IMPACT OF INTERNATIONAL STANDARDIZATION TRENDS

On the U.S. Aerospace Industry

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

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The mission of the Aerospace Research Center is to engage in research, analyses and advanced studies designed to bring perspective to the issues, problems and policies which affect the industry and, due to its broad involvement in our society, affect the nation itself. The objectives of the Center's studies are to improve understanding of complex subject matter, to contribute to the search for more effective government-industry relationships and to expand knowledge of aerospace capabilities that contribute to the social, technological and economic well being of the nation.

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INTRODUCTION

In past decades, U.S. products and technology have dominated the world aerospace marketplace. Recently, however, new competitive factors have emerged on the international scene to challenge that leadership. A very visible indicator of this new competitive environment is the Airbus consortium with strong backing from national governments which, by their control of financing, purchasing requirements, regulations and certification, can effectively promote procurement policies which present barriers to U.S. sales abroad. Another is the NATO focus on rationalization, standardization and interoperability (RSI) in response to European pressure for a "two way street" in acquisition programs.

In this new environment, standards—and related areas of qualification and testing—can have considerable impact as disincentives or barriers to U.S. trade.

The Aerospace Industries Association (AIA) commissioned this study in order to assess the current and potential impact of international standardization on the U.S. aerospace industry, and to provide a foundation for development of a sound industry strategy for the decade ahead. A survey of AIA member companies, augmented by personal interviews, provided the basis for the findings, conclusions and recommendations in this report.

Role of Standards in World Trade

Standards can play a facilitating role in the increasing international framework of aerospace trade. A number of factors currently favor the development of commonality in designs, practices and procedures—most outstanding is the increasing incidence of U.S. aerospace company involvement in multinational joint ventures. The economic and competitive advantages of such arrangements indicate they will increase in the future, with a corresponding need for transnational harmonization of specifications and standards. In addition, U.S. defense procurement policies, in support of NATO, encourage teaming to achieve interoperability of systems and hardware. Many areas of the world, including Europe, are looking to international standards to provide the basic engineering documentation for future initiatives.

Standards also, however, have the potential to act as non-tariff barriers to trade. This was recognized during the Multilateral Trade Negotiations and the resulting General Agreement on Tariffs and Trade (GATT) includes a code on technical barriers to trade designed to discourage discriminatory manipulation of product standards, testing and certification. The GATT "Standards Code" requires signatory governments to give preference to standards adopted at the international level. (See Appendix B.)

The Aerospace Industries Association has identified a number of areas in the international marketplace where standardization is generating or has the potential to generate disincentives to U.S. sales. Examples include: (1) the existence of exclusionist certification arrangements in the electronics field; (2) the adoption of European regional (AECMA) aerospace standards as mandatory European Community requirements; and (3) the potential imposition of metric requirements, whether by foreign government fiat or by international agreement such as Annex 5 of the International Civil Aviation Organization which pertains to units of measurement used in air and ground operations.

International Standards Organizations

Of the variety of organizations, both treaty and non-treaty, involved in international standardization, an increasingly visible role is being played by two principal private sector organizations: The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The structure of these two affiliated organizations may, in the future, evolve toward a single body which could constitute a major central voice for the private sector in world standardization activities.

ISO and IEC are increasingly being looked to by some foreign governments and by NATO as a source for needed standards which have attained international consensus. NATO will look beyond ISO, where gaps exist, for regional or national standards which have achieved through widespread use the status of "de facto" international standards. In aerospace, many AIA and other U.S. standards fall into this category; however, metric standards being developed by AECMA (the Association of European Aerospace Industry Associations) are strong contenders.

In recognition of these developments, the Aerospace Industries Association in 1976 moved into an active leadership role in international standardization. On behalf of the U.S. member body (ANSI), AIA assumed the secre-

tariat of the key international committee for aerospace standardization, Technical Committee (TC) 20 of the International Organization for Standardization. Additionally, AIA established liaison with its European counterpart, AECMA, and has spearheaded initiatives to represent U.S. industry views in NATO standardization activities and the GATT negotiations.

As interest in standards grows on the international level, corresponding concern is growing domestically. In the past few years, standards have been the subject of more government attention than at any other time in the past. A number of initiatives to regulate standards—the proposed FTC rule,[1] OMB Circular A-119 on government participation in voluntary standards bodies,[2] the GATT Standards Code and its implementing legislation (the Trade Agreements Act of 1979),[3] and the pursuant involvement and activity by the Department of Commerce and the U.S. Trade Representative—are forcing fundamental changes in the way the United States handles its national and international standardization activities.

In sum, the five years since AIA assumed a leadership role in international aerospace standardization by taking over the secretariat of ISO/TC 20 has been a period of unprecedented change. The breadth and complexity of worldwide involvement in standardization activities are illustrated by Figure 1. As the pace and scope of international standardization development increase, so do the business implications for the U.S. aerospace industry in the world marketplace.

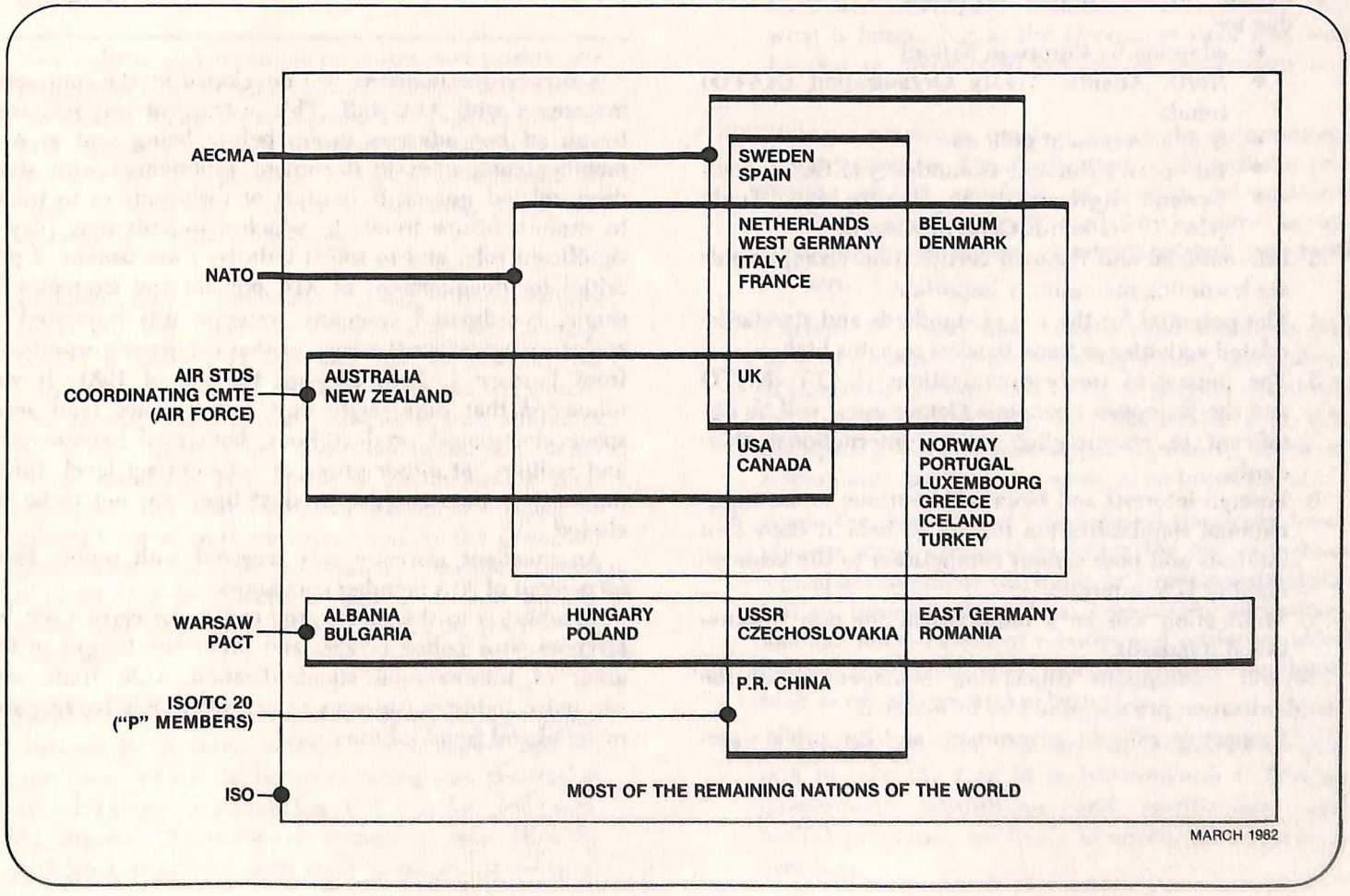
[1]Standards and Certification Proposed Trade Regulation Rule, Federal Trade Commission, *Federal Register*, December 7, 1978.

[2]Office of Management and Budget Circular A-119, Government Participation in the Development and Use of Voluntary Standards, *Federal Register*, January 21, 1980.

[3]See Appendix B.

FIGURE 1

MAJOR BLOCS IN INTERNATIONAL AEROSPACE STANDARDIZATION



STUDY OBJECTIVES

AIA commissioned this study of problems and opportunities in international standardization in order to (1) assess the current and potential impact of international standardization on the U.S. aerospace industry, and (2) provide a foundation for development of a sound industry strategy for the decade ahead.

At the outset, a number of hypotheses regarding international standardization trends were identified which, if valid, could affect the ability of the United States to do business in the world marketplace.

1. The output and pace of international standardization are increasing significantly.
2. The preference given to international standards, especially in government procurement, will increase due to:
   - adoption by European nations
   - North Atlantic Treaty Organization (NATO) trends
   - U.S. government policies
   - European Economic Community (EEC) policies
   - General Agreement on Tariffs and Trade (GATT) Standards Code provisions.
3. International and regional certification arrangements are becoming increasingly important.
4. The potential for the use of standards and standards-related activities as trade barriers remains high.
5. The impact of treaty organizations (GATT, NATO and the European Economic Community) will be significant in encouraging use of international standards.
6. Foreign interests and blocs will continue to use international standardization forums to benefit their own interests and pose serious competition to the achievement of U.S. interests.
7. Metrication will be a requirement for new international standards.

Several assumptions concerning management of the standardization process were also formulated.

1. Respective roles of government and the private sector in international standardization are undergoing redefinition.
2. Management of standardization in the U.S. requires a strong central focal point.
3. Costs of participating and maintaining a leadership role in international standardization will increase.

This study sought to assess the validity of these hypotheses, and their relative significance in the ongoing development of the international standardization process.

APPROACH

A survey questionnaire was developed by the contractor in concert with AIA staff. This instrument was reviewed by an ad hoc advisory group before being sent to AIA member companies to document experiences with standards-related non-tariff barriers or disincentives to trade, to explore future trends in which standards may play a significant role, and to solicit industry's assessment of priorities for development of AIA policies and strategies. A single, coordinated company response was requested of each respondent on the basis of that company's experience from January 1, 1975 through the fall of 1981. It was requested that data relate only to aerospace (and aerospace electronics) product lines, both civil (commercial) and military, at either prime or sub-contract level. Information on non-aerospace product lines was not to be included.

An excellent response was received with replies from 60 percent of AIA member companies.

In addition to the survey, the contractor carried out interviews with policy makers and other key figures in the areas of international standardization, U.S. trade and aerospace industry concerns to provide policy background material and trend information.

EXECUTIVE SUMMARY

FINDINGS

1. The international standardization trends posited were judged valid, although their impact on the aerospace industry was considered manageable for the foreseeable future. Negative impact experienced to date was identified by several companies in terms of inconvenience and increased costs, rather than as major barriers to sales. Sixty-two percent of company respondents had experienced some form of technical barriers to trade.

2. New policies and economic pressures have pushed the Department of Defense toward greater reliance on the private sector for standards. The existing body of MIL specs, which has dominated world aerospace procurement for decades, is likely to diminish in favor of voluntary standards, including those developed by international bodies.

3. Rationalization, standardization and interoperability (RSI) are key goals for NATO and, increasingly, NATO is looking to ISO and IEC as a source for standards which have attained international consensus. European competitors have their own strategies for market penetration and domination and often utilize standards as a means of implementing their strategies. Regional European standards created by AECMA for aircraft and space and by the European Committee for Electrotechnical Standardization (CENELEC) for electrical and electronic components, and bloc voting in ISO, IEC and NATO, are examples.

4. Joint ventures and foreign teaming arrangements, particularly in major defense procurements and acquisitions, appear to be accelerating and generating an advantage in enhancing U.S. market prospects. Appropriate international standards may alleviate problems associated with such ventures. At present, however, collaborative arrangements are not accelerating U.S. adoption of international standards, nor making use of European or regional standards a marketing necessity.

5. Regulation, testing and certification were judged by respondents to the AIA survey to be the most critical standards-related international issues. In the area of certification, the IECQ System, an international quality certification system for electronic components, went into operation January 1, 1982, with the United States and nineteen other countries participating. Organization of this system began in 1970 to counter exclusion of non-European products from the European market by the protectionist CENELEC system. It is expected that what is happening in the electronics field may well happen in mechanical equipment sub-systems and other areas.

6. Stronger aerospace involvement in the International Organization for Standardization (ISO) and the promotion of U.S. standards as de facto international standards are highly favored by industry as approaches to reducing standards-related non-tariff barriers.

7. Current U.S. and new international standards will co-exist successfully for years. Over time, international standards are expected either to play a neutral role or to facilitate the long-term marketability of U.S. aerospace products and services. A minority of survey respondents saw them currently as an impediment.

8. Given the slow pace of international standards development, there are areas in which the rate of technological development will make international standardization impractical, such as: electronics technology and the related areas of robotics and computer-aided design, spacecraft, and new materials technologies such as composites and adhesives.

9. At present, the U.S. industry has no market motivation to take the lead in metric conversion. Foreign government acquisitions and certification, and NATO programs, are likely to encourage conversion over time.

CONCLUSIONS

While the impact of international standardization is manageable for the foreseeable future, there is a potential for negative impact on U.S. worldwide marketing efforts. Projecting the trends, a look into the future suggests that international standards and certification will become increasingly important factors with respect to development, production, procurement and support of aerospace systems and equipment.

Over time, a gradual evolution toward international harmonization of requirements is anticipated, with marketplace factors such as performance and economy experiencing some competition from political concerns and "bloc" voting in determining which standards are adopted. U.S. military and industry specifications and standards, which have dominated world aerospace for decades, will have a "run for their money" in the future marketplace against regional, international and treaty organization standards.

Those U.S. industrial sectors that do not participate effectively in organizations and activities directed toward specifying and certifying products are apt to be at a disadvantage.

RECOMMENDATIONS

The findings of the study suggest a need for the U.S. aerospace industry, in order to avoid potential marketplace disadvantages, to re-examine its international standardization activities in the light of technological, political and marketing trends, and to work harder at influencing international standardization decisions. Within each trade association, professional society, or government institution concerned, there should be a willingness for change and compromise, as well as forcefulness in protecting U.S. interests. The industry must be alert to changing conditions and be prepared to combat that which is detrimental to the U.S. aerospace market position, accept that which is fair, and come forth with proposals acceptable to all concerned parties that will facilitate and enhance international trade.

To achieve these goals requires a strong national standards movement that effectively represents U.S. production, technology and know-how, with a strong and influential voice in international standardization and treaty organizations. Industry must develop a reasoned strategy and implementation plan for achieving clearly defined U.S. goals.

Specifically, the aerospace industry, as part of an overall U.S. industry effort, should:

1. Join with other industries to present a united U.S. front on technical matters affecting trade and technological development.
2. Promote adoption of U.S. standards and practices through all possible means, including "de facto" standardization.
3. Determine the appropriate degree of harmonization of U.S. requirements with international practice.
4. Develop a stronger presence in NATO, providing industry input to influence adoption of standards for NATO acquisitions.
5. Play a stronger role in the area of treaties, such as the General Agreement on Tariffs and Trade, to ensure that agreements negotiated are acceptable and implementation equitable.
6. Improve success level of U.S. technical and policy positions in IEC and ISO, particularly ISO/TC 20 and its working subcommittees.
7. Identify means of countering bloc voting by European consortia and overcoming regional strategies of competitors.
8. Periodically reassess pace and impact of metric conversion.
9. Seek improved lines of communication with relevant federal agencies such as the Department of Commerce and the U.S. Trade Representative, through participation in the Industry Sector Advisory Committees (ISACS).
10. Influence the U.S. government in determining its appropriate role in the private sector standards structure.
11. Continue to gather information on trends and directions in Japan and the rest of the world outside of Europe and North America.

Finally, and most essentially, the U.S. aerospace industry needs to overcome the fragmentation of its own standards community. The organizations concerned need to join in a cooperative approach to developing a cohesive U.S. strategy and speaking in international forums with a unified voice. AIA, as the spokesman for the U.S. aerospace industry, should seriously consider the contribution it could make in acting as a catalyst for needed change in this area.

FRAMEWORK: THE INTERNATIONAL MARKETPLACE

Historically, more than 80 percent of the world's commercial jet aircraft have been manufactured in the United States and we have become accustomed to seeing U.S. manufactured aircraft—large and small—win the major sales competitions around the world. Increasingly, however, foreign manufacturers are gaining stronger shares of the market for commercial transports, light and fixed-wing aircraft, and helicopters.

Since World War II, there has also been a strong market for U.S. military aircraft and there will continue to be. Yet, over the last 20 years, while the trend of all U.S. aircraft export sales has been steadily upward, military aircraft exports have not expanded significantly, remaining at a relatively constant level of total sales (an average 10 percent over the last 30 years). This has been due in large measure to the purchase of "home built" aircraft by European countries, and to U.S. government export restrictions. The 800 Panavia Tornadoes, 400 Alpha Jets and 400 Sepecat Jaguars on order or delivered indicate that indigeneous European competition is a reality, and there is no reason to believe this trend will not continue, given the advent of the proposed Eurofighter. Manufacturers in NATO nations are seeking an ever larger share of military production and this trend is, in fact, encouraged by current U.S. Department of Defense acquisition policies.

Clearly, foreign manufacturers are increasingly capable and competitive in both the commercial and military aircraft sectors, with a consequent impact on U.S. world market share. Commercial manufacturers, however, make an especially important contribution to the U.S. world market position as commercial aircraft, engine and related sales comprise more than 75 percent of total U.S. aircraft exports.

In 1980, when exports of manufactured goods accounted for 65 percent of total U.S. exports and generated a surplus of $1.6 billion, aerospace was the largest contributing manufacturing industry with a net trade surplus of almost $12 billion. Of this, $9.8 billion was due to commercial jet transport exports—one-third of which were parts, equipment and accessories. Preliminary AIA figures show the net aerospace trade balance rose during 1981 by nearly 16 percent to $13.9 billion. Again, the largest share—$11.4 billion—was attributable to foreign sales of commercial transports, engines, parts and accessories and other aerospace products.

The industry's contribution to the American economy assumes increasing importance as exports—particularly high-technology exports—play an ever greater role. Spokesmen from the Office of the United States Trade Representative testified before the Subcommittee on International Economic Policy and Trade, March 19, 1981, that "The export earnings of (U.S.) industrial products will have far greater importance in the American economy in the decade ahead than in the past decade."[1]

Success of Airbus

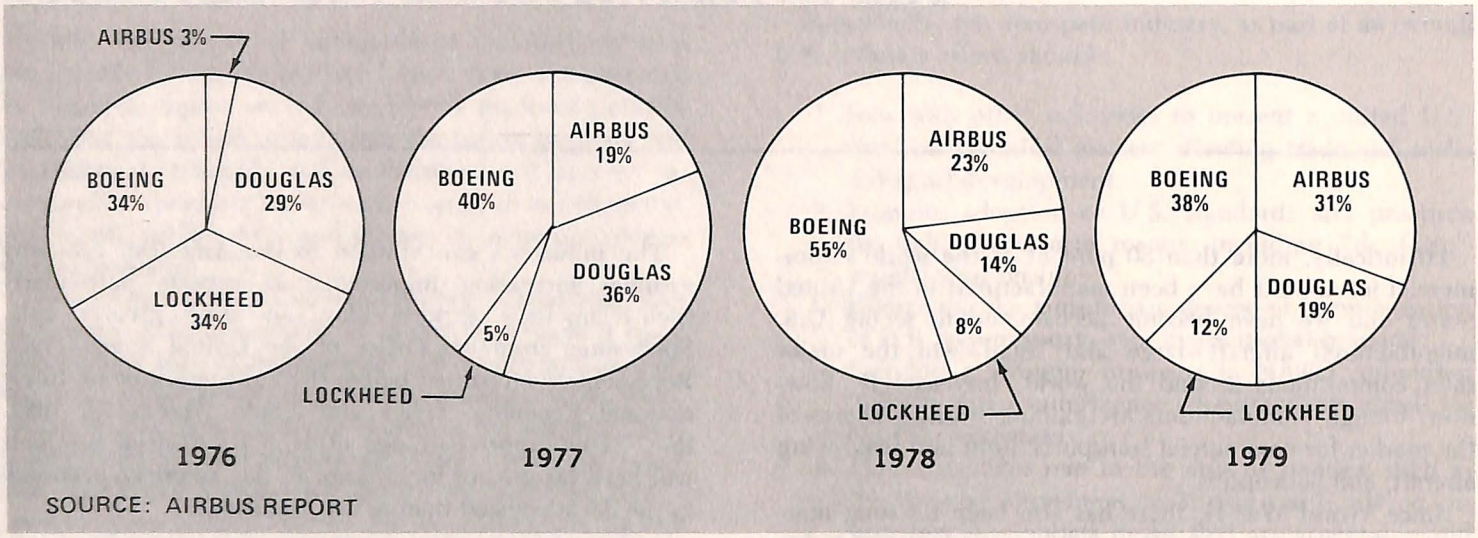
Against the impressive export figures of the U.S. industry, however, must be set the outstanding performance of the European consortium, Airbus Industrie. Europeans have led vast major technological developments in the jet era and, from 1954 through 1980, completed deliveries of 10 different jet transport models (a total of 1,100 aircraft versus 5,980 for U.S. manufacturers, but never more than 280 of one type. With the possible exception of the Caravelle, all of the programs preceding the Airbus were economic failures, largely paid for with government funds. The Airbus itself has not yet generated a profit; in fact, few commercial jet transport programs have done so. Nonetheless, the formation of the four-nation Airbus Industrie consortium gave the Europeans, for the first time, competitive aircraft—both the current A-300 model and the new A-310, a head-to-head competitor with Boeing's new generation 767. In 1976, Airbus captured just three percent of widebody orders but by 1979 its share of widebody signups had grown to 31 percent (Figure 2). The European consortium has continued to do well, generating a worldwide pattern of sales and developing prospects for future reorders—with a major impact on the world commercial transport market.

The success of Airbus is indicative of the fact that, in today's market environment, free competition is sometimes complicated by aggressive policies used by foreign govern-

[1]Testimony of Dr. W. Stephen Piper, Coordinator, Aerospace Trade Policy, Office of the U.S. Trade Representative, before the Subcommittee on International Economic Policy and Trade, Committee on Foreign Affairs, U.S. House of Representatives, March 19, 1981.

FIGURE 2

PERCENTAGE OF WIDE-BODY AIRCRAFT SIGNUPS OF MAJOR TRANSPORT MANUFACTURERS



SOURCE: AIRBUS REPORT

ments to support domestic programs for reasons of national pride or employment. "Best price, best product" are no longer the sole factors in aerospace sales. U.S. firms are at a disadvantage when they must compete against national governments which have such weapons as favorable export financing at their disposal, and are willing to use them.

The enormous costs—and risks—involved in aircraft programs today have led to a restructuring of the marketplace as, increasingly, in order to participate in the international defense market, U.S. firms must collaborate with foreign companies in joint co-development or co-production programs. On commercial programs, U.S. firms are also becoming involved in collaborative undertakings in order to gain market share and decrease financial risk. In fact, some 30 to 35 percent of the Airbus A-300 is of U.S. manufacturing content.

The global market for high-technology aerospace products in the years ahead is a large one and the competition at all levels will be keen. In this new and highly complex environment, there is a potential for standards and related technical requirements to play a dual role: as barriers to trade and as contributors to harmonization and commonality. Against this background of possibility and challenge, this study will look at the major trends in international standardization to identify and assess their potential impact on U.S. market strength.

ANALYSIS OF FINDINGS: STANDARDS AS NON-TARIFF TRADE BARRIERS

Standards in their various forms (including qualification, certification and testing requirements) have a high potential to act as barriers or disincentives to trade. Over half of the member companies responding to the AIA survey have already experienced some problems in this regard, and a much higher percentage think such occurrences possible in the future, especially for products involving licensing agreements or co-production arrangements.

Regulation, testing and certification were judged by survey respondents to be the most critical standards-related non-tariff barriers. Regional standards, and certain international standards, also pose potential dangers for creating obstacles to competition or pre-empting currently recognized U.S. standards. Mandatory imposition of metric requirements could have an appreciable impact. The degree of preference given to such requirements by foreign buyers (especially governments), by NATO, and possibly even the U.S. Department of Defense, will be the key factors in determining their degree of impact.

Experience by AIA member companies indicates that the areas of certification and testing requirements have presented problems with varying degrees of intensity. A repeatedly cited costly obstacle was the necessity for additional testing to meet certification requirements of different countries. For example, differences in certification requirements for transport aircraft autopilots between the United States, France, and England require significant efforts at compliance when installations are made in more than one country. Additional testing is imposed on U.S. suppliers to meet the United Kingdom's requirements for rocket motors and avionic subsystems. In the electronics field, IEC Standard Publication 348, "Safety Requirements for Electronic Measuring Apparatus," is widely applied in Europe but not in the United States. Difficulties have been experienced with Germany, France, Japan, Italy, Canada and the Netherlands in areas such as airframe and engines, wheel and brake hardware, fluid pumps, paint and markings, autopilots and radar.

Similar findings were reported by the 1980 Department of Commerce study, *Assistance to U.S. Exporters by Increased Foreign Acceptance of U.S. Test Results and Certification*. The purpose of the study was to determine which international and regional certification systems are most important for the trade interests of selected U.S. industries. Two of the industries surveyed, electrical equipment and electronic components, each identified Europe as the key problem area. Particular concerns related to European standards, test requirements, and regional certification programs. The Europeans' bloc voting strategy in international standardization forums such as IEC was also a concern.[1]

Certification Requirements as Trade Barriers

A highly visible example of the use of technical requirements for certification as trade barriers was the setting up a decade ago of the protectionist European certification system for electronic components founded by the European Committee for Electrotechnical Standardization (CENELEC). The aim of CENELEC was to exclude the United States and other competitors from access to a two billion dollar per year market. As a counterstroke, U.S. electronics companies active in the International Electrotechnical Commission (IEC) developed the concept of IECQ, the first truly worldwide voluntary certification system for electronic components, operating under IEC auspices. IECQ went into effect in January 1982, after ten years of organizational planning. The Electronic Industries Association (EIA) is the organizer of the program in the United States.

While it is too early to project the impact of IECQ, Peter Levin, one of the system's founders, told a seminar in Washington, D.C. on December 1, 1981, that he expects "IECQ will be around for a long time, its certification mark applied to an ever-growing proposition of world production of components." Levin commented further that "customers for components—that is, American and foreign equipment manufacturers—will necessarily be responsive to buyer requirements for their own products. When export customers for U.S. electronic equipment insist that their purchases contain certified components, those components will conform. At today's price levels, the components alone in that sub-sector of the export mar-

[1] *Assistance to U.S. Exporters by Increased Foreign Acceptance of U.S. Test Results and Certification*, Roger J. Amorasi Associates, Inc., Department of Commerce, July 9, 1980.

ket are worth $6 or $7 billion, not counting military sales. If the U.S. components industries cannot supply them, U.S. equipment producers will find foreign sources who can. When the Japanese exporters of commercial, industrial and consumer electronics to the United States start advertising their wares as more reliable because they contain certified components—and that marketing ploy has not escaped them—their surviving U.S. competitors will have to match the claim with similarly certified components.[2]

Regional Standards Development

Many European nations, with their centralized, quasi-governmental standards structures and strong need to export outside their limited domestic markets, have more clearly developed strategies than does the United States for utilizing standardization to support their industries. France, a cornerstone member of the AECMA European standards consortium, states that its national standards organization, AFNOR, "bears responsibility for one quarter of the world standardization work now in progress. Why? Like certain other countries, one can make use of national standards in order to resist penetration by foreign industries. One can also, in the long term, influence international standardization in order to support French industry throughout the world."[3]

Foreign consortia or regional groups such as CENELEC in the electrical/electronics area and AECMA in aerospace, are becoming more aggressive in developing standards to compete for acceptance with widely used U.S. industry and military standards. By developing new standards which favor their own industries, these regional blocs create a challenge to U.S. products and practices.

In NATO, the Europeans are pushing hard to replace currently used STANAGS (Standardization Agreements) based on U.S. MIL specs with international or European regional standards. NATO's policy is to favor internationally agreed upon standards for purposes of interoperability. Next in order of preference are regional standards. One example of the Europeans' success in NATO is the adoption of the AQAP 1 and 2 documents on quality assurance, over the objections of U.S. industry.[4] The fact that many of the regional or international standards proposed for NATO adoption will be in metric units is another disincentive to U.S. bidders.[5]

European competitors are also pushing hard in international standardization bodies such as ISO or IEC to see that standards favorable to their industries achieve international status. With seven members of the European aerospace industries association, AECMA, represented in ISO/TC 20 for Aircraft and Space Vehicles, they can "bloc vote" on technical matters for economic or political purposes. Such bloc votes are often at the expense of U.S. interests. CENELEC represents a similar bloc in the IEC.

Most of the AIA members surveyed in this study are not aware of any directed efforts on the part of foreign competitors to utilize standards to limit entry into their markets, but most see a potential for such manipulation to occur. A major U.S. airframer noted, "With the growing strength of the European aerospace consortium, European governments could impose standards as requirements which would favor indigenous airplanes and systems (A-300/310/320, etc.) to the disadvantage of competing U.S. systems."

Another respondent suggests an analogy: "The U.S. presently has air pollution requirements upon auto exhausts to which foreign auto makers must comply, sometimes to their disadvantage. It is easily possible that the situation, in reverse, could apply to U.S. aerospace products."

U.S. aircraft noise legislation, which will require modification or replacement of a significant portion of domestic and foreign fleets, illustrates the far-reaching impact of standards when they become mandatory as government regulation.

A less obvious type of barrier occurs when manufacturers from countries which are part of regional consortia have "inside and privileged" information about specification requirements in advance of U.S. competitors. An "inside" supplier also knows the unwritten intent, nuances and interpretation of the regionally developed standards, which permits early compliance and competitive advantage. This can be an especially significant problem to specialized U.S. component suppliers who may not have a strong, organized voice in standardization forums.

Foreign preference for metric dimensions is another potential problem area. The European Economic Community has established policies to require that all trade within its borders be in metric, although implementation is tied to rather flexible dates. International treaty organizations also have policies which favor metric; for example, the newly metric air-ground operational units publication of the International Civil Aviation Organization, ICAO Annex V, if strictly applied by some contracting states could conceivably affect engineering documentation on imports.

More than one U.S. equipment manufacturer has already experienced metric requirements which necessitated

[2]Levin, Peter, in *IECQ System Educational Seminars on Quality Certification for Electronic Components*, sponsored by Electronic Industries Association, December 1, 1981, Washington, D.C.

[3]*Standardization: A Liability or an Asset?* Association Francaise de Normalisation, Paris, France.

[4]Allied Quality Assurance Publications (AQAP) 1 and 2 are: *NATO Quality Control Systems Requirements for Industry* and *Guide for Evaluating a Contractor's Quality Control System for Compliance with AQAP-1*. The U.S. aerospace industry sees detrimental cost-driver features in AQAP-1, which is intended to replace MIL-Q-9858A, "Quality Assurance System."

[5]Recent U.S. legislative actions, including reapplication of the Buy America Act to specialty metals, may indicate a shift in the U.S. commitment to NATO RSI goals. Among the programs which could be affected are several U.S.-European joint ventures.

redesign of otherwise off-the-shelf items. Looking down the road, eighty-two percent of respondents projected that the mandatory imposition of metric requirements by European procurement agencies would have an impact, which 48 percent called "considerable" and 38 percent "measurable but manageable." Virtually all aerospace product lines would be affected: airframes, engines, missiles, avionics, hydraulics, flight operations and communications equipment, and standard parts. Identified as major problem areas were: Selection of standard parts, particularly fasteners and screw threads; qualification of parts; tolerancing; and logistics support (dual inventory). Actual design and engineering were not seen as problems, particularly if conversion was "soft" rather than "hard." Companies felt confident they could adapt if given adequate time to evolve a new product in metric or metric-inch hybrid; too sudden a changeover, or application of metric to existing products, would have major impact.

Using standards to favor "buy local" practices is, of course, a two-way street, as was recognized by the majority of respondents who said they would not favor waiving such U.S. imposed "barriers" as MIL specs, QPLs (Qualified Products Lists) and the like for foreign firms. A thoughtful comment from an electronics firm provided a rationale for the application of standards: "We do not see MIL specifications as non-tariff barriers. We see MIL specifications as easily communicated statements of required performance, configuration, and so forth. Waiving this would be an engineering impossibility. To change (them) to a different dimension system or language would be a minor problem."

The Standards and Certification Code of the GATT Agreement on Technical Barriers to Trade has been designed to reduce marketing inhibitants in the form of technical barriers such as standards or certification. More experience with the Code is necessary before a meaningful assessment of its usefulness can be made. It should be noted that the Code favors standards which have international status.

To date, the problems created by foreign or international standards or other requirements have not been experienced by U.S. aerospace companies as major barriers to sales. Most would agree with those who said that performance will prevail in most situations, and that other factors, such as offsets and financing, will have greater significance than standards selection. Few companies anticipate increased impact by international standards on their company's ability to do business in the next ten years. NATO procurement was most often cited as an affected area (52 percent).

The majority also see standards-related barriers declining through an increased trend toward harmonization of requirements. As one respondent noted, "The hopeful evolution is that the best of U.S. and international standards will be adopted over time, perhaps leading to single standards eventually."

Asked to project what factors might, if experienced, encourage increased application of international standards, most respondents cited government or NATO acquisition policies favoring international standards. Next most often cited were "increase in number and availability of international standards" and "development of a complete set of U.S. metric standards." Most feel such developments will be very gradual; however, as the increasing "internationalization" of the aerospace marketplace is expected to continue, these areas provide a focus for AIA management attention in the decade ahead.

STANDARDS AS CONTRIBUTORS TO TRANSNATIONAL HARMONIZATION AND INTEROPERABILITY

As competition in the international aerospace marketplace continues to accelerate, there is an increased use of creative efforts at market penetration. Industrial teaming and co-production arrangements ("joint ventures") between U.S. and foreign firms have increased markedly in the past few years. Teaming is further encouraged by the dramatically escalating costs of new product development, as well as by NATO procurement policies.

While international standardization is not perceived as a highly significant factor in market penetration, factors such as offsets, financing and performance having far greater impact, some companies see it as a possible plus in markets outside the United States or Europe. Such countries may find international standards, as they become more established, attractive as a way to specify requirements and procure products competitively throughout the world.

Within NATO, "interoperability" is a key goal in acquisition. The concept has gone beyond standardization at the systems level to focus on interfaces and interchange-

ability of equipment and parts. Commonality is also important to follow-up maintenance and support. A strong preference is being shown to standards which have achieved international or regional consensus.

The U.S. Department of Defense, in turn, is opening up competitions to foreign sources and encouraging multinational bids. DOD has cut back its direct participation in government-to-government offset arrangements, preferring to leave the initiative to industry to work out its own arrangements in what has been called a new era of international acquisitions.

As foreign partners in joint ventures play a more active role in product design and development, U.S. companies will encounter some movement away from commonly accepted U.S. practices and requirements. A significant number of companies responding to the AIA survey indicated they have already experienced some problem or inconvenience related to differing standards in their foreign teaming arrangements. The two most commonly cited problems were the necessity to translate standards (experienced by 92 percent) and the necessity to convert measurements (88 percent). Next in frequency were problems related to finding equivalent U.S./foreign standard parts. To date, such problems have been experienced on major missile systems, transport aircraft equipment, development of remotely piloted vehicles, weapons system racks, connectors and threaded parts. On a major four-nation missile program, the U.S. contractor had to procure DIN (LN) fasteners from German suppliers because U.S. firms were unable to provide adequate U.S. metric standard parts, necessitating significant redesign work.

While in most cases costs associated with problem areas related to standards were not of major significance, in others the costs—particularly of translation—exceeded those anticipated. For another major missile program, the cost of translation of documents exceeded $1 million.

Although joint ventures have entailed cumbersome administrative problems and potential technology transfer concerns, the majority of respondents see them as generating an advantage to their products' marketability. As the trend to co-production continues, international standardization can play a role in addressing and alleviating some of the problems encountered by aerospace firms thus far. International standardization can also play a positive role in addressing the commonality and interoperability needs of NATO.

Possible Problem Areas

Two problem areas, however, will affect the usefulness of international standardization in responding to these needs: The slow pace of international standards development, and the risk of technology transfer. If international standards are to play a useful role in the internationalized world of aerospace manufacturing, there is a need for an entire spectrum of standards—design and procurement, materials and parts, environmental and operational. Given the slow pace of international standards development—from five to seven years in ISO—there are many areas in which the rate of technological development will make international standards impractical. The major such area identified by survey respondents is electronic technology: microelectronics, large-scale and very large-scale integrated circuitry (LSI and VLSI), and some passive components, computers and software. Related areas such as robotics, computer-aided design and spacecraft were also named, as well as fast developing materials technologies such as composites and adhesives. The danger of mandatory adoption of ISO standards in such areas would be to discourage technological improvements. In these fast moving technologies above all, "the best to the market—first or highest quality—will be the de facto standard."

The majority of respondents saw no technology transfer problem in relation to international standardization. There were, however, some specific examples cited, possibly by company respondents who are more closely involved with standardization details. These responses documented technology transfer in areas such as U.S. aerospace fastener technology, control cables, and plane spherical bearings. It was noted that such areas are often proprietary to vendors, who will not willingly release such data without adequate compensation.

These comments highlight a resource of U.S. aerospace which cannot be overlooked: the infrastructure of specialized suppliers of parts, materials and services, from fasteners and bearings to alloys and actuators, who provide the support system for U.S. technical leadership in aerospace. Advanced system technology is often paced by the availability of advanced components. These suppliers constitute an essential resource for U.S. aerospace, and they—not the major systems manufacturers—will be the first to feel the immediate effects of changes in the standardization process.

The message here is the necessity for industry-wide coordination on standardization matters, with input and visibility on problems which may affect all segments of industry. Two-way communication must be maintained between those who implement standardization decisions, and those who are responsible for formulating U.S. technological and policy positions in international standardization forums.

INDUSTRY GOALS AND OBJECTIVES FOR THE 1980's

Results of the AIA study indicate that international standards are increasingly significant in the development of U.S. aerospace trading interests with foreign commercial and military customers and with NATO, and that their role is likely to expand. To date, the impact AIA member companies have experienced has been manageable; AIA members view as an asset their ability to adapt to what is economically necessary in response to marketplace requirements. This "can do" attitude is coupled with a strong resolve and calm assurance that the U.S. will maintain leadership in international standardization forums as well.

U.S. standards and practices are currently de facto standards throughout much of the world for aerospace. Survey responses indicate that the industry expects to see, in the years ahead, a gradual evolution towards harmonization of requirements internationally. Marketplace recognition of such qualities as performance and economy generally determines acceptance of a standard, and the United States is expected to continue its lead in these areas. There is, however, an awareness that strong new competitive factors, as well as political concerns and "bloc voting," will have an impact on the potential use of standards as barriers.

The U.S. aerospace industry needs to work to influence standardization decisions in the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), NATO and other organizations at both the policy and technical levels, in a manner commensurate with its position as world aerospace leader. The AIA study identified four broad objectives for industry in international standardization in the decade ahead.

1. Play an active leadership role in international standardization forums.

Effective participation in the ISO and IEC are favored as means of minimizing the possible erection of trade barriers and assuring adoption of standards favorable to U.S. technological achievements. The U.S. aerospace industry should work to improve its record of success in international standardization forums, to see that U.S. technical and policy positions are adopted, and U.S. standards and practices recognized through all possible means. Official recognition of existing U.S. standards as de facto international standards is one key approach.

Survey respondents suggested keeping international standards broad so that they will not inhibit technological advancement. International standardization efforts should concentrate on interfaces and performance requirements; the preparation of product standards at the international level should be discouraged.

The U.S. aerospace industry needs to develop means of countering bloc voting by European consortia and overcoming regional strategies of competitors. Where national or regional political and economic concerns come into play, the U.S. may find itself at a numerical disadvantage in decision making.

The importance of providing both expertise and continuity in U.S. representation to ISO and other international forums was recognized as essential. In the face of well organized and partially government funded delegations from other nations, U.S. interests can only be maintained if adequate industry resources are applied in a consistent manner.

Equally critical is the need to assure that all proposed international standards are provided visibility and coordinated through AIA companies and broadly throughout all segments of industry. The importance of assuring that the U.S. industry speaks with one voice on international standardization matters is discussed more fully in objective number 4.

2. Posture U.S. industry to respond to changing requirements.

Over time, industry expects to see a movement toward international standards, with harmonized U.S. requirements reflected in the DAR (Defense Acquisition Regulation) and MIL specifications. The timeframe for this movement is indefinite; for at least the next decade a transitional environment is anticipated in which U.S. and international standards will co-exist.

U.S. standards activities should be paced to meet market needs, as well as to insure compatibility with international standards. While survey respondents suggested

promoting those international standards acceptable to the United States as a means of eliminating trade barriers and avoiding proliferation, most stressed the need to go slowly in implementing international standards until the competitive impact is understood. One respondent stated, "Care must be exercised to assure that technological problems and cost risks are not introduced into the design, fabrication and use of aerospace products through a premature acceptance of international standards." Similarly, in the area of metrication, timing is important to avoid prematurely developing U.S. metric standards and parts which may not agree with subsequent international standards. The pace and impact of metric conversion should be monitored and reassessed periodically.

In the area of certification and qualification, industry needs to look ahead to a system for testing and qualifying components and materials to international standards.

Determination of the appropriate degree of harmonization of U.S. requirements with international standards will be an on-going task. While anticipating gradual movement towards harmonization, industry is content to let it occur as an "evolutionary melding" of requirements based on the "marketplace test" of performance and economics. U.S. aerospace can stay ahead of the curve by maintaining a leadership role in decision making forums, as well as by continuously gathering information on and assessing the impact of international standardization trends and directions in Europe, Japan and the rest of the world.

3. **Maintain effective coordination with Government.**
Industry needs to play a stronger role in the area of treaty organizations, such as the General Agreement on Tariffs and Trade (GATT), North Atlantic Treaty Organization (NATO), and the International Civil Aviation Organization (ICAO) to ensure that agreements are concluded in a manner favorable to U.S. interests and that implementation is equitable.

Industry should work to influence the Government in its efforts to determine its appropriate role in the private sector standards structure. The appropriate role of the U.S. Government was identified by the AIA study as representation in treaty organizations and coordination. Leadership in standards activities should remain with the private sector, and the voluntary nature of U.S. standardization should be maintained.

The aerospace industry especially needs to develop a stronger presence in NATO, particularly with regard to adoption of standards for NATO acquisitions. In the case of NATO, government coordination with and understanding of U.S. industry's needs and interests was termed "seriously deficient" in some instances. Government representation should be accomplished in close partnership with the private sector, which houses the wealth of technical expertise and whose "ox is first to be gored" in the competition of the international marketplace.

The clearest request that industry has of the United States Trade Representative (USTR) and the Department of Commerce (DOC) is that they keep open the lines of communication, eliciting insight and advice from all segments of the industry and providing early warning of directives or regulations which can affect U.S. interests. One means of achieving this is through meaningful use of the Industry Sector Advisory Committees (ISACs); AIA participation should be focused on the ISACs on Aircraft and on Standards. The government can then enter into negotiations with strong U.S. positions which reflect current industrial practice. Its aims should be to:

- Promote U.S. standards and technology
- Reduce non-tariff trade barriers and subsidization of foreign manufacturers by their governments
- Eliminate unequal reciprocal certification agreements
- Utilize GATT code and follow up quickly on reports of trade discrimination
- Favor international standards over regional
- In general, support U.S. and international standardization efforts; use the U.S. dominance in aerospace technology and its body of proven standards to enhance the U.S. position

More government involvement with private sector standards organizations such as ISO and IEC was also deemed necessary. Foreign governments have considerable involvement in standardization activities in their countries, and maintain authoritative representation on ISO and IEC delegations. As one respondent noted, "Whereas foreign governments have considerable control over international standardization activities in their countries, the United States, with the best asset—aerospace experience and a good body of proven standards—has played a minor role." It was noted, however, that "standards, aside from certifying regulations, should continue to be handled by the private sector."

4. **Develop a cohesive U.S. aerospace standardization strategy and plan.**
These should facilitate evaluation of needs and priorities and assessment of the impact of changed/new standards, and enable the United States to capitalize on its technology and experience. Such a plan must draw input and active support from all segments of the industry, to overcome the fragmentation inherent in U.S. standards development.

Any comprehensive attempt by the private sector to put its own house in order must deal with the multiplicity of interests involved in standardization in the United States. The number of groups involved in aerospace standardization alone has been indicated in the section entitled Background (Appendix A). No single body, whether in government or the private sector, provides a focal point for all concerned interests. In any discussion of standardization and trade, it is equally important to understand the various levels of interest that are involved. These might be

conceptualized in a pyramidal relationship (Figure 3), with policy makers—in government or in the companies—at the top, and the specialized engineering and scientific expertise at the base, with a coordinating and facilitating administrative infrastructure tying them together.

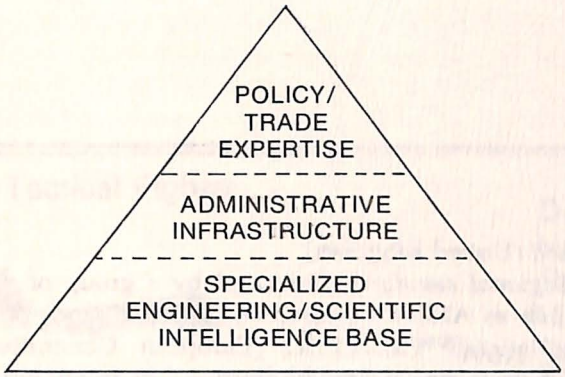


FIGURE 3

CONCEPTUALIZATION OF STANDARDIZATION INTEREST GROUPS

Differences in objectives, point of view and methodology among these levels, and resultant lack of communication and understanding, can result in failure of standardization activities to support industry goals. Those at the top of the pyramid may have little interest in the detailed technical aspects of standardization, while those at the bottom often lack the broad view required to time individual standards actions into a cohesive policy or strategy.

This conceptual pyramid is indicative of the overall state of affairs of U.S. involvement in international standards activities, including both government and private bodies, and also tends to describe relationships which exist within organizations involved. The problem it illustrates should be a primary concern for the Aerospace Industries Association in assuring a leadership role for U.S. aerospace in international standardization.

AIA is in the unique position of having available the expertise of the industry, as well as possessing an overview of its needs and concerns. It is in a position to ensure that questions raised at the apex of the pyramid—the policy development level—are addressed throughout the entire information structure of the pyramid. It has the potential to coordinate its members' participation in international standardization with that of other involved private sector and government bodies, and to assure the achievement of U.S. influence and interests in international standardization activities. How AIA addresses this need will be one of the major challenges for the decade ahead.

Without trespassing on independent institutional concerns, AIA companies could act as the catalyst in assuring that the U.S. industry speaks with a strong, unified voice. By extension, U.S. aerospace should, as part of an overall U.S. effort, join with other industries to present a united front on technical matters affecting trade and technical development.

APPENDIX A—BACKGROUND

CLASSIFICATIONS OF STANDARDS

In aerospace, there is little differentiation between the terms standard and specification. Strictly speaking, though, a specification is the technical description of requisite characteristics and the means for verifying conformance. A standard is a rational selection of preferred, applicable specifications.

Standards may also be classified in the following manner according to how they are applied:

- *Voluntary*—Industry or national standards which are developed for voluntary use and to which conformance is not mandated by contract or by government regulation. Example: standards written by industry for products it uses, such as preferred thickness of sheet metal.
- *Contractual*—Any standards, either governmental or industry, which are written into procurement contracts and therefore become mandatory for that transaction. Example: military specifications which are called out in weapons systems on industry contracts.
- *Regulatory*—Standards which are developed or adopted by governmental regulatory agencies and imposed on industry as mandatory regulations. Example: FAA airworthiness standards.

Note: Many aerospace standards which are written as voluntary standards become mandatory by incorporation in contracts or in government regulations.

LEVELS OF STANDARDIZATION

Generally speaking, there are three levels of standards development: national, regional and international. As used in this report, the terms may be defined as follows:

- *National standards*—Standards accepted at the level of a single nation, whether by government mandate or by widespread voluntary recognition and application. U.S. national standards for aerospace include DOD specifications and standards, as well as those of voluntary groups such as AIA's National Aerospace Standards Committee (NAS's), Society of Automotive Engineers (AMS's, AS's), ASTM, ANSI and others. In the rest of the world, national standards are issued by a centralized, government supported body such as DIN (Germany), AFNOR (France) or BSI (United Kingdom).
- *Regional standards*—Prepared by a group of nations such as AECMA (European aerospace industries associations), CENELEC (European Committee for Electrotechnical Standardization), or treaty organizations such as NATO.
- *International standards*—Issued by an international voluntary organization (ISO, IEC) or treaty organization (ICAO). In addition, certain widely used national standards are recognized as *de facto* international standards. For example, a number of ASTM and ASME-developed standards have attained this status. For aerospace, many U.S. standards, such as MIL specs, NAS's, and SAE documents, are *de facto* international standards.

BENEFITS OF STANDARDIZATION

Using standards results in diverse benefits throughout the aerospace community. Some of these are:

- *Improved communication*—Since standards precisely define requirements, they improve communication among designers, engineers, manufacturing personnel, sellers and buyers.
- *Assured quality*—Standards allow quality control to be based on accepted and explicit specifications and standard test procedures.
- *Increased safety*—Standards for warning signs, labels, colors and symbols help prevent accidents by making hazardous situations easily recognizable. Further, any standard which improves quality or communication, thereby contributes to safety.
- *Interchangeability and interoperability*—Using standard parts ensures that replacements will be identical in form, fit and function. Internationally standardized servicing connections and compatible systems permit easy servicing and maintenance at airports around the world.
- *Preservation and promotion of technology*—The available library of aerospace standards contains the experience and ingenuity inherent to proven parts and practices. Proven technology may be transferred within a company to new projects and new employees, and from the company to subcontractors.

FIGURE 4

USE OF STANDARDS IN TYPICAL AEROSPACE PRODUCTS

		Number of Different Specifications & Standards*	%	Estimated Total Number of Applications	%
Tactical Fighter					
	DoD	1,100	55	48,000	32
	NAS	200	10	36,000	25
	SAE	50	2.5	100	
	ASTM	10	0.5	15	
	**Non Standards	600	30	62,000	42
		1,960		146,115	
Wide Body Airliner					
	DoD	419	20	10,000	6.4
	NAS	122	6	50,000	32
	SAE	86	4	320	2
	ASTM	120	6	1,000	0.6
	Miscellaneous Stds	376	18	9,500	6
	**Non Standards	956	46	85,000	53
		2,079		155,820	
Maritime Patrol Plane					
	DoD	713	34.5	35,000	28
	NAS	192	9	20,000	16
	SAE	55	2.5	400	0.3
	ASTM	90	4	900	0.7
	Miscellaneous Stds	285	13.5	1,600	1.3
	**Non Standards	767	36.5	66,000	53.7
		2,102		123,900	
Commercial Jet Engine					
	DoD	107	17	8,061	34
	SAE	32	5	1,224	5
	ASTM	2		2	
	Miscellaneous Stds	297	48	5,156	21
	***Non Standards	186	30	9,750	40
		624		24,193	

* Airframe only — does not include engines, avionics, or ground support equipment.

** Includes parts, materials and processes for which standards have not been prepared by a recognized standardization organization as well as items uniquely designed for that aircraft.

*** As above except does not include items uniquely designed for the engine.

- *Fairer trade*—International and national standards put all suppliers on a fair competitive basis, thereby stimulating competition.
- *Improved economy*—Time and money are saved at many stages of work because design, procurement and parts stocking are improved and simplified. Often large numbers of slightly different types of parts can be reduced to a few standard parts to meet all needs.
- *More efficient production*—Standards result in more routine activity and familiarity in fabrication and assembly. Economy is realized through special purpose machines for standard processes using standard parts.

THE AEROSPACE STANDARDS DEVELOPING STRUCTURE

The aerospace industry has always made extensive use of standards in aircraft and equipment designed for the civil and military markets. This fact is illustrated in Figure 4; data is for representative aerospace products currently in production. The first column indicates the number of documents defining basic design elements and components, most of which are standards for parts, materials and processes. Each standard may be utilized many times on the various detail drawings and other documentation to specify particular alloys, their heat treatment, types and sizes of fasteners, and so forth. The second column lists estimates of the total number of these applications. It is noteworthy that more than half of the documents used in a wide variety of aerospace products are standards. This characteristic can also be found in aerospace equipment and avionics.

Aerospace standards development has become an exacting and time-consuming process, demanding a combination of technological expertise and skillful management. If standards are to be useful, they must be acceptable to the interests involved. Standards are not theoretical documents; they must be based on what is technologically and practically feasible. The challenge of standardization is to develop standards of the highest quality, realizable and acceptable to the broadest spectrum of users.

The structure that has evolved for generating and propagating aerospace standards is decentralized and complex. There is no single official source for aerospace standards and diverse organizations from both the private and government sectors of the aerospace community interact in various ways. The reason for this complexity is that the structure has developed within the freedom of the U.S. voluntary standardization system. This freedom has allowed it to grow and evolve to meet the needs of the industry and its customers. Traditional spheres of influence, technological expertise and authority overlap and complement one another.

Further, the scope of aerospace standardization ranges from the individual company level to industry-wide, from the national to the international level, from voluntary to regulatory. At the company level, standards engineering departments develop standards to suit particular company needs. Through representation in organizations such as the Aerospace Industries Association, the Society of Automotive Engineers, and American National Standards Institute and others, common industry standardization needs are identified and resolved. These groups are the principal sources of U.S. aerospace standards. A complementary effort at the national level is carried on by the customers of the aerospace industry: primarily, the Department of Defense, and, to a lesser degree, the National Aeronautics and Space Administration and the airlines.

At the international level, representatives of nations with developed aerospace industries meet within ISO, the International Organization for Standardization, to establish world-wide aerospace standards. The ISO committee for aerospace standardization is Technical Committee (TC) 20, Aircraft and Space Vehicles. The American National Standards Institute (ANSI), the official U.S. member body of ISO, has delegated management responsibility for international aerospace standardization to AIA, as international secretariat for ISO/TC 20.

A FOCAL POINT FOR STANDARDIZATION MANAGEMENT: THE AEROSPACE INDUSTRIES ASSOCIATION

As the organization most representative of the U.S. aerospace industry and having the greatest involvement in a successful standardization program, The Aerospace Industries Association (AIA), provides a focal point for aerospace standardization management in the United States. AIA is the national trade association representing the principal corporations involved in the research, development, and manufacture of aircraft, space vehicles, missiles and related equipment. One of the many functions of the association is providing the industry and its customers with a forum for establishing a consensus on standardization and standardization management issues.

This is accomplished through a committee structure with membership drawn from industry technical experts, with liaison representation from various government departments and agencies, other users including the airlines, and other trade associations. The AIA technical committees are a mechanism for developing industry-wide standards and for coordinating the overall aerospace standardization effort.

The highly respected and widely used National Aerospace Standards (NAS's) are developed under the auspices of AIA's National Aerospace Standards Committee. More than 2,600 of these standards have been developed to date. The NASC is discussed in detail later in this section. Other AIA committees, such as Materials and Structures, Electronic Systems, and Manufacturing, also formulate NAS Standards.

AIA interfaces in some way, either formally or informally, with all the developers of aerospace standards, both

government and private. The major points of interface are summarized below:

- Various AIA technical committees review proposed military standards and specifications affecting aerospace and feed back comments to the preparing agencies. These documents are naturally of concern to the aerospace industry which, as a major contractor of the military, must comply with them. When possible, AIA participates in the formulation of military policy on standards and specifications.
- AIA technical committees, such as the Rotorcraft and Transport Airworthiness Requirements Committees and the Aircraft Noise Control Committee, participate in the Federal Aviation Administration (FAA) rulemaking process, prepare industry positions and recommend changes to government airworthiness and noise standards.
- A number of associations and professional societies having expertise in particular technical areas develop standards to fulfill aerospace industry needs. For example, the Electronic Industries Association (EIA) develops electronic component standards, and the Society of Automotive Engineers (SAE) is a major developer of standards for aerospace materials and other commodities. Engineers from AIA member companies participate in many of these organizations' committees, and close liaisons are maintained with AIA committees to prevent duplication of effort.
- AIA member companies are influential participants in ISO/TC 20 through the U.S. Technical Advisory Group. AIA operates the international secretariat which manages TC 20 activities. The AIA International Standardization Advisory Group (ISAG) supports the Technical Specifications Division in maintaining an effective AIA role in TC 20 and in providing guidance to AIA staff in its role as Secretariat.
- AIA also provides the secretariat for the Aerospace Sector Committee (ASC) of the American National Metric Council, the forum for aerospace industry metric planning and coordination. One of the tasks performed by the ASC is maintaining a national log tracking the development of metric standards for aerospace.

MAJOR AEROSPACE STANDARDS DEVELOPERS

The major groups which contribute to the overall aerospace standardization effort are discussed below.

U.S. GOVERNMENT

Department of Defense (DOD)

The Department of Defense has authored a voluminous collection of military specifications and standards, many of which are applicable to aerospace. These standards are an essential part of DOD's procurement process, allowing DOD to specify exactly what it expects from its contractors and, therefore, expend the taxpayer's money more efficiently in the acquisition of new weapons systems. Compliance with military standards becomes mandatory for industry when they are written into procurement contracts. Industry also uses DOD standards for many of its civil projects.

As early as 1919, a Working Committee for Standardization was established by the Army-Navy Aeronautical Board. Today, the Defense Standardization Program requires "the achievement of the highest practicable degree in the standardization of items and practices applicable thereto used throughout the Department of Defense." More than 40,000 standards and specifications are listed in the DODISS, the department's index of standardization documents. About 10,000 of these can be applied in aerospace products and about 5,000 of these are used on a regular basis.

Both the DOD, as a customer, and the aerospace industry, as a supplier whose military contracts account for nearly half its total sales volume, are keenly aware of the need for close cooperation in aerospace standards development. Recently, there has been a move toward increased use of industry standards by the military. A 1976 DOD directive places emphasis on DOD participation in the development of standards and specifications by non-government bodies, and prescribes increased use of existing non-government documents in lieu of the development of a new document by the military. Military liaison representatives have long participated in the AIA's National Aerospace Standards Committee and the DODISS currently lists more than 2,000 industry standards as approved for military use.

Federal Aviation Administration (FAA)

The FAA is responsible for the "regulation of air commerce to promote its development and safety, and the operation of the air traffic control system in a manner consistent with those objectives." The FAA implements its regulatory function by promulgating the Federal Aviation Regulations (FAR's) which carry the force of law and are binding on all U.S. aviation activities. FAA's rulemaking is open to broad public participation, and is directed at enhancing the safety and efficiency of flight, protecting the users of the aerospace system, and assuring the airworthiness of the aircraft.

FARS are published in 64 separate PARTS (Code of Federal Regulations, Title 14). Included are certification procedures (Part 21), airworthiness standards for general aviation airplanes (Part 23), transport category airplanes (Part 25), normal and transport category rotorcraft (Parts 27 & 29), aircraft engines (Part 33), and noise standards (Part 36). These Parts prescribe minimum requirements for issuance of a type certificate and include rules covering flight performance, structural loads evaluation, design and construction, powerplants, equipment and operating limitations.

Part 21 of the Federal Aviation Regulations covers Technical Standard Orders (TSO) which set forth in detail minimum performance and quality control standards for materials, parts, and other components used on civil aircraft. A manufacturer producing an item subject to a TSO must comply with its requirements and establish to the satisfaction of the FAA inspectors who oversee the operation that his quality control system is functioning properly and can be relied on to continue to produce the item in strict conformance with the standards prescribed in the TSO. No manufacturer may identify an item with a TSO marking unless he holds a TSO authorization and the item meets applicable TSO standards. There are approximately one hundred approved TSO's covering such items as instruments and indicators of all types, emergency equipment, communications and navigation equipment; cargo containers, aircraft seats, wheels, tires and brakes.

Department of Commerce (DOC)

Under the Trade Agreements Act of 1979, DOC is given a number of responsibilities relating to international standardization, including ensuring adequate representation of U.S. interests in international standardization; making grants to aid the U.S. effort in international standardization and trade; setting up a technical office to implement Title IV of the Act (Technical Barriers to Trade); and establishing a central national collection facility for information on national and international standards-related activities.

This national library collection is a function of the National Bureau of Standards. The Standards Information Service (SIS) provides up-to-date information on published standards and standardization activities. During 1980, SIS responded to 7,750 inquiries from U.S. and foreign-governmental, business and industrial sources. The SIS is designated as the U.S. inquiry point required by a signatory to the Multilateral Trade Negotiation's (MTN) Agreement on Technical Barriers to Trade. SIS is responsible for notifying the General Agreement on Tariffs and Trade (GATT) Secretariat of proposed federal agency standards-related activities that may affect imports to the United States. The GATT secretariat sends such notification to all MTN signatory countries.

In October 1980, DOC held a first-of-its-kind conference on international standardization to address the need for a more adequate U.S. national standards structure to make the U.S. presence felt in international standardization.[1] A major theme of that session was an attempt to clarify the appropriate respective roles of government and the private sector in such a structure.

The implication of DOC's activities is that both national and international standards activities are becoming increasingly subject to regulation and government may seek to move into a leadership role in standards policy and management.

[1]Proceedings of the Department of Commerce Conference on International Standardization, October 1980.

U.S. VOLUNTARY STANDARDS ORGANIZATIONS

AIA National Aerospace Standards Committee (NASC)

Since 1938, the AIA's National Aerospace Standards Committee has been developing standards for items designed into aerospace products and used in their fabrication. To date, more than 2,600 National Aerospace Standards (NAS's) have been published, constituting the third largest body of U.S. voluntary standards.

The quality of NAS's is recognized throughout the world. Design agencies of every major country that produces aircraft are subscribers to the library of National Aerospace Standards. In addition to being de facto international standards, many have been given international status by being invoked in standards promulgated by the International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), and NATO.

These NAS's define design features and performance requirements of a wide variety of component parts that are essential elements of countless high technology systems. These parts range from precision, high-strength fasteners to hermetic electrical connectors; from aircraft control rods to high pressure hydraulic components. A small number set standards for high technology manufacturing equipment such as numerically controlled milling machines and electron beam welders. The NAS's are procurement documents in contrast to many other standards which define particular characteristics (alloy constituants, test methods, and so forth), but not the specific finished product used to fabricate or maintain equipment. Nearly 600 NAS's have been given a status equivalent to Military Specifications (MIL specs) and Standards (MIL-STDs) through listing in the DODISS.

The requirements for a new standard are determined by users; in addition to the aerospace manufacturers they include the three Armed Services, the Defense Logistics Agency, NASA, FAA, AIA Canada, and the airlines through their Air Transport Association. The aerospace standardization due process procedures are fully observed and widely known throughout the industry. While standards are developed from the user viewpoint, coordination is accomplished with all materially affected interests.

Integrity and configuration control are maintained by strict compliance with MIL-STD-480 and MIL-STD-483. The NAS's are reviewed on a five-year cycle for timeliness and appropriate application of available technology.

SAE

SAE, formerly known as the Society of Automotive Engineers, is a professional society of engineers and scientists, whose aim is to develop the arts, sciences, standards and

engineering practices of the automotive industry; automotive is used in the sense of self-propelled vehicles, whether for land, sea, air, or space. The formal beginning of aerospace standardization is considered to be 1917, the year when the Society of Aeronautical Engineers merged with the Society of Automotive Engineers, the present SAE. The earliest SAE aeronautical standards are written for aircraft nuts and bolts and control wheel movements.

The SAE provides a forum where interested segments of government and industry can join together in a cooperative spirit to discuss technical problems. An important distinction between SAE and AIA where regulatory, procurement and contractual standards issues are concerned is that AIA represents the combined viewpoint of the aerospace manufacturing industry, whereas the SAE represents the viewpoints of individual scientists and engineers.

Traditionally, SAE standards have covered the area of aircraft materials, engines, propellers and accessories, whereas AIA standards principally have covered the airframe, structural fasteners, and mechanical and electrical hardware. SAE's program has developed the well-known and widely accepted series of aerospace standards: AMS's, AS's, ARP's, and AIR's. There are 1,900 standards for aerospace materials and over 1,000 for other aerospace items.

The U.S. Technical Advisory Group (TAG) for TC 20 formulates U.S. proposals for international aerospace standards and develops the U.S. position on international standards questions. The SAE plays an important role in international standardization by administering this group.

American National Standards Institute (ANSI)

ANSI comes closest to being the official U.S. national standardization body for all areas of technology. Founded in 1918, ANSI is a federation of manufacturers, consumer organizations, national trade associations and professional societies, which coordinates the overall voluntary standardization efforts of the United States. ANSI's primary concern is maintaining the well-being of the voluntary standards system, through certification of standards-developing processes of other organizations, identification of the need for standards projects, and circulation of standards prepared by others to determine if they meet the requirements for approval as American National Standards. This ANSI-approved series of standards covers many technological areas, some of which are applicable to aerospace, such as basic dimensions of metal bars and sheets, drafting practices, surface finish standards and material standards.

ANSI is the official U.S. member of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Administrative responsibility for activities in specific technical areas is sometimes delegated by ANSI to specialized organizations in those fields, such as AIA and SAE in the case of ISO/TC 20.

OTHER CONTRIBUTORS

Among other organizations which contribute to the growing body of U.S. national standards applicable to aerospace are the following:

Electronic Industries Association (EIA)

Aerospace systems rely heavily on electronics and often call for unique environmental and performance requirements. EIA has written 450 standards covering a broad range of electronic equipment and components. This trade association represents mainly manufacturers, as opposed to users, of electronics. In certain mutual areas of interest, EIA and AIA jointly review government standards and submit a coordinated response to preparing agencies.

Air Transport Association (ATA)

ATA represents the nation's airlines, and has published several standards used by the commercial airlines. ATA standards are concerned with such areas as the preparation of aircraft and associated grouped equipment manuals for the use of airline operators, packaging, procurement, and requirements for standard fasteners. ATA has joined with IATA, its international equivalent, in publishing a manual on standard methods for interline aircraft communications. Aeronautical Radio, Inc. (ARINC) which works under the guidance and advice of ATA, develops standards for performance, case size and wiring of radio communications/navigation equipment and other onboard electronics.

Radio Technical Commission for Aeronautics (RTCA)

The membership of RTCA is comprised of industry and government organizations identified with aviation electronics and telecommunications. Sixty RTCA standards have been published dealing with minimum operational characteristics and minimum performance standards of avionics, providing guidance to manufacturers, installers, users, operators and regulatory agencies. A major RTCA publication used world-wide, DO-160A Environmental Conditions and Test Procedures for Airborne Equipment has been recognized as a de facto international standard under the designation ISO 7137.

American Society for Testing and Materials (ASTM)

ASTM is the largest developer of voluntary consensus standards in the United States with some 6,600 standards available for use. About 300 of these are regularly used in aerospace, most of which are test procedures. ASTM and ANSI are the only two organizations in the United States concerned exclusively with the preparation of standards.

INTERNATIONAL, REGIONAL & FOREIGN STANDARDS ORGANIZATIONS

The International Organization for Standardization (ISO)

ISO is one of the two major international standards developing organizations. Its membership includes 88 countries, with nearly every industrialized nation of the world participating. ISO's goal is "to promote the development of standards in the world with a view to facilitating international exchange of goods and services and to developing cooperation in the sphere of intellectual, scientific, technological and economic activity." Member countries participate through technical committees which cover virtually every area and aspect of technology and have published over 4,300 international standards to date. The significant growth in the pace and output of ISO standardization is illustrated in Figure 5.

Of the 163 ISO technical committees, TC 20 for Aircraft and Space Vehicles is the principal committee developing standards applicable to aerospace. TC 20 is one of the most productive ISO committees, with nearly one hundred published standards active and some three hundred projects in draft form.

TC 20 emphasis to date has been on developing standards to ensure that aircraft may be safely and easily operated and serviced around the world. Standards have been published for interfaces and connections, for cargo containers, operating conditions and tests for equipment, for vocabularies, and design parameters for hardware.

Membership is ISO is officially held by the national standardization body of each member country. For the United States, this is ANSI.

The overall management of the activities of TC 20 is handled by the TC Secretariat, which from 1947 until 1976 was held by the United Kingdom. In 1976, the Secretariat was transferred to the United States and was assumed by AIA on behalf of ANSI. The U.S. technical advisory groups to TC 20 and its subcommittees are administered by SAE. An organizational chart of ISO/TC 20 is included as Figure 6.

The International Electrotechnical Commission (IEC)

One of the few fields where ISO is generally not active is electrical and electronic technology. Most standardization work in this area is handled by the IEC, which is administratively and financially autonomous but maintains

FIGURE 5

NUMBER OF ISO STANDARDS

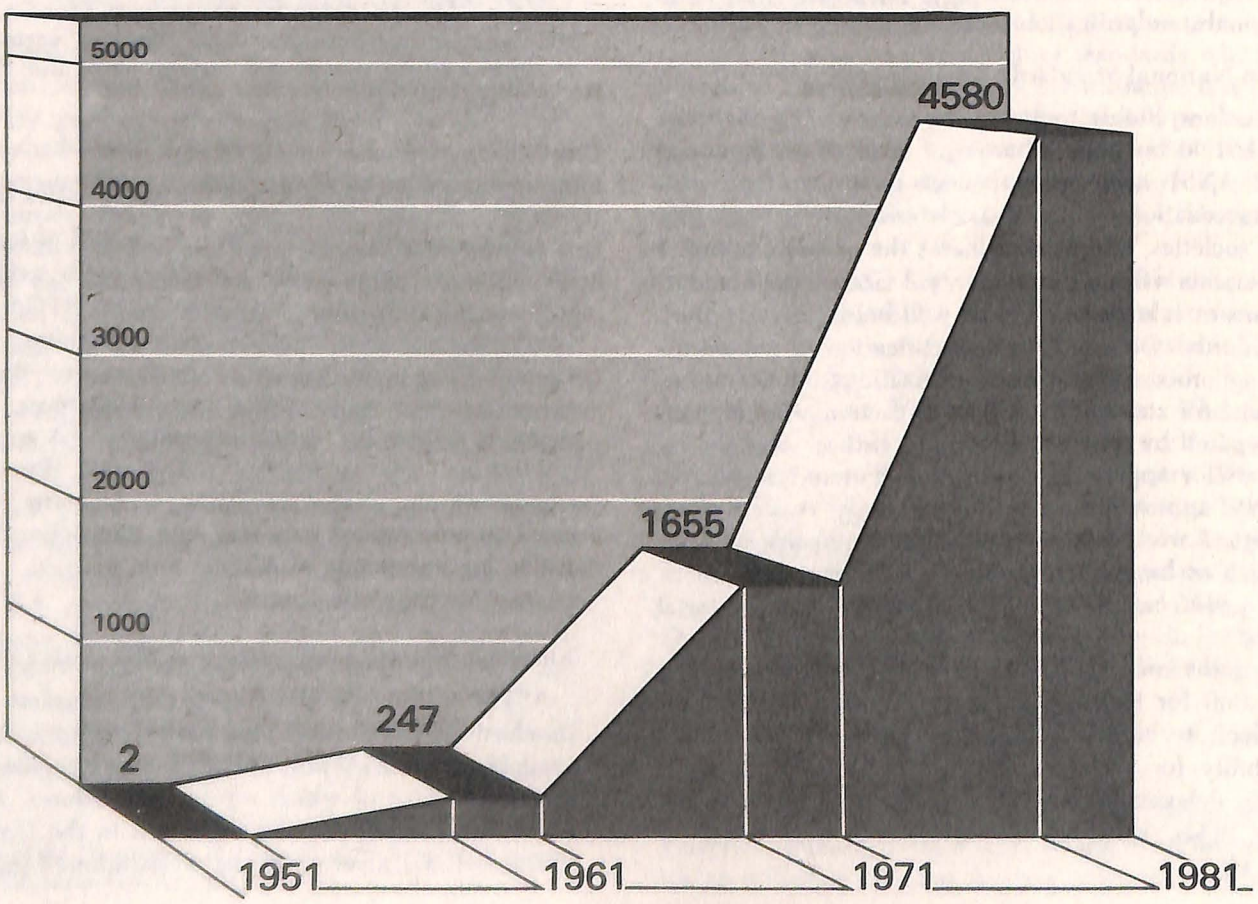
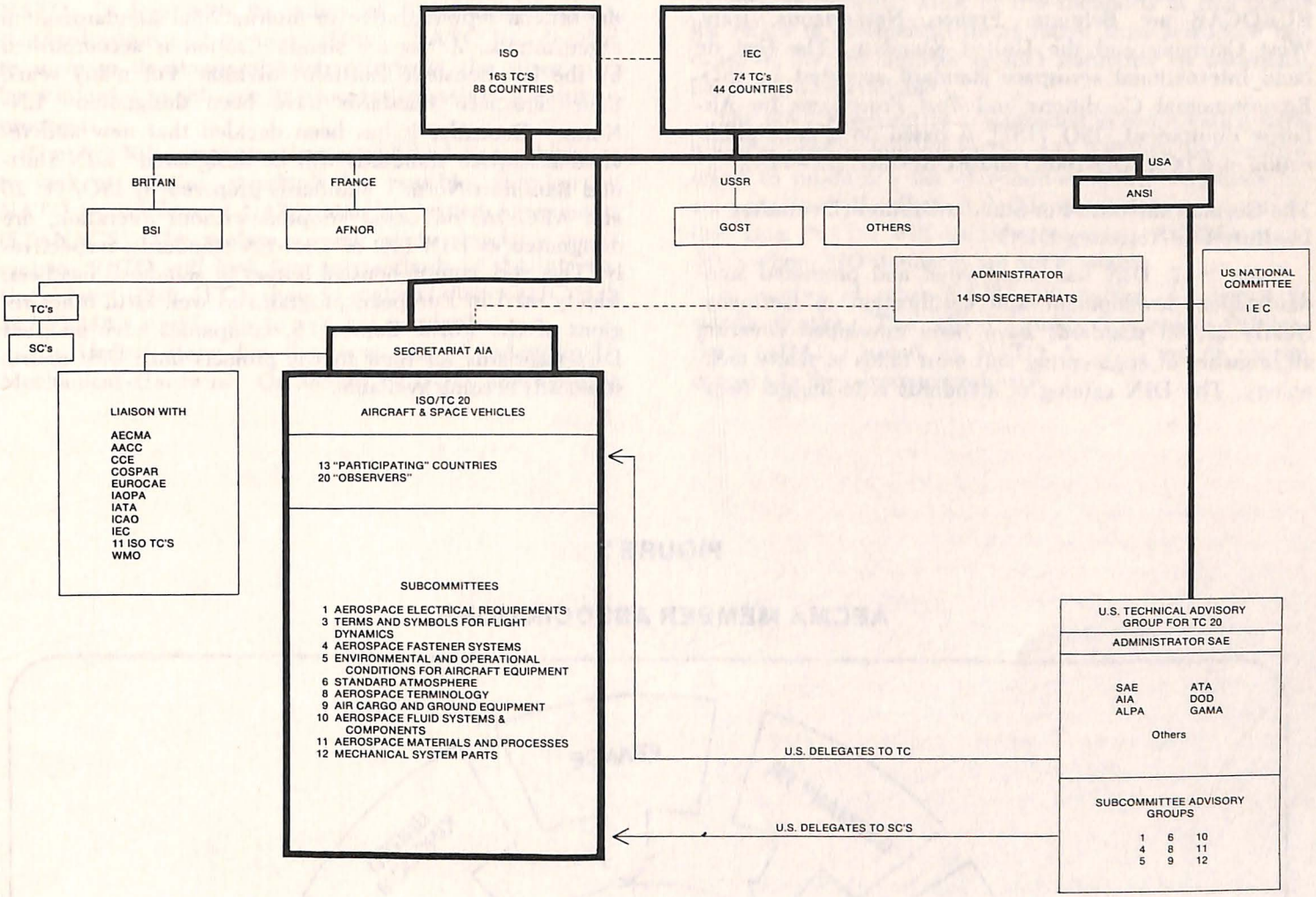


FIGURE 6

ORGANIZATION OF ISO/TC 20 AND U.S. PARTICIPATION



a close collaborative relationship with ISO. Members of the IEC are the national committees of each country, which are required to be representative of the national electrical interests. While most of the 2,000 IEC standards deal with commercial and industrial electric generation and control, a number of IEC standards are important to aerospace. Consequently, ISO/TC 20 maintains liaison with appropriate IEC committees. IEC is moving into high growth new technologies such as microprocessor assemblies and fiber optics. IEC celebrated its 75th anniversary in 1981.

Association Europeenne des Constructeurs de Materials Aerospatial (AECMA)

AECMA is the European association of aerospace manufacturers. Originally known as AICMA, it was founded in 1950 as a forum for communication between the leaders of the aerospace industry of continental Europe. Britain joined in the 1960s. The 1970s saw increased cooperation on intra-European ventures and an increased "European" consciousness within the aerospace industry. In 1973, the "I" in AICMA became "E" for "European" instead of "International."

AECMA seeks to promote the development of the aerospace industry in Europe by making it more competitive and by promoting the domestic European market. Commonality of standards is seen as one means of working toward this goal. The more than 300 AECMA standards, when fully coordinated, will become mandatory standards (EN's) for the European Economic Community. To date, AECMA has issued over 175 candidate standards for European Community adoption, primarily in the areas of aerospace materials and bearings. AECMA is actively promoting its standards in NATO and in ISO/TC 20 as well. With seven out of thirteen votes, AECMA constitutes a strong voting bloc within TC 20. Figure 7 shows the membership of AECMA.

Recognizing the significance of this new initiative by the European aerospace industries to harmonize their standards, AIA has established contact with AECMA to harmonize new metric U.S. national aerospace standards with those of the Europeans.

European Organization For Civil Aviation Electronics (EUROCAE)

EUROCAE is the European counterpart of RTCA. The purpose of the two are generally in accord. Members of EUROCAE are Belgium, France, Netherlands, Italy, West Germany and the United Kingdom. The first de facto international aerospace standard accepted by ISO, Environmental Conditions and Test Procedures for Airborne Equipment (ISO 7137), is based on a joint publication of RTCA (DO-160A) and EUROCAE (ED-14A).

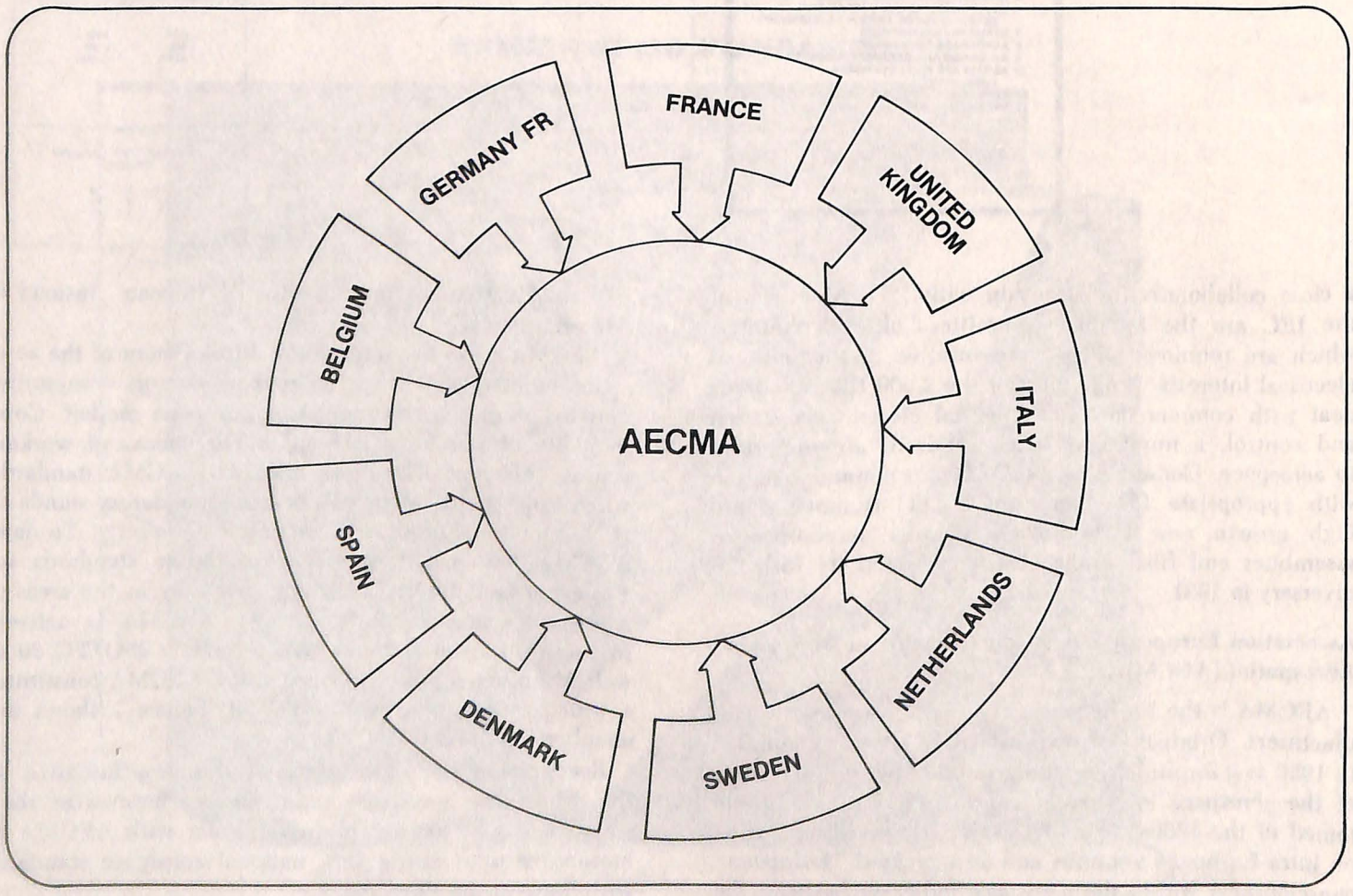
The German Institute For Standardization (Deutsches Institute Für Normung-DIN)

Since 1917, DIN has coordinated and promoted standardization development and certification in Germany. Nearly 22,000 standards have been developed covering all branches of engineering and most fields of safety technology. The DIN catalog of standards is bi-lingual (German/English) and some 25 percent have been translated into English.

The Federal Republic of Germany has designated DIN to be responsible for national standardization as well as the official representative to international standardization organizations. Aerospace standardization is accomplished by the Normenstelle Luftfahrt division. For many years, their aerospace standards have been designated "LN-Norm." Recently, it has been decided that new and revised aerospace standards will be designated "DIN Luft- und Raumfart-Norm." Standards prepared by ISO/TC 20 and AECMA, on being adopted without alteration, are designated as DIN-ISO or DIN-EN standards, respectively. This very comprehensive library of standards has been widely used in European programs as well as in other regions of the world. Some U.S. companies have adopted DIN standards for their metric projects until U.S. metric standards become available.

FIGURE 7

AECMA MEMBER ASSOCIATIONS



NATO Advisory Committee for Materiel Standardization (NATO AC-301)

AC-301 is the materiel standardization committee of NATO. In line with its policy of RSI (rationalization, standardization and interoperability), NATO has decided to increase its standardization efforts at the piece part level in order to enhance its cooperative system acquisition program.

The AC-301 committee has established five subgroups to look at existing standards for possible adoption by NATO to supplement NATO Standardization Agreements (STANAGS). The preference will be to standards in SI metric. NATO will look first to standards at the international level (ISO, IEC); then to regional documents, such as AECMA's, and finally to national standards.

The United States has the secretariat of Subgroup II, Mechanical Hardware. On behalf of DOD, the Defense Industrial Supply Center has already circulated an initial list of ISO hardware standards for approval by the NATO members. Members are also asked to identify equivalent national documents. Most of the standards in this initial list relate to commercial items rather than aerospace because of the low number of ISO standards for aerospace hardware now available.

The NATO committee is interested in coordinating with industry, and is looking to the AIA-AECMA cooperative effort to produce a list of common metric standards for aerospace use. If sufficient development does not occur in this area, NATO will consider adopting AECMA standards where ISO standards are not available.

A number of other NATO groups are also active in standardization. The Allied Quality Assurance Publications (AQAPs) issued by NATO AC 250 are of special concern to the aerospace industry.

APPENDIX B – MULTILATERAL TRADE NEGOTIATIONS AGREEMENT ON TECHNICAL BARRIERS TO TRADE[1]

The most recent series of Multilateral Trade Negotiations (MTN) held under the General Agreement on Tariffs and Trade (GATT)–the Tokyo Round–resulted in six major international agreements on nontariff measures. This summarizes the Agreement on Technical Barriers to Trade, also popularly known as the "Standards Code." The purpose of the Standards Code is to eliminate the use of standards and certification systems as an impediment to trade. The Code became effective on January 1, 1980.

Product standards, certification systems, and procedures for testing the conformity of products with standards have been used to interfere with international commerce. Product standards can be structured to exclude imports in numerous ways. Certification systems, which provide assurance that products conform to standards, may be manipulated to limit access of imports or deny the right of a certification mark to imported products. Testing can be conducted arbitrarily or in such a way as to increase expenses unnecessarily or otherwise disadvantage importers.

Realizing that the GATT has no provisions on the trade effects of product standards, a number of countries began in the early 1970s to develop an international code of conduct regarding standardization and certification. This effort culminated in the results of the Multilateral Trade Negotiations.

The United States will benefit greatly from the provisions of the Standards Code. For the first time, our major trading partners will be required, under most circumstances, to publish a notice of their proposed standards, to provide copies of these standards, if requested, and to allow the United States to comment on them. Additionally, the Code will enable U.S. suppliers to gain access to foreign national and regional certification systems that had previously barred products from non-member countries. In brief, the Code will serve to open up foreign markets previously closed to U.S. suppliers and will generally facilitate and promote U.S. exports.

Main Features of the Agreement

The Standards Code does not attempt to eliminate all technical specifications acting as barriers to trade, to delineate standards for individual products, nor to set up specific testing and certification systems, since these activities fall within the scope of other institutions and organizations. Rather, it seeks to establish, for the first time, international rules between governments concerning the procedures by which standards and certification systems are prepared, adopted and applied, and by which products are tested for conformity with standards. The Code aims to promote the use of standards in facilitating trade and to prevent standards from becoming technical barriers to trade. While it does not offer immediate solutions to all the international trade problems caused by particular product standards, the Code provides a vehicle through which signatories can work toward solutions for particular standards problems.

The Code's provisions are applicable to all products, both agricultural and industrial. They are not applicable to standards involving services, technical specifications included in government procurement contracts, or standards established by individual companies for their own use.

Standards (both voluntary and mandatory) and certification systems promulgated by central governments, state and local governments, and private sector organizations are subject to the Code's provisions although only central governments are directly bound by it. The Code requires that signatories "shall ensure that" central government bodies comply fully with its provisions. With respect to regional, state, local, and private organizations, the Code requires signatories to "take such reasonable measures as may be available to them" to ensure compliance, a so-called second level of obligation. The nature of such reasonable measures is left to the discretion of each individual signatory to determine within the context of its domestic political and legal system. However, if standards-related activities of bodies subject to the second level of obligation are found to create unnecessary obstacles to international trade, the signatory in whose territory such governmental or private bodies are located could be the subject of a complaint under the Code.

The Code applies to new and revised standards and certification systems. Nonetheless, if a signatory believes that

[1]Source: U.S. Department of Commerce, June 1980.

an already existing measure conflicts with the Code, it may raise the matter in the committee of signatories, known as the Committee on Technical Barriers to Trade, and use the Code's dispute settlement mechanism to seek a mutually satisfactory solution. In addition, signatories are encouraged to use relevant existing international standards. A Summary of the Agreement is provided below:

1. Standards and certification systems are not to be prepared, adopted, or applied so as to create unnecessary obstacles to international trade. While the existence of any national standards or certification system is bound to have some degree of commercial effect, many such measures are adopted for legitimate domestic reasons and are clearly justified to achieve the desired objective, such as the protection of public health. Nonetheless, the measures can be manipulated so as to constitute a disguised trade barrier, creating obstacles to commerce that are not necessary to achieve the objective of the standards or certification system. It is these practices that would be subject to the Code's discipline.

2. National and regional certification systems are to grant access (i.e., permit goods to be certified under the rules of the system) to foreign or non-member suppliers on the same basis as access is granted to domestic or member suppliers. Where certification systems are in effect, they are required to be nondiscriminatory and applied on a most-favored-nation basis. Signatories are encouraged to accept test results, certificates, or marks of conformity issued in the country of export when they are satisfied that such testing and certification is performed by a technically competent body using appropriate methods.

3. Whenever a new or revised domestic standard or technical regulation is being drafted, or a new certification system is to be introduced, open procedures must be followed unless international standards are used. These procedures include those already undertaken in most U.S. standards-making activities, such as publishing proposed measures, affording an opportunity to make comments, and taking such comments into account.

4. Standards are to be specified whenever possible in terms of performance rather than design or descriptive characteristics.
5. Signatories are encouraged to use relevant existing international standards.
6. Information on standards and certification systems is to be made readily available to the public:
   a. All standards and rules of certification systems must be published;
   b. Each signatory must establish an enquiry point capable of answering questions from all interested parties about specific domestic standards and certification procedures; and
   c. To ensure that each signatory country is kept informed about central government or technical regulations and rules of certification systems under preparation, notices of such measures are to be forwarded to the GATT Secretariat for distribution to other signatories.
7. Upon request, signatories are to provide technical assistance to developing countries on mutually agreed terms and conditions. Such assistance will aid the development of competent standards methods and organizations.
8. Dispute settlement procedures are specified that provide a number of modes and opportunities for signatories to resolve contentious issues. In the first instance, there is an obligation to engage in bilateral consultations at the request of any other signatory. If such consultations do not result in a resolution of the dispute, it can be put before the Committee on Technical Barriers to Trade. The Committee may have the dispute analyzed by a working group of technical experts or reviewed by a panel of trade policy experts or both. Any action recommended by a panel will be reviewed by the full Committee. Any authorization for retaliatory action is limited to the withdrawal of benefits contained in the Standards Code.

U.S. Implementation of the Agreement

The legislation implementing the Standards Code in the United States is found in Title IV of the Trade Agreements Act of 1979 (P.L. 96-39).

APPENDIX D – ABBREVIATIONS

AECMA	Association Europeenne des Constructeurs de Materiel Aerospatial
AFNOR	Association Francaise de Normalisation
AIA	Aerospace Industries Association of America, Inc.
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
ATA	Air Transport Association
BSI	British Standards Institute
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
DIN	Deutsches Institut für Normung
DOC	Department of Commerce
DOD	Department of Defense
EEC	European Economic Community
EIA	Electronic Industries Association
EUROCAE	European Organization for Civil Aviation Electronics
FAA	Federal Aviation Administration
GATT	General Agreement on Tariffs and Trade
GOST	Gosudarstvennyj Komitet Standartov Soveta Ministrov
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Commission
ISAC	Industry Sector Advisory Group
ISO	International Organization for Standardization
MTN	Multilateral Trade Negotiations
NASC	National Aerospace Standards Committee of AIA
NATO	North Atlantic Treaty Organization
RSI	Rationalization, Standardization and Interoperability
RTCA	Radio Technical Commission for Aeronautics
SAE	Society of Automotive Engineers
SC	Subcommittee (ISO or IEC)
SCAG	Subcommittee Advisory Group
TAG	Technical Advisory Group (to Technical Committee)
TC	Technical Committee (ISO or IEC)
USTR	United States Trade Representative

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