

OTA CONFERENCE ON THE NATIONAL AIRSPACE SYSTEM PLAN

ATTACHMENT C-1: AGENDA AND LIST OF PARTICIPANTS

Agenda: OTA Conference on the National Airspace System Plan, Apr. 1-2, 1982

Thursday, Apr. 1

- 9:00-9:10 Welcoming Remarks and Introductions
- 9:10-12:00 Growth of Aviation
Summary of Working Group 1 and 2—H. Clark Stroupe
FAA Forecast Methods—David Lewis
Discussion:
Factors influencing aviation growth
Responsiveness of FAA plan to growth and need for services
- 12:00-1:30 Lunch
Guest Speaker: J. Lynn Helms
Administrator
Federal Aviation Administration
- 1:30-4:30 Implementation of FAA Plan
Summary of GAO Studies—Tony Csicseri
Discussion:
Technological risks
Implementation problems
Scheduling
Flexibility and preservation of options
- 4:30-5:30 Reception

Friday, Apr. 2

- 9:00-12:00 Effects on Airspace Users
Summary of Questionnaire Responses—Larry Jenney
Discussion:
Potential benefits and problems
Difficulties during transition
Implications of automation
Consolidation of facilities
- 12:00-1:30 Lunch
Guest Speaker: Philip J. Klass
Senior Avionics Editor
Aviation Week & Space Technology

- 1:30-3:30 Cost and Funding Issues
 Summary of Questionnaire Responses—Larry Jenney
 Impact of User Fees—David Lewis
 Discussion:
 User fees and other funding strategies
 Operating and maintenance costs
 Allocation of revenues
- 3:30-4:30 Summation and Concluding Remarks
 Review of Key Issues
 Recommendations for Additional Study

**OTA Conference on the National
 Airspace System Plan, Apr. 1=2, 1982**

John L. McLucas, *Chairman*
 President, Comsat World Systems

Ward Baker
 Airline Pilots Association

Frederick Bradley, Jr.
 Vice President
 Citibank, N.A.

Samuel C. Colwell
 Director, Market Planning
 Fairchild Industries, Inc.

Barbara Corn
 BD Systems, Inc.

Anthony Csicseri
 U.S. General Accounting Office

Elwood T. Driver
 Former Vice Chairman
 National Transportation Safety Board

Thomas S. Falatko
 Deputy for Transportation and Civil Aviation
 U.S. Air Force

Matthew Finucane
 Director
 Aviation Consumer Action Project

Rod Gilstrap
 Director
 Flight Safety and Operations
 United Air Lines

William T. Hardaker
 Assistant Vice President
 Air Transport Association

William Horn, Jr.
 National Business Aircraft Association

Victor J. Kayne
 Senior Vice President
 Technical Policy and Plans
 Aircraft Owners and Pilots Association

David Lewis
 Congressional Budget Office

John Leyden
 Executive Director
 Public Employees Department
 AFL-CIO

Kingsley G. Morse
 Chairman
 Regional Airlines Association

Gilbert F. Quinby
 Consultant

J. Donald Reilly
 Executive Vice President
 Airport Operators Council International

Harrison Rowe
 Bell Laboratories
 Crawford Hill Laboratory

Robert C. Seamans, Jr.
 Professor of Environment and Public Policy
 Massachusetts Institute of Technology

Robert Simpson
 Flight Transportation Laboratory
 Massachusetts Institute of Technology

H. Clark Stroupe
 Vice President
 Booz-Allen & Hamilton, Inc.

Richard W. Taylor
 Vice President
 Boeing Commercial Airplane Co.

David Thomas
 Consultant
 General Aircraft Manufacturers Association

Vincent Volpicelli
 Supervising Engineer
 Port Authority of New York and New Jersey

ATTACHMENT C-2: SUMMARY OF QUESTIONNAIRE RESPONSES

Summary of Questionnaire Responses

Participants in the OTA Conference on the National Airspace System Plan were asked to complete a questionnaire outlining their views on FAA's proposed program of improvements in the ATC system. Responses were received from 16 of the 25 participants. Replies from others were promised but not available in time for inclusion in this summary. For this reason, the material presented here should not be interpreted as representing the views of all conference participants.

Responses are summarized under headings that correspond to items in the questionnaire. In some cases, the responses to related questions have been combined because of the overlap in content. All items are presented in a common format—a brief characterization of the replies as a whole followed by a few excerpts to illustrate the variety of views and some of the particular points made by respondents.

It is not the purpose of this summary to suggest a majority view or to attempt to frame what might be construed as a "conference position." Rather, the document was used at the conference to provide participants with a preliminary indication of their colleagues' views, with the object of furthering discussion on the points to be addressed by the conference.

Growth

What are the prospects for growth and where is it likely to occur?

Many respondents indicated that FAA's forecasts of aviation growth are too high. They foresaw little or no growth in air carrier activity. They regarded commuter airlines and business aircraft as the sectors most likely to experience significant growth in the future.

Excerpts:

- "I have been amazed at how constant the number of air carrier aircraft has been over the last decade or so. With the growth of short haul/commuter airlines, I would expect the air carrier (fleet) to continue about as is and the commuter and GA (sectors) to experience a lot of growth."
- "The FAA's forecasts appear to be optimistic in view of the current economic plight of the aviation industry . . . The number of aircraft operations rather than passenger enplanements should form the foundation for any improvements" (to the system).

- "The FAA's latest forecast of itinerant air carrier aircraft operations at airports with FAA traffic control appears reasonable . . . They are becoming more reasonable with each annual update, regarding passenger enplanements and air carrier aircraft operations."

- "Demand placed on the system by the general aviation fleet could conceivably double by the year **2000**. . . due to . . . continued growth in the turbo-jet and turbo-prop and rotary-wing segments of the fleet."

- We view with some caution the (FAA) general aviation projections, particularly in view of the continually declining rates of production of small aircraft and the economic and related factors responsible for this decline (fuel costs, interest rates, student starts).

What factors are most likely to influence growth?

Virtually all respondents cited economic factors as the key determinants of aviation growth. They did not see aircraft or avionics technology per se as a major factor. Many felt that the lack of airports or adequate airport facilities could become a major constraint, and several were concerned that regulatory restraints—notably airport restrictions—could slow GA expansion.

Excerpts:

- "In the past, the business cycle and economic climate have influenced the demand for air travel most heavily, and we see no basic change from this correlation."
- "Business aviation growth will continue, but it will never approach the large increases of 1978-1979. . . . The low growth rate of 1979-1980 is an indicator of how much the economy can affect the purchase of aircraft."
- "Under deregulation, it is not clear whether they (air carriers) will be financially able to continue modernization."
- "We expect no major technology breakthrough during the decade of the 1980's that would again revolutionize air travel."
- "Increased airway capacity and reduced separation standards are necessary, but they will be of no avail if there is no place for the traffic to go If more new airports are not in the planning stages in 1982, the planned sophistication of the airway system will come to naught."
- "The present restriction on flights at saturated airports will, if not alleviated, be a serious negative factor."

National Airspace System Plan

Does the Plan adequately respond to the needs of aviation?

One respondent had a succinct answer to the question: “Yes (finally).” Indeed, nearly all respondents replied affirmatively to the thrust of this question. Some expressed concern, however, about the absence of supporting detail in the NAS Plan.

Excerpts:

- “The FAA Plan is primarily a management document for the U.S. Government to handle what they forecast will be a massive increase in aircraft growth Because of my doubts concerning the validity of the forecasts, I feel that the time frames for equipment purchase and facility consolidation are highly suspect.”
- “The FAA Plan represents an impressive planning effort (But it) is incomplete as a vehicle for truly evaluating whether it can satisfy the user’s needs. The Plan describes primarily an ATC system framework (hardware, software, functional capabilities), but does not describe either how the system will operate or the potential benefits.”
- The Plan “seems to give more a management overview rather than the technical considerations” that led to specific decisions.
- “General aviation, which shows the highest fleet growth, may not be receiving benefits commensurate with their contribution.”
- There seems to be a noticeable gap in meaningful programs to increase capacity . . . at airports and in the terminal airspace, particularly in high-density areas. This element of overall aviation system capacity is identified as a major constraint, but major programs are not included.

What elements of the Plan pose the greatest technological risk?

Though they thought that the elements of technology in the NAS Plan are within the state of the art, respondents expressed some concern about the integration of those elements and their impact on the people who operate and use the ATC system. They singled out two areas: 1) the design of a new computer system (hardware and software) and 2) airborne communications links, namely the Mode-S transponder and TCAS (Traffic Alert and Collision Avoidance System).

Excerpts:

- “The development of a host [replacement] computer which uses existing software from the 9020 programs with ‘minimal modifications’ sounds promising, but . . . the lack of top-down structured design in the present computer software (due to its evolutionary development) all add up

to an enormous and complex rehosting software task.”

- “The ability to design and transition to a new ATC computer system which effectively utilizes the human controller . . . [and] captures the advantages of higher orders of automation may be the greatest risk.”
- “The greatest technological risks involve the reliability of the system and the capability of the human element to perform in the event of a system failure.”
- “Mode S is fraught with potential problems because people will not want to get data out of a black box unless they can check it by talking it over with the man on the ground.”
- (With Mode S and TCAS,) “interference, multi-path propagation, system architecture, (and) data rate will all affect system performance.”

What problems might be encountered in implementing the Plan?

Respondents foresaw several difficulties and felt that the Plan does not adequately address questions of user acceptance, operational safety, costs, and the implications of automation. Many also felt that managerial problems would be encountered.

Excerpts:

- “Pilots will not trust new equipment without thorough checkout.”
- “The greatest problem . . . will be one of a financial burden on the FAA and the aviation user community.”
- Automated En Route Air Traffic Control (AERA) and the Mode S transponder appear to be little more than concepts at this time. A great deal of discussion needs to be carried on between the users and the FAA to determine the basic designs of these systems.
- “The extensive computer-to-computer conversations and black-box-to-black-box coordination . . . necessary in a computer decisionmaking process will require intricate communications linkage and backup.”
- “The funding, management and political support of a reduction in jobs and manned facilities of the magnitude proposed will probably be the most difficult to accomplish.”
- “With all or the majority of the funds coming from the direct users of the system, unrealistic cost projections, manifesting themselves in major budget overruns . . . could threaten the entire plan Only one implementation schedule has been revealed. The FAA fallback position (if actual demand does not match the forecast and

funding is too slow or too low or both) is not discussed.”

Is the schedule realistic?

No consensus emerged. Though some thought the schedule was workable, others considered it too slow or too fast. There was also some criticism of FAA’s failure to consider airport capacity and other restraining factors.

Excerpts:

- “It is realistic—if money is no object. However, the matter of financing may change the schedule.”
- “The schedule is characteristically optimistic . . . (Yet) this is clearly to be preferred from a safety standpoint over having the system’s capacity expansion lag behind the demand.”
- “The proposed schedule, while optimistic, already contains delays in availability of needed services.”
- “The schedule may perhaps be too slow to keep up with demands, even if the forecasts are on the high side.”
- “It isn’t clear just how a 100 percent growth between 1980 and 2000 in aircraft operations and passenger enplanements will be handled at the airports that are already saturated . . . Very little of the NAS Plan addresses (airport) capacity increases comparable to the (traffic) forecast.”
- “The schedules as presented in the majority of the programs are pie-in-the-sky; many of the programs have been a part of the FAA for many years and delay has been a constant factor.”
- “Based on past experience . . . automation of new concepts of the magnitude described in the Plan may take at least twice as long as originally estimated. The Plan may be too ambitious since we do not agree with the FAA projections of fleet size for air carriers and commuters.”

What other options should be pursued?

Respondents provided a wide range of suggestions. Some suggested changes in timing or tactics; others advocated putting more emphasis on airborne systems; and a few recommended a fundamental reevaluation of how ATC services are to be provided.

Excerpts:

- “From a strategic standpoint, the FAA plan is a good one Program-by-program and project-by-project, there will be a need for rethinking options.”
- “The FAA choices represent the best chances for success with the fewest risks. Other possible choices, such as the use of satellite technology for navigation and position reporting, are excellent candidates for succeeding systems and should be kept in the forefront for test and evaluation. However, system improvements, as contained in the

Plan, should not be delayed for something that might be better in the unknown future.”

- “The 9020 computer should be upgraded A greater exchange of information between facilities and between FAA employees and the pilots is necessary We must slowly allow the computer . . . to assist the controller in making his decisions.”
- “A competitive, single (computer) procurement with demonstration prior to award is one alternative that should be investigated.”
- “Major technology options to be pursued should include utilization of airborne data processing capability in the development of such programs as integrated flow management and automated en route ATC (AERA) Our concern is with the apparent lack of involvement of tie-in of the ‘smart airplane’ in the FAA’s automation plan.”
- “Priority should be given to completion of the FSS (Flight Service Station) modernization, which has safety connotations.”
- “The FAA communication plan envisions creating what is in effect a nationwide long-lines network Will this really be cheaper than buying communication services?”
- “Look at feasibility of converting (ATC functions) to private corporation concept and compare overall costs and efficiency.”

Effects on Users

What benefits are likely to result from the plan?

Respondents agreed that a major benefit of the new ATC system would be the ability to handle more aircraft safely and efficiently. Major benefits would accrue to air carriers and business aviation. The magnitude and importance of the benefits to private GA were not perceived to be as clear.

Excerpts:

- “Greater efficiency and safety of operations are major benefits to the users. Increased capacity to handle growth must be pursued when the alternative would be to constrain growth.”
- “Air carrier operations will benefit . . . in terms of improved safety, flight efficiency, and capacity. However, these benefits will be small until the post-1990 time period.”
- “Increased automation, distributed processing, remote maintenance monitoring, and air-to-air plus air-to-ground data links will make the navigation and air traffic control system substantially more stable and reliable.”
- “Improvement in dissemination of weather information, less labor-intensive ATC system (and) in-

creased capacity of ATC system—if everything works out as planned.”

- “Any improvements in the ground computer capability that would allow the business flyer to use this equipment to its maximum usage would be welcomed If the new system would authorize the (GA) pilot with the proper input and output devices to operate directly into the WX (weather) computer and to file his flight plan directly into the 9020 (computer) or its replacement, it would be most helpful.”
- “The increased safety/efficiency resulting from high computer reliability will benefit all users The major benefit will be the eventual availability of adequate ATC computing capability and Mode-S digital data link.”

Identify potential problems and steps that might mitigate them.

Though enthusiastic about technological improvements, some respondents indicated skepticism that higher user fees would be offset by commensurate increases in services and benefits. Because the new system would be more automated, some were concerned that system users might lack confidence in ATC operation.

Excerpts:

- “Transition . . . to a point 10 or 15 years from now where all these benefits of new technology are available will be difficult.”
- There would be “less personal interface between users of the system and those managing and controlling it.”
- “Emergency operation in case of equipment failure seems not to have been discussed much in the (NAS) Plan.”
- “The cost of dual carriage of equipment and the problems of space and weight of this equipment in some aircraft appear to be the only penalties inherent in (the) Plan.”
- “Increasingly sophisticated avionics required for operation at certain high-density controlled airports and in certain airspace (TCA’s) will restrict the operation of general aviation users who do not make the investment.”
- “It will be a defensive move for many people—buy this new equipment or be denied access to the airspace. There could be confusion between ILS and MLS—one more switch can be set in the wrong position.”
- “Consideration should be given to retaining full ILS service The full MLS program should be subject to review . . . after suitable operational experience is obtained Automatic altitude

reporting and Mode-S transponders should be mandated as being essential to safe and efficient operation of the ATC system.”

- “The result will be more restrictions in operations either through operational procedures/requirements or required equipment.”
- (The Plan should provide ways) “to accommodate all segments of aviation in the system by segregating operations based on performance capabilities.”

Cost and Funding

How should costs be allocated among **the Government and system users?**

Respondents’ views seemed to be divided among three different approaches. Some favored reestablishment of the Airport and Airways Trust Fund, with some adjustment of tax rates to achieve parity of cost recovery. Others suggested user fees based on aircraft characteristics or avionics equipment. A third view was that fees should be levied in proportion to the use made of, or the burden placed on the ATC system.

Excerpts:

- “The revenue measures which existed under the Airport and Airway Revenue Act of 1970 should be reinstated.”
- “First, the national interest portion must be determined and subtracted. Failure to do this is what discredited past user charges.”
- “Whatever (funding) mechanism is adopted should . . . not discourage people from using the system.”
- “There is a real danger that funding the (NAS Plan) . . . to a reported 85 percent would have a regressive effect on the very growth in demand that justifies the (new) system.”
- “The business community (air carriers/corporate aircraft) would pass the cost on to the passenger or consumer; general/private or nonbusiness aviation would absorb the cost by not flying as much or would cease flying altogether; the cost to the military would come from an increased budget (taxes).”
- “It seems apparent that the general aviation contribution of roughly 5 percent of the cost, as is now the case, is low and should be increased.”
- “The airport ‘head tax’ will never be tolerated by the traveling public.”
- “Taxes could also be assessed on the purchase of advanced avionics equipment.”
- (Charges should be levied) “depending on the percentage that various groups utilize the system.”

How should revenues from user charges be allocated?

Several respondents stressed the importance of employing user fees to cover the cost of capital improvements in the ATC system. Some indicated that surpluses should be avoided, since they would indicate that the fees are too high and therefore would be likely to restrict access to the system. There was wide disagreement about whether operating and maintenance costs of the ATC system should be covered, wholly or partly, by user fees.

Excerpts:

- “The FAA was created in the public interest, and the public should pay for its operation. If the users are to pay for everything, then we should consider abolishing the FAA.”
- “Taxes should be levied no higher than necessary to support the program and (should be) tied to a commitment to carry it out.”
- “User charges should only be allocated to the Air-
- port and Airway Trust Fund.” (The FAA should) “use the Trust Fund for its intended purpose and prevent accrual of a surplus for other purposes.”
- “ATC system improvements and R&D should receive the bulk of user charges. A substantial portion should be used for operation and maintenance.”
- Trust Fund surpluses “should be applied to the costs of operating and maintaining the system.”
- User fee allocations: “System improvements, 50 percent; R&D, 20 percent; airports, 10 percent; operations and maintenance, 20 percent.”
- “(User fees) should be allocated to cover all facilities and equipment and research and development costs, roughly 50 percent of the operations and maintenance costs, and full funding of ADAP.”
- “A substantial portion should be allocated as aid to airports. None of the user fees should be used for operations and maintenance.”

ATTACHMENT C-3: A SUMMARY OF THE CONFEREES' VIEWS

Implementation of the FAA Plan— A Summary of the Conferees' Views at the 1982 OTA Conference

Technological Risks

The FAA Plan contains few technological risks. Most of the elements of the plan reflect the result of extensive use experiences or long-term development.

Modes S and TCAS were endorsed. General Aviation implementation of new transponders should be voluntary to the extent possible, consistent with system safety standards.

Some elements of the plan are “demand independent,” and constant efforts to improve system safety are in this category.

A cornerstone of the plan is and should be the immediate initiation of a program to replace the present outmoded ATC automation system with modern software hardware of greater capacity, reliability and flexibility.

Making the transition between the present limited system and a new computer system presents the greatest challenge and risks. If the lives of the current computers are extended unduly, maintenance becomes more difficult and capacity for new functions is limited. If present software is “rehosted” to new computers which are to be used during the next two decades, the choice of computers may limit future sys-

tems development. Rehosting to interim “throw away” computers (emulators) has been suggested as a method of providing adequate capacity during the new software development stage without freezing the computer technology or architecture now.

The best way to proceed is a judgment call, and is a matter which this group does not have time to resolve. The FAA judgment is to proceed with a “final” computer replacement selection, and we suggest that good answers will be available only after bids on their proposals are received.

Implementation Problems

The ability of FAA to implement a plan of this magnitude was discussed. Considering the ultimate responsibility of FAA for the safety of those using the system, and the prior success of it and other agencies, such as the National Aeronautics and Space Administration and the military services, in implementing major programs, it was the consensus that FAA should manage the program and obtain necessary additional management and engineering assistance from industry early in the program.

The plan relies heavily on consolidation of manned facilities to achieve economies of scale. Removal of major Government facilities from communities is often difficult, and aviation groups should support consolidations wherever it is shown that costs can be reduced without degrading services.

Scheduling

FAA has not presented sufficient engineering data to assess the proposed schedules. However, the need to rebuild the system and reduce its manpower intensity indicates there should be no delay in starting on the plan.

Flexibility and Preservation of Options

There is good correlation among independent forecasts of trunk air carrier activities, but less confidence in detail of General Aviation forecasts. Implementation of plan should be flexible and adapted to real growth in demand.

The plan appears to provide flexibility to accommodate some changes in direction, such as increased use of cockpit displays and various types of airborne navigation devices, but is not susceptible to such basic changes as whether to replace computers and provide more automated functions if manpower intensity is to be reduced.

Other Concerns

Other concerns are:

1. **Airports:** A companion airport development program is required. Airport capacity in major communities is the ultimate limitation.
2. **Safety:** The plan does not specify the most urgent safety needs in a priority manner, nor is this needed if adequate funding is provided. However, if funding becomes critical, each year's budget must be examined closely to avoid safety items being dropped or deemphasized. Priority determination must fully consider the relationship and interdependency of the separate elements. Failure to do so could adversely affect other systems within the plan if those systems were somehow dependent upon the element in question. A thorough systems look is necessary.

3. **Long-Range Funding:** Unless adequate long-range funding is assured, by both user charges and Government commitment to its share, there is little prospect that the improvements contemplated will be accomplished.
4. **Demand:** Forecast demands may be wrong, and planned capacity may either not meet—or exceed—demands. It may be necessary to adjust schedules to reflect actual demand experience, but the basic concept of providing more automation should be pursued regardless of precise rate of growth.
5. **Man-Machine Interface:** The new sector suite concept pushes reliance on automation much further than current practice. Thus, controllers can handle more traffic per individual, but their duties and responsibilities would be changed significantly. There is little technical risk in the sector suite concept, but care is needed in designing man-machine interfaces to achieve controller efficiency without requiring extraordinary effort or skill.
6. **Wake Vortex:** Increased emphasis should be given to solving wake vortex generation and detection so that acceptance rates can be increased.

Summary

Despite inevitable flaws in the detail elements of the plan, the conference agreed that it merits general endorsement and strong support for long-term funding as a specific element of legislation. One basis for this position was that the proposals within the plan are directed toward the resolution of past and current problems—safety, economics, and reliability—as well as anticipated growth, demand, safety, and reliability problems. There was concern over the proposed use of user-funded trust funds to pay a very high percentage of the operations and maintenance charges of FAA, but this issue must be resolved in the appropriate congressional committees.