Integrated Design and Assurance System (IDAS)

What is IDAS?

- NASA Kennedy Space Center's (KSC) Integrated Design and Assurance System (IDAS) is a supported, secure, mature, modern, and continuously updated capability that is used by all KSC Programs and allows any KSC civil servant or contractor at any network computer to learn and use a set of integrated best-in-practice software tools to perform technical risks analyses over the life cycle of a complex system.
- IDAS addresses all types of employee work goals, namely, routine work, problem solving, innovation, and employee training and development (Ref. George S. Odiorne).
- IDAS is a proven, effective, and low-cost strategic resource and production capability that directly contributes to NASA's core values and mission.

What are the benefits of IDAS?

- A May 2008 survey indicated that 44 KSC engineers especially those doing safety and mission (S&MA) work want to continue using the Relex software. The Relex software is the backbone of IDAS and has been used at KSC since Fall 2002 (and at other NASA Centers as well).
- IDAS and especially the Relex software have delivered real and useable analytical products at KSC. Examples: Hypergol Oxidizer Storage Facility at Fuel Storage Area #1, Cx Launch Equipment Test Facility (LETF), Automated Guided Vehicle (AGV), ISS Crew Health System (CHeCS), and Orbiter Fuel Cell Pump Motors.
- IDAS allows engineers and analysts to immediately go to work—that is, produce, share, and report analysis products. Time is not spent on finding, developing, learning, debugging, and verifying the method to do each analysis.
- IDAS reduces errors commonly found in work produced by generic office tools (e.g., Microsoft Excel). IDAS' resources (e.g., help desk, vendor manuals, and NASA examples) focus on learning and applying the engineering science (e.g., how to determine and analyze the failure paths in a fault tree) and are not limited to the operation and "IT features" of the tools (e.g., how to insert a fault-tree graphic into a Word document).
- IDAS keeps the Relex application and Relex data files on a KSC server and not at the user's workstation. Thus, work is backed each evening by KSC's IT contractor (ODIN) and will not be lost when users move to another job or users' hard drives are wiped clean by ODIN when they leave KSC.
- IDAS is scaleable to any number of users. IDAS is adaptable to our style in reporting. IDAS tools provide various technical approaches; we are not limited to "their way."
- IDAS is many times less costly than making software tools and buying vendor training (i.e., lectures with little "hands on" and virtually no application engineering support afterwards). For example that compares the cost of two training methods:
    - Three-day class on general reliability during year 2007: Approximately $17,000/3 days/20 students = $283.33 per student per day.

08-06-2008 NASA KSC, SA-G, Tim Adams, 321-867-2267, tim.adams@nasa.gov

- Starting year 2009, Relex Maintenance Contract: $88,000/3 years/50 work weeks per year/5 work days per week/50 KSC users = $2.35 per user per day.
- Note: Even though Relex's online and webinar training method has a unit cost 120 times less costly than the traditional-classroom-type course, the cost for Relex also provides software updates, failure-rate-parts-library updates, and unlimited use of the 40 hour per week live help-desk support.

IDAS can be a system, a tool, a collection of tools, a reporting system, or any combination.

- What system or tool did Lockheed use?
  - Headlines: Defense Dept. blasts Lockheed missile program. "…a $5.8 billion Lockheed Martin Corp. Cruise-missile program faces termination if its performance does not improve soon...Recent test failures led the Pentagon to seek further review…Lockheed Martin must convince the government it has a way to fix navigation glitches and improve reliability…For now, the reliability questions just mean the Air Force would have to use more missiles if it needed them to attack an important target." (Florida Today, June 7, 2007, page 3C).
- Has the following viewpoint worked for Toyota? Could it work at NASA?
  - "At Toyota, we get brilliant results from average people managing a brilliant process. Others get average results from brilliant people managing broken processes."

From A System Development Point Of View, IDAS …

- Is an engineer's[1] response to helping other engineers[2] do engineering work[3] over a system's life cycle.
- Provides, integrates, and supports secure, validated, and "best-in-practice" tools.
- Allows when desired work to be done in a collaborative manner with any other engineer[4] at KSC (and if desired ultimately across the Agency) at any time without requiring face-to-face meetings, e-mail, or paper.
- Provides embedded standards and a variety of tools and techniques that could improve or augment existing work processes or support a new work process.

Foot Notes:

1 –IDAS' start-up team consisted of four members with work experience and/or education in mechanical engineering, electrical engineering, industrial engineering, systems engineering, reliability engineering, human factors, computer science, business administration, crew training, and PRACA.

2 – IDAS has tools for engineers in the following areas: design, safety, reliability, maintainability, risk, logistics, human factors, quality, cost, sustaining, and corrective action.

3 – Engineering work is limited to predicting and analyzing a system operating outcomes (e.g., safety, reliability, maintainability, availability, usability, and supportability) and not the system's technical characteristics (e.g., size, weight, function, strength, etc).

08-06-2008 NASA KSC, SA-G, Tim Adams, 321-867-2267, tim.adams@nasa.gov

Integrated Design and Assurance System (IDAS)

4- At KSC, IDAS is installed on a network server that is backed up daily. KSC's Relex software is licensed such that any KSC civil servant and contractor can use the software as well as receive direct and unlimited training and support services provided by the maintenance plan.

From A Tool or Tools Point Of View, …

- In general, the IDAS' tools provide a means to analyze and assess risk associated with system assurance (system operating outcomes). For example, the Relex has modules address likelihood and consequence (hazard), the dimensions of risk.
- For example, the Relex software:
  - Analyzes and evaluates engineering designs and engineering-test and field operating-and-failure-history data. Thus, the Relex software can be used to verify quantitative (probabilistic)-type requirements via the analysis method, one of the three methods for verification (the other two methods are test and inspection).
  - Allows to design engineer to import (if desired) and model a system's bill of materials and then configure the system elements to analyze and forecast (predict) the systems' safety, reliability, maintainability, availability, usability, and supportability.
  - Does not create all of the tools it provides—but it surely integrates them. Examples: The deterministic mechanical prediction module comes from the US Navy. The "217Plus" electronics prediction module comes from Department of Defense's Reliability Information Analysis Center (RiAC). The Weibull module comes from Wes Fulton and Dr. Bob Abernethy, internationally known experts in Reliability. Other modules (e.g., FMEA and Maintainability) are based on a variety of standards. Relex's product line for over 20 years has been dedicated solely to prediction, analysis, and reporting tools in the areas of technical risk (i.e., engineering assurance).

As a Reporting System, Relex's PRACA module (called FRACAS) provides …

- A functional PRACA system for a new program while the perfect PRACA is being defined, developed, tested, and setup. Relex's FRACAS reduces the risk associated with "home-made" tools from local Excel and Access that once made will most likely never go away.
- The new program a fall back in event the perfect PRACA does not become operational. The Relex fall back would be better than fragmented Microsoft Office tools.
- A mechanism for NASA to integrate all of its PRACA systems since the Relex FRACAS module has the capability to run multiple and dissimilar PRACA systems.
- An automated means to compare problem activity (i.e. actual) to engineer's predicted failure rate (i.e., planned).

08-06-2008 NASA KSC, SA-G, Tim Adams, 321-867-2267, tim.adams@nasa.gov