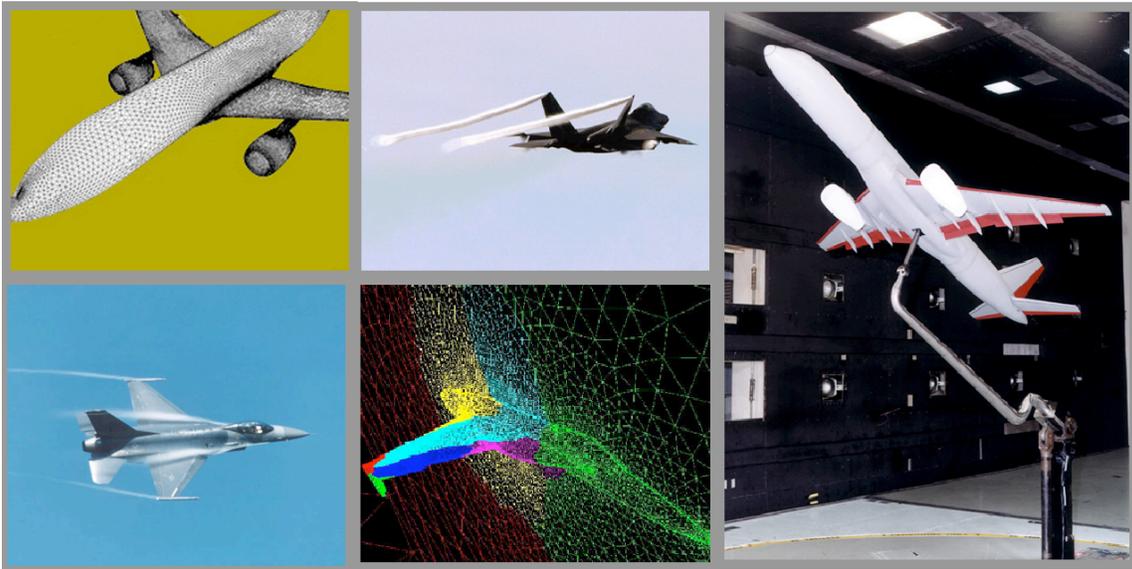


**Preliminary Announcement
and Call for Presentations**

NASA Symposium On Computational Methods For Stability and Control (COMSAC)



***Hampton, VA
September 23-25, 2003***

OBJECTIVES OF SYMPOSIUM

This NASA-sponsored symposium on Computational Methods for Stability and Control (COMSAC) will provide a national forum to discuss the status, opportunities, and challenges of applying Computational Fluid Dynamics (CFD) methodology to current and future issues in the field of aircraft stability and control (S&C). The unprecedented advances now being made in CFD technology have demonstrated the powerful capabilities of codes in applications to civil and military vehicles. Used in conjunction with wind-tunnel and flight investigations, many codes are now routinely used by designers in diverse applications such as aerodynamic performance predictions and propulsion integration. Typically, these codes are most reliable for attached, steady, and predominantly turbulent flows. As a result of increasing reliability and confidence in CFD, wind-tunnel testing for some new configurations has been substantially reduced in key areas, such as wing trade studies for mission performance guarantees.

Interest is now growing in the application of CFD methods to other critical design challenges. One of the most important disciplinary elements for civil and military aircraft is S&C. Experience has shown that predictions and analyses of aerodynamic S&C characteristics for full-scale aircraft can be in serious error because of Reynolds number effects, configuration sensitivities, dynamic motion effects, and related issues. Existing experimental facilities may not even be capable of replicating the motions required for aerodynamic measurements. As a result of these shortcomings, a major portion of aircraft development wind-tunnel time is typically devoted to S&C testing, especially for various off-design conditions ranging from takeoff and landing to cruise and maneuver. Even with an enormous amount of experimental work, pre-flight aerodynamic prediction errors result in unacceptable increases in program costs, “fly and try” approaches to fixing deficiencies, and extensive developmental delays. Unfortunately, applications of current and emerging CFD codes to engineering analysis in the field of aircraft S&C have been extremely limited. Although isolated examples of success have been demonstrated for certain configurations, the more global issues in S&C – which may involve massive flow separation, unsteady and nonlinear phenomena, dynamic effects, and other extremely complex factors – have not yet been significantly addressed by the CFD community. The current lack of COMSAC-related activities has been further aggravated by the fact that, in contrast to the areas of CFD and performance, very little cross-cultural interactions and communications appear to occur between participants in the areas of CFD and S&C. Within the aerospace community, it is generally agreed that the field of CFD has rapidly matured to the point that the next high payoff applications could occur in S&C. In particular, CFD offers the potential for significantly increasing the basic understanding, prediction, and control of flow phenomena associated with requirements for satisfactory aircraft handling characteristics.

The objectives of the 3-day symposium are to:

1. Assess the current status of COMSAC-related efforts
2. Discuss the unique aerodynamic phenomena and issues of S&C
3. Define the current characteristics and capabilities of CFD codes
4. Define additional or new code requirements for S&C applications
5. Identify potential approaches to develop validated codes

Participants at the symposium are expected to include individuals from NASA, industry, DoD, and universities.

CALL FOR PRESENTATIONS

To facilitate the preparation of material for the symposium, no formal papers will be required. However, PowerPoint presentation graphics with facing-page text will be required from all presenters. All sessions will be unclassified.

Survey presentations are of special interest. The intended applications of COMSAC to be discussed at this symposium are for fixed-wing civil and military aircraft across the speed range from takeoff and landing to cruise and maneuver conditions, but experiences with pertinent topics such as dynamic effects and entrained flow effects from the rotorcraft and powered-lift sectors are also appropriate. Specific topics of interest include the following:

1. Aerodynamic Issues in Stability and Control

Most of the critical aerodynamic parameters that affect the S&C of current aircraft involve the prediction and control of separated flows, especially on components such as wings and fuselage forebodies. The impacts of separated flow fields on the effectiveness of stabilizing surfaces and control effectors, and on uncommanded motions of the aircraft are critical to ensuring satisfactory characteristics. In addition to the substantial challenges of predicting the onset and characteristics of separated flows across the speed range, CFD methodology for S&C must predict the effects of a myriad of variables such as angle of sideslip, angular rates, unsteady effects, Mach number, and Reynolds number. In addition, the effects of these variables typically cause large nonlinear variations in S&C parameters with small changes in angle of attack. Although extensive wind-tunnel and flight investigations have been conducted for many of the major aircraft S&C parameters, CFD has rarely been applied to analyze or predict them. Presentations are solicited that address the most critical aerodynamic issues facing the S&C analyst now and in the future, with the intent to provide information to the CFD community regarding the needs of the S&C community.

2. CFD Capabilities and Shortcomings

In the recent past, CFD codes have been successfully applied to stability and control applications for configurations that exhibit fixed flow separation behavior, such as the static lateral stability of sharp-edged, swept wings and directional stability contributions of chine forebody shapes. For these unique problems, forces and moments of interest to S&C analyses have been obtained with realistic trends and accuracy. However, the characteristics of more general configurations with free transition and flow separation are orders of magnitude more difficult to compute. Nonetheless, the aggressive advances being made in CFD for performance-oriented studies suggest that the time has come for applications to S&C problems. Presentations in this area will provide a forum for experts in CFD methodology to present their experiences, tools, and perspectives to the S&C community. Presentations are solicited that address past experiences with CFD for S&C, overviews of the capabilities and shortcomings of current and emerging codes for S&C applications, major barriers to COMSAC, resource requirements, set-up time and robustness, methods for preliminary design vs. developmental stages, uncertainty of CFD methodology, and other computational limitations and opportunities.

3. Recommended Approaches

At the present time, many in the S&C community are dubious that CFD methodology will mature and have a significant impact in their area of expertise. This attitude has resulted from experiences with the multitude of variables involved in aerodynamic S&C technology, the complexity of separated flows, and the lack of highly visible CFD efforts stimulated and endorsed by the S&C specialists. At the same time, the CFD community is generally uninformed as to the specific aerodynamic problem areas of aircraft S&C. If progress is to be made in advancing COMSAC, it will require carefully coordinated studies involving the combined efforts of wind-tunnel, CFD, and flight projects to assess and develop reliable codes. In order to motivate and focus the growing interest in COMSAC, it is extremely important to identify the scope and approach of focused efforts to evolve and mature the technology. Presentations in this area are intended to stimulate discussions among S&C and CFD experts regarding the potential content and approaches for COMSAC projects and associated technical thrusts. Presentations are solicited on visions and recommendations for high priority CFD applications, with emphasis on topics such as objectives, scope, codes to be used, gridding techniques, current shortcomings in CFD for the application, data requirements for calibration and validation, and rough estimates of computer resource requirements.

4. Future Challenges and Opportunities

Much of the current interest in COMSAC technology has arisen because of limitations in existing experimental methods for S&C analysis. However, radical new aircraft concepts are rapidly evolving that will present the S&C specialist with even more complex challenges, requiring the use of more flexible and accurate tools. For example, the emergence of “smart structures” and aircraft morphing concepts that enable continuous outer mold-line shape changes will present exceptional challenges for the prediction of configuration aerodynamic characteristics. With innumerable configuration possibilities, the limitations of wind-tunnel models and conventional testing will quickly become apparent. If reliable CFD methods were available, a significant enhancement to the experimental analyses might be possible. Future opportunities for CFD applications to S&C problems might include the application of inverse methods now used in performance applications to determine aircraft geometrical changes required to eliminate flow separation or adverse aerodynamic behavior. Coupled with the maturation of active flow control concepts to prevent and control flow separation, CFD might assume a significant role in the development of design procedures to enhance S&C characteristics. Presentations are solicited on anticipated challenges that will intensify the difficulty of aerodynamic S&C predictions for future civil and military aircraft, and perspectives of the potential of CFD methods to help alleviate risk and improve understanding.

GUIDELINES FOR PRESENTATION SUBMISSIONS AND SELECTION

Presentations of approximately 30 minutes, including questions and answers will be selected on the basis of submitted abstracts of at least 500 words, clearly stating the theme and content of the presentation, supporting graphics, and major findings and conclusions. If possible, authors are requested to specify a particular topic area from the foregoing topics for their presentation. These abstracts may be submitted electronically by **May 30, 2003**, to:

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Following a review by a NASA Symposium Committee, presenters will be notified of the status of their submittals by **June 30, 2003**. Electronic presentations (including facing-page

text) are expected to be available at the time of the symposium, and will be published in an archival document shortly after the symposium.

INVITED PRESENTATIONS

Presentations considered to be of wide interest and significance to the symposium topic will be invited and given additional time on the agenda. These invited presentations may include proposed talks submitted in response to this call.

SPONSOR

The Aerospace Systems Concept to Test (ASCOT) element of the NASA Langley Aerospace Vehicle Systems Technology Office is sponsoring this symposium and providing the organizing staff. Requests for additional information should be directed to one of the following individuals:

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CONFERENCE ARRANGEMENTS

The symposium is scheduled for September 23-25, 2003 at the Holiday Inn/Hampton Hotel and Conference Center in Hampton, Virginia. Arrangements have been made for a reserved block of rooms for attendees. If you are interested in attending or being added to the email distribution for additional information, **please respond to the symposium or technical chairmen and communicate your intent to participate or present in this symposium as**

soon as possible. This response will provide essential information to the organizers to properly plan the symposium. Deadlines for abstract submittal will be on May 30, 2003, and paper selection and notification will be completed by June 30, 2003. Preregistration will be required and will include a modest registration fee. This will be required by August 1, 2003. Details of final agenda will be available on a special web site and e-mailed to participants during early August, 2003.