📐 Managing an Archive of Images

The SSC Multimedia Archive is an automated electronic system to manage images, acquired both by film and digital cameras, for the Public Affairs Office (PAO) at Stennis Space Center (SSC). Previously, the image archive was based on film photography and utilized a manual system that, by today's standards, had become inefficient and expensive. Now, the SSC Multimedia Archive, based on a server at SSC, contains both catalogs and images for pictures taken both digitally and with a traditional, film-based camera, along with metadata about each image. After a "shoot," a photographer downloads the images into the database. Members of the PAO can use a Web-based application to search, view and retrieve images, approve images for publication, and view and edit metadata associated with the images. Approved images are archived and cross-referenced with appropriate descriptions and information. Security is provided by allowing administrators to explicitly grant access privileges to personnel to only access components of the system that they need to (i.e., allow only photographers to upload images, only PAO designated employees may approve images).

☢ MPT Prediction of Aircraft-Engine Fan Noise

A collection of computer programs has been developed that implements a procedure for predicting multiple-pure-tone (MPT) noise generated by fan blades of an aircraft engine (e.g., a turbofan engine). MPT noise arises when the fan is operating with supersonic relative tip Mach No. Under this flow condition, there is a strong upstream running shock. The strength and position of this shock are very sensitive to blade geometry variations. For a fan where all the blades are identical, the primary tone observed upstream of the fan will be the blade passing frequency. If there are small variations in geometry between blades, then tones below the blade passing frequency arise — MPTs. Stagger angle differences as small as 0.1° can give rise to significant MPT. It is also noted that MPT noise is more pronounced when the fan is operating in an "unstarted" mode. Computational results using a three-dimensional flow solver to compute the complete annulus flow with non-uniform fans indicate that MPT noise can be estimated in a relatively simple way. Hence, once the effect of a typical geometry variation of one blade in an otherwise uniform blade row is known, the effect of all the blades being different can be quickly computed via superposition. Two computer programs that were developed as part of this work are used in conjunction with a user's computational fluid dynamics (CFD) code to predict MPT spectra for a fan with a specified set of geometric variations:

- The first program ROTBLD reads the users CFD solution files for a single blade passage via an API (Application Program Interface). There are options to replicate and perturb the geometry with typical variations stagger, camber, thickness, and pitch. The multi-passage CFD solution files are then written in the user's file format using the API.
- The second program SUPERPOSE requires two input files: the first is the circumferential upstream pressure distribution extracted from the CFD solution on the multi-passage mesh, the second file defines the geometry variations of each blade in a complete fan. Superposition is used to predict the spectra resulting from the geometric variations.

The user would typically generate a multi-passage mesh (ROTBLD) with the geometry of one blade perturbed — typ-ically, four or five passages are required. A CFD solution would then be generated for this mesh. Using this solution and specified geometry variations for a complete fan, the MPT spectra can be estimated using SUPERPOSE.

☢ Improving Control of Two Motor Controllers

A computer program controls motors that drive translation stages in a metrology system that consists of a pair of two-axis cathetometers. This program is specific to Compumotor Gemini (or equivalent) motors and the Compumotor 6K-series (or equivalent) motor controller. Relative to the software supplied with the controller, this program affords more capabilities and is easier to use. Written as a Virtual Instrument in the LabVIEW software system, the program presents an imitation control panel that the user can manipulate by use of a keyboard and mouse. There are three modes of operation: command, movement, and joystick. In command mode, single commands are sent to the controller for troubleshooting. In movement mode, distance, speed, and/or acceleration commands are sent to the controller. Position readouts from the motors and from position encoders on the translation stages are displayed in marked fields. At any time, the position readouts can be recorded in a file named by the user. In joystick mode, the program yields control of the motors to a joystick. The program sends commands to, and receives data from, the controller via a serial cable connection, using the serial-communication portion of the software supplied with the controller.