in the fourth quarter 2001. Declining sales and low capacity utilization coincided with a bankruptcy filing by Bethlehem Steel, idling of facilities by LTV and Geneva, and shutdown of Acme Metals.
- Fourth quarter 2001 was also bleak for specialty producers, processors, and distributors with the shutdown of Allegheny Technologies and bankruptcy filings by Metals USA, Sheffield Steel, and Action Steel.
- First quarter 2002 brought additional bankruptcy filings by Huntco and National Steel, but also the announcement by President Bush of temporary safeguards for the steel industry. Response to this action by other nations has included requests for consultations, tariff increases, and institution of safeguard investigations. Details of the U.S. safeguards, including exclusions, are available on the Office of the U.S. Trade Representative website: www.ustr.gov/sectors/industry/steel201/background.htm.
- Imports of finished products during the fourth quarter 2001 increased slightly compared with the third quarter 2001 level of 5.9 million tons, and also compared with the fourth quarter 2000 (table A-1). Semifinished imports declined slightly from the third quarter 2001 level of 1.9 million tons but were up 24 percent compared with the fourth quarter 2000. Yet a year-to-year comparison shows a significant decline in finished and semifinished imports in 2001.

Table A-1
Finished and semifinished imports decreased significantly in 2001 compared with the previous year

Item	Q4 2001	Percentage change, Q4 2001 from		YTD 2001	Percentage change, YTD 2001 from	
		Q4 2000 ¹	YTD 2000 ¹		YTD 2000 ¹	YTD 2000 ¹
Producers' shipments (1,000 short tons)	23,282	-6.5	99,448	-8.8		
Finished imports (1,000 short tons)	6,157	2.4	23,640	-19.6		
Ingots, blooms, billets, and slabs (1,000 short tons)	1,826	24.0	6,440	-24.7		
Exports (1,000 short tons)	1,526	-5.2	6,144	-5.9		
Apparent supply, finished (1,000 short tons)	27,913	-12.2	116,944	-13.5		
Ratio of finished imports to apparent supply (percent)	22.1	² 1.6	20.2	² -2.1		

¹ Based on unrounded numbers.

² Percentage point change.

Note.—Because of rounding, figures may not add to the totals shown.

Source: American Iron and Steel Institute.

STEEL

Table A-2
Fourth quarter 2001 service center shipments decreased by nearly 17 percent from third quarter 2001, and by 14 percent from fourth quarter 2000

Item	Sept. 2001	Dec. 2001	Percentage change, Dec. 2001 from Sept. 2001 ¹	Q4 2000	Q4 2001	Percentage change, Q4 2001 from Q4 2000 ¹
Shipments (1,000 short tons)	1,923	1,600	-16.8	5,280	4,526	-14.3
Ending inventories (1,000 short tons) . .	7,677	7,556	1.6	8,557	7,556	-11.7
Inventories on hand (months)	3.6	4.0	(²)	3.9	4.0	(²)

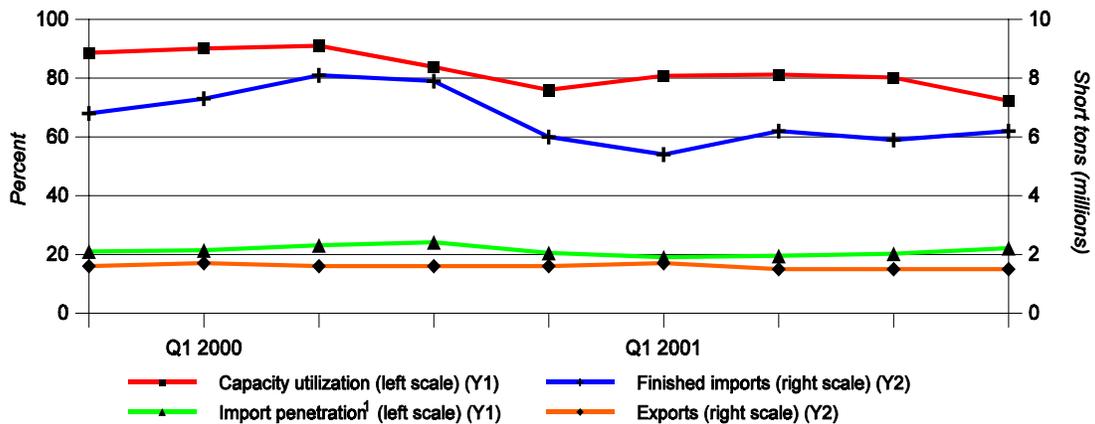
¹ Based on unrounded numbers.

² Not applicable.

Source: Steel Service Center Institute.

- According to the Metals Service Center Institute (formerly Steel Service Center Institute), U.S. service centers shipped only 4.5 million tons of finished steel products during the fourth quarter 2001, a decline of more than 30 percent from the third quarter 2001 level of 6.2 million tons and more than 14 percent from the fourth quarter 2000 (table A-2). Although inventory volume was down slightly at the end of the fourth quarter (Dec. 2001) compared with the end of the third quarter, inventories on hand represented four months of sales at current levels.
- The most recent survey of business conditions (March 8, 2002) by the Metals Service Center Institute (www.ssci.org) predicted an increasing trend in general economic activity, and in steel orders and shipments, during the March through May 2002 time period. During March 2002, coincident with the announcement of temporary safeguards for the U.S. steel industry, there were measurable increases in spot steel prices both in the U.S. and in other steel consuming and exporting countries.
- Domestic capacity utilization dropped to less than 73 percent during the fourth quarter 2001 (Figure A-2). Although domestic consumption of steel declined significantly during the fourth quarter 2001 compared with the third quarter level, the American Iron and Steel Institute (www.steel.org) attributed the decrease in domestic capacity utilization to low price levels for steel imports caused by excess foreign steel capacity.

Figure A-2
Steel mill products, all grades: Capacity utilization fell more than expected during fourth quarter 2001



¹ Finished import share of apparent open market supply.

Source: American Iron and Steel Institute.

AUTOMOBILES

Table A-3
U.S. sales of new automobiles, domestic and imported, and share of U.S. market accounted for by sales of total imports and Japanese imports, by specified periods, January 2000-December 2001

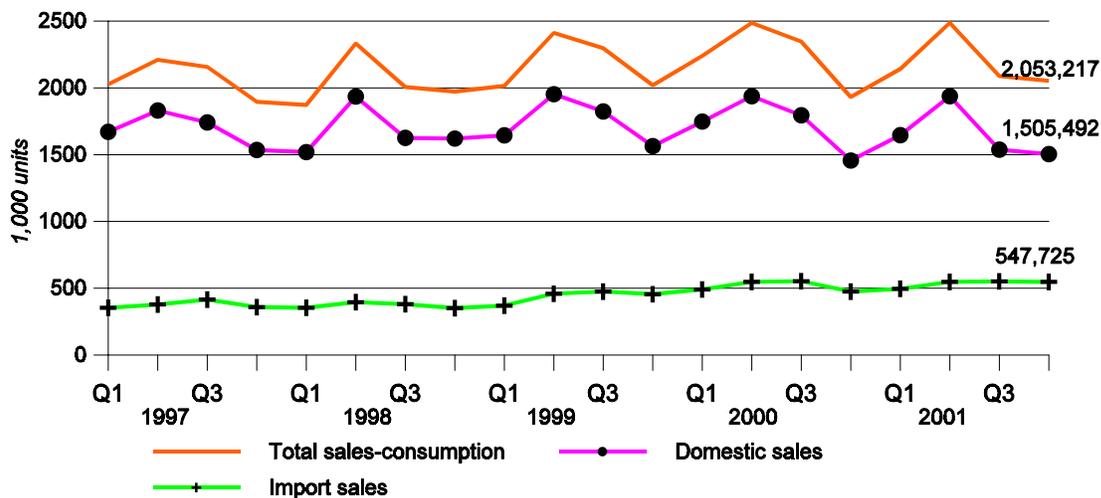
Item	Oct.-Dec. 2001	Jan.-Dec. 2001	Percentage change	
			Oct.-Dec. 2001 from Jul.-Sept. 2001	Jan.-Dec. 2001 from Jan.-Dec. 2000
U.S. sales of domestic autos (1,000 units) ¹	1,505	6,488	-2.1	-6.5
U.S. sales of imported autos (1,000 units) ²	548	2,167	-0.7	4.7
Total U.S. sales (1,000 units) ^{1,2}	2,053	8,655	-1.7	-3.9
Ratio of U.S. sales of imported autos to total U.S. sales (percent) ^{1,2}	26.7	25.0	1.0	9.0
U.S. sales of Japanese imports as a share of the total U.S. market (percent) ^{1,2}	11.9	10.6	7.7	1.6

¹ Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States.

² Imports do not include automobiles imported from Canada and Mexico.

Source: Compiled from data obtained from Automotive News.

Figure A-3
U.S. sales of new passenger automobiles fell in fourth quarter 2001; in a year of decreased U.S. sales, imported autos gained market share at the expense of domestic models

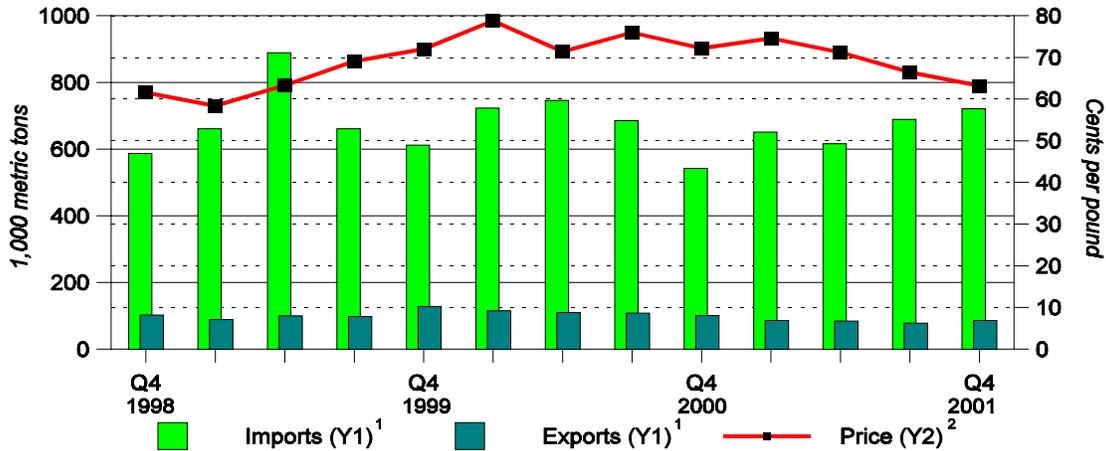


Note.—Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States; these same units are not included in import sales.

Source: Automotive News; prepared by the Office of Industries.

UNWROUGHT ALUMINUM¹

Figure A-4
Import penetration reached over 35 percent in the fourth quarter as imports replaced scaled back U.S. production



¹ Crude forms (metals and alloys) for consumption.

² Quarterly average of the monthly U.S. market price of primary aluminum ingots.

Source: Compiled by USITC staff based on data obtained from the U.S. Geological Survey.

- Energy related production cutbacks significantly impacted both the U.S. and Brazilian aluminum markets in 2001. (See related article in Dec. 2001 ITTR for details.) U.S. production of primary aluminum decreased 28 percent (to 2.6 million metric tons) and Brazilian production dropped 12 percent. Due to improved availability of low-cost electrical energy, production in both countries is expected to increase marginally in 2002 as capacity comes back on line. Slated for production returns in the near-term are the Albras smelter in Brazil and Longview Aluminum Smelter in the United States.
- Restructuring is underway in the U.S. aluminum industry as companies react to pressure from falling prices, production decreases, and increased competition from foreign producers. Kaiser recently announced its intention to restructure its debt under Chapter 11 proceedings. Secondary production is accounting for an increasing portion of aluminum production. In another development, Alcoa announced its first quarterly loss in 6 years.

Table A-4
Prices reached their lowest levels in 2.5 years while surpluses in LME warehouses continued to accumulate, reflecting weakness of the market

Item	Q4 2000	Q3 2001	Q4 2001	Percentage change	
				Q4 2001 from Q4 2000	Q4 2001 from Q3 2001
Primary production (1,000 metric tons)	880	632	627	-28.8	-0.8
Secondary recovery (1,000 metric tons)	756r	795r	771	2.0	-3.1
Imports (1,000 metric tons)	542	689	721	33.0	4.6
Import penetration (percent) ¹	26.1	34	35.5	² 9.4	² 1.7
Exports (1,000 metric tons)	101	78	86	-14.9	10.3
Average nominal price (cents/lb)	72.2	65.4	63.2	-12.5	-4.8
LME inventory level (1,000 metric tons)	322	722	821	155.0	13.7

¹ Calculations based on unrounded data

² Percentage point change

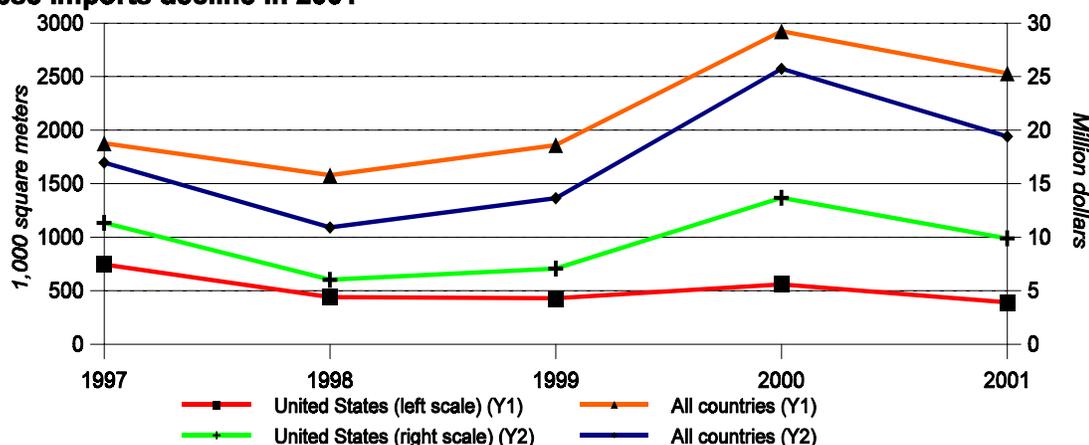
Note.—Revised data indicated by “r.”

Sources: Compiled from data obtained from U.S. Geological Survey and World Bureau of Metal Statistics.

¹ Product coverage includes only unwrought aluminum and certain aluminum alloys for improved data comparability.

FLAT GLASS

Figure A-5
Japanese imports decline in 2001



Source: Average monthly Japanese imports of flat glass compiled from "World Trade Atlas: Japan" at <http://www.globaltradeatlas.com> on Mar. 6, 2002, which uses official statistics provided by the Government of Japan.

Background

- The U.S.-Japanese agreement on Japanese market access for imports of flat glass sought to increase access and sales of foreign flat glass in Japan through such means as increased adoption of nondiscriminatory standards and expanded promotion of safety and insulating glass. The agreement covered the 1995-99 period and expired on December 31, 1999.¹
- Japanese demand for imported glass improved in 2000. The average monthly quantity of Japanese imports from all countries increased by 57 percent during 2000 to 2.9 million square meters, while the average monthly value of such imports increased by 89 percent to \$25.7 million. Imports from the United States increased by 30 percent to 561,000 square meters and by 93 percent to \$13.7 million, respectively, but the U.S. share of the market declined.

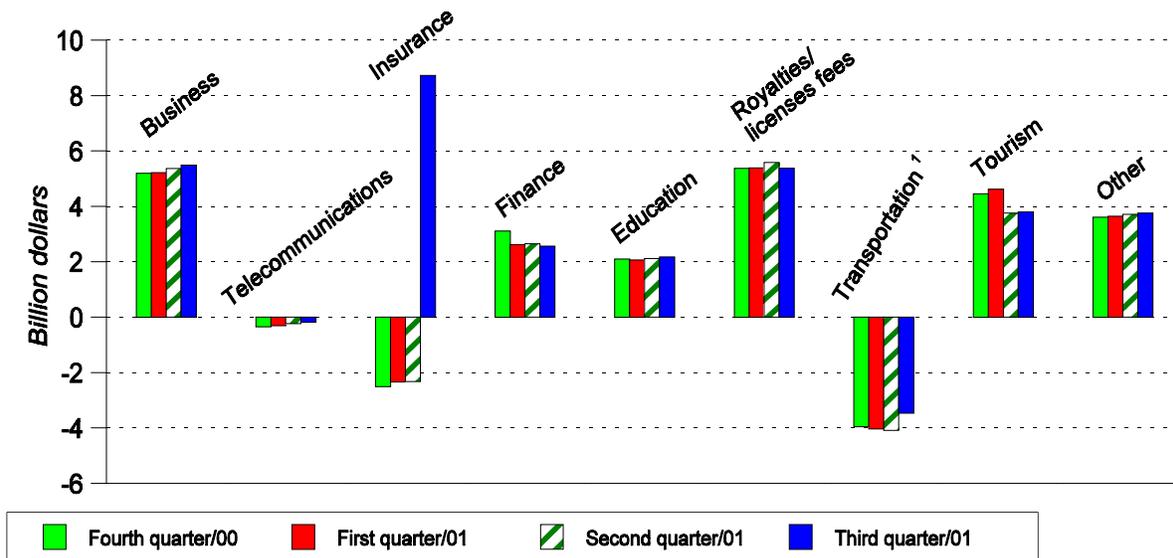
Current

- The Japanese economy slowed in 2001, which further diminished demand for imported flat glass. The average monthly quantity of Japanese imports from all countries decreased by 13 percent during 2001 to 2.5 million square meters, while the average monthly value of such imports decreased by 25 percent to \$19.4 million. However, imports from the United States decreased by 30 percent to 392,000 square meters and by 28 percent to \$9.9 million, respectively, with the U.S. share of the market declining in terms of quantity; imports from the United States lost market share to less expensive imports from Thailand, Korea, and Taiwan during 2001.

¹ Office of the U.S. Trade Representative (USTR), *The President's 1999 Annual Report on the Trade Agreements Program*, p. 227, downloaded from <http://www.ustr.gov/reports/tpa/2000/index.html> on Mar. 3, 2000.

SERVICES

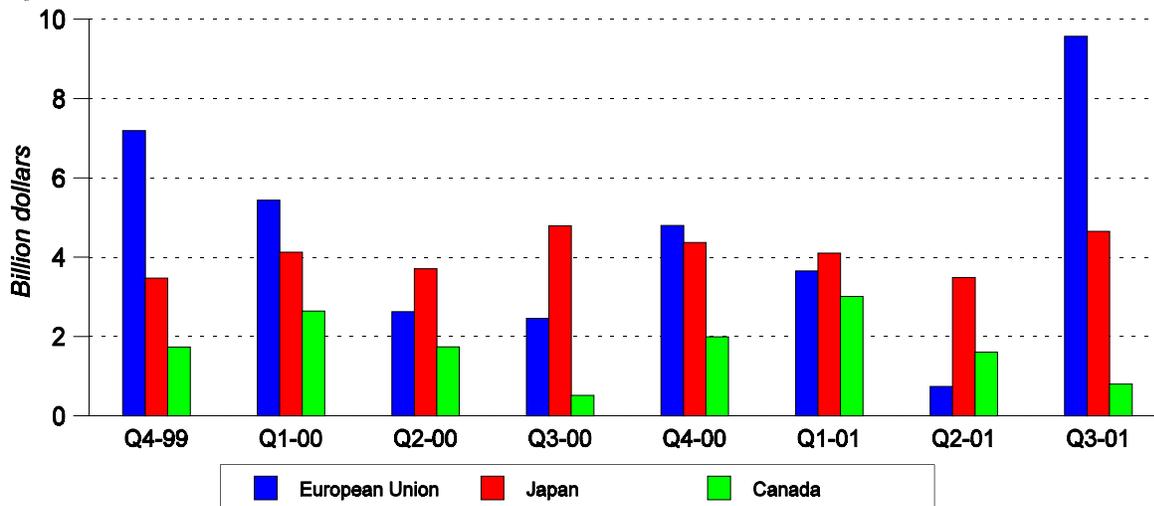
Figure A-6
 Balance on U.S. service trade accounts, by selected quarters, 2000-01



¹ Includes port fees.

Source: Bureau of Economic Analysis, *Survey of Current Business*, Jan. 2002, p. 44.

Figure A-7
 Surpluses on cross-border U.S. services transactions with selected trading partners, by quarter, 1999-2001¹



¹ Private-sector transactions only; military shipments and other public-sector transactions have been excluded.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, Jan. 2002, pp. 52-57; Oct. 2001, pp. 79-91; July 2001, pp. 74-77; Apr. 2001, pp. 62-67; and Jan. 2000, pp. 112-115.

NORTH AMERICAN TRADE HIGHLIGHTS

U.S. trade with its North American partners is highlighted in table A-5. The following is a summary of key developments for year 2001.

- Reflecting the sluggish U.S. economy, U.S. trade with its NAFTA partners in 2001 (\$583 billion) decreased by 6 percent (\$37 billion) from 2000. The U.S. merchandise trade deficit with Canada (\$-72.2 billion) and Mexico (\$-40 billion) continued to rise, expanding by 4.3 percent to \$112.2 billion in 2001.
- Two-way trade with Canada declined 6 percent (\$23.2 billion) to \$361.5 billion in 2001. Leading factors in the reduced trade with Canada were slackening U.S. demand, border delays caused by heightened security, and lower Canadian petroleum prices.
 - U.S. imports from Canada decreased by 5.3 percent (\$12.2 billion) to \$216.9 billion in 2001. Lessened U.S. demand for petroleum, motor-vehicles, electrical machinery, and electronic products were largely responsible for the decrease in total imports from Canada. Eighty-six percent of Canada's total exports were destined for the United States in 2001.
 - Although Canada posted an estimated 1.5 percent increase in economic growth in 2001, slackening demand in certain manufacturing and consumer sectors combined with a strong U.S. dollar resulted in a 7-percent decrease (\$11 billion) in U.S. exports to Canada in 2001. Industries showing the largest decreases in U.S. exports to Canada were certain motor-vehicle parts; motor vehicles; electronic products, such as telephone equipment and semiconductors; and copper and steel mill products.
 - Significant growth in U.S. exports to Canada occurred for electrical energy, rising by 217 percent (\$861 million) to 1.3 billion; and for motors and generators, increasing by 31 percent (\$267 million) to \$1.1 billion. The surge in electrical energy exports to Canada was due partly to unseasonably warm weather nationwide that boosted air-conditioning usage and imports over the electrical power transmission network that Canada shares with the United States.
- Two-way trade with Mexico decreased 6 percent (\$14.1 billion) to \$221 billion in 2001. The decrease was partly due to a slowing down of the U.S. economy along with a Mexican economy that contracted 0.3 percent in 2001, the first decline in Mexico's GDP since the peso crisis of 1995, and a sharp reversal from its 6.9 economic growth registered in 2000.
 - U.S. exports to Mexico declined by 10 percent (\$9.9 billion) in 2001 to \$90.5 billion. Industry sectors with the largest decreases were auto parts and engines, miscellaneous plastic and petroleum products, semiconductors and integrated circuits, telephone apparatus, electrical capacitors and resistors. The majority of these products are typically destined for assembly plants operating under Mexico's two temporary import programs: the Maquiladora Program and PITEEX.
 - Intense competition between Boeing and Airbus Industries in the major civil aircraft market and between Bombardier and Embraer in the regional jet aircraft market has influenced these companies to demand lower costs from their suppliers to remain globally competitive. In response, numerous U.S. producers and subcontractors for aircraft engines and other parts (i.e., wire harnesses and valve assemblies) have established facilities in Mexico, making aircraft components and parts the fastest growing maquiladora sector. As a result, U.S. exports to Mexico of aircraft and related equipment increased by 103 percent (\$278 million) to \$549 million in 2001.
 - Mexico's exports to the United States and its employment under the Maquiladora Program also fell by 10 percent in 2001, while direct foreign investment in Mexico's export assembly industry decreased by 27 percent (\$813 million) to \$2.17 billion. The contraction of Mexico's assembly industry was caused, in part, by the appreciation of the Mexican peso against the U.S. dollar in 2001. That same strong peso, however, has increased the purchasing power of Mexico's emerging middle class and led to a sharp rise in sales of new homes and consumer durables. Commensurate with this trend, U.S. exports of motor-vehicles to Mexico in 2001 increased by 12.5 percent (\$402 billion) to \$3.6 billion.
 - The economic and foreign exchange factors in play during 2001 resulted in a decline in imports from Mexico by 3 percent (\$4.2 billion) to \$131 billion in 2001. Countering this trend, however, U.S. imports from Mexico of computers rose by 15 percent (\$1.3 billion) to \$10.4 billion, and residential and commercial appliances rose by 33 percent (\$655 million) to \$2.7 billion. In 2001, the U.S. market accounted for approximately 88 percent of Mexico's total exports and for 25 percent of Mexico's GDP.

NORTH AMERICAN TRADE

Table A-5
North American trade, 1996-2001

Item	1996	1997	1998	1999	2000	2001	Percent change 2000/01
-----Value (million dollars)-----							
U.S.-Mexico trade:							
Total imports from Mexico	74,179	85,005	93,017	109,018	134,734	130,509	-3
U.S. imports under NAFTA							
Total value	55,076	62,837	68,326	71,317	83,995	81,162	-3
Percent of total imports	74	74	73	65	62	62	-
Total exports to Mexico	54,686	68,393	75,369	81,381	100,442	90,537	-10
U.S. merchandise trade balance with Mexico ¹	-19,493	-16,612	-17,648	-27,637	-34,292	-39,971	-17
U.S. -Canada trade:							
Total imports from Canada	156,299	167,881	174,685	198,242	229,060	216,836	-5
U.S. imports under NAFTA							
Total value	84,245	88,949	111,675	115,715	123,052	113,179	-8
Percent of total imports	54	53	64	58	54	52	-
Total exports to Canada	119,123	134,794	137,768	145,731	155,601	144,621	-7
U.S. merchandise trade balance with Canada ²	-37,176	-33,087	-36,918	-52,511	-73,459	-72,215	2

¹ The hyphen (-) symbol indicates a loss or trade deficit, or not applicable. The \$34.3 billion deficit in U.S. merchandise trade with Mexico in 2000 was partially offset by a \$2.9 billion U.S. surplus in bilateral services trade (latest available services trade data for Mexico).

² The \$72.2 billion deficit in U.S. merchandise trade with Canada in 2001 was partially offset by a \$7.3 billion U.S. surplus in bilateral services trade.

Source: Compiled by U.S. International Trade Commission staff from official statistics of the U.S. Department of Commerce. Statistics on U.S. services trade with Canada and Mexico are based on preliminary data provided in U.S. Department of Commerce, Bureau of Economic Analysis, U.S. International Transactions Accounts Data, tables 10 and 10a, found at http://www.BEA.DOC.GOV/BEA/International/BP_web/list.CFM?ANON=92.

