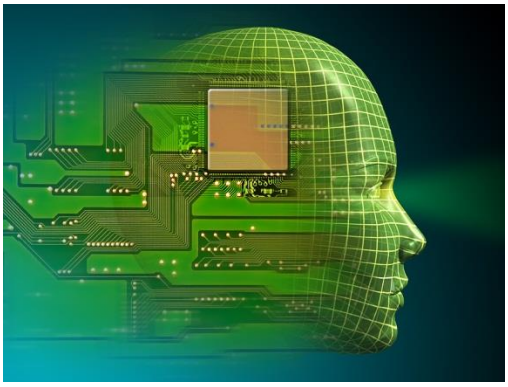
Over 40 Years of Experience and Service as a Defense Contractor

GCAS Incorporated is a cutting-edge technology services and products company with over 30 years of service and experience in support of our national defense missions.



The company's Defense Engineering/Software Development Division has been a leading pioneer in the development and applications in modeling, simulation and analysis utilizing Data Analytics and Artificial Intelligence (AI) techniques to develop software products and services for both government and commercial markets. The major focus of our business operations has been in the areas of probabilistic reasoning under uncertainty using Rule-based Expert Systems, Bayesian Networks, Markov Chaining, Probabilistic Relational Models and other advanced statistical techniques as core technologies. The application of these tools has been into multiple diverse areas including:

- Corrosion simulation and modeling,
- Command and control systems,
- Sensor enabled health monitoring systems,
- Advanced data mining methods for selecting coatings and paints,
- Extending Bayesian methods to include second order uncertainty,
- Determining the fragility of electronic equipment subject to conventional weapon blast waves,
- Intelligent searches of digital libraries,
- Advanced accounting methods for Government contractor companies.

Artificial Intelligence (AI) techniques developed over the past three decades at GCAS have now reached the point where they can impact real world problems. We have developed advanced mission-dependent decision tools and applications for military systems, addressing several types of Intelligence and combinations thereof. GCAS' technologies extract meaningful information from raw data (ALL types) and exploit it for intelligent and predictive applications, specializing in very hard problems that are under-served by COTS approaches. We have developed operational decision systems for the Analyst Intelligence, Information Operations, Information Extraction, Link Discovery, Sensor Data Discrimination, Situation Awareness, Correlation, Multi-Source Information Fusion, distributed Intelligent Agents, and some critical aspects of Mission Planning in Network Centric Environments.

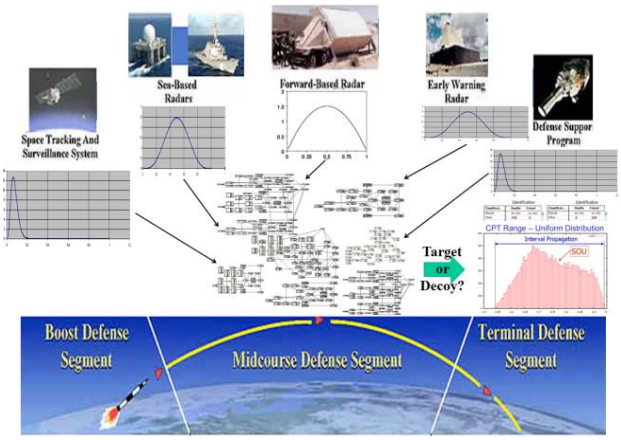
1531 Grand Avenue, Suite D, San Marcos CA www.gcas.net UEI = D871TBH2MK11 760-591-4227

GCAS Data Analytics, Statistics and Artificial Intelligence

GCAS is expert in Data Analytics and Decision Networks for use in difficult problems such as Target Recognition and Engineering Predictions. We have developed custom tools for general purpose applications such as:

SOU-Interval Propagation in Bayesian Networks

A new uncertainty propagation engine and a graphical editor for constructing Decision Networks, called "SOU" (Second Order Uncertainty). The SOU is used for propagating the effects of intervals and Probability Distributions of uncertainty specified for both evidences and Conditional Probability Table (CPT) parameters. The system also supports tracking back to the evidences and CPT parameters, and sensitivity analysis to provide the largest contribution to a belief interval for a variable of interest.

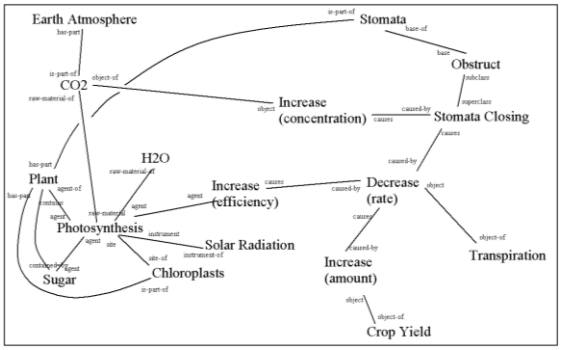


Knowledge Acquisition for Level II/III Fusion

A new Knowledge Acquisition Tool for eliciting knowledge and allowing Subject-Matter Experts (SMEs) to directly encode complex real-world battlespace scenarios for Courses of Action (COA) generation as needed to perform Predictive Battlespace Awareness at both Level II (Situation Assessment) and Level III (Impact Assessment) data fusion. The *Integrated System for Probabilistic and Logical Reasoning* (ISPLORE) system contains algorithms and methodologies for acquisition and integration of mixed logical and probabilistic knowledge and merges the state-of-the-art techniques in both logical and probabilistic reasoning, through the complement of the Knowledge Machine (KM) and Probabilistic Relational Models (PRMs) languages. It encompasses Probabilistic Reason of multiple agents for decision-making as represented by Networks of Influence Diagrams (NIDs). NIDs model the behavior of several agents in an interactive domain and introduces a "naturalistic" approach into Bayesian Net reasoning.

Search Methods for Scientific Data in Digital Libraries

A new method of Knowledge-Base information retrieval for large scientific digital libraries has been developed with an innovative search approach for processing user-queries. Information that will be helpful in answering the user's questions is used, based on the system's estimation of the logical process involved in answering the question. A request is posed as a question and information sources are identified that pertain to steps in the logical process of answering the question. This approach involves extensive automated generation of document metadata, as well as sophisticated probabilistic assessment and tuning of the knowledge base. Different possible paths of reasoning can be identified as bearing different likelihood of satisfying the query. The final answer will include a likelihood estimate of relevance for each chunk of retrieved information.

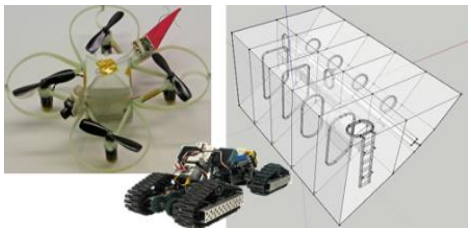


Temporal Database Management System

This system incorporates an event-driven time-line graphical interface for managing large time-dependent data.

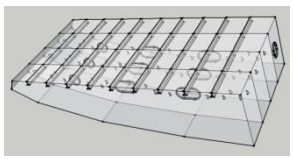
Corrosion &Material Deterioration

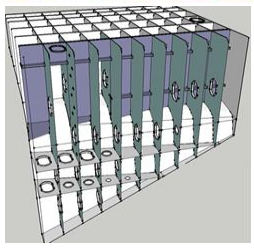
Autonomous Tank and Void Inspection Flying Robots

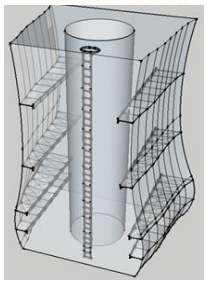


Flying quadrotor UAV robots were designed, developed and test flown in a test chamber that was a full-scale reproduction of an aircraft carrier void. The robots navigated inside the void, reaching small recesses, and moved through manholes, while collecting images of tank and void surfaces via an on-board camera. The companion Tank and Void Inspection Software stores the inspection images for later inspector review, perform automatic corrosion assessment, and prioritize the inspection results by severity.

Tank and Void Inspection Software

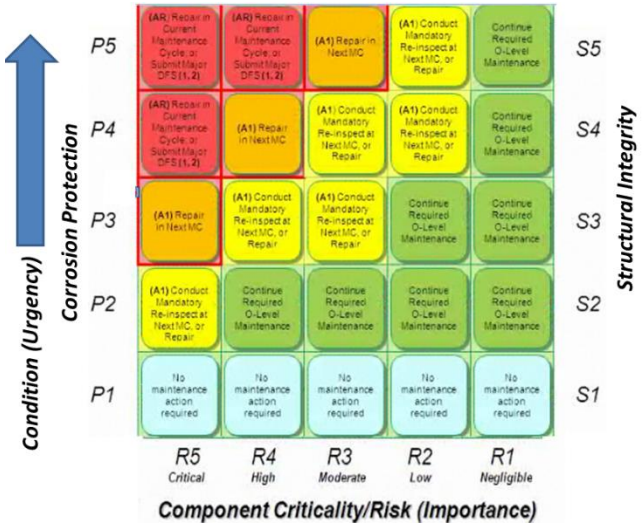






The Tank & Void inspection software is used by Navy inspectors on aircraft carriers to visually assess the coating deterioration, corrosion and structural deterioration of the various parts of the ship. The software includes 3-D models of each of the spaces under inspection which assessed from a deck plan view. Upon selecting a tank or void to inspect, historical data of the prior inspections and repairs are displayed for review. During the inspection process, a 3-D representation of the Tank/Void under inspection is displayed. The location of coating breakdown and corrosion found within the tank are annotated on the 3-D model. Photos of the deterioration can be taken using a digital camera and stored as part of the inspection record for that tank/void and associated with a location in the tank by either using call out arrows or by "painting" the image onto the 3-D model. Upon completion of the inspection of the tank, an integrity check is run to make sure no data entry items were missed or incorrectly entered. The inspection data record is then uploaded from the inspection computer to the Navy central inspection database (CCIMS) via a web link.

Expert Structure and Coating Analysis Tool (ECAT/ ESCAT)

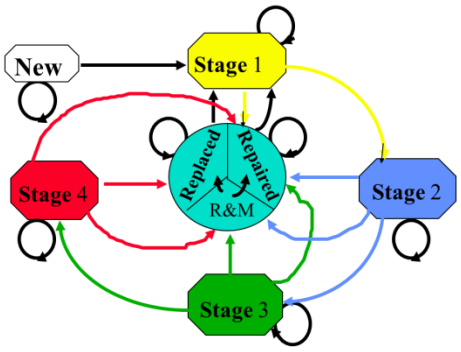


The Expert Coating Analysis Tool (ECAT) analyzes historical coating inspection data and forecasts the expected deterioration for use in scheduling and planning of future maintenance actions. The ECAT system performs data mining on existing databases and utilizes Turnbull Maximum Likelihood Estimates and Weibull Reliability Life Forecasting techniques to model the coating system breakdown risk over time (P1-P5). These techniques are being extended as ESCAT to include the risk of structural deterioration (S1-S5) in order to provide an overall assessment of operational risk for any given facility service level (R1-R5).

COORDBMS

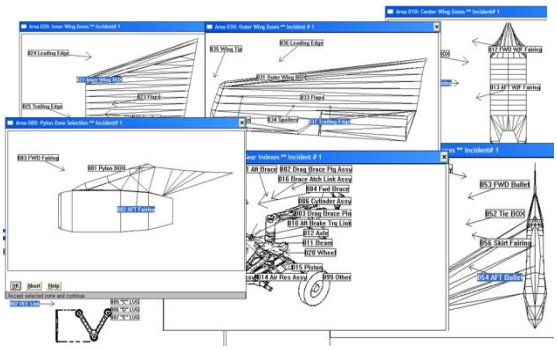
GCAS' development of corrosion inspection and data analytics systems does not stop with Navy ships. We also developed CORRDBMS, a statistical database management System used by Army and Marine Corps personnel for

tracking the corrosion of the fielded wheeled vehicle fleet. CORRDBMS is unique in its ability to extract corrosion rate information from uncontrolled field observations. Corrosion field observations suffer from a number of disadvantages compared to controlled laboratory corrosion tests, or even scheduled maintenance inspections of facilities such as ship tanks and voids, which are subjected to a consistent environment. Field measurements involve performing a number of visual inspections of vehicles over non-uniform time intervals. Frequently, long periods elapse between observations and the conditions and atmospheric environment vary in both its severity and duration. Vehicle command operation and maintenance data needed to construct the vehicle's "use" history between observations are often incomplete and erroneous. CORRDBMS uses a statistical Markov Chain Finite State Machine (FSM) model to represent transition between the different corrosion states of the vehicle. Dependencies between similar components and parts on the vehicle, operational use, road conditions, and environment (corrosion index) are determined using a multi-variant/multi-regression analysis of the composite assembled data. Maintenance and repair data, traced to the observed vehicles, are used to calculate Fleet Readiness, Life Cycle Cost and Time to Repair/Replace under different degrees of corrosion deterioration.



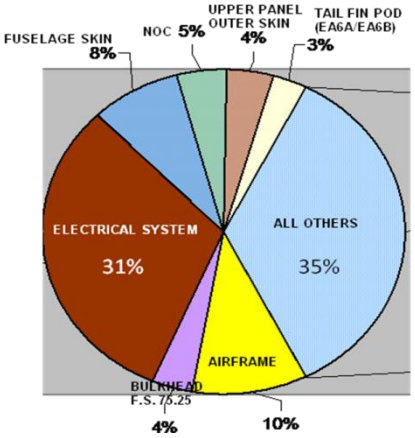
Aircraft Inspection and Repair System (AIRS)

GCAS developed AIRS (Aircraft Inspection and Repair System) for aircraft corrosion data collection under US Air Force contract to automate corrosion maintenance and repair data collection on the aging ***C141*** aircraft. AIRS is unique in its ability to describe the geometry of the aircraft's surface and structure using a detailed accurate three dimensional model which identifies the precise pinpoint location of the corrosion. Also included in the effort was the development of the CLIPBOARD computer, one of the firsts ruggedized tablet computer for inspection data collection.



Data Mining and Analytics of NAVAIR Inspection Databases

Data Analytics can be used to construct a corrosion forecasting model that takes probabilistic input data of service, materials, stress, etc. and predicts, with confidence bands, the likelihood of failure. GCAS performed such data analytics on the NAVAIR depot and field (O/I) inspection data from DECKPLATE, ADCS and MRP-II. The software is used to forecast deterioration of aircraft components overtime. Data Mining and Analytics methods were also used determine the Cost of Corrosion of aircraft processed through Navy depots. The inspection data and maintenance repair data, however, was convoluted such that one could not directly ascertain the hours required to restore a damaged part associated with corrosion. To overcome this problem a Non-Negative Least Squares (NNLS) estimate fit of the data was used to determine the participation of corrosion action item in the total repair.

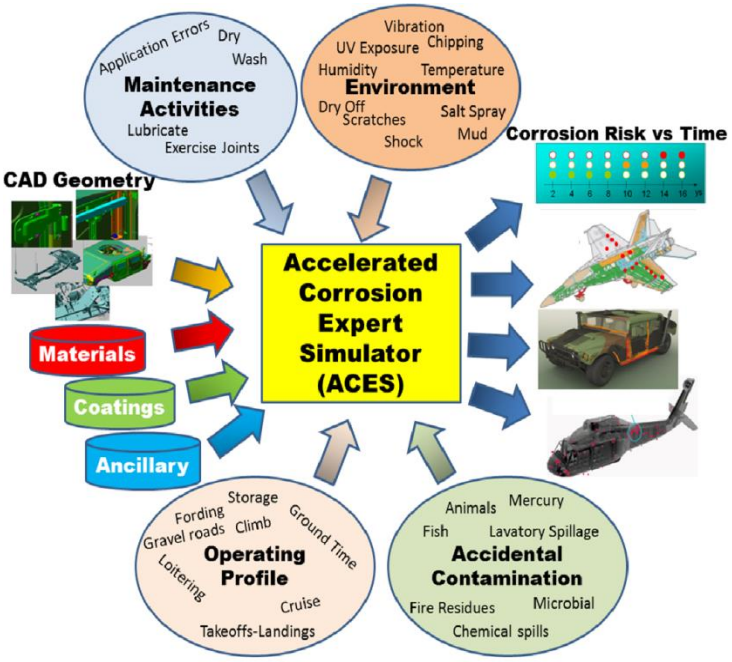


Corrosion Expert System (CES)

GCAS developed the first corrosion prediction simulator, CES, for Army/Marine Corps use in automotive and truck vehicle design to identify design problems leading to galvanic corrosion and for the early assessment of corrosion problems in vehicle. CES is a hybrid expert system in that it utilizes a Bayesian Network as the basic statistical method for propagating uncertainty in the expert design rules as well as a rule-based production system to supply evidence to the root nodes of a Bayesian Network used to predict the galvanic corrosion.

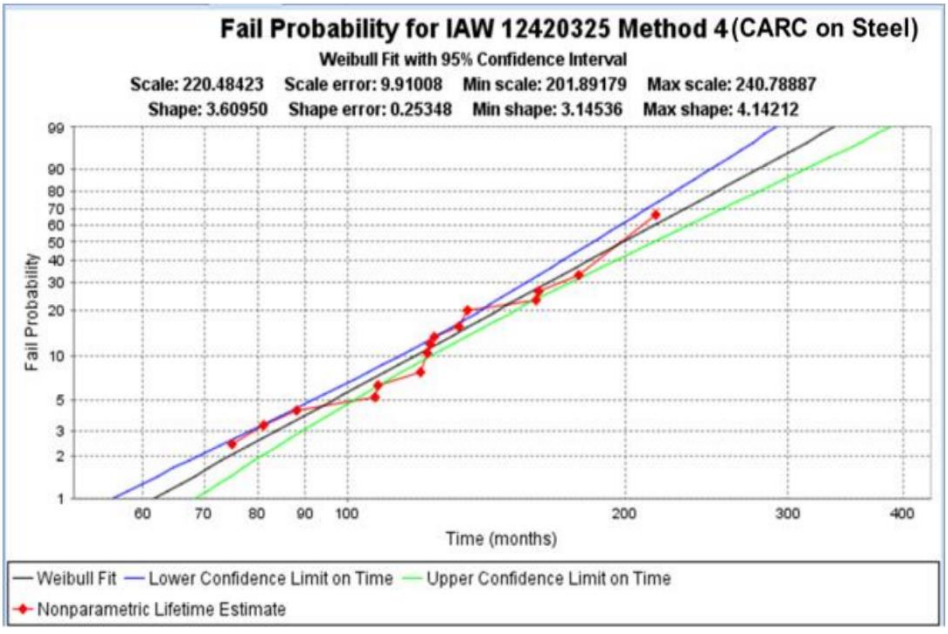
Accelerated Corrosion Expert Simulator for Automotive and Aircraft (ACES)

The success with the CES development has led to the continued development of an Accelerated Corrosion Expert Simulator (ACES) for NAVAIR and the Army. ACES is a complete vehicle simulation and modeling tool that has a high degree of correlation to actual accelerated corrosion test. The system utilizes existing 3D geometry models of the vehicle and missing geometric detail is automatically added associated with observed corrosion hot-spots from prior correlations with other corrosion testing and observations. Deterioration models for corrosion failure from uniform (general), galvanic, crevice, pitting, stress corrosion cracking (SCC) and exfoliation are included, as well as simulation and prediction algorithms for the breakdown of various coating applications, poultice entrapment areas and other mechanisms that influence corrosion in vehicle and aircraft structures, coatings and materials.



Prediction of Coating System Deterioration over time from Field Inspection Data

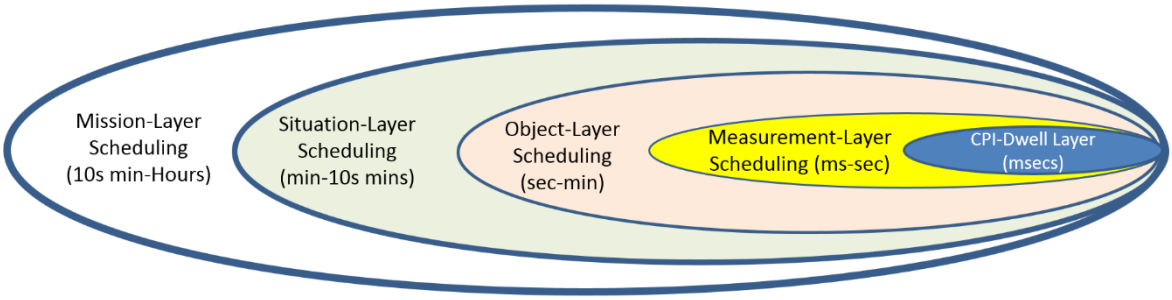
Under a subcontract award from PPG, empirically-based predictive analytics algorithms were developed for the deterioration of the various coating systems found on Army vehicles over time. Using corrosion and coating performance observations from thousands of vehicles collected as part of an Army field survey project, photos of the deteriorated parts were matched to 3-D computer aided design (CAD) geometry models that contained the detailed material and coating system properties of the parts. Censoring techniques were used on the assembled survey data to increase the statistical sample size and maximum likelihood estimates (MLEs) for the coating breakdown were calculated for different points in time. A Weibull probability distribution was then fitted to the MLE values to produce a time dependent coating breakdown prediction algorithm. The result was a prediction of the expected life of the coating system in real field environment.



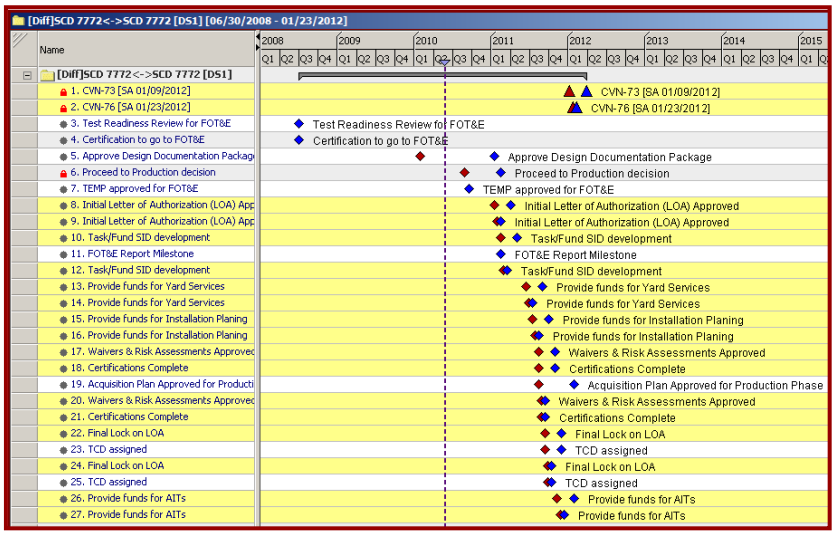
Planning, Scheduling and Project Management

intelligent Cognitive Radar Resource Management System for Maritime Aerial Surveillance

Utilizing Cognitive Radar techniques, developed a Radar Resource Management system for planning and scheduling of maritime aerial surveillance, improving accuracy, precision and speed for surveillance prioritization and survey actions. The approach adopted a 5-layer architecture extending from the CPI dwell level up to high level scheduling consistent with overall maritime situational awareness governed by mission pertinent Tactical Situations (OPSIT/ TACSITs).



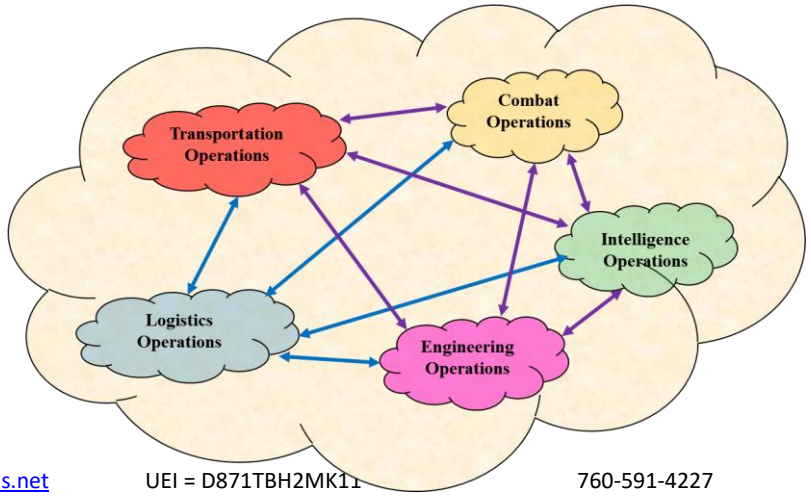
Acquisition Decision Expert Planning Tool (ADEPT)



GCAS developed a web-based ship modernization planning system for the Navy IWS2 that makes use of expert decision support technology solutions. The ADEPT system includes all facets of the planning process including organizations, individuals, systems, requirements, tasks, process-gates, deadlines and resources. This tool uses information from several Navy data sources and subject matter experts, allowing Participating Acquisition Resource Managers (PARMs) to efficiently plan, coordinate, model and track all aspects of ship modernization. More specifically, the system aims to help PARMs with strategic analysis of alternative capabilities that might go into a particular modernization/ overhaul for a ship or a ship class. The system employs AI Planning & Scheduling and Expert Decision support technology solutions that provide task planning, resource management, budgeting, risk identification and mitigation and conflict management.

Distributed Missions and Means System (DMMS)

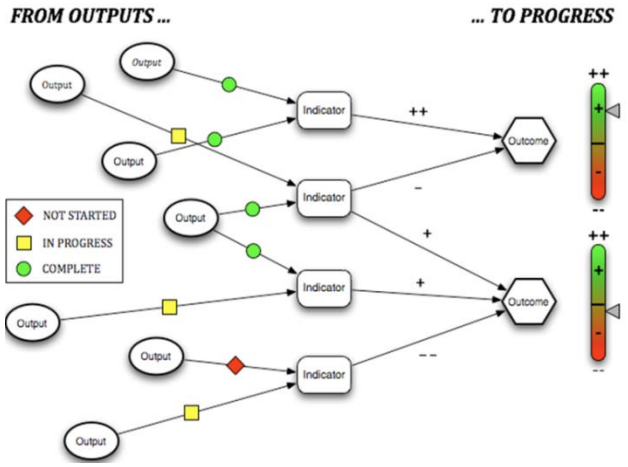
GCAS is developing DMMS using Agent Based Modeling and Simulation (ABMS) comprised of autonomous interacting agents to model multiple military domains or threads (e.g. Logistics, Transportation, Combat Operations, Intelligence, Engineering). Multiple domains and sub-domains interacting with each other constitute a distributed network of systems. Networks are becoming critical to military missions; this requires a mission-centric awareness that enables critical insight of network functioning for decision makers.



The future of assisting the decision makers relies on a foundational understanding of the dynamics of the environment and the requirements of achieving various mission objectives. The DMMS project focuses on addressing the issues of multi-domain, multi-mission planning and execution. DMMS will provide military planners and analysts with additional capability to measure progress using both qualitative and quantitative metrics, conduct analysis and establish clear interdependencies between task outputs and the mission goals. This technology could be applied to the analysis of a number of other government and private sector domains where the mission involves complex tasks and timely material means to meet objectives. For example, DMMS methodology could be applied to the analysis of natural disaster scenarios (e.g., Hurricane Katrina in the U.S., Cyclone Nargis in Myanmar) via simulation of various interacting civil management threads such as sustainment, medical relief, reconstruction, and law enforcement.

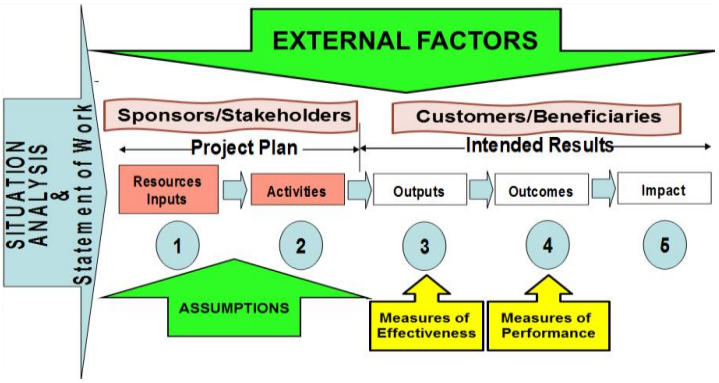
Linking Project Task Outputs to Program Objectives and Long Range Impact

Under Army Corps of Engineers contract, GCAS developed techniques for linking the cause and effect relationships between the outputs of tasks in a project to the long range outcomes and impact of the overall effort. The specific application for demonstrating this advanced AI software was the stabilization and reconstruction of Afghanistan. The software linked the ***output*** of stabilization and reconstruction (peace-building) projects/activities/tasks, determined by a given contract Statement of Work, to desired overall mission ***outcomes/impacts*** being monitored by the stakeholders such as Congress. The linking is accomplished by using Influence Diagram techniques in conjunction with a Logic Model structure.



Logic Model Development

Under contract with the National Institute of Health, GCAS developed a computer software system that guides the development of Program Logic Models for program planning and evaluation. The software allows the user to develop a project plan: resources needed for program operation (Resources/Inputs) and strategies or processes involved in implementation (Activities) link to outcomes, including process outcomes (Outputs), desired changes to the target audience as a result of the program (Outcomes), and long-term program goals (Impact). This system is enhanced by integration with modules for Scheduling (Milestone Charts, Gantt Charts, Pert Charts, Critical Path Analysis, and Critical Chain Method), Project Risk Management (Belief Networks, Influence Diagrams), Timeline Budgeting and Earned Value Management.



Battlespace Management Planning and Scheduling

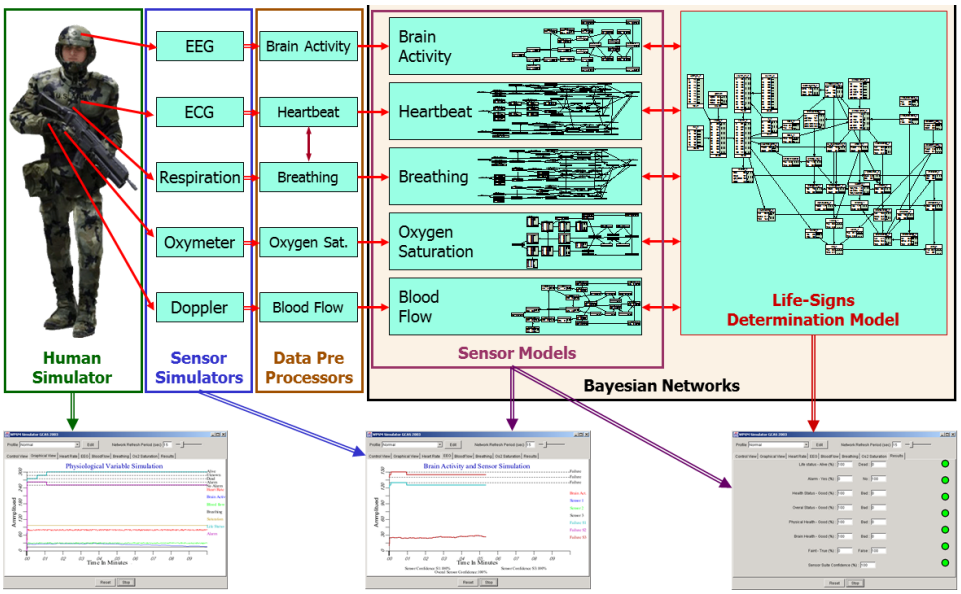
In this Air Force contract we designed an interactive and continuous planning system that can handle multi-level objectives together with their deadlines and priorities for use in managing the Command and Control activities and Course of Action in the Battle Space during engagement. The planner uses the Multilevel Logic Model paradigm to help construct and manage the scheduling from the top level process definition where the intent, mission analysis and course of action are established, to the execution levels where components, weaponry, and detailed planning is established and monitored/tracked. This planning system is able to adapt to real-time information updates (for example changes in the status of resources, additional or revised mission objectives, revised priorities of objectives

or target lists). In addition, the system assists the users in specifying assumptions, situation analysis, and external factors. Finally, the system design supports centralized planning and decentralized execution.

GCAS Medical Systems

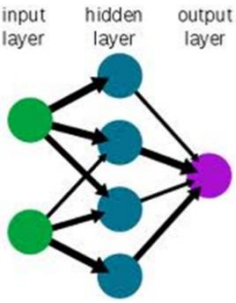
Life-Sign Decision Support for the Warfighter Physiological Status Monitor System

The next generation military uniforms will be smart. They will contain wearable physiological sensors that monitor the life signs of the soldier and analyze the monitored data in a wearable central "controller" clip in order to determine health status of the individual. GCAS developed the firmware for this decision chip. The Life Sign Decision Support Algorithms (LSDSAs) interpret the data from the suite of sensors to infer a soldier's current clinical alive/dead status on the battlefield.



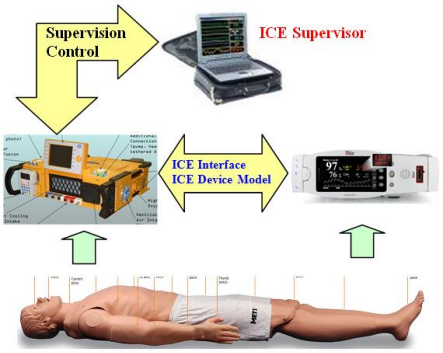
The prediction system use Bayesian Networks (BNs) to model the human physiology. Other BNs are devoted to modeling the sensors, their probability and mode of failures, and the probability of their dislodgment. Further BN models take into account the probability and mode of failures of the data transmission system. These networks are integrated together and complemented with algorithms. Thanks to this architecture, the LSDSAs system is capable of identifying a soldier's physiological status with a high level of reliability by taking into account clinical uncertainty, data uncertainty and reliability of the integrated circuit of sensors and devices. Computational algorithms have also been devised so as to automatically evaluate the reliability of various sensor system configurations. These algorithms possess the flexibility of being readily applicable to different sensor and circuit configurations and clinical analysis.

CASPER Neural Network



CASPER (Computer Assisted Speech Evaluation Rehabilitation) is a Neural Network based system developed for the Veterans Administration Medical Center to assist the professional speech-language pathologist in diagnostic evaluation and treatment of disordered speech. CASPER is composed of nine pre-assembled clinical protocol autonomous agents (Acoustic Monologue, Prologued Vowel, Syllabic Stress, Intonation, Electro-glottography and Oral/Nasal Aerodynamics) and a "User-Specified" Protocol.

Integrated Clinical Environment (ICE) Supervisor



The medical community has a serious problem when it comes to medical sensors and instruments in that different vendor supplied equipment may not be compatible with other sensors and equipment that should complement it but has been supplied by a different vendor. A DoD and NIH collaborative is trying to change all of that. As part of this effort, GCAS developed the decision-support algorithms for a configurable trauma lifesaver assistant to facilitate emergency healthcare task performance and management such as rapidly infusing appropriate intravenous fluids and delivery of medications to save lives at the point of traumatic injury. These algorithms will be integrated

into and executed by a “suitcase ICU”.

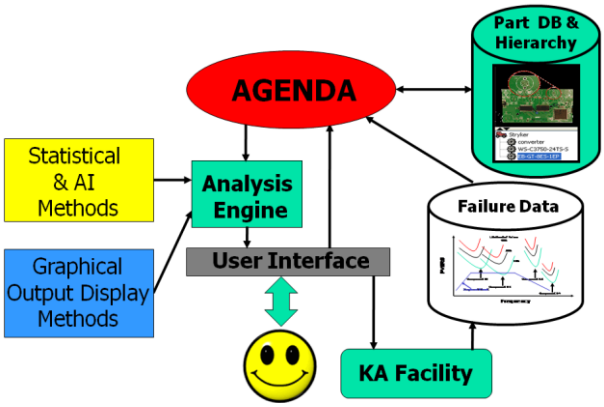
Touch-for-Payment System

The major bottle neck in the exit processing of a patient from a doctor’s office is the conversion of the doctor’s notes and indicated procedures recorded by hand on a *”Superbill”* into the appropriate codes used by the doctor’s accounting software for billing Insurance, Medicare, etc. GCAS developed the ***Touch-for-Payment*** system which uses character recognition to extract the detail from the Superbill and a Touch-screen user interface. The data that is transferred contains patient’s symptoms and diagnosis and also automatically generates a bill to the patient and/or insurance company and schedules any future office visits.

GCAS Acoustics, Structural Dynamics and Control Systems

Blast and Shock Analysis for Vulnerability Codes

A critical problem facing the war fighter is when electronic equipment that is abruptly shaken from a nearby explosion fails to operate even when there are no other damages or injuries. To assess the relative ruggedness of the sensitive equipment, an intelligent evaluation tool was needed to help in designing shock-resistant electronics and mounting systems.



GCAS has developed the Equipment Shock Expert Tool (ESET) to assess the fragility of electronic equipment subjected to blast shock waves from conventional weapons. The core of the ESET product is a Rule-based Production System for capturing expert knowledge, semi-empirical inferences obtained from shock testing and lesson-learned design rules. The output is the likelihood of failure of the electronic equipment expressed in terms of probability of failure, and shock input parameters (such as Pseudo Velocity and Frequency). These predictions should be dependent on only characteristics of equipment, and independent of the shock input. Also included are:

- Knowledge Acquisition Facility is provided to allow new knowledge to be added in the future,
- Explanation Facility that produces a report describing how the system arrived at its conclusion,
- Advisory System giving suggestions for improving the design, and
- Data interface for exporting the results to MATLAB and MUVES.
- A Knowledgebase repository for shock-induced failure test data and system safety failure modes, effects and critical analysis information of fully populated electronic cabinets and components within the cabinet.

In support of the ESET repository, GCAS performed shock failure testing on different technology printed circuit boards both in and out of a characteristic chassis, and on relay components. This test data comprises the bulk of ESET's knowledgebase, along with Subject Matter Expert (SME) rules, mil-specs and vendor no-failure certifications.

Shock and Vibration of Lead-free Assemblies

Under NavAir contract, GCAS developed methods to determine the integrity of different lead-free solder alloys used in electronic assemblies subjected to shock and vibration for a range of package types. Physics of failure models analogous to those employed for eutectic tin-lead (SnPb) solders were developed utilizing Wavelet and other Spectral Analysis methods.

Pressure-Vibration-Temperature Controller (PVTC)

In this contract GCAS developed the environmental test and qualification control system for the US Navy Pacific Missile Testing facility. The system is used for testing of full production missile systems for shock, acoustic blast waves and vibration to the missile structure as well as "steady-state" airflow, pressure and temperature levels representative of the missile life cycle. The system is a multi-purpose, Environmental, Thermo/Dynamic Control System for reliability testing. It can simultaneously control up to ten (10) independent Vibration /Acoustic loops. Up to three (3) channels can be averaged for

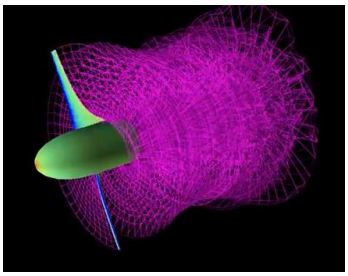
control in either open or closed loop. The output is a continuous Gaussian random signal mixed with any user select pre-stored shock waveform of up to 1.6 seconds in duration. Temperature is controlled using two full PID loops for heating and cooling over the range from -132 to +752°F. TTL outputs and inputs are also monitored and controlled.

GCAS Commercial Test Systems: VC100, CCAS & MAC-II

GCAS designed, developed and fabricated the VC100, a full function real-time PC-based analyzer and signal generator. Transient or continuous waveforms can be generated of any spectral shape and output as an excitation function. Transient or continuous data can be captured and analyzed in either the frequency or time domain using a high-speed array processor. In addition to continuous vibration signal output, shock output can be generated with various shapes and the resulting acceleration measurements analyzed using the Shock Response Spectra technique. The system has been purchased by the Navy for use in environmental testing.

In a joint effort with one of the world's leading accelerometer manufacturers Allied Signal's ENDEVCO, GCAS has developed software for controlling up to 1080 amplifiers simultaneously for use in large complex mechanical tests. This PC based system controls the banks of amplifiers through an IEEE 488 bus. In addition to maintaining the set up information on the amplifier gains, phase and other relevant data, CCAS provides real-time monitoring of the RMS signal level on each channel during testing. In a separate contract GCAS developed the MAC-II signal conditioning software for ENDEVCO's Multi-channel Amplifier Control (MAC) system.

Wake/Structure Interaction Interior Noise



In this NASA Lewis contract we developed software to predict unsteady aerodynamics, sound propagation and interior fuselage noise from the interaction of next generation prop fan wakes with the downstream wing and fuselage structure. This included the development of a 3D turbulent propeller wake prediction model to give the unsteady velocity and pressure profiles downstream of the Propfan engine.

FLIP Azimuthal Control System

GCAS designed, fabricated, installed and tested an azimuthal control propulsion system for marine research vessel FLIP. The effort included CAD/CAM design, stress analysis, control and aerodynamic analysis of the vessel.

Mobile Gun Positioning Control System

GCAS performed analysis and testing of a vehicle mounted mobile gun positioning control system for the FMC Corporation which was experiencing structure/control interaction problems and unable to maintain a lock on its target.

Finite Element Modeling

GCAS developed the three-dimensional finite element model of the Surface Vessel Torpedo Tube Mk32 Rotating Base used on Navy ships. The models consisting of shell, beam and solid elements were analyzed using the Abaqus non-linear analysis tool subjected to dynamic loading inputs from existing empirical test data.

XYPEAK5-Shuttle/Centaur Modeling

XYPEAK5 is a NASTRAN postprocessor-relational database management system for supervising and reporting selected groups of transient and shock dynamics data recorded during space shuttle launch simulations. Specifically, XYPEAK5 was used for locating, sorting and extracting desired

dynamic transient responses produced by a NASTRAN finite element analysis. It includes relations to find peak and minimal responses including associated time responses occurring elsewhere on the structure. Fourier analysis and Component Mode Participation can be automatically calculated for any selected transient. We also performed computer graphic checkout and development of finite element models of the Space Shuttle/Centaur design.

CAD/CAE Services Projects

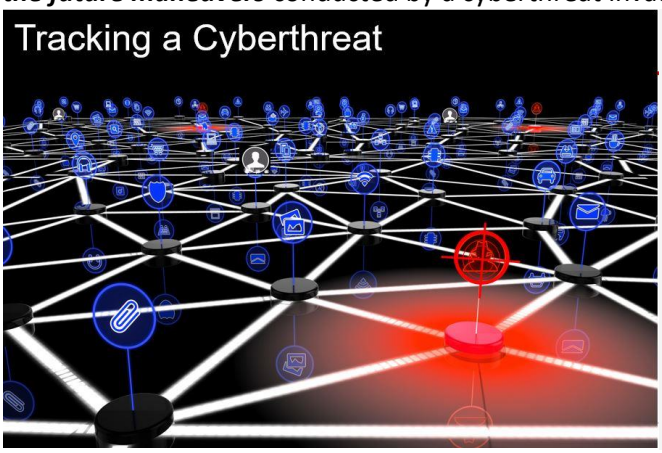
GCAS has performed numerous service support contracts for the Navy and industry including:

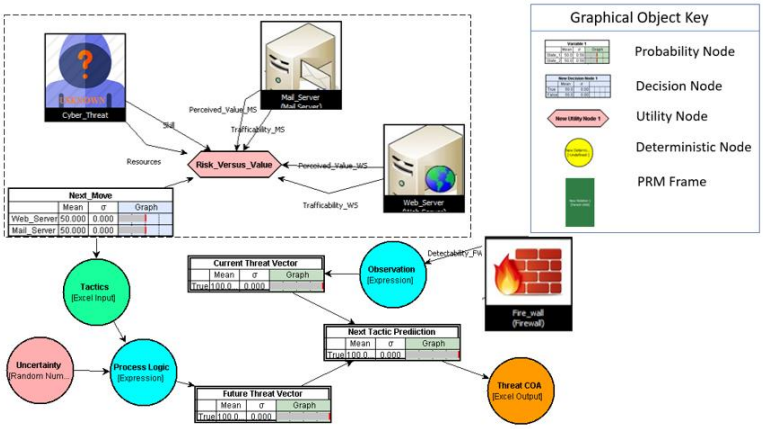
- The development of application software for a procedure to graphically display pressure distribution on a defined curved surface (torpedo nose) using the Navy CAD system. This included the creation of a geometric model of the Torpedo and utilized the existing CAD software to calculate the mass properties.
- Training of Navy personnel on the file transfer of geometry data between PATRAN, NASTRAN and ABAQUS.
- Developed the IGES (International Graphics Exchange Standard) translator for the Solid Modeling Group (CUBICOMP) of AutoDesk Corporation (AutoCAD).
- Creation of 2D engineering drawings of the "FACT" (Flexible Automatic Circuit Tester) developed by Hughes Electronics Division.
- Development a 3D CAD model of a twisted, leaned axial compressor blade within the CAD system for Solar Turbines International. The effort included the generation of the NC tool paths of 3D blade airfoil geometry using the CAD NC package. We also designed the tooling for EDM electrodes and cold rolling dies for airfoil manufacturing., including the generation of NC tool path for the internal cooling flow path of a serrated axial turbine blade flow model.
- Developed a 3D geometry model of a complex radial turbine wheel for Sunstrand Corporation, including the tooling and inspection drawings and associated databases. The 3-D models where then transferred to PATRAN for finite element modeling and analysis.

GCAS Target Tracking, Recognition and Radar Systems

Forecasting and Tracking a Cyberthreat within the Network

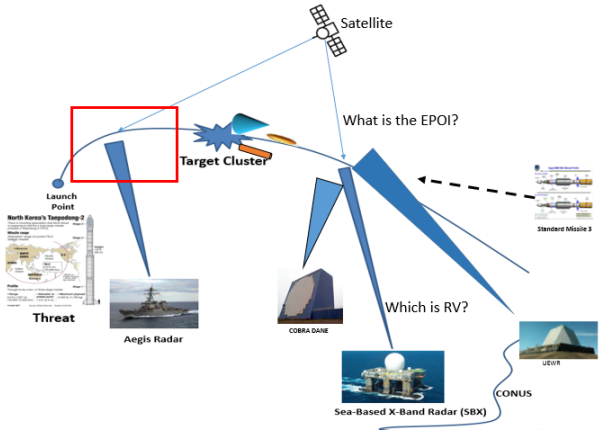
Under Air Force and DOE contracts, developed advanced simulation and modeling methods for tracking and ***forecasting the future maneuvers*** conducted by a cyberthreat invading a network as observed by an Intrusion Detection System.





Uncertainty Modeling and Error Propagation in Missile Tracking

Conducted Uncertainty Modeling in a BMDS environment including the analysis of various Missile Defense Architectures such as Basic Decentralized and AMR to determine the relative sensitivity of the architecture to tracking errors using traditional Extended Kalman Filter methods and Advanced Bayesian Tracker methods including Second Order Uncertainty (SOU) effects.



Target and Feature Recognition

Under MDA contract Second Order Uncertainty was used for feature recognition to distinguish between the incoming warhead, debris and various decoy objects during a simulated missile attack.

AEGIS PIP Tracking & Response Scheduling

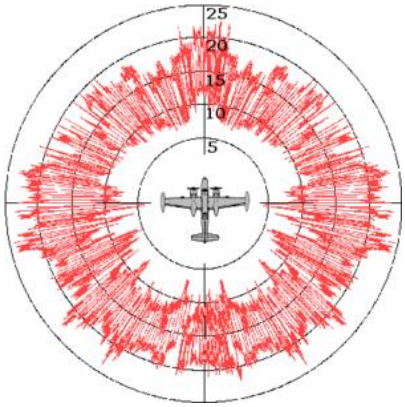
The most recent threat concern involves attacks by swarms of drones. The calculated Predicted Intercept Point (PIP) of the interceptor to the target needed to determine interceptor's engagement sequencing is very challenging with large numbers of closely spaced, highly maneuverable targets. Second Order Uncertainty Bayesian methods were used in conjunction with a Multi-Hypothesis Tracker (MHT) to address this problem as part of a Navy IWS-1 contract award.

Cognitive Radar Design for Aerial Surveillance Management

Designed a 5-layer architecture for Cognitive Radar, extending from the CPI dwell level up to high level scheduling consistent with overall maritime situational awareness.

Low RCS Parabolic Radar Antenna Design

One problem encountered by radar mounted on Navy ships is that the radar dish which is used to detect enemy aircraft acts dramatically exposes the presence of the ship to the enemy. Under US Navy Spawar contract, we designed a low RCS parabolic radar antenna, incorporating feed designs for optimal in-band scattering and radome designs for optimal out-of-band scattering.



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MISCAT RCS

We developed graphical pre- and post-processing programs for the MISCAT RCS code to facilitate construction of the MISCAT radar target models and display of the RCS predictions.

Cloud Cover

Under Air Force contract, we performed an engineering study into the capability of identifying targets from satellite and aerial photographs under various weather and terrain backgrounds.

Vulnerability Analysis-DATANET

Under Air Force contract, GCAS developed the DATANET database management program for linking the FASTGEN-IV, NASTRAN and ASTROS codes used for vulnerability, aerodynamic and structural analysis of aircraft. DATANET stores geometric models of aerospace vehicles for use by the structures, dynamics, aerodynamics, vulnerability and flight dynamics groups involved in the design/analysis effort. A common geometric database eliminates the need for redundant model building and already constructed models of vehicles can be translated into the database for future use by other organizations. Advanced vector graphics modeling, editing and display features are inherent to the product. The effort involved the development of a graphical editor and data translator to for translating 3D geometry between weapon target program, FASTGEN, and structured analysis program, NASTRAN, using the RIM relational database manager. This included implementing a computer aided engineering network within RIM linking NASTRAN, FASTGEN, SPAR, MPLOT, MOVIEBYU and USSAERO.

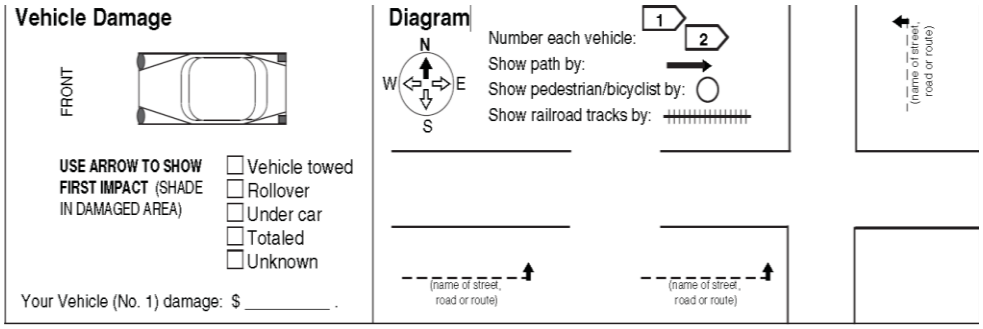
Tri-Services Low Observables Consortium

GCAS chaired the DoD (and NASA) tri-services graphics committee to the Army-Navy-Air Force-NASA government consortium. This effort involved the establishment of a common geometry definition for radar target models as well as the development of a general purpose geometric editor for developing geometric target models, including editing features which are unique to radar work. (e.g. shadow zone identification, multiple-bounce ray tracing, RAM coating modeling, etc.)

GCAS Other Projects

CARS Traffic Accident Reporting System

Under Department of Transportation contract, we developed a software application for use by the police officer in completing DMV traffic accident forms. The effort included conducting a time and motion study of the collection of traffic accident data, starting from the officer collection the information at the scene of an accident.



Computer Art Station

GCAS developed a computer graphics workstation for the Yellow-Pages Advertising Division of GTE. The effort included selecting the workstation hardware and developing the graphics software for use by the commercial artist in designing yellow page advertisement. In support of the computer art station, we developed a graphics database of over 32,000 pieces of clip art for use in yellow page advertising. All the artwork is owned and copyrighted by GCAS.

CLIPBOARD Computer

We developed the first ruggedized data collection computer tablets for use by the Army, Air Force and various police agencies. The unit was used in performing aircraft and vehicle inspections and for use by police officers completing a DMV traffic accident form.

GCAS Commercial Enterprise Software

The company's Commercial Software Division develops and maintains a suite of enterprise accounting and manufacturing ERP solutions. The company's flagship product, GCAS (Government Cost Accounting System), was first introduced in 1986 for use by vendors to the Federal Government.

Government Cost Accounting System (GCAS)

GCAS is specifically designed to meet the requirements of the small business government contractor as well as accounting firms with clients performing government-oriented or project-oriented contracts. Integrated with GCAS are five products eTimecard, eExpense, ePurchase, eManage, and iTMS to provide a complete ERP system.

Inventory Tracking Manufacturing System (iTMS)

Fully integrated manufacturing software package that works directly with any SQL-based accounting system to provide an extremely powerful business management (ERP) tool at a competitive price

Electronic Timecards (eTimecard)

Allows staff employees and consultants to enter Time and Local Mileage directly into the GCAS accounting system via a web-link.

Electronic Expense Forms (eExpense)

On-line, real-time recording of Travel and Other Expenses directly into the GCAS accounting system via a web-link. Includes Government per-diem rates and ceilings, IRS mileage for easy calculation of expense forms.

Electronic Purchasing (ePurchase)

Allows staff employees and consultants to create Purchase Requisitions (PR) for desired items using a secure Question & Answer Wizard entry form on the company's web site. The PR is automatically used as a template for a Purchase Order in the GCAS accounting system.

Electronic Project Mangement (eManage)

A powerful Project/Contract Management, Scheduling, Resource Management and Planning System for use by Contract and Project Managers for entering contract **modifications**, budgets and schedules directly into the accounting system and for monitoring actual expenses versus plan, including EVM.

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