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KEY SOLUTIONS

THE MAGAZINE FOR CADKEY & DATACAD

CAD At Work

REVITALIZING a Harvard Staircase

Building Orthopedic Spinal Plates

Product Focus

ALTERNATIVE Input DEVICES

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CUSTOMIZING Your Software

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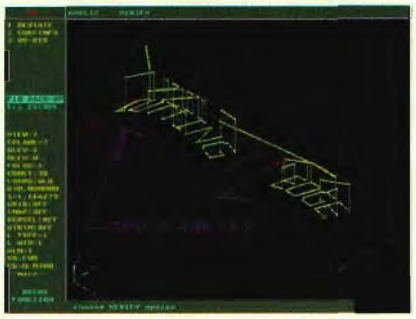

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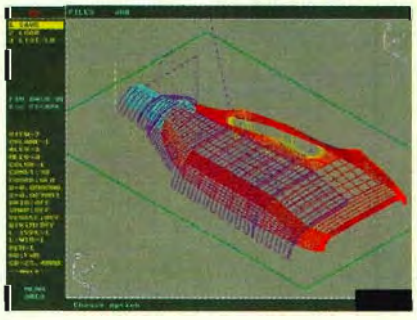

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THE MAGAZINE FOR CADKEY & DATACAD
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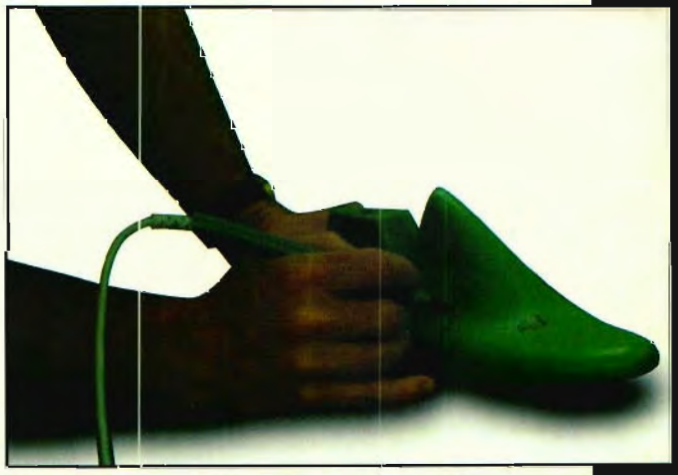


ON THE COVER:
CADD generation and rendering of a renovated staircase at Harvard University by Richard Morse of MGIA Architects, assisted by Mark Madura of Madura Studios, both located in Boston, MA. See DataCAD Portfolio on page 28.

See "Reverse Engineering a Shoe" on page 24.

KeyTalk

NT's here — which finds me bemused, befuddled and besieged by fantasies straight from Stephen King. In one, standing in the middle of a busy highway, I'm clutching a dog-eared DOS manual to my chest, eyes glazed by the headlights of a HUGE semi with *Windows NT* flashing on the side in large neon letters. Unable to move or speak I am powerless against the rushing behemoth. Finally, I'm knocked flat, the DOS manuals fly out of my hands and the wheels reduce the fluttering pages to confetti. In a totally different scenario, I gleefully throw my moth-eaten DOS manuals in the ditch, stick out my thumb and climb aboard for a ride to an unknown destination.

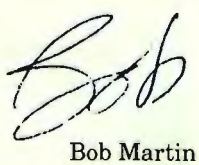
If you want to know what I really think, I'll tell you. I'm not sure. For one thing, I haven't been fortunate enough to try NT yet. I only know what I hear and read. Some of this is obviously Microsoft marketing hype. Some from NT's detractors is very negative. Both are best taken with the proverbial grain of salt. I know that Cadkey (whose judgement I respect) is putting major efforts into NT. The NT version will be out by the end of 1994.

The time is right. The PC world desperately needs a better operating system, especially for high level graphics. DOS has been "cludged to the max" and the Unix world's attempt to get unified is probably too little too late.

The marketplace and the software developers will ultimately decide the fate of NT. First, to make NT attractive to buyers a large number of business and technical software packages must be available. Many major vendors have promised to have NT versions (500+) ready this year. Software development being what it is, some may not materialize in that time frame.

Although casual or small business users may have a problem with NT's heavy hardware requirements, I suspect that most CADKEY, DataCAD and/or Windows users are already used to needing large amounts of RAM, huge disk drives and high resolution graphics. Fortunately, for those with more modest needs, DOS and Windows will continue as a viable and active environment for the immediate future. It may be too much to hope for, but wouldn't it be great if all the software producers releasing NT versions remember to make files compatible across platforms?

In spite of my qualms, I sincerely want NT to succeed. Multi-tasking and NT's other capabilities sound pretty good to me. If Microsoft has done their homework and created a tool that meets the needs of the computing public — *that they're willing to afford* — it could become the OS of the future.



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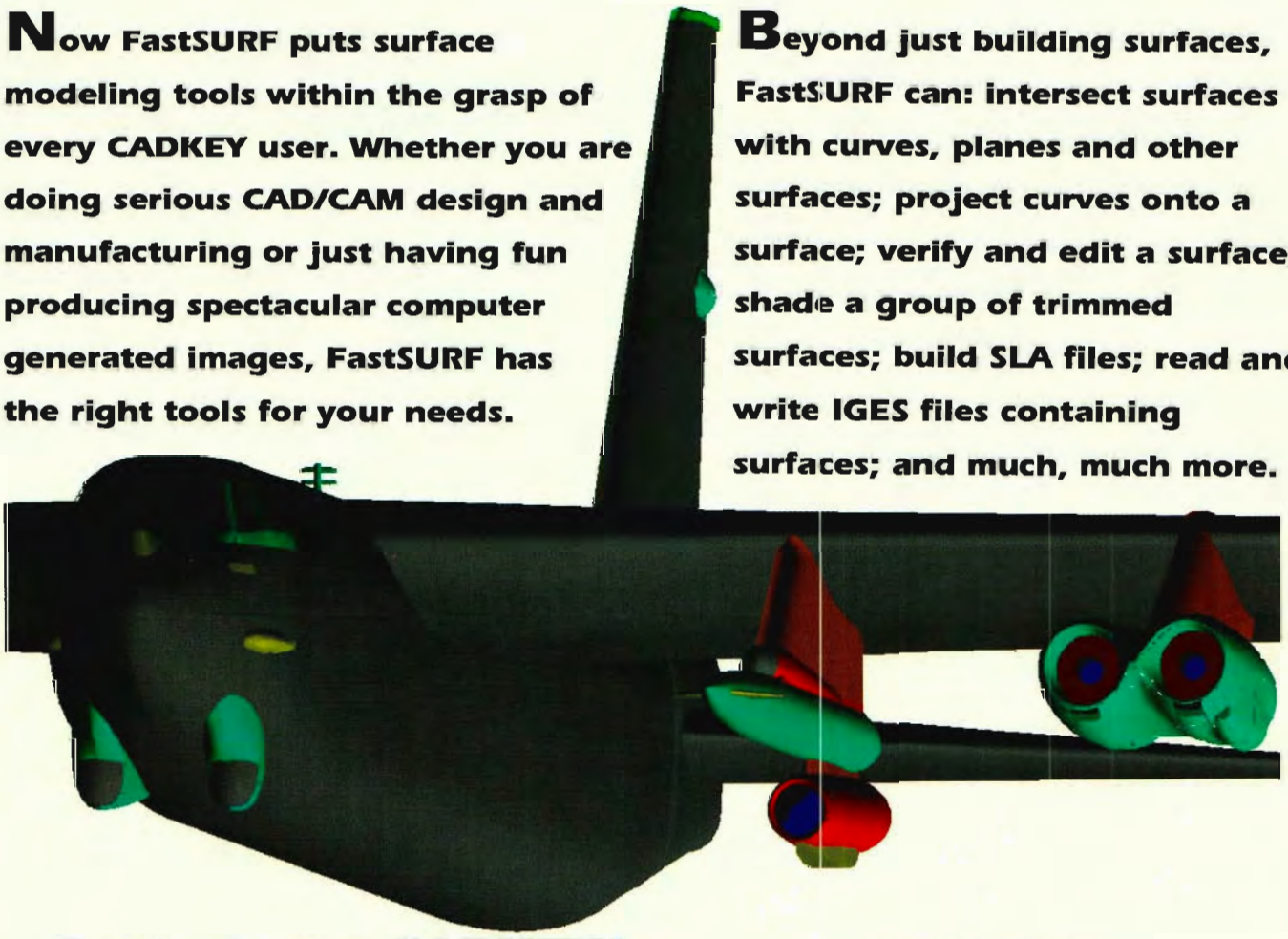

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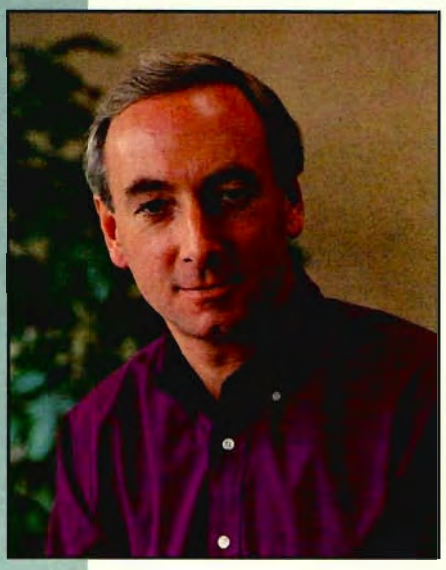
Cadkey Forum

by Malcolm Davies, President and CEO - Cadkey, Inc.



The pace continues to increase at Cadkey, Inc. The biggest news of the past few months was the shipping of CADKEY 7. It contains a host of new features, including a powerful new user interface, and incorporates the Advanced Drafting Module with geometric tolerancing from Baystate Technologies, and FastSURF Light from FastSURF.

Also included is the CADKEY LISP programming environment. This really opens up CADKEY to developers who have written applications on top of AutoCAD and will lead to many new applications being available to CADKEY users. CADKEY 7 is still promotionally-priced at $495, and the upgrade from any previous version of CADKEY is $250.

Response to DataCAD has been phenomenal, and we have recently mailed announcements directly to DataCAD customers of the first of a series of add-on macros to further improve productivity. DataCAD customers now have a set of instructional audio tapes available to them to accelerate their initial learning curve. The tapes are $39.95 and can be ordered by calling 1-800-282-1368. We will be exhibiting at the A/E/C Systems Show in Washington, DC in June and hope to see many of our users at the show.

We have many exciting additional offerings for both CADKEY and DataCAD customers over the next several months. If you are not yet registered, please send in your registration card so that we can keep you informed.

In another announcement in May, we launched "EduCAD America," our ambitious program to help raise the standards of computer graphics literacy among students of all levels and in all disciplines within North America. Under the EduCAD America program, full-time students, faculty, and schools can receive CADKEY Light and DataCAD 5 Plus for the cost of shipping and handling ($19.95). We are also offering the same groups CADKEY 6, CADKEY 7, and DataCAD 5 Professional for $99 each, plus shipping and handling ($19.95). I hope that all readers of **KeySolutions** will make their local schools and colleges aware of this offer, and invite them to contact us by telephone at 1-800-394-2231 Ext. 7100, or by fax at 203-298-6401.

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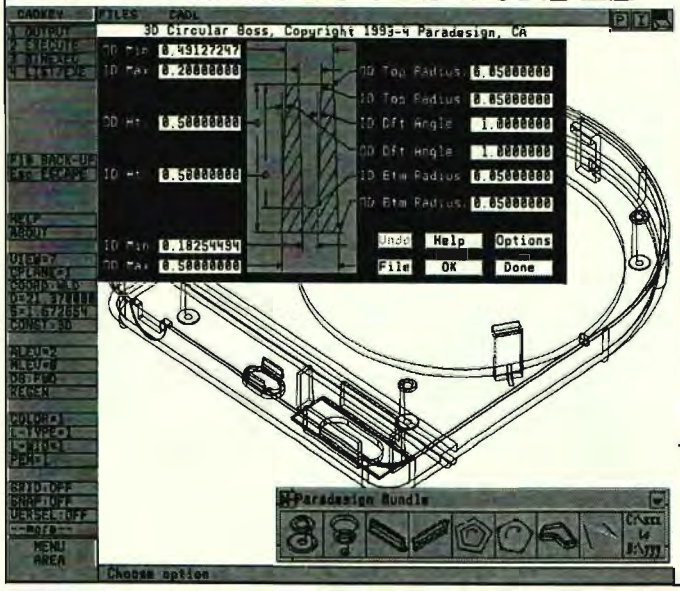

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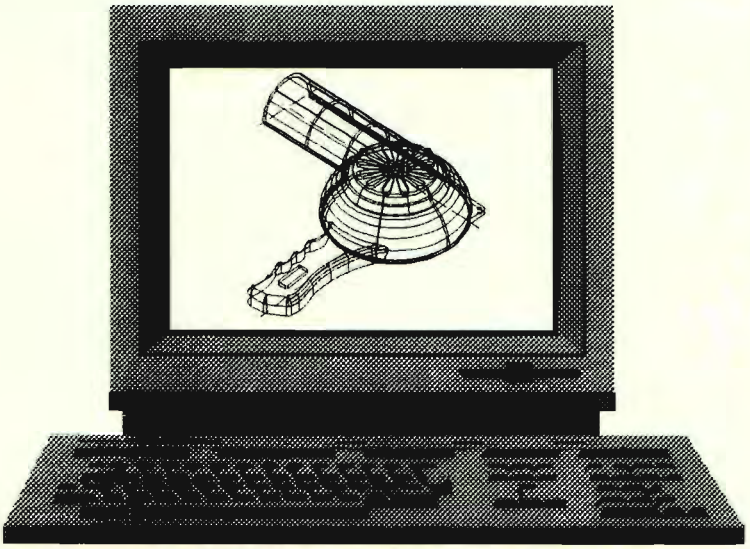

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KeyNotes

CADKEY In the News

New Cadkey Program Supports US Education

Cadkey, Inc.'s new EduCAD America program allows full-time students in the U.S.A. to buy Cadkey 5 Light and DataCAD 5 Plus for the shipping/handling cost of $19.95. Cadkey also offers CADKEY 6, CADKEY 7, and DataCAD 5 Professional to students for $99 each, plus $19.95 shipping and handling.

The primary goal of this program is to prepare students for a globally-competitive workplace by providing the tools they need to help them develop CAD and drafting skills. EduCAD America promotes and supports the Clinton Administration's desire for industry involvement in "school-to-work" activities. "We believe in the future of the United States as the leading industrial nation," said Dr. Malcolm Davies, President and CEO of Cadkey, Inc. "We want to do all we can to ensure that our future work force is the best-educated and most productive in the world."

Cadkey, Inc. launched EduCAD America after a test CADKEY Light grant program last year. Since September 1993, over one thousand schools have received CADKEY Light grants. With budgets being severely cut, it is not surprising that more than half of the grant requests came from secondary schools. "Due to the enthusiastic reaction, we enhanced the program and expanded our offerings in EduCAD America," said Pete Mancini, Educational Programs Manager at Cadkey.

Cadkey, Inc. has offered educational grant programs in the past. "In the 1992-93 school year, we granted over five million dollars (commercial retail value) of CAD software to schools worldwide," explains Mancini. "However, grant programs can be limiting. Grant recipients are typically chosen based on specific criteria. With EduCAD America, we eliminate the limitations and open the doors for full-time students, faculty, and schools," adds Mancini.

(Continued on next page)

Design for Service Program

A new innovative software program called Design for Service that helps product planners consider repair issues from the earliest concept stages has been created by Geoffrey Boothroyd and Peter Dewhurst of the University of Rhode Island. To use the software, a designer enters information about which components could break and how often that's likely to occur. The software then enables the designer to go through a hypothetical disassembly to fix the problem. It lists the time needed for each repair job, indicates costs, and gives the design a 0-to-100 report card.

The purpose is to encourage designers to devise products with parts that are easily fixed or replaced. The results could include lower repair bills that encourage consumers to fix products rather than throwing them away. Environmentally, Dewhurst notes, "When a product reaches the end of its useful life cycle, it will be easier to disassemble for recycling." Ford, Chrysler, Digital Equipment, and McDonnell Douglas are already using the $14,500 package. *Design for Service operates on PCs with Windows.*

Earlier programs by Boothroyd and Dewhurst are *Design for Assembly* (which prompts designers to consolidate components where possible) and *Design for Manufacturability.*

Multimedia-Ready PC Market Booms

Dataquest (San Jose, CA) reports that the multimedia-ready PC market definitely arrived in 1993. Shipments of complete multimedia systems — computers with integrated multimedia capabilities including 8- or 16-bit sound and an internal CD-ROM drive — grew an astronomical 1833% worldwide between 1992 and 1993, from 127,000 units to 2.46 million. On the consumer side, sales of TV based multimedia products for the home continued on a steady upward trend, and new technologies are also beginning to take hold. "Video games dominated the home multimedia market again in 1993," says Bruce Ryan, principal analyst of Dataquest's Multimedia Service. "But the seeds of interactive television are currently germinating and are ready for high growth in three to five years."

New Graphics Accelerator Chips

Digital Equipment Corp. (Maynard, MA) has announced the DECchip 21010. This Peripheral Component Interconnect (PCI)-based graphics accelerator is designed for use in Alpha AXP and Pentium microprocessor based systems. It has a pipelined architecture that delivers graphics throughput over a 64-bit video memory port. OpenGL, enhanced picture quality with patent-pending image-processing techniques, and resolutions up to 1600x1280 pixels in 16.7 million colors are also supported.

The MCAD Market - A Report

International Data Corp. (Framingham, MA) reports that the mechanical segment of the CAD/CAM/CAE market for 1993 was estimated at $1.63 billion, up 2% from 1992's total of $1.59 billion. According to IDC the growth rate slowed from the 1991-1992 rate of 5%, due largely to the continuing economic sluggishness, particularly in Europe and Japan. When Computervision and IBM (who derive a large majority of their revenues from non-U.S. markets) were excluded from the growth-rate calculations, the 1992-1993 growth-rate of U.S.-based mechanical CAD/CAM/CAE vendors was 10%.

IDC postulates that the market has completed its innovative phase and is now reaching maturity with all of the ensuing market characteristics: lack of genuine product differentiators, price wars, and customer awareness of product benefits and limitations. The days when only one or two companies controlled the rate of technology advancement is definitely over.

Wintab Digitizer Drivers Shipping

The Committee for Advanced Pointing Standards (CAPS) announced that all participating manufacturers of desktop digitizing tablets are shipping Wintab™ compliant drivers. Wintab, an open industry standard software interface specification, provides consistent and easy integration between digitizing tablets and other advanced pointing devices, and CAD and graphic arts software applications running in Microsoft Windows.

With Wintab drivers a user can seamlessly switch between using a digitizer as a mouse or digitizer for entering precise points. Wintab drivers also allow a user to have more than one pointing device and easily select the best one for the current task.

Before the Wintab specifications were defined, Windows users needed a different digitizer driver for nearly every software program. With Wintab, software applications never deal with digitizer hardware or low level drivers directly, and can off-load many configuration tasks to Wintab managers. In addition, hardware devices do not need to be reconfigured for individual software applications: a single driver works with all Wintab-compliant software. Presently, CAPS members are working on enhancements to the Wintab specification to support 3D and "6 degrees of freedom" pointing devices used in interactive 3D graphics and virtual reality programs. Cadkey, Inc. is a member of CAPS.

DOS Resource Guide

If you don't plan to jump on the NT band wagon immediately, here's a helpful publication. The *DOS Resource Guide*, a bi-monthly magazine, is full of ways to optimize DOS and ideas about how to work with it efficiently. Material is applicable to all from novices to experts. The cost is $23.70 for 6 issues a year. For information call 800/349-7327.

Taking a Break from CAD

Don't Be Lost in Space - Windows users can look into the world of space exploration with IMSI's new CD-ROM, *Space Missions*. It contains multimedia presentations on all space programs worldwide and has videos and photos, original audio tracks, text and reference materials, and newly composed narration. Users can take a "guided tour" overview of space exploration or use search features to investigate specific missions and space programs. The disc costs $49.95. IMSI, San Rafael, CA; 415/454-7101.

Indian Country - Touring Indian Country, a CD-ROM featuring more than 300 existing Native American tribes from across the U.S., covers contemporary Indian culture. This interactive CD is both a historical reference and a cultural travel guide to modern reservations and current Native American events. The $39.95 CD is available for Windows. A sound track of modern and ancient American Indian music plays throughout the disk. MPI Multimedia, Oak Forest, IL; 708/535-1540.

CADKEY In the News

In addition, Cadkey, Inc. strongly supports the creation of voluntary standards for CAD through a U.S. Department of Education grant awarded to the Foundation for Industrial Modernization.

Cadkey and Digital Equipment

Cadkey, Inc. plans to port its products to RISC-based Alpha AXP™ hardware platforms from Digital Equipment Corporation running the Microsoft Windows NT™ operating system. Cadkey software products will be available for the Alpha AXP family shortly after Microsoft Corporation releases its Visual C++2.0 compiler for the DECchip 21046 (the underlying processor architecture for all Alpha AXP systems), estimated at fourth quarter 1994.

Cadkey products that will be available on Alpha AXP platforms include CADKEY v.7, a version of DataCAD, and the Cadkey Object Developer™ which is an object-oriented framework for developing CAD applications. All Cadkey products will run in both Microsoft Windows NT and Windows versions 3.1 and 4.1.

Digital Equipment Corporation is the world's leader in open client/server solutions. Digital's Alpha AXP systems are available in a complete range of sizes to support open client/server computing, from desktop PCs and workstations to departmental or enterprise-wide servers.

"Cadkey's port to the Alpha AXP is a continuation of our commitment to provide a low cost professional CAD solution to anyone with a mechanical design or A/E/C application", said Dr. George Krucik, Cadkey's senior vice president. "We anticipate that our products will run faster on the Alpha AXP than other platforms."

NEW PRODUCTS

HARDWARE - INPUT

Cordless Pressure Tablet

Summagraphics Corporation introduced SummaSketch® FX™, a desktop tablet designed for drawing-intensive applications such as graphic arts, illustration, and animation. The 12" x 12" and 18" x 12" active area tablets use electromagnetic technology with 256 levels of pressure sensitivity. The new SummaSketch FX SmartPen™ stylus is a pen-like, three -button stylus with two different refills: a spring loaded refill for finer control and more fluid transition within pressure sensitive applications, and a rigid non-spring refill. SummaSketch FX Tablets incorporate a corded/cordless convertible transducer which allows switching from corded to cordless modes. It is compatible with over 400 PC software programs and includes Windows drivers. The complete package includes the SummaSketch FX tablet, choice of 3-, 4-, or 16-button cursor, utilities diskette, interface cables, power supply, ADB Interface, operators manual, lifetime warranty on the tablet, and two-year warranty on accessories.

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Contact Summagraphics at 800/337-8662.

Large Format Scanners

Vemco/Contex introduced four new scanner models for use in technical environments, such as in engineering and architectural conversion of existing drawings into CAD and digital archiving. The Contex FSS3200DSP and the FSS5200DSP are both capable of scanning an E-size drawing in 37 seconds, including automatic threshold setting, alignment, and despeckling. The Contex FSS8200DSP and the FSS10200DSP scanners are both high resolution, large format scanners aimed towards the GIS, Cartographic, and Seismographic markets, as well as Raster to Vector conversion projects. Contex also released its interface software CADImage/SCAN which now allows connectivity to 9 hardware platforms and usability with 14 operating systems including DOS, Windows, WindowNT and UNIX.

Contact Vemco/Contex at 909/599-6745 or Fax 909/599-8199.

The Eagle 3640C Color Scanner

ANA Tech (an Intergraph Division) released the Eagle 3640C large format, production volume, 24 bit, single pass, color scanner. The Eagle 3640C concurrently scans, reclassifies, compresses and saves to disk original E/AO size color documents. Its scan rate is 400 dpi, incorporating three 5000-element, tri-linear, color CCD cameras for true variable scan resolution for archiving documents, converting and publishing maps or incorporating hard copy plots.

Contact ANA Tech at 303/973-6722 or Fax 303/973-7092.

Supra's V.FC Modem Line

Supra's V.FC modem line includes the external SupraFAXModem™ 288 which is available bundled with software, the SupraFAXModem 288i for the PC and the SupraFAXModem 288PB for PowerBooks™. Both the PowerBook and desktop modems include enhancements such as Silent Answer™ and Caller ID, software, cables, and instructions for getting started with high-speed (28,800 bps) data and fax communication, MicroPhone™ LT, CompuServ Information Manager™, and a five-year warranty. V.34 upgrades should be available by Sept. 1994.

Contact Supra Customer Service at 800/727-8772.

HARDWARE - OUTPUT

HP DesignJet Plotter Enhancements

The Hewlett-Packard Co. announced enhancements to the DesignJet 650C color-inkjet plotter. These include improved print quality, increased memory, and more connectivity options. Print quality has been improved through HP's scatter halftone dithering technology, which provides consistent color area fills. Standard 4MB of memory can be expanded up to 68MB to support large, complex files. Enhanced memory enables the plotter to queue more files for unattended or overnight plotting. The optimized HP raster transfer language makes raster data plot faster. An enhanced Windows 3.1 driver allows scaling for applications that don't support large-format output and includes HP's ColorSmart, a technology which automatically optimizes color output. The plotter supports plain paper, bond, vellum, translucent, and special inkjet-polyester film for plotting. D-and E-size models are available with one-year, limited-on-site warranty. Current DesignJet 650C plotter owners may purchase a user-installable upgrade kit.

Contact Hewlett-Packard at 800/851-1170.

DMP® Plotters Re-introduced

Summagraphics Corporation recently re-introduced the DMP160 Series of mutli-pen D- and E-size plotters and the DMP-60SP single-pen D- and E-size plotters. Multi-pen plotters are designed for high levels of productivity at an affordable price, and the single-pen plotters offer professional results at entry-level prices. The Summagraphics line of pen plotters includes the HiPlot 7000 Series D- and E-size multi-pen plotters which provide up to 45 ips and 5.7g acceleration in multi-user environments. All Summagraphics' pen plotters feature standard plot languages, system memory, and Windows™ 3.x drivers.

Contact Summagraphics at 800/337-8662.

HARDWARE - MISC.

Diamond Control™ For Windows

The Display Products group of Mitsubishi Electronics America, Inc. introduced Diamond Control for Windows, an on-screen user-adjustment software system created for Diamond Pro 21T and Diamond Scan 17FS high-performance color monitors. Designed for use with IBM-compatible PCs operating Windows 3.1, the software lets users define the monitors' display set-up, color temperature and power management parameters through an icon-based, on-screen control panel controlled from the PC's mouse or keypad. The Diamond Control kit, which includes software, serial interface cable, and instruction booklet is included at no charge with the Diamond Pro 21T and is available for the Diamond Scan 17FS. *Contact Mitsubishi Electonics America, Inc. at 800/828-6372.*

ViewSonic Upgrade

ViewSonic released an upgrade to the ViewSonic 21 color monitor to include compliance with the EPA's Energy Star initiative for reduced power consumption. This new configuration has a tilt control feature as a separate control, enabling the user to manipulate the screen image to eliminate a tilting or rotating picture, ensuring the image is aligned with the bezel. All controls, including size, moire and pin-cushion adjustments are housed up front in a handy drop-down control panel. Other features include a specially designed anti-

Mitsubishi's Diamond Control for Windows

reflection/anti-glare coating, Invar Shadow Mask, and a double dynamic focus system (for edge-to-edge focus and image accuracy). ViewMatch, a digitally controlled system, matches the color of the screen image to printer output.
Contact ViewSonic at 800/888-8583 or Fax 909/869-7958.

New InterAct Cart

Anthro Corporation, the Portland based designer and marketer of Technology Furniture, announces its new InterAct Cart. This modular cart, designed so two users can sit face-to-face at the workstation, is ideal for business, medical, and educational uses. The shelves can be configured for either "stand-up" or "sit-down" usage, with two smaller, independant shelves and one large continuous work surface. Extension tubes, additional shelves, and many other accessories, can be added to build the workstation either up or out. The InterAct Cart measures 49 1/4" wide, 30 3/4" deep, and 28" high. Made in the U.SA.., it comes with a lifetime warranty.
Contact Anthro at 503/241-7113 or Fax 503/241-1619.

CAD Workstations

TRI-STAR Computer Corporation announces a new line of CAD Workstations based on the INTEL PENTIUM™ 90 MHz Processor, combined with the latest Video Accelerator from ATI. The new INTEL motherboard features 3 PCI (Peripheral Component Interconnect) 32-bit slots, and 4 ISA 16-bit slots. The motherboard comes standard with 256K of external write-back cache. An on-board UART 16550 chip powers the two serial ports, and handles the newer fast modem protocols. The 32-bit architecture allows the use of high-performance video cards and hard drive interfaces. The tower case has a 250-watt power supply, and three fans: one in the power supply, one in the front of the case, and a special fan on the PENTIUM Microprocessor. It has 8 bays: four external, two 5.25 in. internal and two 3.5 in. internal; and a TEAC 3.5 in. 1.44 MB floppy drive. The standard hard drive is a Western Digital Caviar™ 540 MB IDE. Other configurations are available; optional multi-media kit. TRI-STAR also offers lifetime toll-free technical support, CAD support, and a 24-hour Bulletin Board Service. *Contact TRI-STAR Computer Corporation at 602/731-4926 or Fax 602/731-4979.*

Quannon POWERstation 90 with CADKEY 7 for $4,999

- 90 MHz Pentium™ CPU; 16MB RAM; 256 Cache
- High Speed PCI Graphics Accelerator w/2 MB DRAM
- 17" Flat Screen Monitor
- 4 PCI and 2 VESA Local Bus Slots; 2 ISA Slots
- 515 MB Enhanced IDE Hard Disk and 1 Floppy Drive

Available Now!

Leading CADKEY Reseller since 1985. "We know what a system needs to make CADKEY fly!"

Quannon CAD Systems, Inc.
(800)467-3467 or (612)935-3367

NEW PRODUCTS

SOFTWARE

Visual Reality™ for Windows

Visual Software released Visual Reality for Windows, its 3D graphics and animation software suite, including five software programs that work together and two CD's of clip art and textures. RenderizeLive allows users to combine input from other modules to create full-color, high-resolution renderings which can then be animated, previewed in wireframe mode and output to standard FLC, AVI, TGA, TIF, GIF, BMP, or for VTR controllers. Visual Model enables the user to build simple 3D objects and edit 3D clip art. Visual Image permits the user to combine, collage or enhance photos and images of any resolution or color depth. Visual Font gives the user the ability to create extruded 3D text from a 2D Windows Truetype font or WingDing, using RenderizeLive to render it and Visual Image to add it to the scene. Visual Player plays animations in FLI and FLC formats or frame by frame. Visual 3D ClipART libraries are ready for rendering, including a "Business Objects" CD containing more than 500 objects such as buildings, furniture, and maps. ImageCELs provides texture maps including bricks, marbles, metals, stones, backgrounds, designer textures, and background images. Suggested configuration is 486/33, 8MB of RAM, 40MB of disk space, DOS 5.0, Windows 3.1 and a 1.44MB floppy drive. Suggested retail price is $595.
Contact Visual Software, Inc. at 818/883-7900, 800/669-7318, or Fax 818/593-3750.

Myriad For Windows™

Informative Graphics, Inc. announced a new version of its viewing software, Myriad for Windows. This version 2.1 includes text and font imports with over 25 file formats including MS Word, Word Perfect, and Excel; hyper link text or graphics; a "Zoom Width" command that lets the user view A-size drawings without losing any details on the outer fringe; Redline Tools Menu that simulate red lining activity; enhanced DWG to include paper space, font support, and reference files; enhanced reference file clipping which allows the user to associate related drawings and text. Myriad for Windows also has enhanced Softhooks™ DDE functions which feature DDE/DLL support and customizability for third party applications in document management and imaging. File viewing support is available for CADKEY users.
Contact Informative Graphics at 602/919-2496 or Fax 602/661-6142.

PackRat™ Supports BCRs

Polaris Software announced their newest version of PackRat, a Personal Information Manager for Windows. PackRat 5.0 allows automatic entering of contact information directly from business cards into PackRat's Phone Book, using the new Business Card Reader peripherals. It supports BCRs released by such companies as Ocron, CypherTech, and Pacific Crest.
Contact Polaris Software at 619/592-7400 or Fax 619/592-7430.

OOgler 1.0 For Windows™

Inset Systems announced its newest graphics tool, OOgler 1.0 for Windows, the Universal Picture Viewer. Oogler provides easy access to images from a wide variety of software packages, and can view 34 file formats, including BMP, GIF, TIF, TGA, JGP, DXF, CGM, and WMF. Image viewing may be accomplished through the use of OOgler's menu interface or its graphical button bar, or through File Manager in Windows. Zooming tools allow close-up viewing, while viewed images will not be damaged because editing is not allowed. OOgler requires Microsoft Windows 3.1, DOS 3.0 or later, and 3MB of hard disk space, 2MB of RAM with 4MB of RAM recommended.
Contact Inset Systems at 203/740-2400 or Fax 203/775-5634.

Informative Graphics' Myriad for Windows

ENGINEERING TOOLS

Free Catalog

Techno/Isel's free 88-page "Linear Motion Components Catalog H810" features over 950 components in two sections: Mechanical Components and Aluminum Extrusions. The Mechanical Components products include linear rails, ball slides, acme lead screws, precision shafting, pillowblock bearings, acme lead screws, and anti-backlash nuts. A complete selection of Aluminum Components for building machinery safety enclosures, bases, prototypes, fixtures, worktables, and other furniture is available.
Contact Techno/Isel at 516/328-3970 or Fax 516/326-8827.

Electronics Packaging

CAD Design Services is an electronics packaging service whose services include Electronics Products Design, including all types of power supplies, microprocessor controls and communications devices with integrated software; PC Design, specializing in the design of Microwave, RF, Flex and Power Supply PC Boards; Electro-mechanical Packaging, with complete packages and documentation ranging from small modules to large chassis; Drafting Services; Conversions Services; Old Gerber Files to Intelligent CAD Databases; and Custom CAD Programming. Also available from CAD Design Services is GerbArt Pro, a DXF-Gerber-DXF converter which runs in DOS or UNIX.
Contact CAD Design Services at 408/462-6494 or Fax 408/475-0738.

New EDMS Software Module

The van der Roest Group, Inc. unveiled its new engineering change (EC) control module, an extension of DMS Pro, their engineering drawing and document management solution (EDMS). The module helps manufacturers reduce EC cycle time, electronically supporting the entire change control cycle process from the initial change request to the engineering change incorporation, to the final

change notice, and distribution. The EC module gives users access to the most up-to-date information during the review and approval of a change since all information is on-line. DMS Pro supports the entire life cyle of engineering drawings and documents, including all stages of creation and capture, release and change control, distribution and fulfillment. It supports DOS and Window operations on all major network and client/server environments.
Contact The van der Roest Group at 714/542-2201 or Fax 714/543-4931.

The Clear Solution

Advanced Cleaning Systems (ACS), an operating unit of The Dow Chemical Company, offers customized services for industrial cleaning conversion. To determine the optimum surface cleaning process for a customer, ACS performs aqueous, semi-aqueous, and vapor degreasing processes on sample parts to identify quantitative cleanliness specifications. ACS will help you develop, design, and implement an alternative cleaning system, or optimize existing equipment.
Contact Advanced Cleaning Systems at 800/436-9227.

Advanced Cleaning Systems determines optimum surface cleaning processes.

CSV Two-Hand Controls

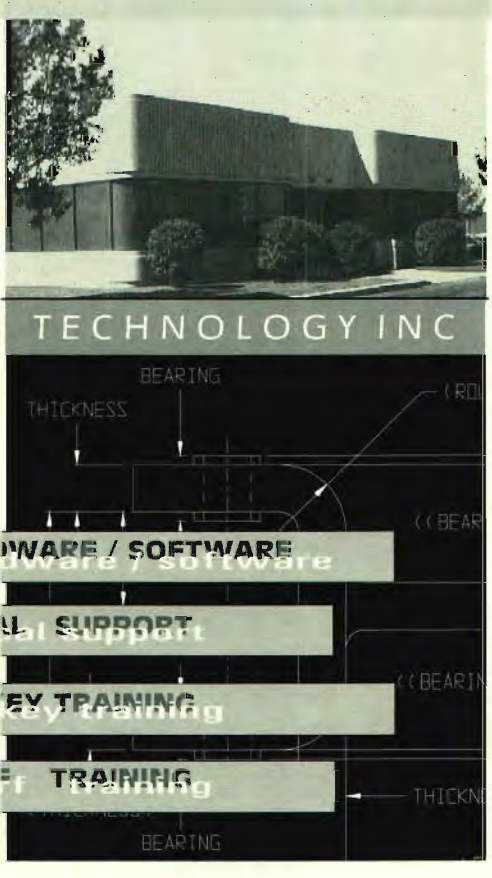
Mead Fluid Dynamics recently announced the release of their CSV two-hand control units, new "Low Stress" models which only require six ounces of force for actuation. They are designed to reduce the risks of Carpel Tunnel Syndrome and other repetitive motion disorders in high production applications. Model CSV-101LS provides single air output for actuating any 3- or 4-way air piloted power valve or small single-acting cylinder. Direct actuation of double acting cylinders or air presses is possible with Model CSV-102LS, which contains a 1/4" power valve and two air outputs. Both units are totally pnuematic and require no electricity.
Contact Mead Fluid Dynamics at 312/685-6800 or Fax 312/685-7002.

LOOK AT WHAT'S NEW

Parametrics for CADKEY® 6

Parametric Solution (PS) stretches Cadkey's abilities in mechanical design a step further. It allows you to mold Cadkey to fit your individual needs. Cadkey contains a powerful programming language called CADL. Unfortunately, developing programs in CADL takes time and experience. PS changes this by converting dimensioned drawings into easy to use parametric programs. Using PS, anyone who can draw and dimension in Cadkey can make their own parametric programs. Once a parametric program has been developed, it can used over and over to generate any variation of...

- **Proposal Drawings**
- **Job Drawings**
- **Specification Sheets**
- **Family of Parts**



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WHEN YOU HEAR THE WORDS "INPUT DEVICE", DO YOU THINK ONLY OF THE MOUSE, TABLET DIGITIZER, AND KEYBOARD? THINK AGAIN. WHILE THESE OLD STAND-BYS MEET MOST 2D NEEDS ADEQUATELY, SEVERAL INNOVATIVE PRODUCTS AND TECHNOLOGIES ARE NOW BRINGING POWERFUL NEW CAPABILITIES TO CAD AND RELATED TECHNOLOGIES. SOME ADD 3D FUNCTIONALITY; SOME CAN DIGITIZE OBJECTS IN SPACE; OTHERS FREE YOUR HANDS ENTIRELY BY USING VOICE COMMANDS. AND EVEN THE COMMON KEYBOARD IS GETTING A MAJOR ERGONOMIC FACELIFT. ALTHOUGH THEY'RE A LITTLE "PRICEY" COMPARED TO THE EVERYDAY VARIETY OF INPUT DEVICE, ALL THE PRODUCTS DESCRIBED HERE ARE CAPABLE — IN THE RIGHT SETTING — OF SIGNIFICANTLY ENHANCING PRODUCTIVITY.

3DRAW®

The 3DRAW digitizer from Polhemus is versatile. It can be used in the same manner as a standard digitizing tablet for 2D and 3D applications. Or the stylus can operate in 3D space to measure physical objects accurately. It is, for instance, often used to measure anatomical features for medical and anthropological applications.

Interior surfaces of objects can be digitized so nooks and crannies present no problems. Since all non-metallic surfaces are invisible to the fields, there are also no problems with signal blockage, reflective surfaces or shadowing. It can even digitize through a cement wall. 3DRAW continuously updates the position and orientation of the stylus which lets you trace intricate contours, track the motion path of a moving object, or write and design in 3D space. The foot switch can be used as an alternate to the integral stylus switch for capturing data points.

The 3DRAW has a working volume of 12" x 18" x 12", but larger objects can be digitized in sections since the system allows you to change the object's position, if necessary.

3DRAW uses a patented electromagnetic technology and is accurate to 0.01 inch (ten thousandths) RMS. You control the number of data points you capture, eliminating data glut and reducing post-processing time. The portable components (tablet, stylus, foot switch, power box, etc.) fit into an optional carrying case and weighs 27 lbs.

For more information contact Polhemus, Colchester, VT at 802/655-3159 or Fax 802/655-1439.

SpaceController

Until recently, working in 3D PC CAD required interesting mental gymnastics and software gyrations. Users had to break down natural 3D movements into a series of 1D or 2D operations, picking screen icons or menus and entering keyboard commands and switching views.

Now with the SpaceController from Spaceball Technologies and a mouse or digitizer, it's like having two six-guns. Use your mouse as normal for picking, pointing and menu commands and the SpaceController in your other hand for full six-axis 3D control of your image. You use both devices simultaneously, right within your design session, saving considerable time. You can start a line, move and

Alternative Input - At A Glance

Product Name	Device Type	Typical Applications	Price
3Draw Polhemus	3D / 2D Digitizer	2D/3D CAD, 3D reverse engineering, virtual reality	$6500
Ergo-Max Maxi Switch, Inc.	Ergonomic Keyboard	All standard keyboard input; CAD, business, etc.	$149
SAC's GP-12 Science Accessories Corp.	3D Sonic Digitizer	Reverse engineering, rapid prototyping, tool paths, CAD, 3D Graphics, medical	$3200-$5965
SpaceController Spaceball Technologies	3D Control Device	CAD/CAM/CAE, science, medicine, virtual reality, visual communications	$395
MicroDyn II Voice Dynamics, Inc.	Voice command / input	CAD, CMM, quality control, microscopes, data collections	$1995

rotate the part with the SpaceController into any position or orientation and then complete the line. There's no need to swap back and forth between views.

This latter feature plus ease of use increases productivity substantially. Typical productivity gains are in excess of 25% over using traditional methods or devices. To use the device you simply apply light fingertip pressure to the SpaceController ball. Any pressure, twisting motion or combination

applied to the ball happens instantly to the 3D part or model up or down. Push in or out to zoom or twist in any direction to rotate. Also, take note that the ball does not move like a trackball.

This device saves a lot of command input and thus time but it also has additional benefits. First off, movement is essential when working in a 3D environment. Since we are limited to viewing 3D images on flat 2D screens, a 3D image must be moved to understand it. The easier it is to move an image, the more likely you are to move it, increasing design understanding. Plus, the more you move a part or model, you're more apt to catch errors earlier in the design cycle, reducing costly ECOs. An increase in productivity also means that you may have a little extra time to experiment with some new concepts.

Two function buttons on the sides of the device provide additional functionality. The left function button activates a dialog box pop-up menu within CADKEY. Functions include Translations On/Off, Rotations On/Off, Single Axis Filter (limits translations and rotations to one axis at a time), SpaceController sensitivity adjustments, Select Center of Rotation, and Keep in View. Pressing the right button performs a CADKEY AutoScale function. You're also able to reduce the number and types of entities to be displayed during movement to enhance image dynamics.

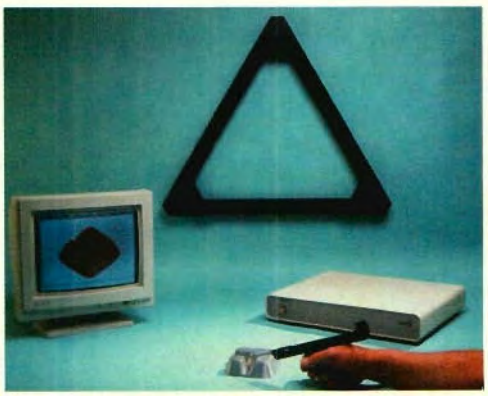
The SpaceController also works with Picture-It, Cadkey's solid synthesis and shape recognition tool, where it can be used to translate and rotate a rendered image interactively without the need to rerun a program, simulating real-time solids manipulation.

The SpaceController is being offered at a limited-time special promotional price of $395 to CADKEY users (regular list $595). Spaceball Technologies offers a 30 day money back guarantee. *For more information contact Spaceball Technologies, Lowell, MA at 508/970-0330 or Fax 508/970-0199.*

SAC GP-12

The GP-12 is a tool for digitizing 3D objects. Used primarily for reverse engineering, rapid prototyping and tool path generation, it has a working volume up to 8' x 8' x 8'. It also works indoors, outdoors, and in any lighting.

The GP-12 is based on sonic technology. Since sound travels between two points at a speed which can be calibrated, sound travelling from a single emitter to three or more receivers can be used to



calculate the location of the emitter in three dimensional space.

Sonic Technology allows any material including metals to be digitized. Use is simple. Two emitters on the gun-like probe transmit sound in a direct path to the three receivers. Through offset algorithms, X,Y, Z coordinates of the tip of the probe are inputted into CADKEY, CADD-Inspector or CUTTING EDGE.

Or a complete system is available with the GP-12 that enters the data directly into Cutting Edge Technologies' CADDInspector software which works inside CADKEY. (See the article on CADDInspector in this issue.) Because geometry generation and display occurs in real time, visual verification is easy and automatic. The GP-12/CADDInspector/ CUTTING EDGE SURFACES system is compatible with other CAD/CAM systems via IGES, DWG or DXF.
For more information contact Science Accessories Corp., Shelton, CT 203/925-1661 or Fax 203/929-9636.

Voice Control

The MicroDyn II system from Voice Dynamics Corporation literally lets you tell your computer what to do. You can input up to 1000 spoken commands and each command can send up to 250 characters to the computer. This means your hands and eyes are free for designing or other tasks (not keyboarding or propelling an input device).

Why would you want a voice system? For faster, more accurate and less stressful operation of CAD/CAM or CMM. MicroDyn II also works with word processing, spreadsheet and data entry operations. According to Voice Dynamics, CMM operators have benefited the most by voice recognition — with many operators saving 20 to 40 percent of their total command input time. CAD users benefit from the natural, intuitive interface, and the powerful voice macros.

One primary application is quality control with CMM. Normally when a technician finishes inspecting a component (for example the bottom of a machined slot), he must take hands and eyes off the probe, turn to the computer, press the keys and go through several menus to select the "circle" option, turn back to the part, reposition the probe, and then start the next inspection sequence. With MicroDyn, he keeps his hand and attention focused on the probe and just says "circle."

The MicroDyn system would also be invaluable for operators struggling with repetitive stress injuries caused by overuse of mouse, puck or keyboard, or someone with physical disabilities.

The concept is simple. Your voice patterns are stored in the MicroDyn. You speak commands into the microphone which are converted into keystrokes (ASCII characters through a standard RS-232 serial port). The unit has a robotic voice and can ask for a command, echo your command, or remain silent. MicroDyn can contain voice patterns for several individuals so the equipment can be shared. Noise cancelling microphones mean it can be used in both noisy shops and environmentally controlled inspection areas.

VoicePaks™, pre-written vocabularies for common CAD/CAM (including CADKEY) and business applications, are available to get you started. Voice Dynamics can handle other packages or customizations. You make a list of words and corresponding keystrokes. They prepare the voice library of words. Then in a session that usually lasts 30-40 minutes, the system is "trained" or "personalized" to the user's voice.
For more information contact Voice Dynamics Corporation at 714/252-1211.

PREVIEW

AN ERGONOMIC KEYBOARD

STANDARD KEYBOARDS ARE FLAT, RECTANGULAR AFFAIRS. NOT DESIGNED TO ACCOMMODATE REAL HUMAN ANATOMY, THEY HAVE RECEIVED MUCH BLAME FOR THE EPIDEMIC OF RSI.

THE ERGO MAX, A NEW ERGO-NOMIC KEYBOARD (TO BE RELEASED IN THE FALL OF 1994) ATTEMPTS TO REMEDY THIS. IT LETS THE USER PHYSICALLY ARRANGE THE KEYPAD IN MULTIPLE POSITIONS FOR MAXIMUM OPERATIONAL COMFORT AND EFFICIENCY. THE MAIN KEYBOARD CAN BE SPLIT IN HALF. THE HALVES, SUPPORTED BY TWO INDEPENDENT JOINTS, CAN BE PARTED, RAISED AND THEN LOCKED INTO THE OPTIMUM POSITION FOR THE INDIVIDUAL. THE KEYS ARE LAID OUT IN THE STANDARD FASHION, SO THERE IS LITTLE OR NO LEARNING CURVE.

THE PRINCIPAL COMPONENTS OF ERGO MAX INCLUDE A 72-KEY MAIN KEYBOARD AND A 30-KEY NUMERIC KEYPAD. THE 30-KEY KEYPAD INCLUDES NUMERIC KEYS AND TRADITIONAL NON-WINDOWS-TYPE FUNCTIONS SUCH AS FUNCTION, CURSOR AND PAGE CONTROL. THE KEYPAD CAN BE PLACED ON EITHER SIDE OF THE MAIN KEYBOARD, A REAL ADVANTAGE FOR CADKEY (OR WORD-PERFECT) USERS WHO LIKE TO USE THE FUNCTION KEY COMMANDS.

ERGO MAX'S OPTIONAL 40-KEY KEYPAD WILL INCLUDE THE ADDITIONAL FEATURES OF BUILT-IN CALCULATOR FUNCTIONS (ANOTHER ADVANTAGE IN CAD) AND LCD DISPLAYS. A SECOND OPTION IS A WRIST PAD WHICH FEATURES A BUILT-IN TRACKBALL MODULE.

THE ERGO MAX HAS A SMALL FOOTPRINT. THE MAIN KEYBOARD AND KEYPAD IS ONLY 13.25" BY 7.75" BY 1.62 INCHES.

For more information contact Maxi Switch at 602/294-5450.

DMS Dossier

by Martin van der Roest

Justifying Costs of EDMS Implementation

Generating cost/benefits justification for significant purchases seems to be the norm for most companies today. Especially in the "lean and mean" tenor of the 90's, understanding the cost and expected pay back is essential.

Developing the benefits of a solution expense is often straightforward. Justifying CAD, spreadsheets, and program scheduling systems, for example, are almost intuitive. This "point" solution can be justified quite easily by simply analyzing the time savings alone. There may be some training cost and ramp up time, but otherwise the only barriers to approval may be budget restrictions.

For engineering drawing/document management systems (EDMS) solutions, measurable and tangible benefits are just as easily definable. In some of the past columns, I've talked about some of these benefits. These include such highlights as reducing document retrieval and distribution costs, reducing change control cycle times, and supporting quality requirements such as ISO 9000.

Other significant benefits fall out as well. Take, for example, an engineering document control center which processes requests for documents. To fulfill requests, personnel are required to pull an original plot of aperture card. This information is housed by some type of file cabinet which takes up floor space. A copy is made using a drawing duplication device. The device requires maintenance and also takes up real estate. The resulting document is placed in a pigeon hole and is now available for pick up. The individual who requested the information or the designated 'gopher' walks over and picks up the documents.

A properly implemented EDMS solution creates the effect of the "virtual document control center." The center operates on the network. A user can retrieve a document and view, print, plot, FAX or transfer the information instantly. I'll bet that most users don't need an actual copy of the document they want. All they need is quick reference information which can be found by simply viewing the documents. Hence no paper, no expensive copying machines, etc.

The cost benefits analysis of the above example is a "slam dunk". But wait! Is the cost benefit of the final solution all that's needed? Dark, unseen forces lurking in the implementation closet need to be exposed.

I've helped a large number and wide variety of companies implement EDMS solutions over the past several years. I'm convinced now more than ever, that the cost benefit of effective implementation is a significantly overlooked aspect of the EDMS solution. This oversight can turn a project into a government project story fraught with cost overruns and rubber band schedules. Truly the makings of a business nightmare.

So, how can you justify the cost of implementation? The first thing to realize is that unlike "point" solutions, EDMS is not simply loading "shrink wrap software" with a little training thrown in. An EDMS solution is a complete working environment which impacts many areas of your company. In a nutshell, an EDMS solution radically improves data management by modeling the document creation, change control, release, and distribution activities. As a result, good implementation takes time, energy and money. But in the long run, you'll save lots of time, energy and money. If EDMS is treated like plug-and-play software, it will fall short in achieving maximum results. You might fix a few problems temporarily, but you won't see any lasting results.

Implementation is an exciting opportunity to rethink how you can improve everything in your company. Much of EDMS follows the trend of "re-engineering." Are your current processes effective? Which steps should be streamlined? How should data be initialized and managed? Who needs access to data? How should documents be secured? Which activities should be completely eliminated?

Once you decide how you want to improve your current processes, another key issue is planning the conversion of existing data to electronic format. Keep in mind that not all data may need to be converted, but you still need to determine how data will be tagged in the EDMS system — such as by part number, name, key words, history, etc. This conversion process is critical to the success of an EDMS solution. Otherwise, users will lose confidence in the system after several failed attempts to access data. The result? A complete waste of money.

So consider the cost benefits of investing in an effective implementation program. You'll reap what you sow, and you'll see the benefits for years to come.

I'd like to bid farewell. Sadly, this is my last article. Thanks for all your feedback over the past months. Best of luck!

GLOBAL Manufacturing

Riding the Information Highway with CALS

by George Elwood

Completed F-5 nosewheel steering parts on display at CALS EXPO '93

As the United States proceeds towards the 21st century, the need to move data is becoming more critical. The Air Force Continuous Acquisition and Life-Cycle Support (CALS) project offers manufacturers tools to meet this need.

CALS was developed by the Department of Defense (DOD) as a way to save time and money when developing weapon systems. The concept focuses on neutral file formats that permit CAD data to be exchanged between dissimilar systems. Once created, data can be reused with substantial cost benefits. Although initially developed for manufacturing weapon systems, the CALS concept is gaining support around the world. The Europeans see CALS as a way to compete with the United States and Japan, not only in the military arena but com-mercially as well. Companies in the U.S. that expect to survive and compete in the global marketplace need to reduce costs and improve productivity. CALS can help!

CALS is one part of the information highway we've been hearing so much about. The ability to send and receive data elec-tronically is a major step into the 21st century. Company survival depends on it. CALS is a key part of electronic commerce and is moving to the forefront as a way of doing business.

Standards Are the Key

Standards are at the heart of the CALS concept. The DOD did not invent new standards to develop CALS, but adopted accepted international or national standards. These include MIL- standards for packaging and media requirements, data, raster images, and vector CGM data and IGES.

IGES is a neutral format that can be used to transfer CAD data between systems. Why not use DXF to transfer data? The IGES standard is accepted by inter-national commerce and controlled by the IGES/PDES organization. IGES is available to anybody. The DXF "standard" was developed by Autodesk who controls the format. They could change the requirements or definitions to meet market demands and nobody could challenge the change.

CALS Struts its Stuff

To show CALS capabilities, stress the standards, and see where problem areas occur, the Air Force CALS Test Bed (AFCTB) has been conducting manufacturing demon-

CADKEY at CALS EXPO

CADKEY was used by two groups. The Oklahoma Air Logistic Center of Oklahoma City, Oklahoma manufactured part 16. They used CADKEY v6.0 and SmartCAM v7.0. They delivered the part to the booth at CALS EXPO and reported no problems.

The Robert E. Byrd Institute of Huntington, W.Virginia produced part 15 without incident. They downloaded both the IGES files and the raster data to ensure dimensions were correct. They used CADKEY v6.0 and SmartCAM. The programming and setup time were estimated at 2.5 hours. The actual machining time was 2.5 minutes.

Although CADKEY performed beautifully, some of the other CAD systems had difficulty reading the CALS IGES files. To get usable files to these participants, DXF and AutoCADR 12 files were created. While neither of these file types meet the CALS standards, the AFCTB attempted to resolve the problems and meet the demands of the real world.

EXCEED THE SPEED LIMIT!

A recent study comparing the efficiency of a TEMPLATE/DIGITIZER compared to a MOUSE found that the TEMPLATE/DIGITIZER offered up to 54% GREATER efficiency. If you've used CADKEY you've hunted up and down CADKEY's HIERARCHICAL MENUS looking for a particular CADKEY command like, for example VERIFY ANGLE. (Mmmm...now, is that command under EDIT, maybe it's under DISPLAY.....well, I know it's somewhere.) Anyway, CADKEY Users realized long ago the MOUSE/KEYBOARD combination of command execution in CADKEY is not nearly as fast as the TEMPLATE/DIGITIZER/KEYBOARD - especially if you have a well designed Template like CADJET. Have you ever noticed how many function-key strokes (and/or Mouse 'picks') are involved in executing CADKEY commands. CADKEY's 40 or so Immediate Mode <ALT> Commands help some if you could memorize that many. (do you know anybody that have them all memorized) But, you don't have to worry about this with the CADJET Master Template as all 40 <Alt> Commands are on it. Exclusively executing CADKEY Commands with a MOUSE/ KEYBOARD is not only time consuming but extremely unproductive. With CADJET Master Templates, you'll save as much as 5 or more keystrokes for every CADKEY Command. (Considering how many commands the typical user uses, this can add up to hours of unnecessary finger-hopping and command hunting!) Whether you're a NOVICE or EXPERIENCED CADKEY User, you'll really appreciate the way CADJET Master Templates works in excellent tandem with KEYBOARD entry and coincidentally eliminates much repetitive, tedious command entry. Layed out exactly like CADKEY, the Template is easy to learn and use! And, don't worry when CADKEY comes out with major new versions for we have Template Upgrade Kits for existing CADJET users providing instant access to all the latest and greatest CADKEY commands. CADKEY users with many years of experience on CADKEY have told us that they wish they had gotten the CADJET Master Template much sooner. Considering how many satisfied CADJET Master Template users around the world are using our product everyday, day in and day out, we think it is safe to say that the CADJET Master Templates for CADKEY save the user time and effort. If you're using CADKEY with a MOUSE/KEYBOARD, then you are wasting minutes and sometime hours each day. So, convert from your old, unproductive MOUSE/KEYBOARD and see why CADKEY users around the world have made the switch. Don't take our word for it. All our products can be tried FREE. SEE FOR YOURSELF HOW EASY AND FAST CADJET Master Templates CAN MAKE YOUR CADKEY! (Cadjet Master Templates - sold separately or with a DIGITIZER.)

"CADJET is well laid out. It groups commands in an order that makes sense to CADKEY users. The bright background colors and logical icons make it visually appealing. It is easy to see that CADJET will add to the productivity of any CADKEY user. With all of the CADKEY commands at the user's fingertips, less time will be required to learn the system."
Paul Resatarits,
Co-Author - *USING CADKEY*

"The CADJET Template made our part-time designers into CAD experts in a very short period of time. My two previously CAD-shy toolmakers literally fought over who was going to use the CADKEY system first. CADJET is undoubtedly one of the best products to come along in a long time. It speeded up training and increased productivity considerably. As long as I'm in charge, we'll never work without it. It makes CADKEY fun to use."

Brian Gross,
CAD Manager

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Tom Gray,
CADKEY Dealer

"CADJET saved our company time and money. Now, we have instant access to CADKEY's commands right at our fingertips. Detailed drafting and design is easier and much improved in quality. I highly recommend CADJET to any CADKEY user."
Mike Decker,
CADKEY User

"As I have been using CADKEY for several years, I was amazed at how fast and easy CADJET makes CADKEY to use. CADJET really works. Thanks for a great product."
Henry Dieken,
CADKEY User

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strations in conjunction with CALS EXPO and Autofact for the last three years. These demonstrations have been a way to expose more companies and organizations to the CALS standards. Each year an in-creasing number of participants have been involved, growing from three participants with a simple part in 1991 to over 50 par-ticipants from the U.S. and five foreign countries last year.

For the first demonstration in 1991, an IGES file for a simple part was sent from the floor of the show in Phoenix to Concurrent Technology Corp. in Johnstown, PA. They modified the file by adding the date and time and passed it to Moore Quality Tooling in Centerville, OH. Moore also modified the file by adding the date and time and passed it to the DMMF at Wright-Patterson AFB. The file was modified one last time and sent back to Phoenix. Each site that received the file manufactured one part using clear plastic. These parts were sent overnight to the show where they were on display. Total time involved was less than 24 hours. The parts, when lined up on top of one another were exact duplicates.

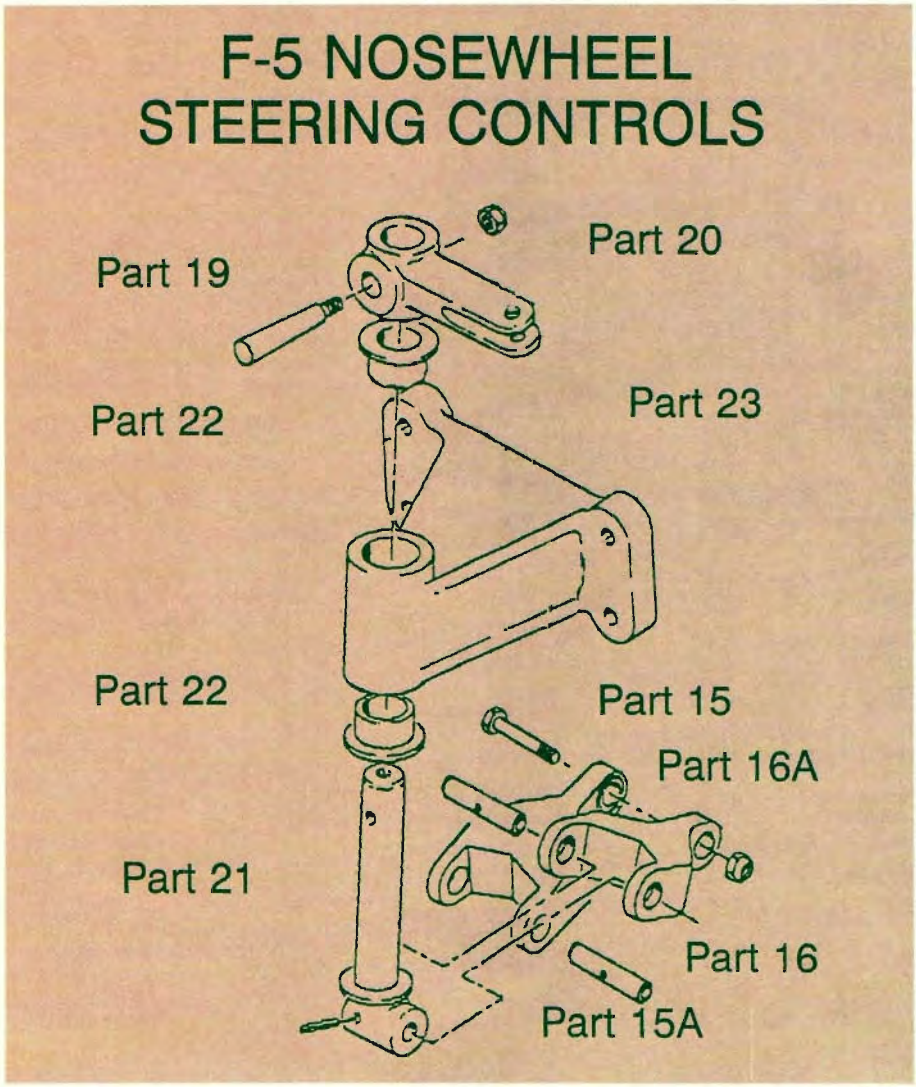
The second demonstration involved 14 companies in two countries. A 3D IGES of a bomb hook was sent serially around the U.S. and Canada. Because of time constraints and communications problems, the file had to be restarted several times. Nevertheless, when the actual parts were compared, they were exact duplicates. An example of the savings possible were expressed by Moore Quality Tooling. They knew what the part looked like and had the fixture ready. From the time the IGES file was received via modem until it came off the milling machine was three hours. The total cost was estimated at $300.

An assembly was selected for the demonstration at CALS EXPO '93 and Autofact '93 to further stress the system and test tolerance capabilities. The assembly consisted of eight parts from the F-5 nose landing gear steering assembly. The original print files were recovered from the Air Force raster system in San Antonio, TX. These raster files were then redrawn into a CAD system which generated the CALS IGES files. Because the purpose was to demonstrate file passing and not actual machining, the parts were simplified. The original parts had been machined castings.

Each company or organization that participated was assigned a part. The files were made available via internet and a PC based dial-in bulletin board. The companies ranged in size from the 21-man Wright Tooling in Bluff City, TN to Rolls Royce in England. A vocational school in Ponca City, OK, Eastern Kentucky University and Penn State partic-ipated. Air Force, Army, Marine Corps and Navy sites were also involved.

The first problem that surfaced was easily solved. Initially, one file per part was output. This caused problems with many of the small CAD systems. So the single file was broken into a drawing file and a model file. Another problem was the scale of the model file. Some CAD systems created the model in a large scale.

Fifty-two companies or organizations from Australia to Germany working with a wide variety of CAD/CAM systems participated. The parts they built were delivered to the AFCTB or to the floor of CALS EXPO in Atlanta.



The F-5 nosewheel steering subassembly was selected as typical of that available for reprocurements. The parts were selected for their close tolerance requirements in order to stress the IGES Standard, show its capabilities and detect any shortfalls in the standard.

The question was would the parts fit together and meet the very tight tolerances called for. The first parts that arrived at the AFCTB all met the tolerance requirements except for one that had been plated by the company to make it look "nice." They had not taken the plating into account during the machining which made the part too thick.

CALS EXPO attendees had the opportunity to create an assembly from the parts on display. Interest was very high and the title of the demonstration was changed from IGES Manufacturing Demonstration to Global Manufacturing Demonstration. Interest at Autofact was also very high. Five minutes after the doors opened, people were in lines four deep in front of the booth.

How to Be in the 1994 Demonstration

Another global manufacturing demonstration will be conducted for CALS EXPO '94 and Autofact '94. The goal is to test the CALS standards, prove the CALS concept, and expose more people to the stan-dard. The demonstration is open to any company, school, or organization who can receive digital engineering data and manu-facture a part. The goal is to have at least one part of the assembly manufactured in every state in the U.S.

Each participant will be tasked to manufacture a small part of an assembly. The part, a list of hardware and software used, a listing of any problems uncovered, comments as to cost and possible benefits and a company logo must be delivered to the AFCTB by the end of October 1994. Reported cost in last year's demonstration ran from $50 to $2500. Many companies reported that the benefits and the learning exceeded the cost by margins as high as four to one.

Last year's booth was configured with a map of the U.S., Australia, and Europe. The name of each participant was printed on the map (an IGES file) with a line indicating their location. Around the map were plates with the participants' logos and a list of hardware and software used.

The IGES files for 1994 will be available in July with a required delivery for the first week in November in time for Autofact. Over 150 participants are expected from the U.S. and 10 foreign countries.

If you are interested in participating, contact the Air Force CALS Test at 513/427-5869 X329 or Fax 513/257-5881.

George Elwood is a Senior System Engineer at AFCPO (Air Force CALS Program Office), Global Manufacturing Project. He can be reached at 513/427-2295 or Fax 513/427-5881.

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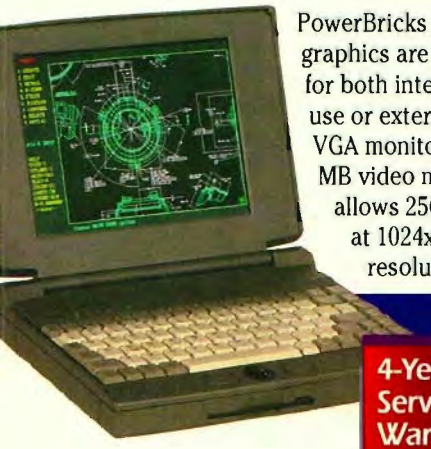

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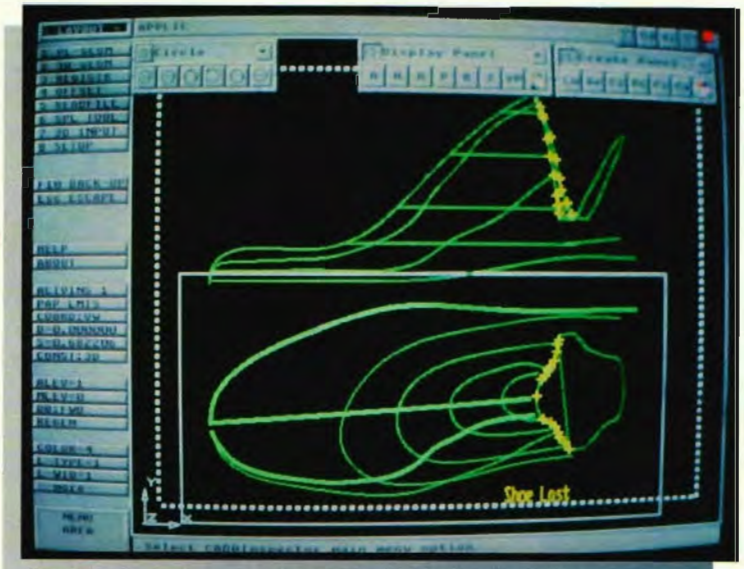
Reverse Engineering a Shoe

by Claudia Martin



A part file of a last directly digitized into CADKEY 7 with CADDInspector.

In the first century Horace said, "You cannot put the same shoe on every foot."* And in 20 centuries nothing's changed — except there are a lot more feet around.

So, to meet and beat the competition, mass-market footwear manufacturers are bringing broad technological changes to an industry that has been around (and not changed much) for centuries. Their new tools include 3D CAD, 3D input devices, and computer driven sewing machines and cutters. They use state-of-the-art reverse engineering techniques to create lasts for shoe production and parts for antique machines for which replacement parts are no longer available. They even copy and modify designer shoe styles for mass production. These computerized tools dramatically speed a shoe's "time to market" — a critical factor.

In spite of the new technology, shoes are still manufactured around forms called "lasts" and large numbers are required for each style of shoe. For example, a left and right with all the iterations for size and width totals over 100 lasts for many styles. This is a lot to produce by hand, but with today's computer tools, a model or shoe can be digitized in 3D, the digitized data turned into a computer model, and the model easily modified in CAD to produce endless variations. Then prototype and production lasts can be machined with CNC, or produced with stereo lithography or other manufacturing processes.

Digitizing a plaster cast of a foot with a hand held device.

While few companies take advantage of the full range of software tools available, stiff competition (especially from the developing world overseas) is pushing all of them to do more with less. Time to market is the key to success in the fickle world of style, fashion and foot fads.

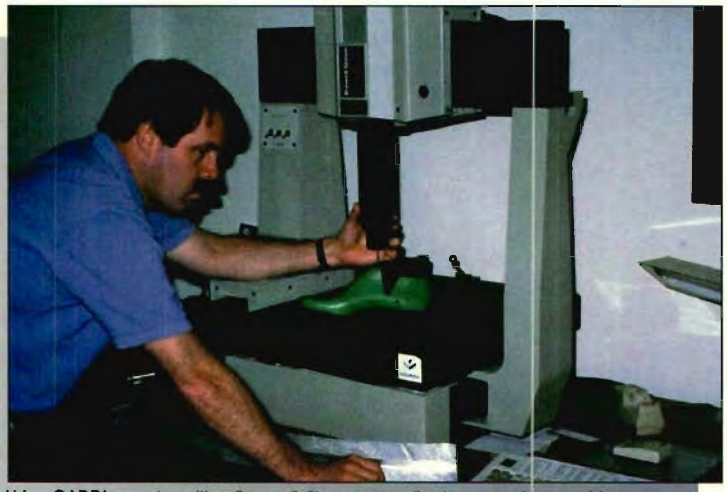
Several manufacturers currently use CADDInspector™ Version 7.0 and CADKEY for some of these tasks.

CADDInspector is innovative, versatile software used with a 3D data-input device (e.g., coordinate measurement machines - CMM, hand-held probes and digitizers, magnetic and sonic digitizers). The CADDInspector/input device combination lets the user gather 3D data rapidly and easily in a CAD-compatible and CAD-displayable format. This is the initial information required to manufacture replacement parts or shoe lasts. CADDInspector's process of creating geometry occurs in real time. You can tell what you have done because you see it displayed on the computer screen.

CADDInspector & Hand-Held Devices

When using a coordinate measurement machine (CMM) to capture data from an object, especially surface data, one axis is usually physically locked so that a cross section of the object can be captured. This assumes that the data is collected in an orderly, useful form. However, if you are using a hand-held interactive digitizer to acquire 3D data, it is not possible to physically lock an axis. In the past, this has limited the usefulness of hand-held data-input devices.

CADDInspector has solved this problem with the *virtual cut plane*™ an advanced 3D data-input technology. The *virtual cut plane* simulates planar axis locking and allows you to define a plane which serves as the cross section. When the digitizer crosses the plane, data collection takes place.



Using CADDinspector with a Brown & Sharpe coordinate measuring machine.

You can quickly acquire a cross section to the object simply by sketching with the probe back and forth over the object and crossing through the "virtual" plane. The software will acquire data only as you cross the plane. Since you end up with cross sections of the object, you can create surfaces directly. For example, you can use the cross sections to create a lofted surface in FastSURF.

Even more significantly, the *virtual cut plane* does not have to be defined by any relationship to an axis to create the data-collection zone. The user defines the *virtual cut plane* at any orientation. This dramatically increases CADD-Inspector's versatility, as well as the utility of hand-held digitizers.

CADDInspector's Other Uses

CADDInspector is versatile. Besides input of digitized 3D data for reverse engineering it can be used for computer-aided inspection, defining surfaces and, in some cases, replacing machine gauges.

Inspection - The CADDInspector can be used to digitize an as-built part and compare it with a CAD design. Dimensions can be verified and position features established from a part designed in the system or transferred via IGES, DXF, DWG or other translators. Typical measurements include the distances between the centers of holes, parallelism between surfaces, and angular displacements between features can be verified with CADDInspector with procedures very similar to digitizing for reverse engineering.

Surfaces - A surface is a composite entity built up from splines (i.e., irregular curves) which are defined by points or nodes. Think of this as a hierarchy of data. Surfaces are made from splines; splines are made from points; points are the fundamental data provided by your digitizer. CADDInspector can capture surface definitions and has many tools which allow generation of splines. The surfaces or defining splines can be brought directly into CUTTING EDGE or CADKEY. They can also be transferred via IGES or CADL to other CAD/CAM systems for surface generation or manipulations and ultimately machining. The CADKEY IGES translator is widely and effectively used to transfer 3D geometry to such systems as CATIA, ProEngineer, Unigraphics, Intergraph and CUTTING EDGE SURFACES.

Soft Gauging - Soft gauging is using computer processing of dimensional and positional information to replace or reduce the need for machined gauges. For example, if you're interested in measuring the distance and parallelism between two surfaces, you might use a granite surface plate, gauge blocks and a micrometer. It might be necessary to build special gauges to measure the part or build fixtures to fix its position. Or you can use CADDInspector to collect data defining the surfaces and measure the distances. In this case, you would probably not need any special fixtures or gauges. The part could be mounted in any arbitrary position.

CAD/CAM Compatibility

Because CADDInspector is written in "C" within the CADKEY® Dynamic Extension™ (CDE) environment, it is directly compatible both with CADKEY and CUTTING EDGE SURFACES™, Cutting Edge Technologies' product for computer-aided manufacturing. Through IGES, DXF or DWG translation, CADDInspector is compatible with virtually all other CAD\CAM software systems available today.

*(Publilius Syrus Maxim 596)

Digitizing a polycarbonate last with a Polhemus ISOTRAK II.

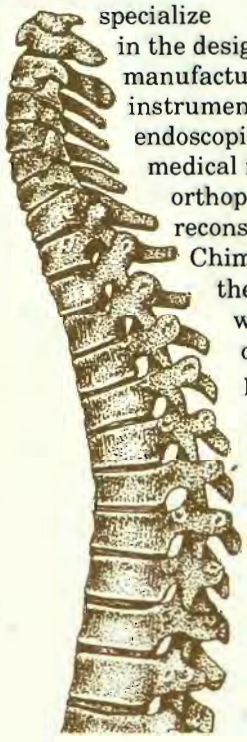
Cutting Edge Technologies, Inc. develops and markets productivity-enhancing software tools for design and manufacturing industries around the world. Their products ranges cover processes from reverse engineering through design, to computer-aided manufacturing and quality-assurance inspection.

For additional information, contact Cutting Edge Technologies, Inc., 4 Griffin Road North, Windsor, Connecticut, 06095. Telephone: 203 / 298-6433; Fax: 203 / 298-6490.

Complex Orthopedic Implants with CADKEY & CNC

by Frank Simpson

The chimaera was a mythological fire-breathing animal with a lion's head, a goat's body and a serpent's tail. Mr. David Sutton and Dr. Stanley Hurd, presidents of twin companies, Chimaera, Inc. and Chimaera Medical Products, Inc., Milford, Connecticut, chose this ancient Greek name for their companies to symbolize the diversity of technical disciplines that they represent. Chimaera and Chimaera Medical Products (CMP) specialize in the design and manufacture of instruments used in endoscopic surgery, and of medical implants used in orthopedic reconstructive surgery. Chimaera, Inc. does the developmental work, and this often leads to full production through strict division in functions, equipment and personnel.



"We were introduced to CADKEY® in 1986 by CIMTECH, and we have been designing our products using CADKEY ever since," said Dr. Stanley Hurd. "Steve Kidd provides us with training, hardware troubleshooting and contract engineering related to some of our projects."

We design as a team of engineers and toolmakers so the manufacturing emphasis is always present.

Most of the products that Chimaera designs are manufactured in materials such as titanium, cobalt chrome or stainless steel. These materials provide the strength and corrosion resistance required by the medical applications in which Chimaera's products get used. Manufacturing considerations, especially related to computer numerical-control (CNC) manufacturing, are also critical elements in the design process. An example of one such product is a spine plate, manufactured for an industry leader in orthopedic implants, that is used to bridge vertebrae when one vertebra has been damaged beyond repair, as an aid to spinal fusion.

"We programmed this spine plate using two splines, representing upper and lower contours, and 150 construction planes to model the surface between the two splines," said Hurd. A spline is an irregular curve. Adding to the complexity of the design of the spine plate is the fact that the surfaces, designed on the 150 construction planes linking the upper and lower splines, must have a radius that conforms to the radius of an R10 cove-mill cutter to be used in CNC manufacturing. Machining these plates with an R10 cove-mill cutter is the only economical method of manufacturing them in large quantities. Another element of complexity is the fact that some of the tolerances in the spine plate are within one-thousandth (0.001) of an inch.

"There is nothing intuitive about the geometries involved in the design of these spine plates," said Hurd. "We knew what was mathematically required, and we relied on CADKEY to get us there. In using a cove-mill cutter in CNC manufacturing, we were really creating a new application for old toolmaking technology. The problem would have been insoluble without CADKEY. There are only two realistic ways to make these spine plates with their R10-radius surfaces. First, you could CNC machine the plate using a ball mill, but that would have required repetitive machining and considerable time. It would not

have been economical to do it that way. Or secondly, you could recognize, as we did, that the old-style cove-mill could work well if it were possible to derive the correct cutter path." The spine plate, made of titanium, now exists as a family of orthopedic implant parts in ten different sizes.

"CAD, specifically CADKEY, has shrunk the time that we need to respond to our customers' needs," said Hurd. "And, we can modify existing components into new designs for new medical applications with almost zero lead time. This is important because the medical field is aggressive and competitive, like most manufacturing niches left in the United States. There is high risk and high return, but you cannot have developments requiring two years. Periods of three to six months, from concept to production, are not uncommon. Some projects have incredibly tight tolerances; in one instance, 300 millionths of an inch on each component of an assembly." Chimaera has had customers come to them with projects on which other firms have worked unsuccessfully for up to 18 months. In one case, Chimaera was given 15 weeks to develop a solution for one customer's need. This need became more pressing, so the schedule was reduced by six weeks. Design through production had to be completed in nine weeks. Chimaera was able to complete the design in three weeks

We can modify components into new designs for new medical applications with almost zero lead time.

and move into manufacturing in the fourth week. "You have to do concurrent engineering, and you have to keep manufacturing requirements in mind all the time," Hurd concluded. "We always do our design work as a team of engineers and toolmakers together so that the manufacturing emphasis is always present in the design."

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The DataCAD Portfolio

Lehman Hall Stair
Harvard University
Boston, Massachusetts

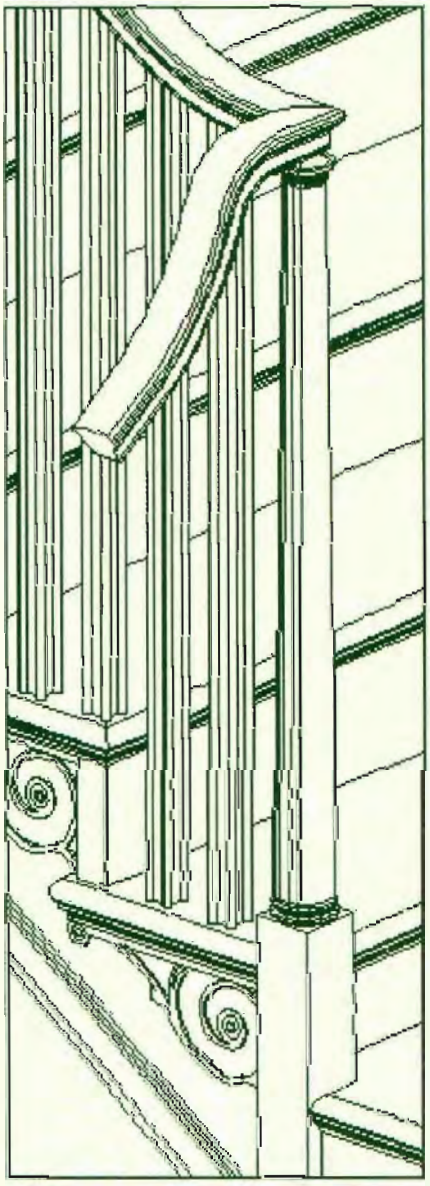
CADD generation and rendering by Richard Morse, Project Manager, MGIA Architects, Inc., Boston, MA

Rendering assistance and expertise provided by Mark Madura, Madura Studios, Inc., Boston, MA

A modest renovation project is being undertaken by Harvard University to the Lehman Hall Building. Part of a group of structures which defines Harvard Yard, the building contains two stairwells with fairly ornate marble stonework and wood detailing. One of these stairs presently contains an elevator at its core which is to be removed. The University wanted to investigate alternatives to reconstructing the remaining stair. The rendering shown here and on the front cover depicts a total reconstruction matching the opposite stairwell.

Constructing the Model

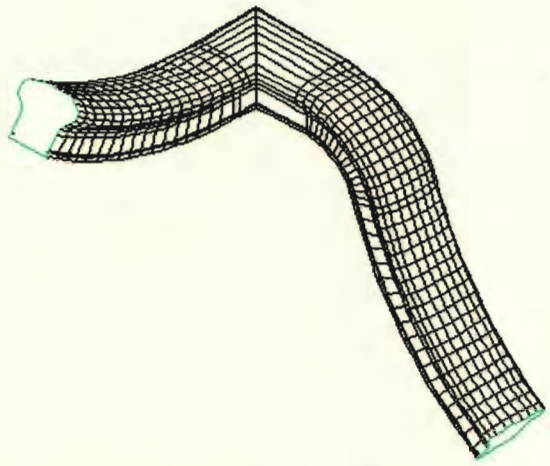
As the scope of the project did not allow for an intense focus on computer modeling, an effort was made to generate the model as quickly and simply as possible.



Because a staircase contains a repetition of similar elements, symbols were used for the riser, tread, balusters and ornamentation of a typical step. Detail in the various model parts was reduced to the absolute minimum required to convey the feel of the contoured shape. To duplicate the ornamental scroll work on the stringer, a digitizing tablet was used to trace over a field photograph. The stair was then snapped together with symbols having differing z heights. The landings are composed of treads that have been stretched to a larger dimension.

The most difficult part of the stair to duplicate was the undulating bannister. To make the handrail, a polygon representing its section was generated. This section is visible at the cut ends of the rail. This entity was moved and copied through space at every critical geometrical intersection of the rail: end points, mitred corners and radius point. To make a radius, the wedge was generated by copying the polygon at an angular distance.

To create the mitred corner, the polygon was enlarged by a factor of the square root of 2 and angled at 45 degrees.



Once all the critical elements were in place, vertical polygons were traced about the many end points and stretched as necessary. The result is similar to a mesh surface, creating the effect of a continuous extruded tubular shape. The resulting model was used to generate hidden line isometric drawings that were further edited for plotting. Total time to produce the model was eight hours.

The Rendering

To generate a realistic image, the model was brought into Renderize, a rendering software application by Visual Software* via DXF. This package allows the user to define a view, create lights, and assign surface texture and color to the model's different elements. Many adjustments were made to the scale of the textures for wood and marble and the intensity of colors.

* See "New Products" column in this issue for more information on Visual Software products and contact information.

If you have a project you would like to share in The DataCAD Portfolio please send the information to the Technical Editor, **KeySolutions**, *P.O. Box 11978, Spokane, WA 99211-1978.*

DataCAD Dialog

by Philip Hart

One of the best ways to customize DataCAD is to modify your Keyboard Macros. Tailor them to the way you use the software and you can work more efficiently.

What are Keyboard Macros?

Keyboard Macros are saved sequences of DataCAD menu selections. They execute when you hold down the ALT key and press one of the (26) letter keys. A Keyboard Macro cannot do anything more than you can do when you select a series of menu options. It can, however, immediately jump you from a position deep in DataCAD's menu structure to a menu that you use frequently, or it can recall a long sequence of selections that you use regularly. When such sequences are "played" by keyboard macros, you can save a lot of time and tedium.

Don't confuse Keyboard Macros with Keyboard Interrupts or with DCAL Macros.

Don't confuse Keyboard Macros with Keyboard Interrupts or with DCAL Macros. Keyboard interrupts are the single-key "hot keys" that jump you to different menu locations in DataCAD; the X interrupt, for instance, takes you to the Object Snap menu, m to the Move menu, M to the Macros menu, etc. You find DCAL macros under the Macros menu. They are actually "mini-programs" written in the DCAL programming language and act as extensions to the functionality of DataCAD by adding features not found in the DataCAD menus.

How Keyboard Macros Work

When you invoke a Keyboard Macro by holding down the ALT key and pressing one of the letter keys, DataCAD reads the file DCAD.MCR and executes the command sequence described on the line that begins with the letter that you pressed. In a standard setup, DataCAD locates this file in the \DCAD5\SUP directory.

To understand the structure of a Keyboard Macro, let's take a look at the ALT+A keyboard macro in DCAD.MCR as shipped with DataCAD 5. Figure 1 illustrates its

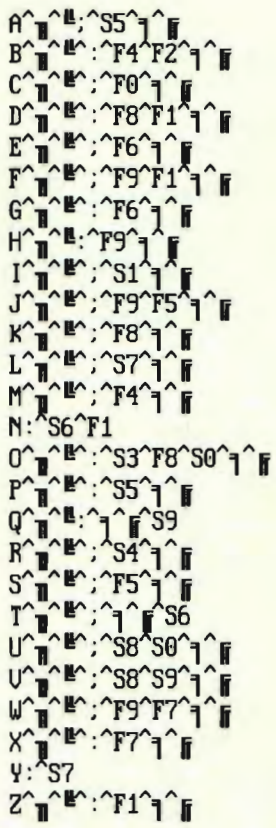


Figure 1 - DCAD .MCR as shipped by Cadkey with DataCAD 5

contents. When you press ALT+A, DataCAD reads the line beginning with A. The next character in the line is a carat (^); carats separate individual commands in a Keyboard Macro line.

Note that in DCAD.MCR (as shipped) carats are missing from some positions in A, H, N, Q, and Y. The file works properly, but you should follow the practice of always separating the commands with carats.

The next two characters on the line are **extended ASCII characters**; they tell DataCAD to turn off the display of menus and messages. This speeds the execution of the Keyboard Macro. At the end of the command line, there are two more extended ASCII characters. They turn the display of menus and messages back on.

Figure 2 illustrates the appearance of the four extended ASCII characters as they display in a DOS ASCII editor (DOS's EDIT, for instance). You write them by holding down the ALT key while typing the number on the numeric keypad of the keyboard (with NUM LOCK on). The extended ASCII character displays when you release the ALT key.

Remember, any Keyboard macro that begins with the suppression of menus and messages should conclude with turning them back on. Note also that some Keyboard Macros (ALT+N in Figure 1, for instance) require that the display be kept on during their execution. If you find that a particular Keyboard macro is not working properly, you might try removing the extended ASCII characters from that line as a possible fix.

Let's get back to the line defining ALT+A. The first actions of this Keyboard Macro have been to stop the display of menus and messages in the DataCAD screen. Next, the Keyboard Interrupt for the Edit menu (;) is invoked.

A Keyboard Macro may contain any **Keyboard Interrupt.** Generally, it is wise to begin any Keyboard Macro with a "jump" to either the Edit (;) or the Utility (:) menu. This ensures that you will exit your current menu position and be placed in one of the two primary menus, from which you may then select menu steps using Function Key calls.

In ALT+A, the next command, S5, corresponds to the menu position at S5 (Shift F5) in the previously selected Edit menu: Curves. **Function Key calls** (F1-S0) are the primary means of specifying a command in a Keyboard Macro line. The Keyboard Macro line then closes with the extended ASCII characters that resume the display of menus and messages.

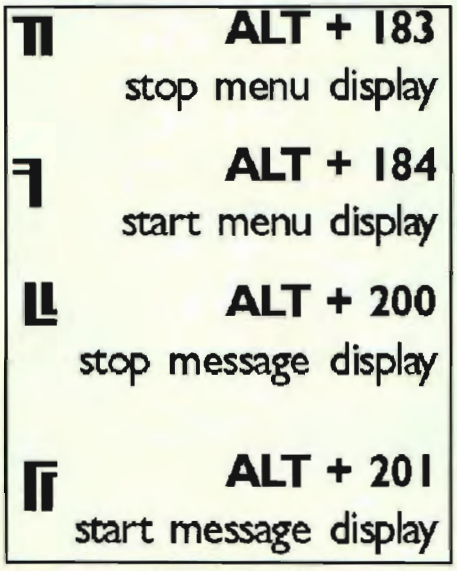


Figure 2 - Extended ASCII Characters

With a bit of DataCAD experience, you will be able to identify which Keyboard Macros you wish had been provided.

Modifying DCAD.MCR

With a bit of DataCAD experience, you will be able to identify which Keyboard Macros you use frequently, which you never use, and which you wish had been provided. Let's say that you never use ALT+O (which toggles Perpendicular snapping in the Object Snap menu), but wish that there were a way to go directly to One Line Trim (in the Cleanup menu). To modify a keyboard macro:

1. Enter DataCAD and write down the menu sequence that takes you to the desired menu. In this case, it is: Edit (;), Cleanup (F9), 1Ln Trim (F4).
2. Next, exit DataCAD and, in DOS, change to the directory containing DCAD.MCR by typing CD\DCAD5\SUP.
3. Make a backup copy of the file in case you ever need to return to it: COPY DCAD.MCR OLD.MCR
4. Using an ASCII editor (DOS Edit command, Windows Notepad, or any word processing program that can save the file in plain ASCII format), open DCAD.MCR and modify the line beginning with O to contain the menu sequence that you wrote down while in DataCAD (; F9 F4). See Figure 3. Then using the text editor's commands, save the file as DCAD.MCR and close the editor.
5. Finally, enter DataCAD and invoke the modified Keyboard Macro by holding down the ALT

key and pressing the O key. You will have accessed One Line Trim.

```
A^┐^└;^S5^┐^┌
B^┐^└;^F9^F7^┐^┌
C^┐^└;^F0^┐^┌
D^┐^└;^S3^F9^┐^┌
E^┐^└;^F6^┐^┌
F^┐^└;^F6^F3^┐^┌
G^┐^└;^F6^┐^┌
H^┐^└;^F2^S2^F0^HereIwas^$^S0^┐^┌
I^┐^└I^$^S8^S0^┐^┌
J^┐^└;^F9^F5^┐^┌
K^┐^└S^F0^F8^S0^F4^F1^F5^┐^┌F0^F1^S0^F2^F1^F0^F2^S9
L^┐^└;^F9^S1^┐^┌
M^┐^└;^F4^┐^┌
N:^S6^F1
O^┐^└;^F9^F4^┐^┌
P^┐^└;^F7^F9^┐^┌
Q^┐^X^S5^S0^┐
R^┐^└;^S4^┐^┌
S^┐^└;^F5^┐^┌
T^┐^└;F9^F0^┐^┌
U^┐^└;^F7^┐^┌
V^┐^└V^S5^┐^┌
W^┐^└;^S3^F0^┐^┌
X^┐^└;^F9^S2^┐^┌
Y^┐^└;^S6^┐^┌
Z^┐^└;^F0^S8^S2^┐^┌
```

Figure 3 - Philip Hart's DCAD.MCR

6. If you ever need to revert to the original version of DCAD.MCR, you can do so by renaming the files as follows:
   CD\DCAD5\SUP
   REN DCAD.MCR NEW.MCR
   REN OLD.MCR DCAD.MCR

Since DataCAD always reads the file named DCAD.MCR when accessing a Keyboard Macro, whichever file currently has that name is the one that controls the execution of the Keyboard Macros within the software.

Using Keyboard Interrupts

"Returnable" Keyboard Interrupts provide some special opportunities in Keyboard Macros. Most of the Keyboard Interrupts in DataCAD act in a "positive" way. When you invoke one, you jump to a specific menu position. When you exit that menu, you go to its parent menu and back on up the menu structure to the Edit or Utility menu. Some interrupts, though, are "returnable." When you use one of these, you go to the designated menu and, when you exit that menu, you return to the menu from which you invoked the Keyboard Interrupt.

If, for instance, you are in the Dimension menu and you press the m key, you go to the Move menu. When you click the right mouse button or press S0 to exit from Move, you do not return to the Dimension menu. You go to the Edit menu, the parent menu for Move. This is a "positive" Keyboard Interrupt. The X (Object Snap) Keyboard Interrupt, though, is "returnable." Let's say that you are in the Copy menu and have selected the "first point of the distance to copy." You then press the X key and jump to the Object Snap menu where you change a setting for snapping. Upon exiting from Object Snap, you return to Copy at the same place in the command sequence as when you invoked the X Keyboard Interrupt, i.e., you are being prompted to enter "the second point of the distance to copy."

You may take advantage of "returnable" Keyboard Interrupts in a Keyboard Macro. ALT+Q in my Keyboard Macro file (Figure 3) enters the Object Snap menu, toggles Layer Snap on or off and exits Object Snap. Because X is a "returnable" interrupt, I am returned to the menu position from which I invoked ALT+Q. I use it to toggle Layer Snap on or off within any command sequence. Note that it turns menus off and then on when it executes, but it leaves the display of messages turned on. This allows me to read the message line where DataCAD briefly displays a message that indicates whether all layers or only the active layer will be snapped to. I look for the word "all" or "only" as a verification of the snapping status.

Direct Entry of Text can be useful in a Keyboard Macro. A Keyboard Macro can reach a point in a command sequence where a User Input Line opens; you may enter text to that line by including the text in the Keyboard Macro. A $ must follow text that is being entered onto the User Input Line. DataCAD reads the $ as the ENTER key or as a left button click.

In Figure 3, my ALT+H saves the current view as 2D GoToView 10 and names it HereIwas. Note the text entry followed by the $. I use this Keyboard Macro frequently. Since I always have LayrSet in GoToView turned on, ALT+H lets me save a view position/layer combination, switch away from it to perform some operation, and return quickly to that view/layer combination by pressing Shift+0.

Since the $ character can serve as a left mouse button click, a Keyboard Macro such as ALT+I in Figure 3 is possible. In operation, I place the cursor close to an entity in the drawing area of the screen and then press ALT+I. The Keyboard Macro performs an Identify, Set All on the entity closest to the cursor.

Similarly, the N and n Keyboard Interrupts may be useful in a Keyboard Macro file. Since they correspond to the middle mouse button, n or N may be used to snap to a position associated with the location of the cursor at the time the Keyboard Macro is invoked.

I have included the content of my Keyboard Macro file in Figure 3, not because it contains commands that I think other people should use, but because it illustrates many methods for constructing command sequences. I encourage you to explore what they do and, more importantly, how they do it. May it give you ideas on how to modify your own Keyboard Macro file.

Philip Hart works in the offices of Stephen Blatt, Architects in Portland, Maine. He has been a DataCAD user since 1986 and a member of the DataCAD Boston Users Group since its inception. He has written extensively on the practical applications of DataCAD in the professional environment.

DataCAD Tips

It's all in the configuration...

by Mark Madura

Optimal DataCAD 5 Configurations

I often find DataCAD performance on what should be a fast 486DX-based system quite disappointing. In fact, I'm often asked why our 386DX-based training systems run faster than "my brand new 486DX2 66MHz Vesa Local Bus computer." It's all in the configuration!

With a few modifications to your system startup files, (config.sys and autoexec.bat) and the DataCAD configuration program, you can realize an increase in performance of 10 times or more! The goal is to customize your system configuration so that it performs well for the way that you work.

Most of you probably have a 486DX based computer running MS-DOS and Windows, with a VGA display and 8MB of RAM. I will use this system as a basis for this article and the concepts covered within. In this article, I present ways to setup a system so it offers the best performance for DataCAD.

CPU, Video and RAM

Primary areas to consider when optimizing the performance of your DataCAD system are CPU, Video, and RAM. In general, a faster CPU will provide the best overall performance. However, the "wrong" video card can turn DataCAD's display performance to molasses. You can also reduce the time required for data intensive operations, such as hidden line removal, by taking advantage of the RAM installed on your computer.

CPU - The Central Processing Unit is the most important component in any computer. If you are buying a new computer to run DataCAD, consider a 486DX2 66MHz Vesa Local Bus based or faster machine.

Video - When manipulating a DataCAD file, most of your time is spent navigating about the drawing. DataCAD has to regenerate the display each time you change the view. This is the most noticeable operation in any CAD program. If your screen refresh is slow, drawing will seem more laborious. That is why the video card you chose is so important. A slow video card installed in a fast machine is still a slow video card. If you are currently using IBM VGA, or VESA, you are probably not getting the best display performance out of DataCAD. If you are running a video card that supports IBM 8514a, S3, or ET4000, you can greatly reduce the refresh time by using the corresponding drivers provided with DataCAD.

An investment of about $160 in the "right" video card will provide excellent performance. Do not make your choice based strictly on price. More expensive does not always mean faster when it comes to DataCAD. The most common trap I see people fall into is investing over $400 in a Weitek P9000 based video card because it was rated #1 for Windows. The problem is that Cadkey has not developed drivers for DataCAD to take advantage of this chipset. The same holds true for some of the newer chipsets that have recently appeared on the market like the Matrox MGA.

Unfortunately, you'll have to use IBM VGA or VESA, which provides "o.k." performance. Until drivers are available, or until DataCAD is running under Windows, your video investment in one of these cards will remain underutilized while running DataCAD. My recommendation, if you run DataCAD most of the time, is to invest less than $250 dollars in a video card that takes advantage of specific drivers written for DataCAD. At the rate video technology is changing, you will invest the same or lesser amount in a faster, replacement card within two years.

RAM - Random Access Memory should not be confused with Hard Disk Space. RAM is volatile memory that is reset each time you start your computer. You can greatly increase the overall performance of DataCAD by utilizing this type of memory. When you open a DataCAD drawing file named plan.dc5, its contents are copied to a "virtual" file named plan.swp. This is the file that you are actually working on while editing in DataCAD. By default this file is located on the hard disk in the \DCAD5 subdirectory. You can use a RAMdisk for the location of this file instead. DataCAD will run faster because RAM access time is 100's of times faster than hard disk access time.

DisplayList

DataCAD's DisplayList processing feature reduces refresh time by storing the display information in RAM instead of the hard disk. It requires that you have at least 1MB of available expanded memory (EMS).

Disk Cache

Even with a RAMdrive, DataCAD will have to access the hard disk at some point to execute a command or to write files to the hard disk. Information that is frequently accessed by DataCAD can be stored in RAM by using a Disk Cache like Smartdrive. On an 8MB system you'll want to dedicate about 1MB of RAM to this task.

Page Frames

DataCAD is a DOS application. As such, it is limited to working within 640K of conventional memory. For DataCAD to run at all, you need at least 512K free out of 640K. That leaves about 120K for additional drivers. This may seem adequate. However, DOS alone needs about 60K. Your mouse needs about 27K, 13K for video, 14K for display list, 27K for the quick shader, 28K for a disk cache, etc.

DataCAD accesses available base memory through 4K Page Frames. The greater the number of page frames available, the more efficiently DataCAD operates. You can check the number of available page frames by going to the Directory menu and selecting MemCheck. You would like to see 30 or more for optimal performance.

To maximize the number of page frames while running DataCAD you will need to use an expanded memory manager like QEMM by Quarterdeck, or EMM386 that ships with MS-DOS 5. These programs allow you to relocate memory resident programs into high memory thus freeing conventional memory.

A typical rundcad.bat file looks like this:

```
DRV\CK_911
DRV\DISPLIST
DRV\LEV3FILL
DCAD %1
DRV\LEV3FILL -r
DRV\DISPLIST -r
DRV\CK_911 -r
```

This file contains the necessary files to enable video, display list and quick shade processing. These drivers can require an additional 50K of available base memory. Placing these drivers into your autoexec.bat file allows an expanded memory manager to load them into high memory. Then, because they are loaded into memory each time you start your computer, your rundcad.bat file should look like this instead:

```
DCAD %1
```

Since this file is written automatically each time you re-configure DataCAD, you might want to create a new batch file with a different name like dc5.bat for this purpose.

Configurations Compared

To provide some insight into how much difference a properly configured system can make, here are performance results from different test configurations applied to the same machine. The test system was a 486DX 50MHz ISA with a Matrox Impression 1024, S3 video card, and 8MB of RAM. The test drawing file size is approximately 400K. Please note that a much larger file, i.e., 3072K would not benefit as greatly from system #2 due to the size of the disk cache. The config.sys and autoexec.bat files for each are below.

Configuration #1

Config.sys:

```
files=30
buffers=20
```

Autoexec.bat:

```
path c:\dos;c:\windows;
set prompt=$P$G
c:\mouse\mouse.exe
set temp=c:\temp
```

This is a minimal system configuration to run DataCAD. It does not take advantage of DOS 5's ability to load DOS high and free an additional 60K of conventional memory. There are only 14 page frames available to DataCAD in this configuration. The display device option in this case is set to IBM Personal Systems/2 VGA, Screen Resolution is set to 640x480 16 colors. Note the test results of this system are at least ten times slower than any of the other configurations.

Configuration #2

Config.sys:

```
device=c:\qemm\qemm386.sys x=c000-c7ff ram
    st:m
```

CHEAP TRICKS

Invaluable Monthly Resource for DataCAD

Cheap Tricks is a monthly newsletter that has served the DataCAD community since 1990. As the name suggests, it provides a "no frills" approach — giving readers straight tips, techniques, and yes, even cheap tricks on how to use both DataCAD and computers for peak efficiency.

It is organized around short column-type articles. They include the "Cheap Trick of the Month" (a major time-saving technique), "Computerese" (definition and discussion of an important computer term), "DataCAD Tutor" (an exploration of the DataCAD program menus), "Quick Tips" (five or six immediate shortcuts), "Dr. DOS" (sheds light on the often frustrating world of MS DOS commands), "Q & A" (answers to readers' questions), "Architips" (a discussion of CAD technology applicable to the construction industry) and "From the Editor" (news and views on DataCAD).

Cheap Tricks' content and approach reflects the attitudes of editor, Evan H. Shu, AIA, a practicing architect in Boston, MA for 16 years. His articles are often laced with his no-nonsense approach and his off-beat humor.

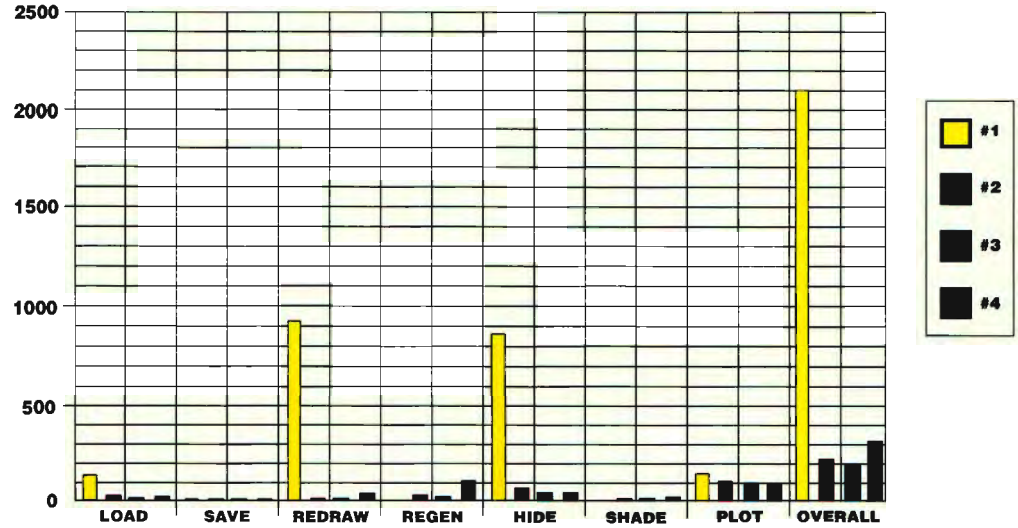
"Cheapware", an amazing shareware listing of over 330 disks of details, macros and utilities contributed by DataCAD users, is also part of the newsletter. Initiated at the suggestion of Rick Ferrara of the Dallas Area DataCAD Users Group, "Cheapware" has blossomed into an incredible resource for DataCAD users.

Yearly subscriptions to Cheap Tricks are $30 for U.S. subscribers. For more information or a free sample copy, contact Shu Associates, 10 Thacher Street, Ste. 114, Boston, MA 02113. Phone / Fax: 617/367-9622.

```
dos=high
files=30
buffers=20
stacks=9,256
Autoexec.bat:
c:\dos\smartdrv.exe 512 512
path c:\dos;c:\windows;c:\qemm;
set prompt=$P$G
c:\mouse\mouse.exe
set temp=c:\temp
```

This configuration begins to take advantage of the resources available on an 8MB system, and offers the greatest performance gain. Note the use of an expanded memory manager, loading dos high, and the creation of a 512K disk cache. The only change made to the DataCAD configuration file was to turn display list processing on. There are 27 page frames available to DataCAD in this configuration.

	Load	Save	Redraw	Regen	Hide	Shade	Plot	Overall
#1	141	5	940	-	858	-	162	2106
#2	12	3	4	38	55	10	107	229
#3	8	2	3	35	40	9	103	200
#4	19	2	32	109	40	17	104	323



Time in seconds to perform specific operations within a DataCAD test file.

Configuration #3 and #4

```
Config.sys
device=c:\qemm\dosdata.sys
device=c:\qemm\qemm386.sys x=c000-c7ff ram
      st:m r:3
device=c:\qemm\dos-up.sys@c:\qemm\dos
      up.dat
device=c:\qemm\loadhi.sys /r:2 /size=8592
      c:\qemm\qdpmi.sys swapfile=dpmi.swp
      swapsize=1024
dos=high
device=c:\qemm\loadhi.sys /r:2 /size=6176
      c:\dos\ramdrive.sys 3584 /e
files=30
buffers=20
stacks=9,256
shell=c:\qemm\loadhi.com /r:2 c:\command.com
      c:\ /p
Autoexec.bat
c:\qemm\loadhi /r:2 c:\windows\smartdrv.exe
      512 512
path c:\;c:\dos;c:\windows;c:\qemm;c:\ndw;
      c:\bat;
set prompt=$P$G
c:\qemm\loadhi /r:1 c:\dcad5\drv\ck_911.exe
c:\qemm\loadhi /r:2 c:\dcad5\drv\displist.exe
c:\qemm\loadhi /r:2 c:\dcad5\drv\lev3fill.exe
c:\qemm\loadhi /r:1 /lo c:\mouse\mouse.exe
set temp=c:\temp
```

The same configuration files are used for system 3 and 4. The big difference is the inclusion of the video, display list and quick shader drivers in the autoexec.bat file, and the use of the S3 driver, ck_911.exe, which is specific to the Matrox Impression 1024 video card used for testing. These batch files have also been "optimized" by QEMM to load all of the drivers into upper memory. There are 50 page frames available as a result! In both cases the path for temporary and virtual files in DataCAD's configuration program is set to the RAMdrive path, in this case d:\. System #4's display is set to 1024x768 256 colors. Both systems' overall performance is about the same. However, display operations on system 4 are actually slower due to the increase in resolution.

Summary

General rules for better DataCAD performance:

- Use a fast CPU, i.e., 486DX4 100MHz.
- Use a faster BUS, i.e., VESA Local Bus or PCI instead of ISA.
- Use DOS v.5.0 or later and load DOS=HIGH
- Use an expanded memory manager to load drivers into high memory, i.e., QEMM386.
- Use a disk cache whenever possible.
- Use RAMdrive whenever possible for virtual files.
- Use the display drivers written specifically for your video card, i.e., S3 for Diamond Stealth 24, etc.
- Use the lowest "comfortable" display resolution for fastest redraw times, i.e., 800x600 on a 15" screen.
- Use 16 colors instead of 256 if you don't plan on using the quickshader.

This article covers major issues for "optimizing" your system performance. Keep in mind that the many nuances with every computer cannot be covered here. For the ever power-hungry, there are other issues that can tweak your system further. However, they are very specific, and offer little improvement over the techniques discussed here; but here's to pushing the envelope. In future articles I will discuss the human performance factor and how you can increase your productivity simply by using techniques you will not find in the documentation.

Please see the Advanced Configuration section of the *DataCAD 5 Getting Started Manual*, pg. 3-23 through 3-29, for further reference.

TECH SUPPORT DIRECT

The AutoHide Function in DataCAD's ViewMast Macro

by Mark Hyjek

The **ViewMast** macro includes a very powerful function called **AutoHide. AutoHide** lets you automatically do a hidden line removal on several views in a drawing, all at once. The hidden line removal process (HLR) usually requires that you be in the view that you need or want to hide. Then you go to the DataCAD 3D Edit menu and select **Hide**. This process can take considerable time if your drawing contains a lot of views that you want to hide. It could take you several hours, and it would probably be to your advantage to do it at night, in a batch mode, so that when you return, the process will have been completed.

Before you begin to use **AutoHide**, you must save the views that you are going to hide by using the **3DView-GotoView** function. Use the **AddView** option in **3DView-GotoView** to save all the views that need to be hidden. Select **AddView** and name the view. You need to do this for every view that you want to hide. Here is a helpful hint. When saving views to be hidden, make sure that only those layers that you need for the specific view are active ("on"), and make sure that you have toggled **LyrSet** "on." This will save HLR processing time.

After you have used the **3DView-GotoView** function to save all the views that you want to hide, go to the macros area of the DataCAD menu. Select the **ViewMast** macro. After you enter the macro, pick **AutoHide** (Shift-F2). You will then see these menu options displayed:

AutoHide Options

F1 **Begin**

F3 **Select** Use this option to select the 3D views that are going to be hidden.

F4 **ClearAll** This option clears or de-selects all the currently selected views.

F5 **SelctAll** This option selects all the 3D views that have been previously defined.

F6 **LayrSet** This option is a toggle *on/off* switch. When **LayrSet** is off, the HLR process will hide only those layers that were "on" when entering the macro. When **LayrSet** is "on," the HLR process will hide only the layers that were "on" when the 3D views were saved.

F7 **DrwHidn** This option will let you control whether or not the hidden lines will be displayed. The settings for color, linetype and line spacing will be taken from the main DataCAD 3D Hide menu settings.

F9 **ToScreen** This option displays the result of the **AutoHide** on the screen only. When you select this option, no file is created or saved that you can manipulate in any way.

F0 **ToLayer** This option saves the result of the AutoHide onto new layers in the drawing file. **Caution**: This increases the file size, and depending on the number of views saved, the file can increase to a size that will be too large for the virtual file path or for DataCAD's 8MB file-size limit.

S1 **ToLyrFil** This option lets you save the result of the **AutoHide** to a layer file outside the actual drawing. This will not increase the drawing file size at all. These files are permanent files.

S2 **LyrPath** This option lets you define the path through which to save the layer files. The path defined here will be used by the **ToLyrFil** option. *Do not* set this option to save the layer files to a floppy disk.

S0 **Exit** This option exits this menu.

Make sure that you set one of these options (F9, F0 or S1) "on."

Now use the **Select** or the **SelectAll** function to select the views which **AutoHide** will process.

You must determine whether or not you need to set **LayrSet** "on" or **DrwHidn** "on."

Finally, you must decide which method of viewing or saving the results of the **AutoHide** you are going to select and if saving to a **LyrFil**, where you are going to save it to. Just as a reminder, the **ToScreen** function is not permanent and will be gone after it's viewed on the screen.

All you need to do now is to wait until the end of the workday and select the begin button to start overnight processing. The number of views that you have selected earlier determines the length of time that the HLR process takes.

Recommendations

There are three things to remember about using the **AutoHide** function of the **ViewMast** macro:

(1) When saving **ToLayer**, it is important to remember that there is an 8MB file-size limit in DataCAD 5.0x, and that you must have proper space in the temporary file path and the virtual file path when saving **ToLayer.**

(2) You can not select the order in which it processes the views.

(3) You can end the HLR process at any time by pressing the END key on the keyboard.

Mark Hyjek is Senior DataCAD Applications Manager at Cadkey, Inc.

DataCAD Training

Here's a list of resources for DataCAD® Training in the U.S. You may contact any of the following people to inquire about DataCAD Training dates, pricing, and available locations. Several of the trainers listed also do on-site training at your facility.

California

CADDAC - San Jose
Carolyn Bell - (408) 997-3230

Cal. State at Los Angeles - Los Angeles
Virgil Seaman - (213) 343-4550

Nikken Designs Systems - Hacienda Heights
Roy Yoshino - (818) 968-2230

SysCon Technology, Inc. - La Mirada
Glenn Osborne - (714) 739-0981

Talbott & Associates - Mill Valley
Richard Talbott - (415) 388-7634

Connecticut

CIMTECH - Branford
Steve Kidd - (203) 488-3032

Florida

Autumn Technologies - Largo
Peter Augustyniak - (813) 530-0626

David Porter Assoc. Architects - Palm Beach Gardens
David Porter - (407) 694-0100

Illinois

Hagerman & Company, Inc. - Mt. Zion
Dennis Hagerman - (217) 864-2326

Indiana

Logic & Proportion, Inc. - Indianapolis
John Mahaffey - (317) 251-0533

Tekni - Fort Wayne
Dennis Jeffrey - (219) 478-4014

Massachusetts

Madura Studios - Boston
Mark Madura - (617) 536-5326

Michigan

Architectural CADD Concepts - Berkley
Tim Murad - (810) 543-1149

Architectural CAD Services - Ann Arbor
R. J. Reinholt - (313) 668-6700

Minnesota

Graphic Ideas - Anoka
Steve Rick - (612) 422-0141

New Jersey

BAM Compugraphyx, Inc. - Mt. Laurel
Michael Meighan - (609) 235-1644

Gloucester County College - Sewell
Steve Rosbert - (609) 468-5000 X308

New York

999 Design Group - Valatie
Vito Mazzariello - (518) 758-9046

CADIMENSIONS - East Syracuse
Pete DiLaura - (315) 434-9787

SAGG Computers - Plainview
Arkady Kleyner - (516) 938-6422

Oklahoma

Oklahoma State University - Stillwater
Gerald McClain - (405) 744-5714

Oregon

Rogue Community College - Grants Pass
Del Harris - (503) 479-5541

Pennsylvania

Butler County Comm. College - Butler
Mike Aikens - (412) 287-8711

Tennessee

Architectural Intelligence - Memphis
Stewart Brown - (901) 529-8889

Southern College - Collegedale
John Durichek - (615) 288-9126

Texas

CADDLINC - Dallas
Liana Handley - (214) 891-3812

Virginia

ARCHSOFT - Burke
Bruce Kaplan - (703) 644-2816

Washington

TECH-NET, Inc. - Seattle
Joe Brouwer - (206) 623-1403

DataCAD Productivity Tools

Customizable Fonts

Precision Fonts, a new program for DataCAD users, includes 270 font files, matching POF view files, and utility programs that allow end-user font customization.

The font library consists of 87 typeset quality fonts, each in 3 variations—standard filled, full outline and "QUICK" sketch. The standard filled and full outline are constructed entirely of true curves and lines. The specially developed "Q" (QUICK) fonts consist of straight lines and are not filled. The "Q" fonts provide maximum productivity during drawing creation while retaining the "look and feel" of typesetting. Before the final drawing, the "Q" fonts are simply replaced with the corresponding standard fill font.

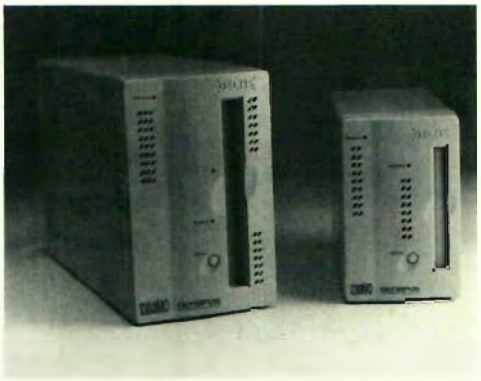
Special emulations of nine "stick" fonts extremely popular with architects using AutoCAD are included. These come in very handy when exchanging drawings with AutoCAD shops that use these font sets. The font customization programs are FSPACER (allows microadjustments of inter-character spacing), FLINER (allows adjustment of line feed distance), and FSIZER (allows adjustment of the interpreted text size versus the text cursor display in DataCAD.

The following special characters are included in ARCHFAST, ARCHQUIK, ARCHITXT, ARCHTITL, ARSTENCL, MONOFAST, MONOQUIK, MONOARCH AND MONTITL.

Precision Fonts for DataCAD comes on four 3.5" diskettes and retails for $49. For more information Contact ArcDraft America, 904/389-4899

Olympus - Desktop Mass Storage Solutions for CAD/CAM

by Bob Martin



As an active CAD user, I struggle constantly with a shortcoming of my PC system that defies an easy solution: CAD/CAM files, to be truly functional, tend to be large (2 megabytes and larger). An average scenario for an average user faced with a hard disk overload might go something like this: "Since no one in their right mind wants or needs these kinds of elephantine-sized files clogging up their hard disk drive, I'll send it to the network file server. Right! I'll give the problem to the systems manager. Why not? Better him than me. Besides my boss doesn't have any more budget for disk expansions in our individual PC's." Of course, if your systems manager is under the same budget constraints as your department manager and has a physique like a Dallas Cowboy fullback, it wouldn't pay to disregard his need not to supply "unlimited storage space" to everyone in the company.

Recently, Olympus Image Systems, a division of the camera company, sent me their latest development in magneto-optical storage devices called the 128MO. This device allows you to write to replaceable 3 1/2" disks that can hold up to 128 megabytes of data and up to 256 megabytes if you use automatic archive compression. That stores a lot of drawing files.

The data capacity of the disk made light bulbs pop up over my head. Why not put the CAD program files on the optical disk and treat it like the main drive? True, the optical drive is slower than the system hard drive, but if my CAD program resides in RAM, what do I care once I'm up and running? Besides, some of the temporary swap files for CAD/CAM programs become huge during operation.

I couldn't wait to get this sucker hooked up to my system and make it spin. I'm getting down to my last 5 megs on my hard drive and can't afford to take anymore programs off and the CAD data files left on my hard drive are all active projects. (I'll bet you've never heard that one before.) Hooking up the drive was dirt simple. I just plugged it into the SCSI port on the back of my PC, did the automatic software install and Bang, I was in business. After reading the documentation (which I did after I installed the equipment, as usual, proving that the install was fool proof) I learned that this system works with Mac's as well as PC's. These masked men have their stuff together.

Both versions come plug in ready. The PC version comes with everything you need even if you don't have a SCSI port on your PC drive: 16-bit SCSI adapter cord, SCSI cable, driver/formatter software, and a cartridge. The same is true of the Mac version except that a SCSI adapter is not required.

Now for the big question, "How do I organize my data?" The best way for me is to put my projects in separate directories on the optical disk and label the disk accordingly. When I did this I immediately removed 35 megs of compressed files from my hard drive, opening up 75 megs of disk space on my system drive.

Another consideration is the sneaker-net (passing files on floppies) versus the network. A lot of us "development-types" don't like passing files on new products around on the network. We give files on floppies to our support technicians. But size raises its ugly head again. With the latest CAD/CAM systems, all the detail drawings for a given assembly are in one file (the CAD file that ate New York City). Even "zipped" or compressed, one file can take up so many disks the technician might get a hernia just transporting the disks. With the MOS300S you can get your whole project on one optical disk and be up and running without the loading and restoring of archive files from multiple disks.

Now for the real cruncher, "What does it cost?" The stand-alone unit is $950. Each replaceable disk has a street price of $35. More interestingly, you can find the drive on special promotions with up to five additional cartridges (600MB) for the same price. This makes the cost a function of how many disks you use in this unit but, from a comparative view its a heck of a lot cheaper than additional system disk drives.

For more information contact Olympus Image Systems 714/453-4400 or FAX 714/453-4468.

THE FALL/WINTER 1994

CADKEY RESOURCE GUIDE

IS COMING!!

Call Jo Schmidt at 508/922-5168 for more information on placing your advertisement.

Hercules Graphite - One Fast Puppy!

by Robert Martin

I just installed the Hercules Graphite Power VL graphic accelerator in my 486. Frankly, I didn't expect the difference from my old video card to be so dramatic, but this one's hot. CADKEY redraws are much faster and the 1280 x 1024 resolution is great for the complex drawings I've been working on for the airplane article.

The installation was very simple and I was up and running immediately. For one thing, CADKEY has a direct driver. For another, I've never had compatibility problems with any Hercules graphic accelerator.

There have been others in my past which required long tech support calls and futzing around with autoexec, setup, win.ini, etc.

I firmly believe you shouldn't cut corners on your monitor and graphic card. If they are not high performance (i.e., sustaining high refresh rates), you will pay the price in eye strain, fatigue and slower productivity. But, high performance doesn't necessarily mean high price. The Graphite Power 1MB model is only $379; the 2MB model, $499.

The Graphite is a VRAM design (see technical details below). It incorporates a 32-bit AGX accelerator chip from Xtec. It supports high refresh rates from the VESA standard 72Hz to 120Hz enhanced by a Hercules technology called SuperStable™.

If you use Windows, Graphite Power also has powerful features for Windows graphics, including virtual desktop and software control of image and settings.

For more information contact Hercules Computer Technology, 800-532-0600.

Graphics Board Memory Explained

DRAM or VRAM?

The data stored in the memory of a graphics board (display memory) is constantly being read out by a special circuit called a CRT controller at a very high speed. A typical monitor is updated at least 60 times a second so that at 1024 x 768 resolution with an 8-bit pixel (256 colors), roughly 50 megabytes per second are being transferred out of the display memory. An ability to read data out of display memory at a faster rate allows the system to provide a better quality image (higher refresh rate), but requires that even more data is read out each second.

As the memory is being read, display memory is continually being written to by the CPU or coprocessor to change the display; for instance, if you scroll a word processor, zoom your CAD drawing or preview a graphic design. This part of the process is what you see and most users perceive this screen update as the speed of a graphics board.

Behind the scenes, however, a great deal more is going on. A high performance graphics board has the complex task of coordinating access to memory to update the contents of the display memory, with the need to continually read out memory and maintain a stable image on the monitor.

There are two types of memory used in graphics boards, DRAM (Dynamic RAM) and VRAM (Video RAM). DRAM is more general-purpose and manufactured in greater quantity, so is less expensive than VRAM.

DRAM's limitation is that it must be accessed by both the processor and by the CRT controller via a single port. For the read and write accesses through this single port not to conflict, the processor and the CRT controller must "take turns" accessing memory. With DRAM if you want to read out memory faster to increase the screen refresh rate, the processor has to wait for its access to the memory and this causes performance to degrade.

VRAM overcomes this limitation by providing two ports to access memory - one for the processor and one for the CRT controller. De-coupling this access allows the CRT controller to read the memory without inhibiting the processor's ability to write to the memory.

The differences between DRAM and VRAM boards are most apparent at high refresh rates. The ergonomic benefit of high refresh is a major reason that users purchase a VRAM accelerator and a fast (64kHz or above) monitor. On a typical DRAM board the maximum refresh rate for 1024 x 768 is 70-72Hz. Beyond this refresh rate the performance is seriously degraded by the wait state imposed on the processor.

When A Picture's Worth a Thousand Words

If it's easy for a mechanical design department or an architect to communicate designs to colleagues and clients, they will do so more often and the cost of errors will fall. If they have tools that let people understand designs of any kind quickly and intuitively, communications will be enhanced. That's what rendering, animation and virtual reality are all about.

The problem until recently has been that photo-realistic high performance virtual reality systems for the PC were expensive and hard to use. Now StereoCAD, Inc. are the virtual reality gurus for the PC. They have an affordable suite of VR products that work with DXF files. The programs are designed to fill rendering, animation and presentation needs in a wide variety of applications from architecture and plant design to education and CAD training, product design, marketing, mechanical engineering and electromechanical design. Advanced features allow simulation of machines at work or creation of videos for clients.

The basic REALTIME program offers 3D, 256 color interactive walk-throughs or 3D wire-frame models. REALTIME runs on PCs (386 and better), supports resolutions up to 1280 x 1024, 256 colors and runs on a variety of graphics cards.

RT Texture uses Targa files to add true-color realism to CAD models. Its viewing capabilities include textures, transparency and model linking. You can walk through models interactively in any of the three viewing modes, replay animations, capture walk-throughs to video tape or capture still images for printing in minutes. RT Texture runs on any 386/387, 486 or Pentium PC and requires a SPEA Fire Graphics card (available through StereoCAD at a special discount) and a dual monitor configuration. RT Texture has been favorably compared to SGI Indigo workstations.

RT View is a low cost texture viewing utility that is an ideal add-on for RT Texture. You can translate between Targa and other popular image formats including TIF, GIF and BMP. You can print, resize or compress images by a factor of 50x.

Unlike some virtual reality rendering/animation software REALTIME is easy to use. Most users are walking through their CAD models within one hour — that includes opening the box, installing the software and completing the tutorials. Another refreshing feature is file size. StereoCAD files won't eat your lunch, time or your precious disk space. StereoCAD lets you create a two minute, 10 frame per second animation in exactly two minutes and store it on just 30K of hard disk space (instead of hours and hundreds of megabytes).

StereoCAD will also build custom versions of its product to any user specification. Examples include UNIX workstation versions, immersive head-mount display systems, kinetic animations, alternative input file formats, links to external databases for update and display, exotic input device support, custom language interfaces and 3D sound support, and more.

StereoCAD offers excellent educator discounts. Low cost demo disk and demonstration videos are available.

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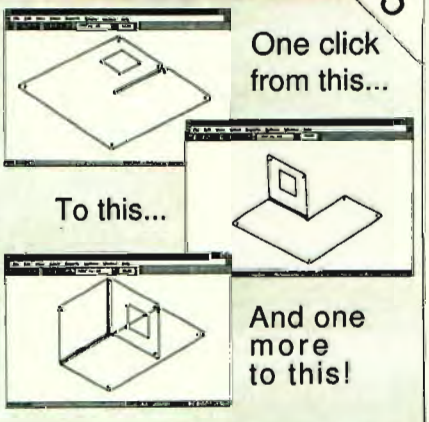

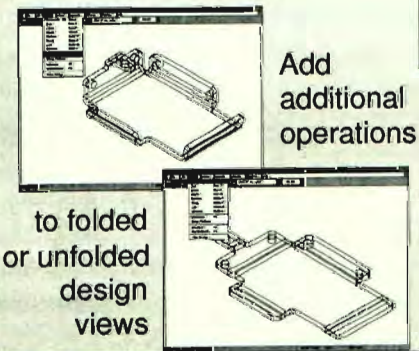

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CADKEY CORNER

by Dana Seero

One of the features that makes CADKEY so productive for 3D modeling is the PROJECT command, found under the X-FORM menu (not available in LIGHT or DRAFTER).

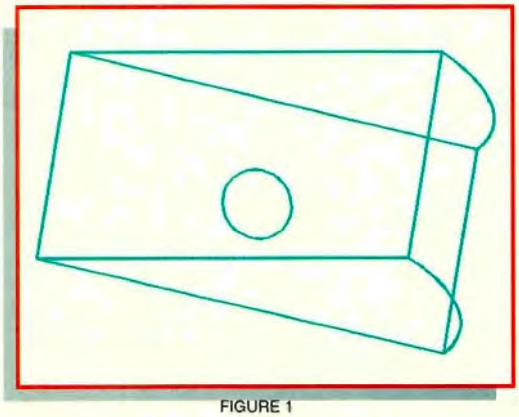

FIGURE 1

In our first example, we need to "drill" a hole from the front face to the back face of the "pie slice," as shown in Figure 1. The hole is normal to the front face, and will create an ellipse of major axis sqrt (2) times the diameter on the back face.

You will find two choices under the PROJECT menu: NORMAL and SKEWED. The selection for NORMAL is not normal to the front face, but to the projected face, as shown in Figure 2.

To drill the hole, we want to select SKEWED. If you are not sure of your choice, always pick SKEWED, as that will allow you to choose the projection direction you wish. Note that in our example, we want to project normal to the original circle, which is a 2D entity: we can select "2D ENT" for any arc, circle, ellipse, or 2D splines. The standard choices for MOVE, COPY, or JOIN are available. T he result is shown in Figure 3.

In our example, the hole conveniently pierces a single plane, but what if that isn't the case? For an intersection with two or more planes, perform the PROJECT more than once, specifying each intersection plane. Then trim the geometry, as shown in Figure 4.

PROJECT is also useful for "flattening" a 3D model, or insuring that all geometry is at a single depth if you are exporting data to a 2D system (some competing systems cannot dimension 2D entities with different depths).

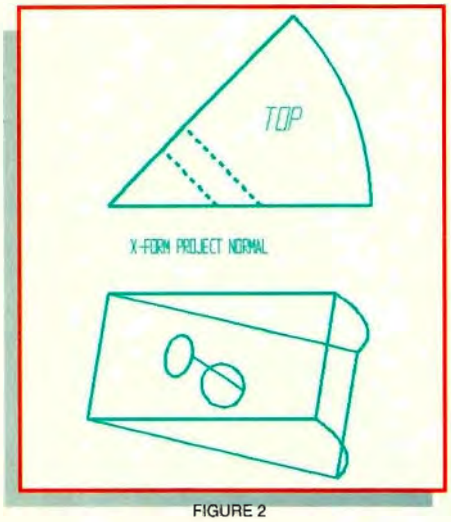

FIGURE 2

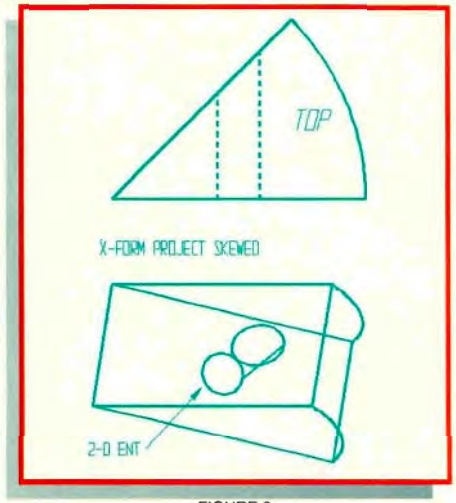

FIGURE 3

What about projections to non-planar faces? This capability is not standard in CADKEY 6 or earlier versions. It is available using tools in the FastSURF subset of CADKEY 7, FastSURF, or ADVANCED MODELER.

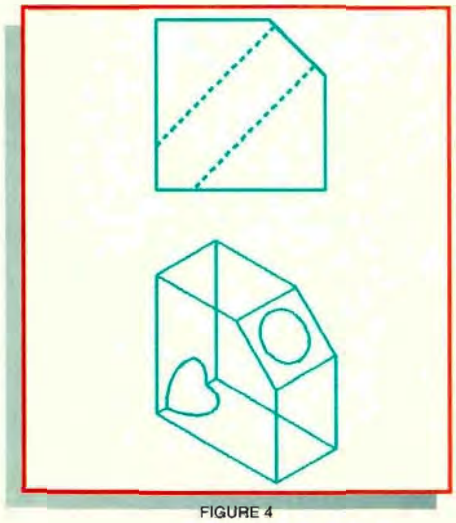

FIGURE 4

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Customizing CADKEY

by Debbie Rossing and Craig Storms

The Floating Toolbar in CADKEY 7

CADKEY 7 offers new ways to customize your system. The new graphical user interface (GUI) lets you easily create a custom toolbar environment. Toolbars are built of *icons* which you either design yourself or copy from the samples provided. Each icon can be assigned to any existing CADKEY menu option. You can mix and match any number of icons into a custom *panel* to create toolbars which "float" to any location you choose. They can even be placed outside the viewport area, maximizing your drawing area.

Using toolbars, one click of the mouse brings you three or four steps down the menu tree. Even faster than macros, icon buttons can allow you to create a more heads-up environment. You won't have to remember dozens of key-bindings and macro names to do your common tasks. You can even assign your favorite macros, CADL, or CDE utilities to a toolbar icon. Once created, these files can be saved as external files and shared with other users.

The following steps explain the procedure for creating icon buttons and panels, exporting and importing your custom icon buttons. There are also hints to make the procedure quick and easy.

To create an Icon and assign it to a CADKEY menu option:

1. Here are some helpful hints:
   - Simple graphics are the easiest to create and to understand.
   - Filled arrows (style 2) are more clearly visible than other styles.
   - Create filled polylines for thicker arrows.
   - When using CADKEY notes and labels, use the bold, filled font for best results.
   - To get a colored background use filled rectangular polygons.
   - Against the gray background, red and black provide the most contrast. When using other backgrounds, white and yellow are good choices.
2. Write down the keystroke sequence, including keyed-in values, for the function you want to use. The icon recorder does not follow the keystrokes through the menu tree the way the macro recorder does.
   If you are going to use a macro, rather than a keyed-in sequence, make sure that you load the correct library and create the macro **before** creating the icon.
3. Click on the *Icon Grabbag* button (an **I** in what looks like a grocery bag, top right).
4. Click on *New Icon*. At this point, you can select *Text* or *Graphic* by clicking on the appropriate button.
5. If you select *Text*, you are prompted for the icon text. Fill in the button text.
   If you select *Graphic*, a selection window appears. Position the window around geometry. The exact scale is not critical, as you can move and stretch the box as needed to accommodate any size. When you have properly positioned the window, click on *Select* (S).
6. The system brings up a dialog box panel with all 6 possible button shapes. Select the button shape that you prefer. If you notice that some geometry is missing or the graphic is not centered correctly, select *Abort* (A).
7. Choose whether you want this button to replay *Keystrokes* or a *Macro*. The macro library must be loaded and the macro must already exist before binding it to a button.
8. If you choose *Macro*, fill in the name of the macro and the name for the button — it doesn't need to be the same.
   If you choose *Keyboard*, fill in the name for the button and click on *Record*. As with macros, it is good practice to start with four **ESC** to make sure the function begins at the main CADKEY menu. Then continue by pressing the appropriate keys from the list you made in Step 3. You will see a string representing the keystrokes. Click your mouse button once to end recording.
   If you make a mistake, click the mouse once to stop recording and then click Record to start the recording over at the beginning.
9. Click on *OK* to save. The icon will be added to the *Icon Grabbag*. This placement is not permanent. You can move the new icon to a new panel (toolbar) later.

To create a new panel:

The next step to organizing your icon buttons is to create *panels*. Panels are logical groupings of buttons to perform functions or open other panels. A panel is

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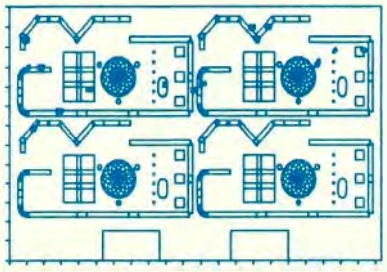
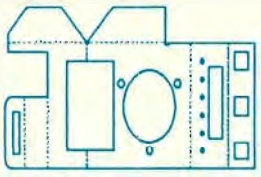


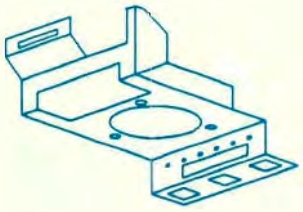
GeoPOINT

GeoFOLD

The "all new" Version 4.0 GeoFOLD automatically creates a fully-dimensional flat of parts assemblies from a 3D design. From a single-sided wire frame model, GeoFOLD produces a full double-sided or solid part, fully prepared for CADKEY's Automatic Shading. GeoFOLD also provides full bend reliefs and automatic notching. GeoFOLD even unfolds conical surfaces and allows for parametric modifications. It does all this from simple CAD wire frame drawings of 2D and 3D designs. The new GeoFOLD has the ability to fold up using tooling for press brake operations. Modifications can be made in either folded or unfolded views. GeoFOLD also interfaces with GeoPOINT. Demo available. Platforms: Unix, SunSPARC, and DOS. Links via CADL, DXF, MDL, IGES.



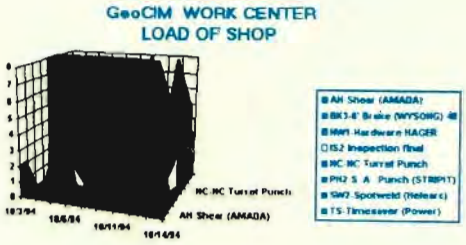
GeoFOLD



GeoFOLD

GeoCIM

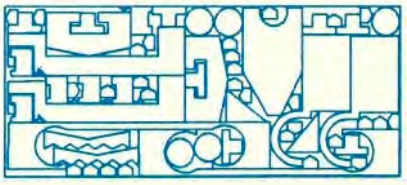
GeoCIM is a complete shop floor manufacturing management and control system. GeoCIM consists of Job Estimating, Order Entry, Inventory Control, Capacity Planning (Scheduling), Job Tracking, Purchasing and Sales Analysis. This user-friendly system can include options such as an accounting package that automatically updates Accounts Receivable and General Ledger. Other options include Nesting and GeoPOINT, which customizes GeoCIM sheet metal and plate fabrication for parts that use punch presses, lasers, and plasma machine tools. Platforms: DOS. Links via CADL, DXF.



GeoCIM

GeoNEST

GeoNEST provides efficient automatic nesting for an unlimited number of parts and jobs to an unlimited number of sheet or plate sizes and thicknesses. GeoNEST also has options that provide material management, order scheduling, part assembly and customer analysis. GeoNEST is designed for punch presses, lasers, plasma cutters, etc. and directly interfaces to CADKEY. Demo available. Platforms: SunSPARC, DOS. Links via CADL, DXF.



GeoNEST

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Fax: (612) 829-9328

another name for floating toolbar. In the sample that came with your CADKEY 7, there is a button named ***LINE***. Clicking on this button opens a new panel (toolbar) with a set of icon buttons assigned to different **CREATE, LINE** menu options.

Creating a panel is very similar to creating an icon button. You'll need to decide whether you want to use text or graphics. However, panel buttons are a fixed 1x1 size. You won't have a choice as you do with icon buttons.

1. Click on the *Panel Grabbag* button (a **P** in what looks like a grocery bag, top right).
2. Click on *New Panel*.
3. Choose *Text* or *Graphic*. (See the previous Step 6 for details on this step.)
4. Enter the name for the panel and click on *OK*.
5. Click on *OK* again (unless you want to modify or delete the panel). A very small panel appears with the panel name located in the top border.
6. Copy the icon buttons for this panel from the *Icon Grabbag* by selecting them, then dragging and dropping them into the panel. (If you aren't sure which mouse button to use to copy icon buttons, see the *SoftEngine / CK* manual under Mouse Actions.)

You can share toolbar panels with friends and co-workers. To do this, you export the desired icons and panels to a **.res** file which others can import. It's also a good idea to export and save the **.res** files as backups in case something happens to your copy of CADKEY. Whenever CADKEY is installed, the **vibseck.cfg** file is overwritten. The **vibseck.cfg** file is the configuration file for a complete definition of icons and panels, including their open/closed states and locations. If this file is overwritten or corrupted, you will lose panels and icons that you have created. However, with **.res** files saved as backups, you can import custom icons and restore your system quickly. Use care not to make the **.res** files too big because each time you import a particular icon, you'll end up with another copy of it. It is more efficient and safer to save small groups of icons in .res files.

To export icons:

1. Open the *Icon Grabbag* and click on the *Export* (E) button.
2. Fill in the name for the file, for example **custom1.res.** Hint: Develop a consistent naming scheme for your .res files so you'll be able to find what you need easily.
3. A temporary panel appears. Copy the panels and/or icon buttons you wish to export to the panel. To export an entire panel of icons, you need only copy the panel icon button to the export panel, not each individual icon button.
4. Click on the *Export* (E) button. The file will be created and the Export panel will disappear.

To import icons, simply open the *Icon Grabbag*, select the Import button, and type in the name for the file, for example **custom1.res.** The icons and panels are added to the *Icon Grabbag* and *Panel Grabbag*.

A Complete Example - Creating two icon buttons in a new custom panel:

To create a panel containing two buttons, one to load a blank file in inches and one to load a blank file in millimeters, complete the following steps. Start with two blank files named **blank.prt** and **blankmm.prt**. The graphic for the blank inch file will be a box with an X through it. The blank millimeter file will be the same with the characters **MM** in the box.

1. Create the appropriate geometry in CADKEY. See Figure 1.

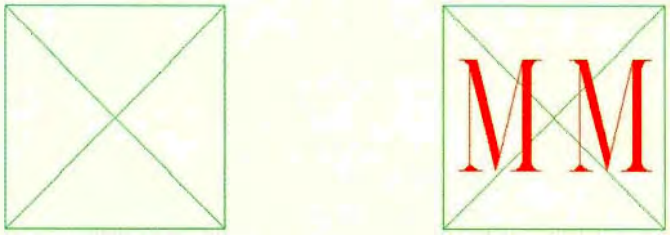


Figure 1

2. Open the *Icon Grabbag* (click on **I** in upper right of screen). If necessary relocate the *Grabbag* to not interfere with the geometry display.
3. Click on the *New Icon* button.
4. Click on *Graphic*.
5. Surround the geometry on the left with grab window and click on *Select*. See Figure 2.

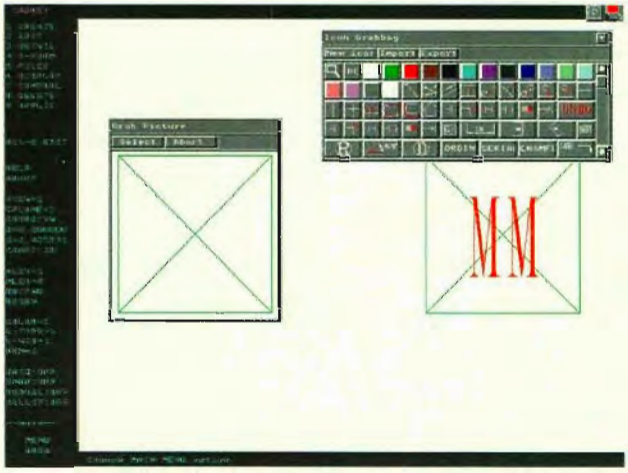


Figure 2

6. Pick button shape (1X1).
7. Name the button **Blank.**
8. Click on *Record* and enter the following keystrokes: ESC/ESC/ESC/ESC/F5/F1/F2/F1/blank/<Enter>/ESC/ESC/ESC

These steps execute the CADKEY menu options **FILES, PART, LOAD, NO,** and enters **Blank** as the file name to load.

9. Click the mouse button to end recording.
10. Repeat Steps 3-9 for the second button, naming it **Blankmm** in place of **Blank.**
11. Scroll to the end of the *Icon Grabbag* to see your two new icons.
12. Open the *Panel Grabbag* (click on **P** in upper right of screen). If necessary relocate the *Grabbag* to be accessible.
13. Click on *New Panel.*
14. Click on *Text* and name it **New File.**

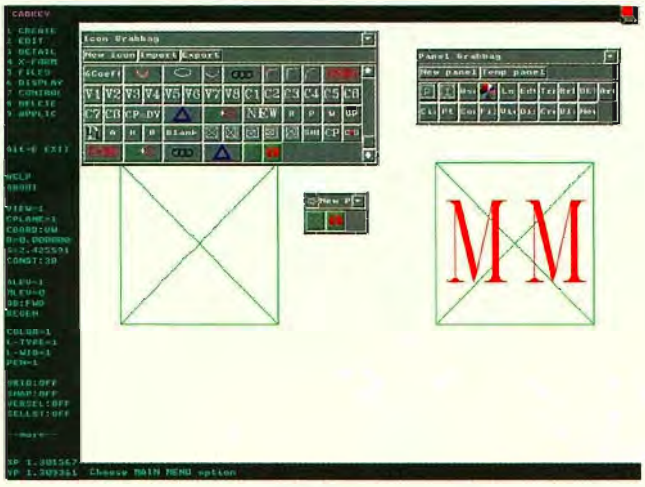


Figure 3

15. Copy the two new icons from the *Icon Grabbag* to the **New File** panel. (If you are unsure about how to copy icons, see the *SoftEngine/CK* manual under Mouse Actions.) See Figure 3.

To export these two icons to a .res file to share and backup your work:

1. In the *Icon Grabbag*, click on Export (E). The temporary *Export panel* appears. See Figure 4.

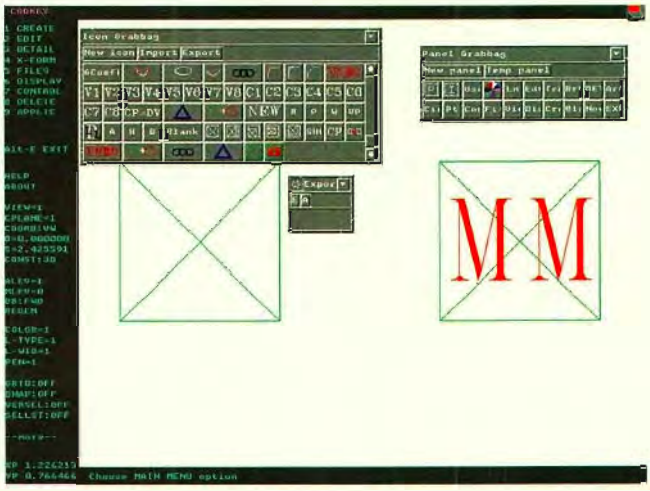
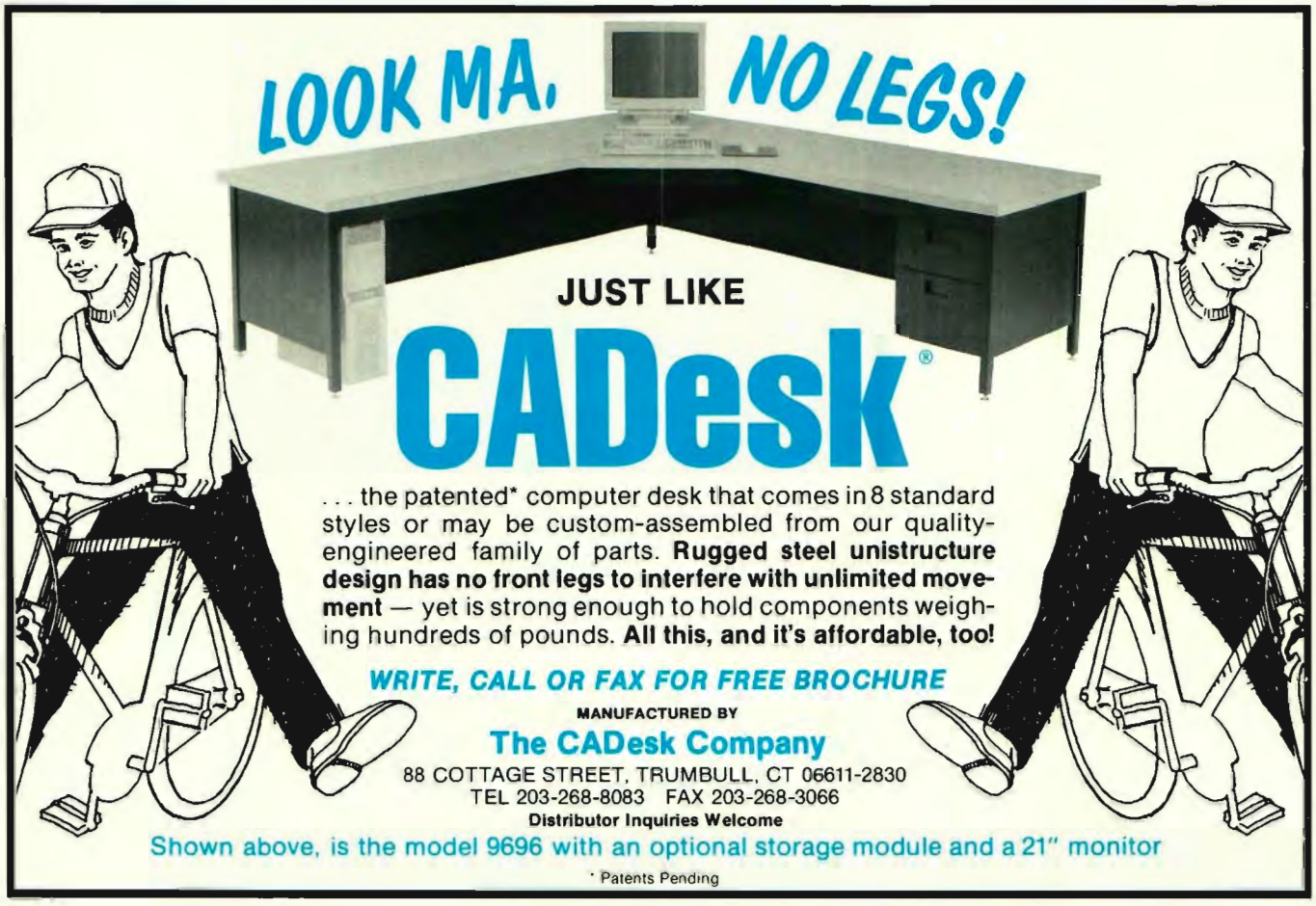


Figure 4

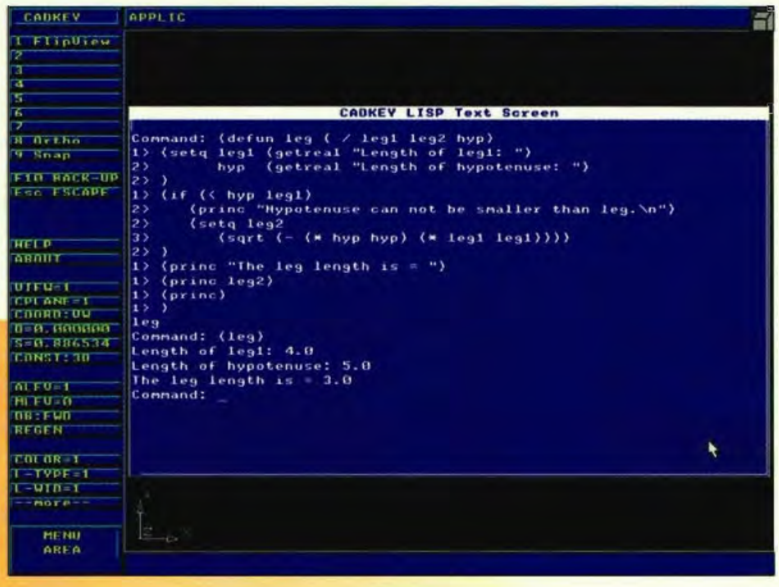
2. Copy the *New File* button from the *Panel Grabbag* to the *Export panel.*
3. Click on *Export* (E) and give it a filename (for example, **newicons.res**). The *Export panel* disappears. This completes the export process.

Congratulations! You've just created your own custom icons, put them in a new panel and exported them for co-workers to use! Follow these steps to create a variety of toolbar panels to best suit your work habits.



CADKEY LISP

Getting Started with CADKEY LISP



by Ron Brumbarger and Scott Workman

In an ongoing series of articles we will be talking about many facets of CADKEY LISP. We start slowly this time with the basics for those who do not already know AutoLISP programming. If you know AutoLISP, bear with us. Through the series, we will work up to more complex problems. If you have a suggestion or idea about areas we should cover in future articles, leave a message via Compuserve - CServe ID: 72730,3154

Why LISP?

All powerful software packages today allow the user to tailor the package to a specific set of needs. Usually, they offer both macro languages and software interfaces built around standard programming languages. Mechanical engineers, architects and others routinely use these functions to create tools that increase productivity and efficiency by alleviating mundane and repetitive tasks.

A big concern, however, is the wide range of customization tools offered from package to package. A typical user may have to learn several different macro languages depending on the number of applications used. To provide a better way, Cadkey, Inc. recently introduced CADKEY LISP in CADKEY v7.0.

CADKEY LISP is a LISP interpreter designed to help users write tools specific to the needs of their industry. It supports around 150 functions and offers a subset of AutoDesk's AutoLISP programming interface. This makes it easier to develop cross platform customization tools. CADKEY LISP programs can work in AutoCAD and LISP programs can work in CADKEY with minor modifications. Those who learned AutoLISP can use CADKEY LISP without learning a new macro language.

Starting CADKEY LISP

CADKEY LISP is a CDE-based program. You can load the program using one of two methods.

The simplest way is to add it to the list of CDEs automatically loaded whenever CADKEY starts. The Install program for CADKEY 7.0 can perform this step for you or you can run the CONFIG program and select option 7, "Set automatic file loading options." If the CKLISP is not in the list of CDEs, retype the list of CDEs displayed separated by commas and place CKLISP at the end of the list.

The second way to load CADKEY LISP is to use the menu selections FILES, CDE, and OPEN and type CKLISP as the CDE name.

Once the program has been loaded, it can be executed by selecting the Main Menu selection APPLIC. Select CADKEY LISP from the displayed dialog box. A Command Area dialog is then displayed at the bottom of the screen.

CADKEY LISP is a command oriented interface, and the LISP programs, as well as any interactive commands such as LINE or CIRCLE, are typed in the command dialog. You can press the F1 key, to enlarge the box to display the last 25 lines of text in the command dialog. Pressing F1 again restores the smaller 3 line command dialog.

Issuing LISP Commands

Both commands and LISP statements can be issued at the LISP command line prompt. Let's give it a try:

In the LISP command dialog box, type LINE followed by either the space bar or the Enter key. The LINE command responds with the prompt, "From point:". Pick the starting point for the line using the mouse. The LINE command now responds with the "To point:" prompt. Pick another point for the ending point of the line. The line will continue to chain with new end points until the Enter key is pressed without picking a point.

We have seen how commands can be issued from the command line. Now let's try a couple of LISP statements. Type (+ 1 2) followed by the Enter key. CADKEY LISP will respond with 3. All LISP functions start with a left parenthesis followed by the operation to perform and then any parameters to the operation. When control is returned to the command line, the result of the last function to be executed is displayed. In this case the last result was 3.

Now type (princ "Hello World\n"). The string Hello World is displayed twice; the first time without quotes and the second time with quotes. The first line is the output of the princ function which prints the string given it. The second line is the result of the princ function which returns as an answer the string has given it.

Let's try one more example which combines a couple of operations. Type (+ (* 10 2) 4) which will multiply 10 times 2 and then add to the result 4. CADKEY LISP will respond with 24.

Starting LSPEDIT

While simple LISP statements and commands can be issued directly on the command line, larger programs are much easier to write using a text editor outside the command line. CADKEY LISP includes a text editor specifically designed for editing LISP programs. LISP programs written in this editor can then be loaded to make them available for execution.

The LISP editor has context sensitive help for the syntax of all CADKEY LISP statements. Pressing <Ctrl-F1> or clicking the right mouse button on a LISP keyword displays a help screen with the syntax of that keyword. A help index is also available to help find the proper function to use.

The command LSPEDIT starts the editor from the command line, a program called LSPEDIT.EXE that exists in the LSP subdirectory. It may be necessary to adjust your CONFIG parameters for running programs within the CADKEY DOS shell.

Writing a function

Let's try using the editor to write a simple CADKEY LISP program. The program illustrates how CADKEY LISP can be used to solve a specific problem. In this example, we calculate the length of a leg on a right triangle given the length of the hypotenuse and the other leg. At this point we will do nothing with the result except display the answer.

To start, enter the LISP editor by typing LSPEDIT on the CADKEY LISP command line. From within the editor, select the FILE, NEW menu selections to start a new file. Enter the following program into the editor window:

```
(defun leg ( / leg1 leg2 hyp)
        (setq  leg1  (getreal "Length of leg1: ")
           hyp   (getreal "Length of hypotenuse:")
        )
        (if (< hyp leg1)
        (princ "Hypotenuse can not be smaller than leg.\n")
        (setq leg2
           (sqrt (- (* hyp hyp) (* leg1 leg1))))
        )
        (princ "The leg length is = ")
        (princ leg2)
        (princ)
)
```

The program, called leg, uses three local variables called leg1, leg2 and hyp. The getreal function prompts for a floating point number and will only allow a valid number to be entered. After checking that the hypotenuse is longer than the leg of the triangle, the other leg is calculated using the square root of the hypotenuse squared minus the leg squared. The result is then printed to the command area. The final (princ) in the program keeps the leg function from returning a value that would otherwise be displayed at the function's exit. (Try removing it to see the difference.)

After entering the "leg" program in the editor, use the menu selection FILE, SAVE AS and type "triangle" as the file name. Make sure the current directory is the LSP directory. This will create a file called, triangle.lsp. Return to CADKEY by using the FILE, EXIT menu selection.

To load the program, type (load 'triangle') on the command line. This loads the file, triangle.lsp, from the LSP directory into memory. Run the function by typing (leg) and answering the program prompts.

Loading LSP files

If you build a set of tools in CADKEY LISP that you want available at all times, the routines can be loaded automatically without explicitly loading them first. When CADKEY LISP is started, it executes a LISP file called ckinit.lsp which must be in the LSP directory. By placing the line (load "triangle") in this file, the "leg" routine will automatically be loaded any time CADKEY LISP starts. The (leg) routine can then be executed from the command line at any time. The ckinit.lsp file can be used to execute any LISP statement including functions that configure CADKEY LISP to your personal preferences.

Conclusion

This article focused on getting started more than on LISP programming. In future articles, we will present specific LISP routines to solve common CAD tasks. Next time we will start addressing the issues of creating geometry using the LISP interface.

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Comparing Results Obtained with Thermodynamics Calculations and CADKEY ANALYSIS

THE PROBLEM

A chemist decides to store a liquid methane (CH4) in a 0.75-m-diameter hollow metallic sphere. To keep heat losses at a minimum, he decides to insulate the thin-shelled spherical vessel with a 50-mm-thick insulating material with a thermal conductivity constant k = 0.0025 watt / (m • °C). The air surrounding the vessel is at 30°C with a free convective heat transfer coefficient constant h = 11 watt / (m^2 •°C). A temperature of -162°C is maintained in the vessel in order to preserve methane in its fluid state. (See Figure 1)

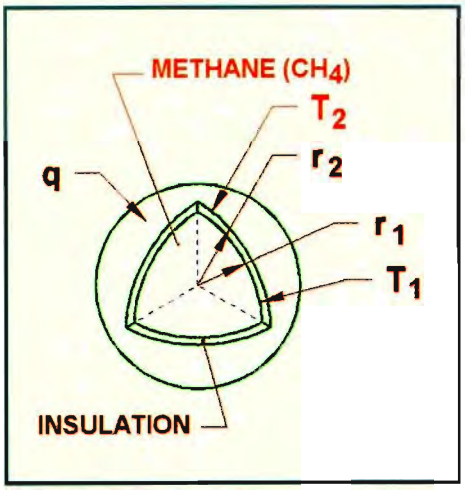

Figure 1

GOALS

a) Determine the total rate of heat transfer from the ambient air to the methane.
b) Determine the temperature dis tribution in the insulating mater ial from r_1 = 0.375 m to r_2 = 0.425 m at Δr = 0.005-m intervals.

ASSUMPTION(S)

a) One-dimensional steady-state conduction through the spherical vessel system with uniform and constant interior and exterior surface temperatures.
b) Neglect thermal resistances through the thin metallic sphere wall and from the vessel to the methane.
c) Neglect radiation exchange between the outer surface of insulation and surroundings.

DATA

T_1 = -162°C ... inside surface temperature of insulated sphere (liquid methane / shell temperature)
T_2 ... outside surface temperature of insulated sphere
T_{air} = 30°C ... ambient air temperature
r_1 = 0.375 m ... inside surface radius of insulated sphere
t = 0.050 m ... thickness of insulated material
$r_2 = r_1 + t$ ... outside surface radius of insulated sphere
= 0.425 m
k = 0.0025 watt / (m • °C) ... thermal conductivity of insulated material
h = 11 watt / (m^2 • °C) ... convection coefficient of the ambient air
$A_{S2} = 4\pi \bullet r_2^2$ ... outer insulated surface area exposed to the ambient air
= 2.270 m^2

Table 1

r (m)	T (°C)
0.375	-162.000
0.380	-140.612
0.385	-119.780
0.390	-99.482
0.395	-79.697
0.400	-60.407
0.405	-41.594
0.410	-23.239
0.415	-5.327
0.420	+12.159
0.425	+29.233

THEORETICAL ANALYSIS

By applying standard thermodynamic laws and equations I obtained the temperature results shown in Table 1 for r = 0.375 m through 0.425 m. The total rate of theoretical heat transfer is q = 19.578 watt. **These equations are available on request from KEYSOLUTIONS.**

CADKEY ANALYSIS V.7 SOLUTION

In CADKEY, prepare the sphere model by drawing two concentric semi circles of radii 0.375 and 0.425 (centered at <0,0,0>) and join the two semi circles with a line at each extremities. (See Figure 2)

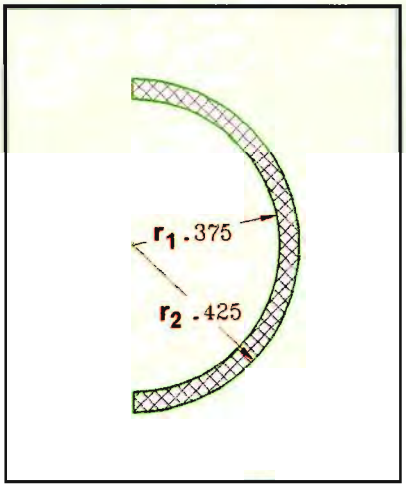

Figure 2

Save the file (for example, as CASE1.CDL).

Activate CADKEY ANALYSIS (CKA) and follow the steps below:

- **FILES**
  Input Filename = Case1.CDL
  Input File Type = Line Segments
  Session File = Case1.SES
- **CONFIG**
  Analysis Type = Thermal
  Dimensionality = Axisymmetric
  Units = SI_(m)
  Material = Type 0.0025 in the thermal conductivity text box.

- **SEGMENT**

  Global = Segment 0.014025 m
  (the smaller the segmentation, the more accurate the output results)
  Process, Done, Save file as Case1-S.CDL ('S' for segmentation)
- **ASSIGN**

  CONDITION
  TEMP
  Temperature = -162°C
  Selection Method = Elements
  OK, Done
  (Select the inner radius of the semi circle)
  CONVECT
  Conductance (A) = 0 watt / m^2
  Thin Film Coef. (H) = 11 watt / (m^2 • °C)
  Ambient Temperature (To) = 30°C
  Selection Method = Elements
  (Select the outer radius of the semi circle)
  OK, Done, F10 (Back-Up), Done
- **SOLVE**

  At this stage CKA is running the solver and at the same time is showing the steps being executed along with the error analysis.
  The total rate of heat transfer is shown as Total Positive Flux = +19.14 watt and Total Negative Flux = -19.14 watt.
- **RESULTS**

  Results are found as follows:

(1) Figure 3 which describes the temperature distribu tion of the sphere was cre ated using the following steps:
Result Type = Temperature
Plot Type = Shaded
Dimension Mode =2D_View
OK
OK

(2) To get accurate temperature readings, change the Plot Type from Shaded to Fast_View; this helps to find the exact temperature at any location using the coordinate function (Key-In): Refer to Table 2 for the r values to be keyed in.

<x,y,z> = <0.380,0,0> = Point 1

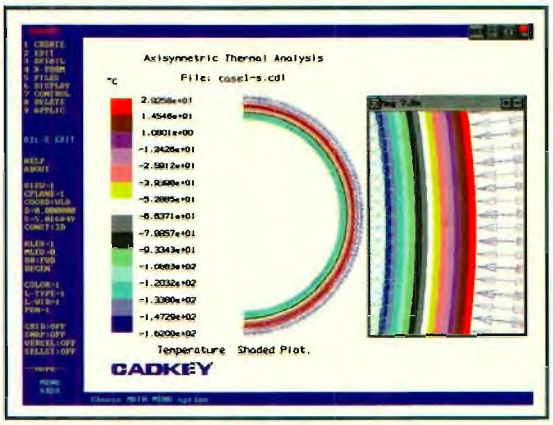

Figure 3

<x,y,z> = <0.385,0,0> = Point 2

/ / /

<x,y,z> = <0.425,0,0> = Point 10

Here, in this case, the values of x are taken to be r.

F10 when done. The results can be found in Table 2.

A comparison between theoretical results and CADKEY ANALYSIS is described in Tables 3 and 4.

Ara Kirdi is a mechanical engineer at SPAR Aerospace Ltd., Quebec, Canada.

Table 2

r (m)	T_{CKA} (°C)
0.375	-162.000
0.380	-140.456
0.385	-119.615
0.390	-99.320
0.395	-79.540
0.400	-60.253
0.405	-41.441
0.410	-23.091
0.415	-5.1792
0.420	+12.310
0.425	+29.258

Table 4

r (m)	T_{Theory} (°C)	T_{CKA} (°C)	Difference (%)
0.375	-162.000	-162.000	0.000
0.380	-140.612	-140.456	0.111
0.385	-119.780	-119.615	0.138
0.390	-99.482	-99.320	0.171
0.395	-79.697	-79.540	0.197
0.400	-60.407	-60.253	0.255
0.405	-41.594	-41.441	0.368
0.410	-23.239	-23.091	0.636
0.415	-5.327	-5.1792	2.775
0.420	+12.159	+12.310	1.240
0.425	+29.233	+29.258	0.087

Table 3

Theoretical Heat Transfer Rate (watt)	19.579
CKA Heat Transfer Rate (watt)	19.14
Difference (%)	2.24

REFERENCES

(1) Lindon C. Thomas, Heat Transfer, Professional Version, PTR Prentice Hall, Englewood Cliffs, New Jersey, 1993.

(2) Alan J. Chapman, Heat Transfer, Macmillan Publishing Company, New York, 1974.

(3) Frank P. Incropera, Introduction To Heat Transfer, John Wiley & Sons, New York, 1985.

DESIGNING AN AIRPLANE

With CADKEY 7 Episode II

by Bob Martin

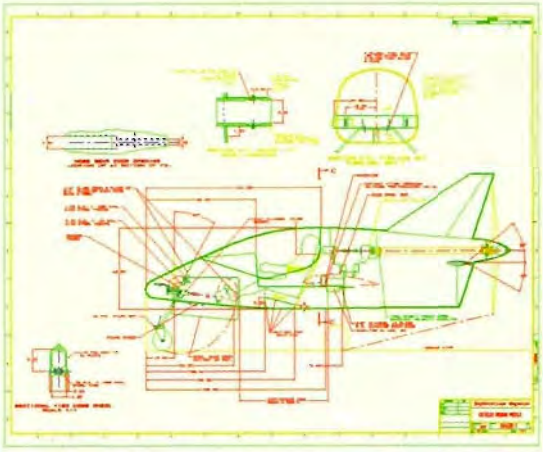

Figure 1

Last time we presented a general design of a four-place aircraft which we called the "Wild Weasel." For this article we have changed the design to a two-place version which we will use from this point on in the series. The designs are similar with a few minor exceptions. (See Figure 1.)

This installment explains in detail how the design was generated using CADKEY 7 and Fastlite (FastSURF's latest product bundled inside CADKEY v.7). Knowing how to use these tools together skillfully is the key to a good design no matter what kind of product you are designing.

Roughing Out the Center Section

First, I drew the approximate side profile I desired in view 2 with the nose of the aircraft facing left. (See Figure 2.) Then I changed to view 7 and created a vertical line that intersected the side profile at the approximate location of the cockpit. Shifting to **cplane 6**, I created two parallel lines that represented the width of the cockpit. Once these lines were completed, I connected the two outboard lines with horizontal lines to form a box. To smooth the cross-sectional lines I used 96" radii on both sides whose horizontal vertex was located 12" above the bottom cross sectional line. The top and bottom radii were located on the fuselage centerline. I then filleted all four radii; at the top I used a 12" fillet, at the bottom I used a 9" fillet. (See Figure 3.)

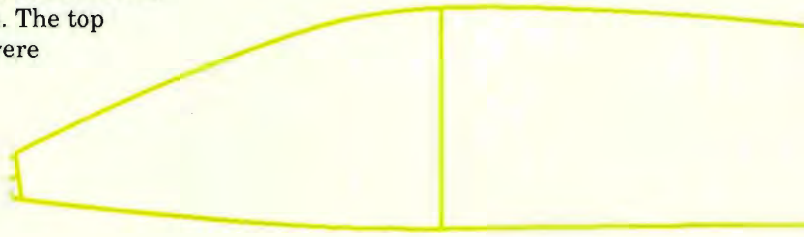

Figure 2 - Creating the side profile

Splines for the Center Section

Once the center section was complete, I initiated Fastlite and created a spline over the now existing center section lines. Then I created a circle at the nose (again in cplane 6), but at a new construction depth that represented the nose cross section. I changed to a new construction depth and created a second circle at the aft end of the aircraft right, where the propeller spinner would begin. After completing all three sections, I broke them on the vertical centerline. I then copied the center section in the aft direction 2' (24"). (See Figure 4.)

Now the copied cross section no longer matches the side profile lines. This was done to make the finished lines closely match the side profile lines. The more sections you create that match the original side profile, the more accurately the finished body lines are going to represent the side profile lines. To match the newly copied cross section to the side profile, I had to scale it down. Once this was accomplished and the new section was split on its vertical center, I was ready to make my first try at surfacing the fuselage.

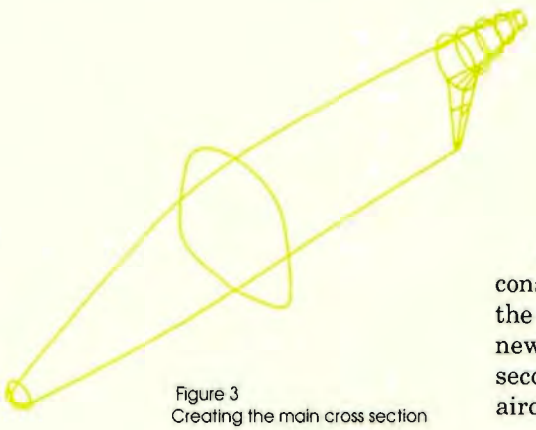

Figure 3
Creating the main cross section

Surfacing the Fuselage

Remember, I split each cross section on its vertical centerline. So, surfacing the fuselage had to be done in halves, a right and a left. Looking at the nose of the aircraft I started with the right or starboard half. In view 7 I used Fastlite's GENCURVE command, starting with the first half section forward picking each half section in order. Once I reached the last half section I hit enter and the right side of the fuselage was surfaced. Surfacing the left side of the fuselage was easy with the MIRROR command. (See Figure 5.)

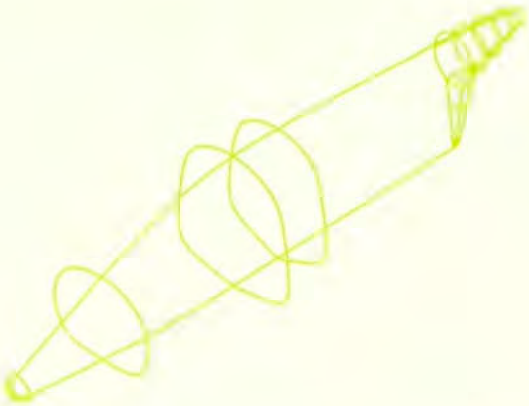

Figure 4 - Designing sections

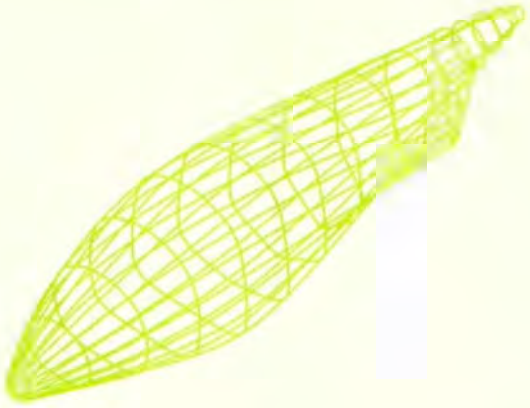

Figure 5 - Fuselage surfaced

Breaking Out Section

Using the **Planes** function in Fastlite, I created lines where I wanted to create bulkheads or frames in the aircraft's fuselage. Remember that you must first attach a Planes icon to the end of each of the lines that indicate the plane's section. (See Figure 6.) The orientation of this icon determines the direction in which the plane is made (the plane should be constructed on a level of its own.)

Once the planes are constructed, all the other levels should be shut off.

Shift to view 6 or 5, and change to the same cplane as the view you are in and do a "project to zero" for all the planes. You can save these out as a pattern and create a bulkhead drawing separate from your fuselage surfaces drawing. But remember that the surfaces model is used to extract dimensional drawings if you are creating a full size aircraft.

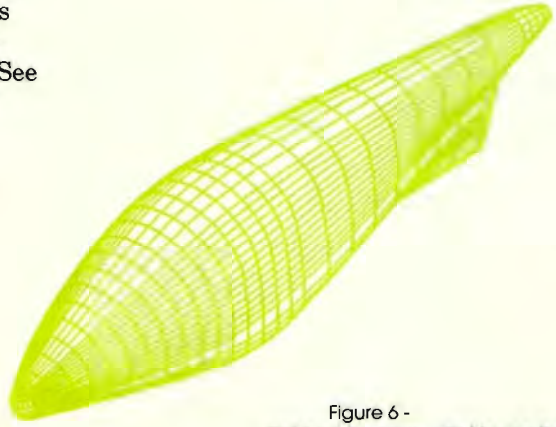

Figure 6 -
Finished fuselage with hidden line removed

This completes the fuselage section. The next article will deal with the wing and other flying surfaces, specifically how to intersect these features to the fuselage and create angles of incidence and dihedral.

Complete drawings and the basic code used to develop this design are available on disk. Just send $15 for shipping and handling charges to Airplane Project, **KeySolutions**, P.O. Box 11978, Spokane, WA 99211-1978.

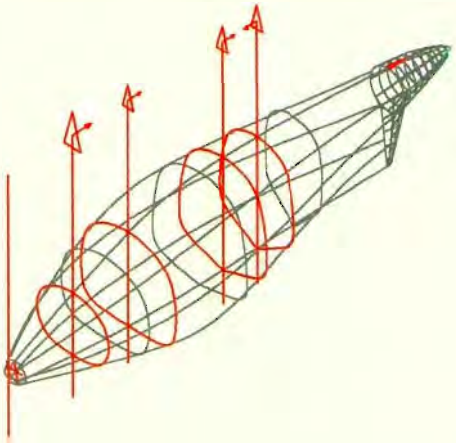

Figure 7 - Creating other sections with Fastlite's Plane

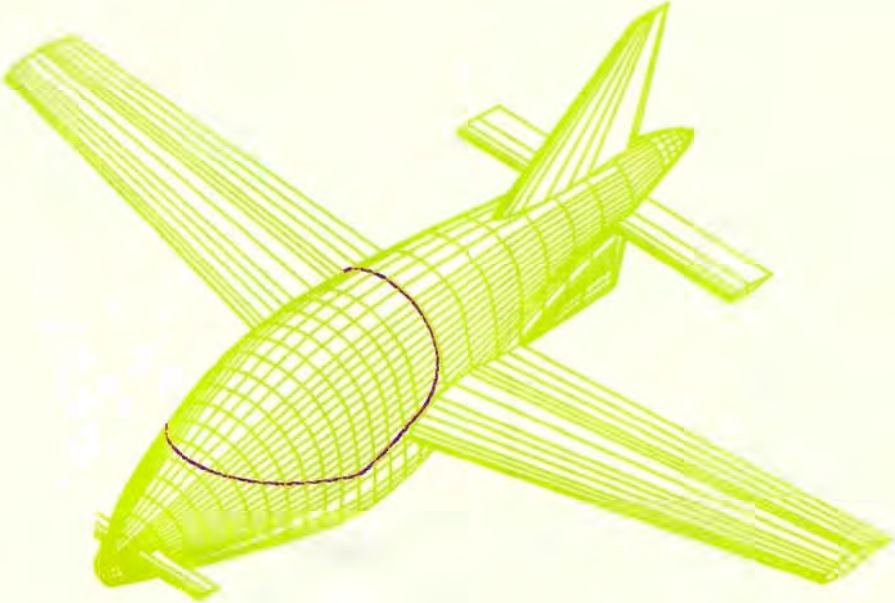

Figure 8 - What the finished aircraft will look like

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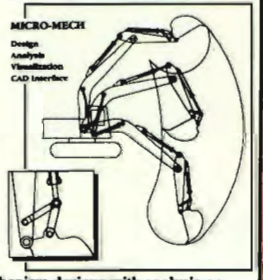

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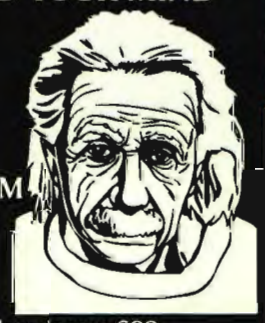

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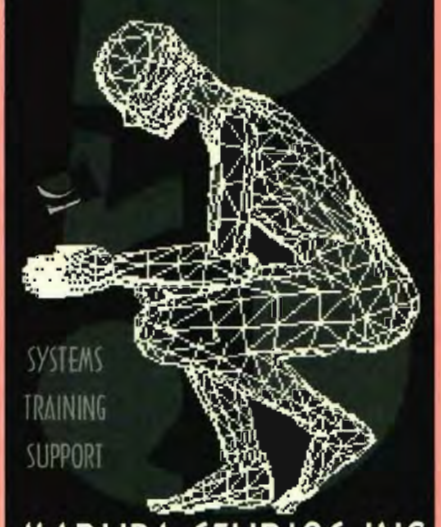

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LATE BREAKING NEWS

CADKEY 7 Upgrade Price $249

Cadkey, Inc. announced that the special promotion for upgrading from CADKEY 6 to CADKEY 7 for $99 ended on April 30, 1994, as scheduled. The regular upgrade price of $249 became effective as of May 1, 1994.

Cutting Edge Technologies, Inc. Offers CADKEY Training

Cutting Edge Technologies, Inc. is now offering a complete range of CADKEY related training at its facility at 4 Griffin Road North, Windsor, CT. When Cadkey, Inc. decided that it would no longer offer training directly, CETI saw this as a wonderful opportunity to expand its business. Since CETI had previously done training under contract from Cadkey, Inc., this means that users can now get the same high quality training as in the past, from exactly the same staff, in exactly the same location.

CETI is uniquely qualified to offer CADKEY training because much of the company's staff used to work directly for Cadkey, Inc. in technical positions. The company's trainers have consistently received outstanding reviews by their students. CETI offers courses both in Introduction to CADKEY and in Advanced CADKEY. In addition, CETI is one of the first organizations in the U.S. to base its introductory CAD course on the newly released CADD Standards which were developed by the Foundation for Industrial Modernization under a grant from the U.S. Department of Labor and the U.S. Department of Education. Because of his long standing interest in technical education, Livingston Davies, President of CETI and Chairman of the Board of Directors of Cadkey, Inc. was an active proponent of the creation of these standards.

Cutting Edge Technologies, Inc. is a technology spin off from Cadkey, Inc. created in August, 1993. It has taken responsibility for and expanded upon the products developed by Cadkey's former Manufacturing Systems Division including CUTTING EDGE (3 axis surface machining), and the CADDInspector (reverse engineering). Its primary offices are located in the Cadkey Building in Windsor, CT.

KEY MAIL

Cheap Tricks

I have just seen a copy of the May issue of KEYSOLUTIONS. While I congratulate you on the technical polish and look of the DataCAD section, I do have to register my disappointment and dismay at the editorial approach you have taken toward our newsletter Cheap Tricks.

In your KeyTalk section, you write that "This meant that DataCAD users did not have an up-to-the minute source of information" — until you came to the rescue. That statement is obviously not true. Unless I am getting unnecessarily paranoid, it does seem clear to me that you are trying to pretend that Cheap Tricks does not exist as a resource for DataCAD users.

I feel that the fast growing DataCAD market is certainly big enough for both of us and I welcome the opportunity for you to handle subjects and reproductions that Cheap Tricks has neither the ability, space nor inclination to handle.

Evan Shu
*Editor, **Cheap Tricks***

Editors Note: Our apologies! KEYSOLUTIONS *indeed recognizes **Cheap Tricks** as a valuable source of information for DataCAD users and wants to have a complementary not competitive relationship. For the reader's information, there is a brief description of this publication in the DataCAD Technical Section.*

A Different DOS Fix

I enjoyed the May issue of KEYSOLUTIONS — except for the Productivity Tip by Larry Malderelli. His article provides a dangerous and incorrect solution to a problem that he thinks exists.

First, copying a CHKDSK.EXE file from an older version of DOS and using it while running a newer version is computer suicide. It's a cardinal sin to mix DOS utilities among different DOS versions. It basically "voids the common sense warranty." Second, if you type the SETVER command as it states in the article, it will not work as typed. It should say ...CHKDSK.6.20, not ... CHKDSK 6.02.

Third, the way he describes the use of SETVER is totally incorrect. You can't just "run" SETVER and go on. SETVER is run from the DOS prompt to add or delete a program's version identification to the table. SETVER itself must be located in the CONFIG.SYS file of the disk that the system boots from as a device driver. Once you run SETVER to update the version table, you must reboot your machine to have it take effect.

Here's a simple solution to the problem he described. Remove the line CHKDSK/F from the autoexec.bat (or whatever batch file it's in) and replace it with

C:DOS\SCANDISK/ALL/AUTOFIX/NOSAVE/NOSUMMARY.

This will automatically scan all local hard drives and fix any problems found, all without touching the keyboard. If you want to know what /nosave and /nosummary do, as well as other scandisk options, type SCANDISK/?. (SCANDISK only comes with DOS 6 and up.)

Hans Dekkers -Nachtmann USA
Warwick, Rhode Island

Yankee Ingenuity

Thanks for your positive article on the 1994 Bobsled that competed in Lillehamer, Norway. You portrayed the gruelling 18 hour work days and time spent on this project better than any writer to date.

It has been so discouraging for all involved in this project to read the negative articles filled with fabrications. It is soothing to find a review like yours that appreciates the time and effort that went into this exciting and demanding endeavor.

I am the proud wife of one of the designers, Robert Vaillancourt of Chassis Dynamics. I wish to thank you again for noticing a truly wonderful bunch of hard working small business owners.

This is not the end. Hopefully, with sponsorship, we will be involved in the World Cup Competition and also in Nagano, Japan.

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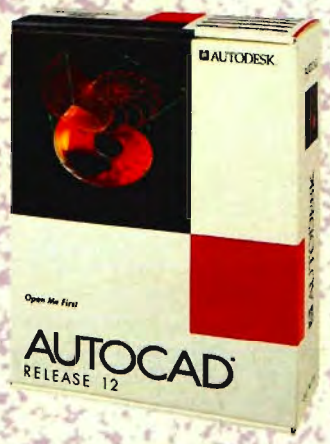

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