tion of adverse effects on trade resulting from government support of civil aircraft development, production and marketing. The United States sought first to establish commercial competition as the basis or standard on which the civil aircraft industry, worldwide, should operate, and second to focus attention on non-tariff issues. In the end our view prevailed, but there was a great deal of reluctance to have what the Europeans and Japanese refer to as fair and equal competitive opportunities as an expressed objective in the preamble.

What does the Aerospace Industries Association think should be done about some of these issues? We have a statement in which we set forth most of these, where we note that foreign competitors in the international market are often strengthened by government incentives, and even by government partnerships. If our government is to help meet this competition it must give sufficient national priority to exports and to effective implementation of policies and practices designed to increase sales in the international marketplace.

We see a need for export tax incentives to offset the tax advantages of our foreign competitors. For decades most developed nations have recognized that economic survival is critically dependent on exports. Accordingly, they have forged an array of incentives -- financing facilities and trade devices to assist their industries to promote exports and jobs and other economic consequences therefrom. Such supportive measures not similarly available to American exporters put U.S. industry at a distinct disadvantage in international competition. Specifically, we recommend an expansion rather than a reduction in the one principal program that we have available to us, commonly referred to as the DISC program (the Domestic International Sales Corporation). This is an effort to offset in part the tax advantages enjoyed by our foreign competitors. We would amend the U.S. tax system as a means of expanding exports, with emphasis on depreciation, investment tax credit, and other incentives helpful to the export community.

We also see a need for firm action against those countries that provide preferential credit terms or impose tariff or non-tariff barriers in violation of the MTN agreement. In countries where an industry is owned or controlled by its national government many important factors can be manipulated, not the least of which is financing of their foreign purchases; indeed they are being manipulated. This puts countries such as the United States at a distinct disadvantage.

We have many more recommendations but that is the overview. Attention should also be directed to a study that was recently done under the auspices of the National Research Council. Several months ago at Woods Hole it assembled a group of distinguished individuals to talk about aeronautical research and development. NASA of course was involved in this study. Here are three sentences from the news release of that report.

"The dominant world position of the United States aircraft industry may be in danger, according to a National Research Council Report on the National Aeronautics and Space Administration's role in aeronautics. Citing the erosion of the momentum in U.S. aeronautical technology, the report warns that opportunities during the next decade may favor a foreign competitor, if this country fails to maintain and improve its technological capabilities in

aeronautics. As foreign countries have increased their efforts on civil aircraft manufacturing, on advanced aeronautical research, and on expansion of their airlines, the United States has continued in a path that has increasingly constrained all three, stated the report, pointing out that 20 percent of the commercial transport market has been lost to European competitors over the last few years."

As for the diffusion of technology from the military, it has been reversed in the past decade from its direction before 1970. Prior to 1970 our industry realized great economic, technological and other benefits from military R&D. But the trend has shifted. The infusion or the transfer of technology has been more in the other direction for good reason. There has been a switch in military emphasis from aircraft to missiles. For remaining large-type military aircraft, technology transfer has been from civil to military. In addition, NASA's emphasis on space instead of aeronautics also has been a principal reason for the lack of transfer, or as much transfer, from military and space research as we had prior to the 1970's.

COMMUNICATIONS - TELECONFERENCING
Richard C. Harkness, Satellite Business Systems

Teleconferencing has become quite prominent in the trade journals and in many corporations, reflecting the thrust of the "office of the future." Teleconferencing comes in several varieties but this discussion will deal mainly with "videoconferencing." This contrasts with computer conferencing which is like electronic mail, and with audioconferencing which is like a speaker-phone conference call.

There is growing interest in teleconferencing for two reasons. One is the concept of saving travel fatigue, travel time, and direct dollars. However, the most important benefits will be productivity enhancement, faster and better decision making, altered organizational structure, and just better communications. In these ways, rather than being a mere substitute for travel, teleconferencing is really a supplement.

The history of teleconferencing goes back ten to fifteen years. The Department of Defense was active in the late 1950's and the New York banks had systems in the 1960's. A year ago there were about 50 organizations that had experimented with teleconferencing. There are probably over 100 today. Awareness in the business community and adoption on a pilot basis have been growing rapidly. There are new entrants such as Procter and Gamble, Hercules, Control Data, Aetna, United Technologies, Boeing, Exxon and others. However, teleconferencing has had an uneven, rocky history. There have been failures for a variety of reasons.

There are also a number of different technical approaches. Some have used audio, or audio with facsimile, while others employ still frame video or full motion video. Still frame is one of the newer key developments. Pictures or graphics can be sent at low cost.

Pictures of teleconferencing rooms give a feeling for what is actually going on. The Bank of America has a room in its headquarters in San Francisco, and a twin room in Los Angeles. This audio-only system has been working for over ten years, used for regularly scheduled committee

meetings. It has been very successful. It has replaced all of the meetings that used to require travel between those cities for some committees. One key point is that the people involved meet periodically face to face for other reasons.

NASA started teleconferencing for the Apollo program and now uses it for the shuttle for project management. For "viewfoil" presentations the foils are mailed ahead and projected during the conference.

NASA was said, incorrectly, to claim savings of 20 percent of their travel by teleconferencing. They did have many teleconferences, but actually there was no drop in their travel budget. Travel money saved by teleconferencing was consumed by other uses. Some people are publishing forecasts on teleconferencing growth, market impacts, and so forth. Often they quote from bad data, or as in this case, misquote, so be wary of forecasts.

There is a Bell conferencing room on the premises of Arthur Anderson & Co. in Chicago - an elegant implementation. A room IBM had several years ago has been considerably upgraded since. A project manager did it to solve a problem. He was manufacturing a device in San Jose, designed in Denver, and engineers and production people were constantly going back and forth. He put in a slow scan system with about $30,000 worth of hardware. It was very successful, so much so that it has grown within IBM. Now IBM has one of the largest and most successful internal teleconferencing systems in the country. Bell also has very successful teleconferencing for internal use. These are the only two examples of reasonably large scale systems.

Satellite Business Systems has been developing a room facility for demonstration. A new feature coming along is the high-resolution, image screen. It solves a most serious limitation of teleconferencing, by providing a way to show flip charts, foils, drawings or typed pages. Regular television does not have enough resolution.

Pacing or "gating" factors provide an interesting perspective. If teleconferencing is such a great idea and has been around for fifteen years, why is it not everywhere? There are several reasons. The technology has been inadequate in some areas, for example high quality audio, and high resolution graphics. Also, prospective users have found it difficult to obtain the kinds of circuits they want; what has been available was for the broadcast television industry. Prices are very high for such circuits.

Another important point is that the typical user, intent only on his own immediate problems, has often been unable to implement teleconferencing. The technology has not served the users. Rather the users have had to bend over backward trying to use the technology. A significant investment in design is essential to produce a good teleconference room, taking account of human factors.

Accessibility has been another gating factor. British researchers report that teleconferencing on the executive floor will not be used by people on other floors - it is not their territory. Finally, there has been a problem with system integration. Teleconferencing is not just miscellaneous cameras and other devices that one orders and uses together. The systems integration problem is fairly difficult, and complete systems have not been available.

Coordination is required between users and suppliers. For widespread teleconferencing, carriers must provide transmission facilities, users must be saying they want it, and the RCA's and Sony's of the world must be making room equipment and turnkey systems available. Over the last several years the question has been who will take

the first step. Now these three things are at last coming together, and teleconferencing is becoming a reality. In the past, to connect two points the choice was between buying a telephone line or buying a network television channel. The telephone line did not have enough capacity to carry graphics at sufficient speed for presentations, and the cost of the network TV channel was too high, as Dow Chemical found. Dow paid $2500 an hour for a video channel between Midland, Michigan and Freeport, Texas. They had teleconferencing four or five years ago, but discontinued it because of high cost.

Satellite Business Systems (SBS) and other carriers are now bringing new band widths to bear on this problem. There are band widths intermediate between telephone lines and network TV which meet teleconferencing needs more effectively and economically.

There is another very basic question: can people really communicate effectively with teleconferencing? That was the big question ten years ago. There has been a lot of research and here are some findings. Besides the laboratory research, there have been studies of people's attitudes toward teleconferencing. Today both the laboratory and attitude studies have been put in perspective by actual user successes but acceptance will be governed by intrinsic advantages of teleconferencing, regardless of the research and attitude studies. These advantages are that it is faster, more convenient, and less expensive.

Behavioral research shows the percentage of meetings suitable for teleconferencing. This work was done by C.S. and P., a group in London, about 1975, sponsored by the British Post Office and the British Civil Service. After looking at laboratory experiments and also at surveys of real meetings, CSP concluded that about half the meetings were not suitable for teleconferencing. This is because there would be some deterioration in people's ability to communicate. The big surprise, and the key finding, was that most of the other half could be handled with narrow band teleconferencing. They do not require full motion two-way video, which is very expensive. SBS has done similar studies. We find about 75 percent of U.S. business meetings to be eligible. Thus, in the long run, and given suitable pricing and ubiquitous service like the telephone, the upper limit for teleconferencing is about 75 percent of trips to business meetings. Note that about 75 percent of business trips are to business meetings.

With respect to participants' attitudes, SBS completed a demonstration several years ago. Small earth stations were used to conduct teleconferences at several large companies such as Montgomery Ward and Texaco. A key finding was that about 75 percent of the participants felt teleconferencing to be an acceptable way to handle a meeting.

Bell Canada did a survey in 1975 concerning the desire to travel. Questionnaires were given to 10,000 business travellers as they got off the airplane. The main conclusion was that many people want less travel or marginally less travel. That constitutes a sufficient market from the viewpoint of a telecommunications provider. We do not worry about the 19 percent who say they want to travel more.

A final point concerns the question of convenience. We believe convenience is the most important factor. There is a great loss of convenience associated with travel. This is illustrated by people waiting for a taxi outside busy airports.

Most IBM trips to meetings are for mundane activities, such as information exchange and informal presentations. Forty-four percent of the

meetings are informal working sessions; 23 percent
are formal information exchanges. Sales calls are
a relatively small part. The high proportion of
routine, informal meetings explains why so many
early users are no longer concerned about behavioral
acceptability. Meetings with much necessary inter-
personal contact, such as delicate negotiations and
first time meetings with clients, are not suggested
for teleconferencing, but they are a small part of
the total.

Almost nine-tenths of teleconferences at IBM
are two hours or less. The average length of a
meeting at IBM that involves travel is about four
hours. This supports the general belief that tele-
conferences are much shorter than the face-to-face
meetings they replace. This affects, and is affected
by, the economics. Users are aware that the clock
is running.

IBM found that 88 percent of the people said
they were either very satisfied or moderately
satisfied with teleconferencing. Another question
was whether they would use teleconferencing again
for this type of meeting. More than three-quarters
said yes. If teleconferencing had not been avail-
able, two-thirds said they would have travelled.
This suggests that many teleconferences do not
substitute for trips, but rather represent addition-
al communications. Finally, IBM asked users what
was the greatest advantage. Time saving was rated
more important than anything else.

What of the potential impact on air travel?
SRI International (SRI) did a large study for the
National Science Foundation and the Department of
Energy called a Technology Assessment. The purpose
was to assess the societal impacts which might
occur if there were some change in the balance
between transportation and telecommunications.
Much of the emphasis was on urban commuting, the
need for rail transit, and so forth. Part dealt
with long range air travel.

The approach was to postulate some "what if"
scenarios. One of them assumed that telecommunica-
tions substituted for 20 percent of business travel.
The task was to estimate some of the impacts on the
aviation industry. Some people have claimed recent-
ly that SRI concluded teleconferencing will substi-
tute for 20 percent of business air travel. That
is incorrect. SRI did say that 20 percent substi-
tution was felt to be realistic based on research
and logic. There was another scenario assuming
business travel would increase 20 percent. This
20 percent generation was purely arbitrary since
there was no logic to go on. The object was of
course to do a sensitivity analysis.

A 1976 version of Air Transport Association
statistics for revenue passenger emplanements
projected growth out to the year 2000. About half
of that travel was for business. A wedge showing
a 20 percent net substitution for business travel
would mean a slightly slower growth rate for air
travel. That 20 percent assumes teleconferencing
is ubiquitous, but it is not. Over the next five
to ten years many of the Fortune 500 companies will
be going in this direction by putting in telecon-
ferencing at half a dozen or a dozen of their major
locations. All of the trip origins and destinations
are certainly not going to be connected for a long
time - only a very small portion of them will be.
It will be a long, long time before teleconferenc-
ing is everywhere, and that has to be accounted for
in any assessment of its impact on travel. The
last important point is that the market for tele-
conferencing can be very large and attractive, while
the impact on air travel is still slight.

The SRI report reviews the research into
teleconferencing, and gives average trip lengths,
meeting durations, and other data. It is available
from the National Technology Information Service in
Springfield, Virginia. The session numbers are
PB 272694, 5 and 6. It is the single summary source
for most of the research in this area.

REVIEW AND CRITIQUE OF FAA FORECASTS AND
ASSUMPTIONS
Robert W. Simpson, Massachusetts Institute of
Technology

General Summary
There were three presentations - one on data
sources; one on a new general aviation (GA) fore-
casting model; and an overview of FAA's air carrier
forecasting model.

The FAA uses Wharton Econometrics, Data
Resources Inc., and others for national economic
data, CAB data, and FAA internal reports of air
traffic control. There is also an annual FAA
survey of general aviation activity and avionics.

Methods were presented to give aggregate
national activity by general aviation aircraft.
The models are now made sensitive to fuel prices,
and indicate a temporary decline in GA activity
over the next few years. Some inputs on fuel
prices and consumer prices cause the decline.
Increasing GA activity is indicated after 1982 or
1983. However, the model presented has a rather
low "R-square" of .65. Discussion brought out
that there is disagreement on the value of aggregate
economic indicators such as GNP. Whether or not
such indicators should be employed is still un-
resolved.

The advisability of having a point estimate,
a single estimate of the forecast numbers, or high
and low estimates, was discussed. Some participants
advocated a measure of the uncertainty of the
forecast, particularly over longer time periods.

The FAA reviewed their techniques of air
carrier forecasting. Results indicate a 4.5 per-
cent annual growth in revenue passenger miles and
slow growth in airline operations. Operations
have declined in recent years, but growth is
expected to resume during the 1980's. Though
impressive on a chart, the growth is only about 20
percent by 1990 for total U.S. airline operations.

Some discussion disparaged reliance on
mathematical econometric models. Other techniques,
judgmental or consensus-seeking kinds of activity,
were proposed, and a variety of several techniques
advocated. Perhaps a variety of sources of fore-
casts should be examined. It was also suggested
that aggregate models should be broken down into
component quantities, and other factors of one
kind or another introduced into the component
analysis. Results might be better in forecasting
component parts, rather than aggregates.

FAA Presentation and Discussion

Gene Mercer, FAA
First, we present our forecasting models and
discuss our assumptions on exogenous variables and
how they affect our results. We would like a
thorough discussion of our theoretical structures,
inputs, and assumptions. These discussions are
valuable to us, because we rely heavily upon