IADS is an analysis and display software tool developed to address data delivery, visualization and analysis needs faced by the engineering community working in both a real-time control and post-test environment. The IADS software development team faced the challenges of writing software for high performance test programs located at the Air Force Flight Test Center (AFFTC) at Edwards Air Force base in California. Major goals for the product were varied and complex, including the need to not only standardize the product across real-time and post test, but also across geographically separated test facilities. In addition the AFFTC required that IADS data from the mission room be available immediately after completion of the test. The AFFTC asked that IADS perform these functions on inexpensive COTS hardware.

The IADS develop team began with these overall needs, and over time learned of other processing requirements of the engineering flight test user. The main focus was the ability for multiple engineering disciplines to clear test points efficiently during a test since each processed test points using similar techniques. In addition the users asked for the ability to create displays dynamically and have those displays support both time and frequency domain data. The AFFTC community desired to have IADS fulfill these needs as an integrated tool within the over-all capability of the control room systems. In response to this, the AFFTC assembled a team of lead flight test engineers to write an operational requirements document that outlined these requirements. This document became the groundwork for the IADS software. It was quickly concluded that solving these problems would bring a new generation of efficiency into the control room environment.

The IADS development team performed an analysis of current systems at the AFFTC and other large test facilities in the United States in order to gain a deeper understand of the users requirements. What they found was a philosophy of testing that poorly met not only the needs of the structural analysis community but other disciplines as well. Most test facilities employed a shared-memory data distribution model which was developed primarily for data monitoring functions. In this method a display package running un-connected from the data, reads data from shared memory and displays it on the screen. In this model data delivery to the client workstations needs to have very low latency and the client display update rate was critical for proper data alignment. This CVT approach to data delivery makes every data point very difficult if not impossible to provide, dramatically increases hardware costs, and therefore was rejected by the testing community attempting to perform analysis in test clearance. Early attempts to meet these needs produced specialized systems that did not share data from the same telemetry system as the main data systems in the control rooms. These separate data acquisition systems provided limited channel counts. Non COTS hardware was used for specialized functions such as vector processors for calculating frequency data and expensive graphical display engines. The software running on those systems were specialized for the structures discipline, therefore the development costs weren't shared among the entire engineering test community. Overall these systems were cumbersome and limited the number of users and actually hindered group wide processing and information sharing.

The IADS team met this challenge by developing a system that integrates several capabilities into a single product. An identical user interface for both real time and post test, system logs that track critical analysis data during a mission, data delivery techniques that provide all of the data needed for in-depth analysis and a graphical display environment for data presentation and system monitoring functions. IADS also responded to the training needs by developing a key product called the Post-Test data server, which simulates playback in non-real-time and a group enabled environment for training and local office access. Early on the IADS team decided to concentrate solely on the PC platform using the Windows operating system. Surveys found that this was the preponderance of systems that most engineers had at their desk. Also it was found that the PC platform would allow for cost reductions and performance increases. In terms of data acquisition, IADS decided that the most efficient and portable concepts was to build an on-demand requested driven data acquisition system that utilized the streaming data capabilities available from most telemetry systems. This design permitted use of COTS networking techniques to drive the workstation display software because it reduced the overall distribution requirement.

Initially IADS was targeted for the structures community, but as time went on the capabilities in IADS, (every data point, full data recall, etc.) were desired by other engineering disciplines in the control room. More than once IADS was used to identify anomalies seen by other test engineers, but could not be verified because of the limited system capabilities. Using IADS, structures engineers were able to display non-structures data when an anomaly was detected, but other disciplines could not view IADS

data. This every data point, and scroll back capability sparked interest from other control room engineering disciplines and IADS began to be used by other groups, such as; Engines, Avionics & Airframe, Fire Control, Performance and Flying Qualities. During this time of increased usage it was also found that the need for mechanical strip charts began to decrease. Even though engineers had a certain comfort level with strip charts the expanded capabilities offered by IADS far exceeded them. With the disadvantages of mechanical strip charts (expense, maintenance, ink/paper) the control rooms slowly replaced these older systems with PC's. IADS workstations were easy to maintain, and provided more flexibility. Soon the control rooms removed the mechanical strip charts and replaced them with IADS workstations. There was a paradigm shift in the control rooms when engineers realized they could get complete data recall in real-time without affecting anyone else in the control room. Also the ability to immediately take the data with them became a valuable time saving for quick-look style analysis. Many test programs provide this data on a server farm to the engineering users thereby reducing the load on the post test data product generation function.

The IADS testing tool differentiates itself from most other display systems currently in use, it is PC based, provides a multitude of displays and analysis techniques, as an extensive derived engine, a work group environment with integrated full data recall and the ability to capture every data point requested. The software is developed with extensive input from various engineering disciplines, resulting in a finely tuned software package geared for the flight test community. The IADS team realized that in order to supply the most benefit to the flight test community the software would need to have the

ability to connect to multiple telemetry systems. This allowed standardization at the real-time processing level within organizations.

Future IADS development plans call for expansion in both real-time and post test. In real-time a video distribution system, with full data recall that's integrated with engineering data will keep pace with the next generation aircraft. In post-test IADS will have the capability to perform intelligent queries on data stored across multiple flights. These advancements will advance the capability for engineers to respond to test situations thereby gaining more knowledge in less time.