



# CADD/GIS Bulletin

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## From the Chief

by Harold Smith

Chief, The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment

Check out our new name! We are now The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment!

After much consideration and numerous discussions, the Center's former Executive Steering Group selected the new name to better reflect the Center's expanded scope and organizational changes, as delineated in the new Charter.

Since its inception in 1992, the Center has served users of computer-aided design and drafting (CADD) and geographic information systems (GIS) throughout government and industry, with specific

emphasis on the Tri-Service (Army, Navy, and Air Force). During the past few years, the Center has extended its customer base to include much of the Department of Defense (DoD). This extended outreach includes a broadened customer base from the private sector, as well as from colleges and universities.

Part of the expanded role of the Center is to expedite the development and promotion of consensus standards and provide meaningful business performance measurement systems to the CADD/GIS community at large. The Center will continue to emphasize the need to identify the best CADD/GIS practices available and to disseminate that information specifically to member organizations and the contract companies who support them. In many instances, the Center will participate in development of these best practices and will promote CADD/GIS technology applications, while avoiding duplicate efforts.

To facilitate implementation of its broadened vision, the Center has undergone organizational changes (Figure 1). A newly formed Board of Directors consisting of at least one flag officer, SES-level individual, or senior-level designee from each participating organization (Figure 2) will provide the strategic business and marketing vision for the Center. The Board will also oversee funding and resource requirements, business leads and potential customers, marketing strategies, and future products and services. A Corporate Staff composed of

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#### From the Chief

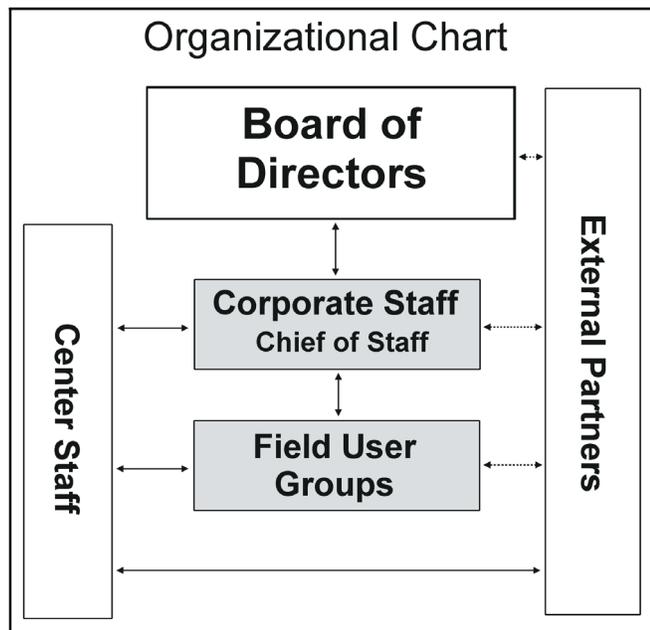
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Visit: <http://tsc.wes.army.mil>

representatives from the member agencies will serve the Board by preparing annual budgets and policy, developing and managing the Center's annual work plan, promoting and monitoring return on investment for dollars expended, and providing direction for coordination, integration, and interoperability of the standards. In addition, the Corporate Staff will establish and manage Field User and Task Groups, as required, to accomplish the mission.

A key element in the Center's extended scope and reorganization will be an increase in fostering partnerships with the private sector and academia. These partnerships will ensure that best practices are implemented by design and not by change and that customers receive comprehensive solutions to facility, infrastructure, and environmental problems.



**Figure 1. The CADD/GIS Technology Center's new organization**

The CADD/GIS Technology Center will continue to live up to its motto, "Excellence through Automation." Within the recent past, the Center has received two Vice President's Hammer awards: one in 1996 for its Electronic Bid Solicitation and the second in 1998 for creating the Center, facilitating government and private sector cooperation, and centralizing CADD/GIS acquisitions. The Spatial Data Standards have become the de facto standard of large- and small-scale GISs throughout the government and private industry in 43 states, with implementations in 16 foreign countries.

We invite all CADD/GIS users to visit our Web site at <http://tsc.wes.army.mil/>, and welcome your comments and suggestions.

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**Figure 2. The CADD/GIS Technology Center's Board of Directors for FY 2000**

*The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment is dedicated to fostering the application of computer-aided design and drafting (CADD) and geographic information system (GIS) technologies for facility life-cycle efforts throughout the Army, Navy, and Air Force. The CADD/GIS Bulletin is published by The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment of the Information Technology Laboratory, U.S. Army Engineer Research and Development Center, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199.*

# Use of GIS and CADD at U.S. Airports

by Michael T. McNerney, Ph.D., P.E.

Director, Aviation Research Center, The University of Texas at Austin  
Chairman of Airport GIS Committee, American Association Airport Executives

The use of geographical information systems (GIS) at U.S. airports has increased in the last few years. As airport managers realize the benefits and see gains from implementation of certain applications, more applications are being added. Airports, especially large ones, have been compared to small cities in that they provide a host of services, such as utilities, roadways, and the infrastructure necessary to maintain airport operations. Just as we are seeing an increase in the numbers of municipalities using GIS, we are seeing increases in airports using GIS.

I have surveyed airports in the United States concerning the use of GIS four times since 1993. The results of these surveys are remarkably similar. (The first survey was reported in a paper presented at a conference to the Urban and Regional Information Systems Association in 1994.<sup>1</sup>) This article presents the preliminary results of the latest survey conducted in 1999 by the American Association of Airport Executives (AAAE), Airport GIS Committee, and includes some conclusions and recommendations for future use of GIS and computer-aided design and drafting (CADD) standards at airports.

## AAAE Airport GIS Committee

In 1998, the AAAE formed an Airport GIS Committee during its first annual Airport GIS Conference. The purpose of the committee is to educate airport personnel on the technical and beneficial aspects of airport GIS, to provide a forum to promote GIS use at airports, and to increase communication among airport personnel on lessons learned in the implementation of GIS. The committee sponsors an annual Airport GIS Conference and Workshop in which airport personnel and consultants come together and showcase successful case studies and lessons learned.

The committee has five organized subcommittees to help in the accomplishment of its goals. These are:

- Conferences, Promotion, and Education.
- GIS Standards.
- Department of Transportation (DOT)/Federal Aviation Administration (FAA) Liaison.
- GIS Certification for Airport Personnel.
- Cost/Benefits Analysis.

Although not a requirement, over half of the 50 Airport GIS Committee members belong to the AAAE. The committee has a Web site and conducts most of its business through e-mail. People interested in joining the committee should check out the Web site at [www.utexas.edu/research/ctr/aviation/](http://www.utexas.edu/research/ctr/aviation/) (Figure 1).

The Web site will be a vehicle for publishing documents related to airport GIS and posting the committee's meeting minutes and membership roster. Also available on the site are articles, papers, reference links about airport GIS, and the full 1999 Airport GIS Survey form and partial results.

## Survey of Airports

The Airport GIS Committee edited a previous survey that I conducted on airport GIS. This comprehensive survey included several new potential GIS applications and questions related to implementation and GIS personnel at airports. The survey asked the important questions of whether airports were actually using CADD and GIS and whether they planned to start GIS in each of the next 3 years. Participants were instructed to answer the questions based on information as of December 31, 1998.

The survey also asked about specific applications, numbers of computers, types of software, primary users of the software, and availability of CADD/GIS standards. The committee faxed the survey to AAAE members under a cover letter. As in the previous three surveys, even airport personnel who used no CADD/GIS were asked to complete the first half of the survey. Personnel from airports of all sizes responded to this survey. Those who reported their annual operations ranged from a low of 2,000 at Raleigh County Airport to a high of 897,354 at Chicago O'Hare International Airport. This differs slightly from the three previous surveys, which were mailed only to airport managers as listed in the FAA database for approximately 170 airports with commercial air service and over 40,000 annual operations. There are smaller airports included in this survey, and one would expect the percentage of GIS to be reduced since the previous surveys reported higher percentage of GIS usage in larger airports. However, this is not the case.

<sup>1</sup> M.T. McNerney, "The Use of Geographical Information Systems at U.S. Airports," *Proceedings, 1994 Annual Conference of the Urban & Regional Information Systems Association*, August 1994.

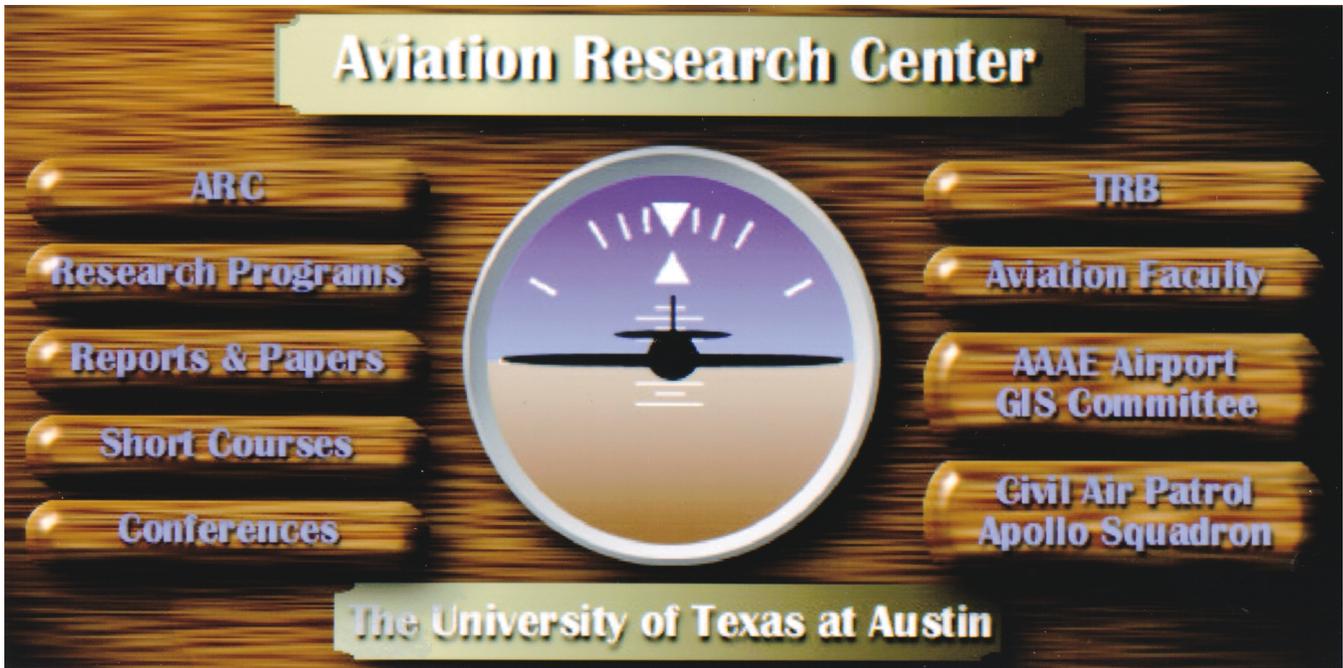


Figure 1. Aviation Research Center web site (<http://www.utexas.edu/depts/ctr/aviation/index.html>)

## Analysis of Results

The surveys were analyzed once before the annual workshop with only 84 surveys returned and again with 104 surveys returned. Analysis of the surveys is continuing to extract more details. The following preliminary results are for the current situation of 104 returned surveys, except for the analysis of GIS applications that were completed before the annual workshop and reported at the workshop.

The percentage of airports that actually use or plan on using GIS is 62 percent, which is higher than any previous survey. As shown in Figure 2, more airports plan on using GIS within the next 3 years than actually use GIS at present. Although there is a slight increase in this year's percentage, the previous three surveys have all reported between 56 and 59 percent of airports currently using or planning on using GIS within 3 years.

When one considers the applications most prevalently reported as actually or planned in use, some changes can be noted in the surveys. The first survey of December 1993 reported environmental analysis and compliance applications as the most used applications. In the second year, the survey reported infrastructure and pavement management in particular as the most used application. As shown in Figures 3 and 4, the current survey has airports using GIS for both infrastructure management and environmental applications.

Also evident in Figures 3 and 4 is the fact that far more applications are planned than are actually in use. This is a continuation of the trend noted in the first three surveys. The total number of applications planned, by greater than a factor of three, exceeds the total number of applications in use. This revelation bodes well for the airport consultant because if the planned applications turn into requests for proposals, there will be plenty of work to keep all the consultants very busy. However, the ratio of planned within 3 years to actual use has always remained very high, probably due to one of two possibilities. First, the planned applications are not happening or not happening within the 3-year time

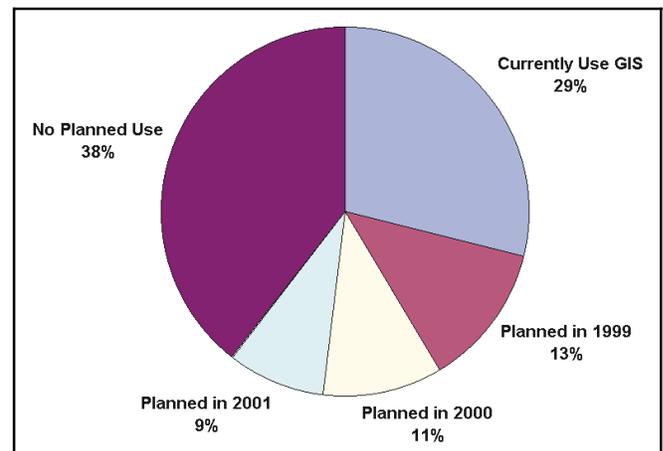
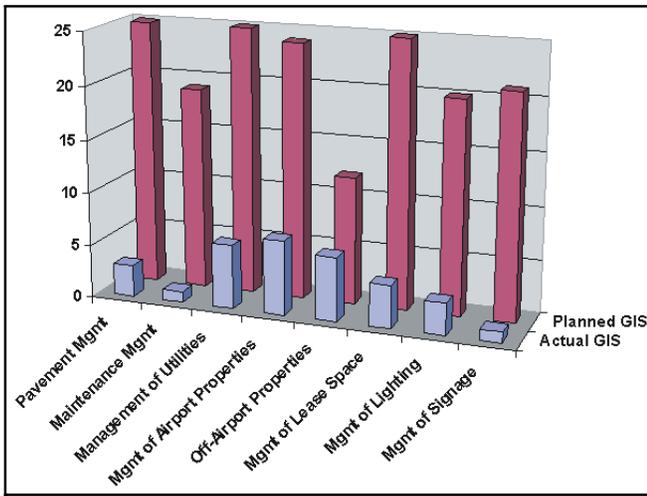
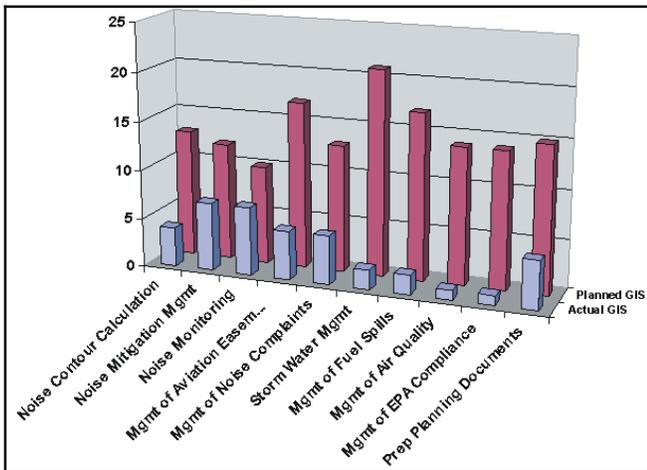


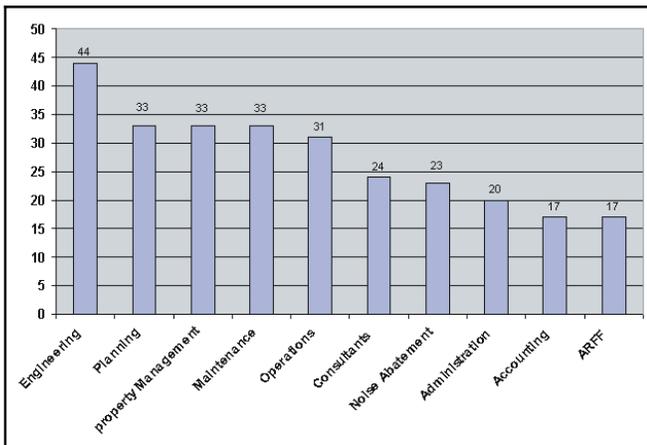
Figure 2. GIS use in U.S. airports, 1999 survey



**Figure 3. Actual and planned GIS applications for infrastructure management**



**Figure 4. Actual and planned GIS applications for environmental analysis**



**Figure 5. Planned and actual GIS use by department**

frame. Second, the survey respondents are overly optimistic in their reporting.

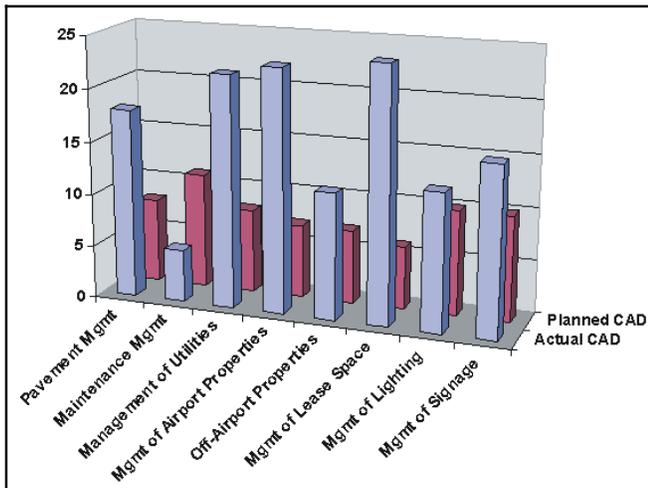
This survey asked for the first time which departments are GIS users and which are the primary GIS users. As might be expected, Engineering and Planning were two of the departments that were reported most as GIS users at airports. The two next most reported users might be somewhat surprising: Operations and Maintenance (Figure 5). The fact that 31 respondents reported Operations and 17 reported Aircraft Rescue and Fire Fighting (ARFF) as GIS users is highly encouraging and would indicate a higher degree of integration in GIS at airports than was previously reported. Several factors may account for this finding: the reduction in cost of differential global positioning systems (GPS) in the last few years and increased GPS deployment in both operations and ARFF vehicles at some airports.

When asked which department was the primary GIS user, the respondents also replied with Engineering and Planning. However, because this was a write-in response, airports have different titles and organization structures. Development, for example, was listed only once as the primary user but was written in nine more times as “Planning/Development” or other combinations of departments with Development. Therefore, the responses listed in the following table include combinations of primary GIS users.

Department	Number
Engineering	14
Planning	14
Development	10
Operations	4
Maintenance	3
Noise, Information Systems	2
Facilities, Public Works	2
Administration, Headquarters	1
Marketing, Business, Capital Programs	1
Geotechnical, GIS Division	1

## CADD Use at Airports

The survey also looked at CADD use at U.S. airports, and as would be expected, it was even more prevalent than GIS use. Also to be expected are several applications that begin as CADD drawings and later develop into full-fledged GIS applications. Therefore, it is often reported that an important consideration in the implementation of GIS is an ability to display CADD drawings. As shown in Figure 6, CADD use at airports for infrastructure management applications is much higher than GIS usage (Figure 3). Not shown is a corresponding figure for environmental analysis, which is not dramatically higher than the GIS usage.



**Figure 6. Actual and planned CADD applications for infrastructure management**

An important implementation strategy often used in infrastructure management applications is to begin the application in CADD drawings to visualize the data. Also, an often-used implementation strategy is to develop CADD standards before developing GIS standards. In the survey to airports, each respondent was asked to list the CADD software used and indicate whether or not it has CADD standards. A surprisingly large number of responding airports do not have CADD software. In many cases, the airports are small enough that the airport relies completely upon consultants to prepare and submit CADD drawings as necessary.

As shown in Figure 7, most airports use AutoCAD software as their CADD software. However, this may be a little misleading as the larger airports tend to lean more toward the MicroStation software or to use both of the most popular CADD programs in the United States today. What is both surprising and highly encouraging is that a large percentage of airports have adopted CADD standards. This is surprising because the FAA uses neither of the two

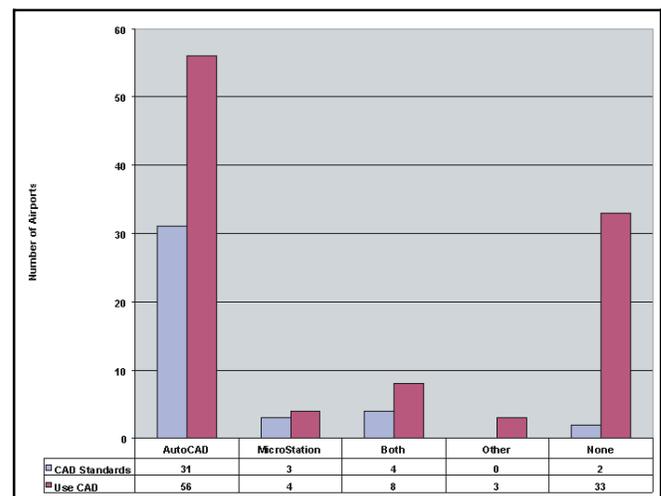
popular software packages for its CADD software. In fact, within the last 2 years, the FAA has published a change in its advisory circular specifying how to translate CADD drawings into a format that the FAA software can read.

## Conclusions and Needs Assessment

One of the conclusions reached from the 1999 survey of U.S. airports is that there appears to be in the very near future a period of rapid growth in the implementation of both CADD/GIS applications. Airports that have developed GIS for single applications are now developing other applications and integrating them with other departments. The Orlando airport-wide integration of CADD/GIS data provides a good example for others to follow.

However, there is a need for FAA involvement both in the promotion of CADD/GIS usage and in accepting data in digital form from airports for analyses. Many airports are developing their own GIS standards and custom applications for the same problems every other airport is facing. Although each airport is different in layout and unique to itself, many problems and data collection tasks are common to most airports of similar size.

There are many benefits in the implementation of CADD and GIS at airports. One is the creation of data into timely information that can be better analyzed. More reliable information and better analyses should lead to cost savings through more efficient management of infrastructure and an improved environment. One frequently observed benefit from CADD/GIS implementation is a reduction in data loss. Airports with standardized CADD/GIS systems have to repurchase the same data much less frequently than in the past. The process of collecting



**Figure 7. CADD use and CADD standards at U.S. airports**

and converting data into useful information is costly in terms of both money and resources. CADD/GIS systems properly implemented can result in great savings over time.

If airports were better organized to learn from each other's mistakes and successes in the implementation of GIS and CADD for similar applications, significant savings should result. The FAA can provide a big impact by taking a role in developing and promoting sensible and reasonable CADD/GIS standards. The FAA should be working with the CADD/GIS Technology Center in setting GIS standards.

The AAAE Airport GIS committee has begun to fill the need for the education and promotion of GIS

usage at airports. The GIS standards subcommittee is working closely with the Center and with large airports that have put considerable resources into the development of CADD/GIS standards. The FAA needs to acknowledge that GIS is here and being implemented at airports by joining with the major contributors to GIS standards under development and providing resources to establish a consensus standard that all airports can use regardless of size and geographic location. The FAA needs to begin accepting and requesting data in CADD/GIS formats that conform to these consensus standards.

For additional information, contact Dr. Michael McNerney at (512) 232-3140 or e-mail to [mcnerney@ccwf.cc.utexas.edu](mailto:mcnerney@ccwf.cc.utexas.edu).

## **Spatial Data Standards (SDS) and Facility Management Standards (FMS) - Release 1.80 Year 2000 Compliance Statement**

*by Bobby G. Carpenter*

*The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment*

It has been determined that the SDS/FMS Release 1.80 software tool suite is Year 2000 compliant (Y2K). This means that no data-processing errors will be produced by SDS/FMS tools when the year changes from 31 December 1999 to 1 January 2000. This determination is based upon the fact that the development tools used to create the SDS tool suite,

namely Microsoft Access 2.0 and Visual Basic 5.0, have been evaluated by Microsoft Corporation to be Y2K compliant. Specific data on Y2K compliance of Microsoft products may be found at: <http://www.microsoft.com/technet/year2k/y2kcomply/y2kcomply.htm/>.

### **Year 2000 CADD/GIS/FM Symposium and Exposition**

**What?**

The Year 2000 CADD/GIS/FM Symposium and Exposition, sponsored by The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment

**When?**

May 22-25, 2000

**Where?**

Adam's Mark Hotel, St. Louis, MO

**Who?**

Government agencies, commercial firms, service firms, and hardware/software vendors

**Why?**

To promote the services of the Center to others and transfer technology from government to public sectors and vice versa, as well as from service to service

For additional information, contact Toby Wilson at (601) 634-3604 or [wilsonj@wes.army.mil](mailto:wilsonj@wes.army.mil)

# An Inter-Service Approach to Geographic Information System (GIS) Configuration and Development

by Ayman S.A. El-Swaify, P.E.  
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## The GIS Implementation Dilemma

Although the payback of a properly planned GIS will inevitably be very large, setting one up can be expensive. A GIS manager typically has two basic concerns: to ensure that data are properly formatted for use with the system and to plan the system component design (the way that the data and applications will be physically laid out on the workstations and network servers).

A GIS cannot exist without data; thus data collection and preparation become the paramount and most expensive of these two tasks. As those who have seriously pursued a GIS implementation know, GIS will drive the collection, compilation, standardization, and maintenance of data beyond what they have ever done before (and “it ends up costing a lot of money”).

Inevitably in the initial stages of a GIS implementation, management applies pressure to GIS managers to show results quickly or risk the loss of continued funding. As a result, GIS managers are tempted to shortcut the system design process (or figure it out on the fly) for the sake of expediency. The drawback of this approach is that once a design is in place and being built upon, it becomes difficult to go back and revisit it. Thus, the foundation for future GIS development has potentially been set without consideration for the big picture of future growth and portability between sites.

I have been through this cycle more than once, and I know from personal experience the pressure to produce. The purpose for the Spatial Data Standards (SDS) is to help Department of Defense (DoD) GIS managers format their data, but system design is beyond its scope. Thus, this paper was written to present the Navy PWC Yokosuka GIS data and application models as a proposed basis for GIS system design for U.S. Military agencies in Japan and the Pacific region.

This model is the result of two intense years of GIS activity by the Navy in Japan and thus incorporates many lessons learned. Throughout the document, I add my own insight as to what is of particular importance and where the consistency should lie. Although this is by no means a perfect model, the need exists for a baseline from which to grow the portable GIS design concept. I have coined the term “portable GIS” to refer to the ability to

transfer GIS technology investment between sites without a loss of functionality. This design assumes that ESRI ArcView is the GIS query and analysis software of choice among the bases choosing to adopt the portable model.

The benefits of adopting a common system model are as follow:

- It serves as a baseline that facilitates system growth. Therefore, GIS managers have a meaningful approach to growing their systems and are less bogged down with configuration details.
- Data and applications become transferable between agencies. This is portable GIS. If done properly, agencies could conceivably use a combination of in-house staffing and different contractors for their application development and yet the applications could be shared by all.
- A common system model facilitates inter-agency coordination and cooperation and becomes a channel for sharing knowledge and lessons learned. One agency will solve a problem that another will eventually face and incorporates it into the model, thus saving others from the time and expense of “reinventing the wheel.”

## Elements of a Portable GIS

The core product of a portable GIS is the installation base map with basic geographic features (buildings, contours, roads, etc.). All other data and functionality are built upon this map. There is no functionality contained within the core map project that is not part of the commercial-off-the-shelf ArcView product.

Application coding is contained within modular program units (termed ArcView extensions) that can be loaded and unloaded from the core model as necessary.

Data that are not a part of the base map can be loaded in two ways. Casual users (those who simply need to view the data) can load *data groups*, which add overlays of related data on top of the base map. Advanced users (those who need to perform analysis on the data) can load an ArcView extension, which in turn loads the data that the application needs to perform its analytical function.

# Aspects of Navy PWC Yokosuka's GIS Design

## Network server configuration

The number of file servers used is not of particular concern to the portable model. This information is provided solely as information. PWC Yokosuka uses three Windows NT 4.0 network servers at this time and for the foreseeable future. The server names are contained in parenthesis.

- File server (fugu). The purpose of this device is to store all mapping data and documents associated with mapping features, including floor plans, construction drawings, photos, schematics, etc. The file server has two NT sharenames: *caf*m and *drawings*. The *caf*m sharename holds the mapping data; the *drawings* sharename holds the associated documents.
- Database server (suppon). This device holds the Oracle7 software and database tables related to the GIS. This presently includes three database systems: the Real Estate Database (REDB), the Regional Planning System (RPS), and the Engineering Plan Files Database (PFDB). The database server is configured with multiple disk devices to maximize Oracle performance.
- Web server (matsutake). This device holds the Microsoft IIS and ArcView IMS software. Access is currently restricted to users within PWC Yokosuka and upon request by other DoD users.

## Workstation system variables

These variables are used in all of our applications in lieu of hard-coded drive paths to enable users with different drive mappings to change the variables to suit their particular setup. Although not all variables need to be standardized, the concept of applying variables in lieu of drive mappings is an integral part of the portable GIS model.

The variables are set on the workstation as system variables versus user variables (Windows NT makes the distinction). This way, they are automatically available to any user who might log into the station.

- \$CAFMHOME. This variable is set to the location of the core mapping data. In the case of PWC Yokosuka, it is set to drive n:, which points to the *caf*m sharename of the fugu server.
- \$DWGHOME. This variable is set to the location of the documents associated with mapping features. I recommend that this be a standard. In the case of PWC Yokosuka, it is set to drive o:;

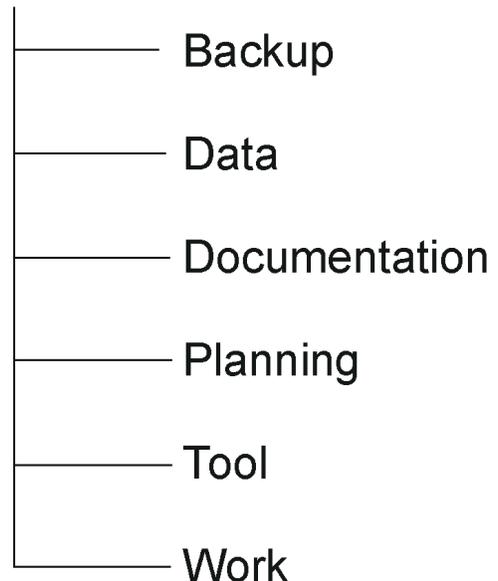
which points to the *drawings* sharename of the fugu server.

- \$CIPHOME. This variable is set to the location of the Capital Improvement Plan data. This is an example where the variable is necessary only in order for a user to run a specific application. Thus, across the board standardization is not necessary unless a site is specifically interested in running that application. In the case of PWC Yokosuka, \$CIPHOME is set to drive n:, which points to the *caf*m sharename of the fugu server.
- \$USEREXT. ArcView automatically recognizes this variable as an alternate location for extensions. ESRI suggests setting this to the \samples\ext subdirectory of ArcView where the sample extensions provided with ArcView are installed. PWC Yokosuka determined that it was more advantageous to store the custom and sample ArcView extensions in a shared location on the server. \$USEREXT is set to n:\tool\ext, which points to the *caf*m\tool\ext directory of the fugu server. Each organization will have to decide whether to store extensions on the workstation or on the server in a shared location. The portability of the GIS design is not affected by this decision.

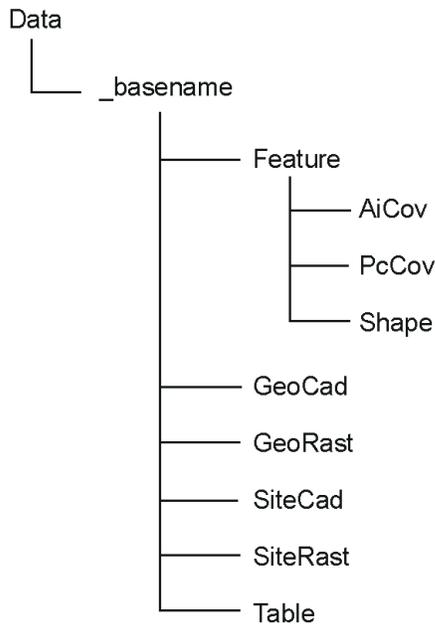
## File server directory structure (\$CAFMHOME)

As a part of setting up a GIS, decisions must be made regarding how data and application components should be stored on the file server. The portability of the GIS design is affected by some of these decisions. The \$CAFMHOME file area has a root directory structure as follows:

### \$CAFMHOME



- The Backup directory is the location where previous versions of published data are moved when the published versions are updated. Its data structure replicates \$CAFMHOME, but the TSSDS file names may be appended with version numbers.
- The Data directory is the location for the current published versions of all mapping features. Standardization of this directory structure is not absolutely critical in the portable design, but it would facilitate data consolidation and rollup at a regional level.

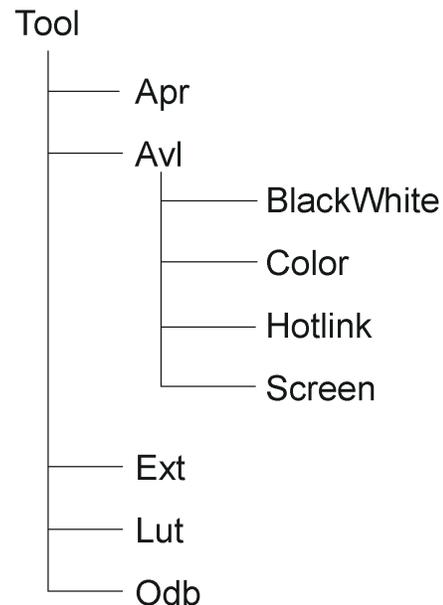


- `_basename` is an ArcView variable that identifies the common-use name of the base or installation. In the case of PWC Yokosuka, this name is set to Yokosuka, Ikego, or Japan (for regional level data).
- Feature holds data in GIS format, either Arc/Info coverage, PC coverage (created with ArcCAD), or Shapefile format (created with ArcView). These differing GIS formats are further split into subdirectories as indicated.
- GeoCad holds geographically referenced vector data in AutoCAD format.
- GeoRast holds geographically referenced raster data.
- SiteCad holds non-geographically referenced vector data in AutoCAD format. Note that this does not include documents such as floor plans, which would properly reside in the \$DWGHOME location of the file server.
- SiteRast holds non-geographically referenced raster data. Note that this does not include

documents such as scanned schematics or digital photos, which would properly reside in the \$DWGHOME location of the file server.

- Table holds tabular data (other than Oracle) that is related to GIS features for the `_basename` installation.
- The Documentation directory stores electronic copies of user manuals, training materials, procedures, etc.
- The Planning directory stores data for the Capital Improvement Plan. Its data structure replicates \$CAFMHOME, but the data placed here related strictly to proposed future development and are separated from other data for security/sensitivity reasons.
- The Tool directory stores the ArcView application components. Standardization of this structure is most critical to the portable design concept.

The directory tree below shows the components of the tool directory that relate directly to the GIS system. On PWC Yokosuka's production system, there are also directories that are used to hold CAD automation components.



- Apr is the directory where all shared ArcView project files are placed.
- Avl is used to store ArcView legend files. The Screen subdirectory is used to hold the avl files that control the screen display of the GIS features. The Black/White and Color subdirectories are used to hold avl files that are used to represent the GIS features in a manner that produces optimum results for black and white and color printing, respectively. The Hotlink subdirectory is

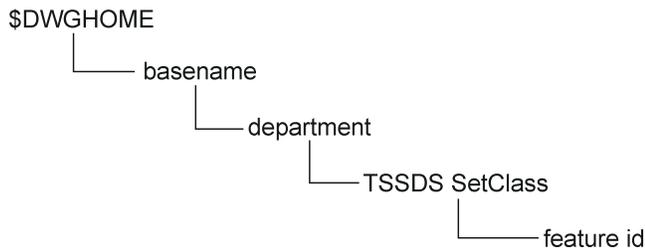
used for holding avl files that are used for representing GIS features that have associated documents that can be retrieved with the hotlink function.

- The Ext subdirectory holds the custom ArcView extensions and the useful sample extensions that are provided with ArcView. This is the directory that the \$USEREXT system variable is set to.
- The Lut directory is used to hold lookup tables of various sorts that are needed by the GIS applications. Two of these that are especially significant are the CAFM.INI file and the DATADEF.DBF, both of which are described later in this document.
- The Odb directory holds ArcView Object Database objects that are used by the GIS applications.
- The Work directory is the location where data are being updated. Periodically, these data are posted to the Data directory and previous versions are posted to the Backup directory. Its data structure replicates \$CAFMHOME.

### File server directory Structure (\$DWGHOME)

Files placed in the \$DWGHOME area of the file server become accessible via the CAFM Hotlink extension.

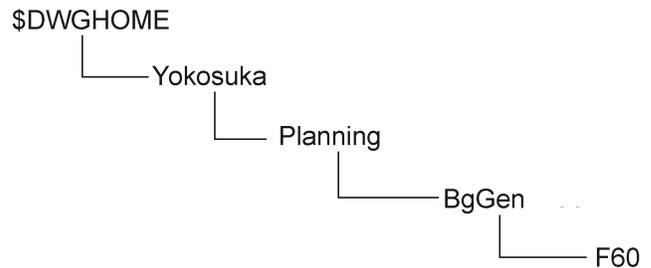
The \$DWGHOME file area has a directory structure as follows:



Where

- Basename is the common-use name of the base to which the documents pertain.
- Department is the functional group responsible for generating the documents. For PWC Yokosuka, these presently include Contracts, Engineering, Environmental, Maintenance, Planning, Resource Protection, and Utilities.
- TSSDS SetClass is derived from the group of features to which the mapping feature belongs. This is automatically derived from the ArcView theme properties.
- Feature ID is the identifier for the specific feature within the group (theme).

As an example, the directory structure used to hold Planning documents associated with Yokosuka Building F60 would be as follows:



For additional information, contact Ayman S.A. El-Swaify at 011-81-3117-34-7986 or [elswaifya@pwc-yoko.navy.mil](mailto:elswaifya@pwc-yoko.navy.mil).

# Training News

by Denise Martin and Stephen Spangler

*The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment*

The "Implementation of TSSDS" Workshop was recently held (22-25 June 1999 and 24-27 August 1999) at The CADD/GIS Technology Center in Vicksburg, MS. The workshop attracted a total of seventy-four participants from Army, Navy, Air Force, Marine Corps, and the Corps of Engineers. The primary purpose of the workshop was to provide instruction on the TSSDS data model structure, browser, and toolbox. Other topics included GIS concepts, database concepts, data resources, metadata, GIS planning, and data input and management. Hands-on lab demonstrations accompanied formal presentations by Center staff. Overall, the workshop was a resounding success and will be held again 25-27 January 2000. On-line registration is available at the Center homepage: <http://tsc.wes.army.mil>. For additional information, contact Bobby Carpenter at (601) 534-4572 or [carpenb@wes.army.mil](mailto:carpenb@wes.army.mil).

The A/E/C CADD Standards Workspace Training for System Managers was held 10-11 August 1999 at The CADD/GIS Technology Center in Vicksburg, MS. The course addressed the three major components of the MicroStation Workspace: the Workspace Generator, the Workspace itself, and the Checker. The class covered installing the Workspace on individual machines or networks, and its impact on existing office Workspaces. Basic functionality of

the Workspace was also addressed. The workshop covered the functionality limitations of the checker and how to interpret its reports. Each attendee was provided a CD-ROM containing the Generator, Workspace, Access database, and Release 1.8 of the A/E/C CADD Standard. Attendees had a strong background in MicroStation and system administration. The class was not intended for designers/engineers; a separate class for designers/engineers covering the functionality of the Workspace will be announced at a later date. The next workshop will be held October 26-27, 1999. For additional information, contact Toby Wilson at (601) 634-3604 or [wilsonj@wes.army.mil](mailto:wilsonj@wes.army.mil).

PROSPECT Course #187, GPS/GIS Applications, will be held 13-17 March 2000 and 11-15 September 2000 at The CADD/GIS Technology Center, Vicksburg, MS. The course covers GPS principles and applications; absolute and differential modes; survey applications and procedures; data collection, reduction and analysis; and GIS database development using the Spatial Data Standards (SDS). To register for the course for FY 00, you must complete a Form 1556 and fax it to (256) 895-7469. For further information, contact Diane Hollingshead at (256) 895-7449 or [Diane.Hollingshead@HND01.usace.army.mil](mailto:Diane.Hollingshead@HND01.usace.army.mil).

# CADD/GIS News

by Lee Byrne, Information Technology Laboratory

## Congratulations

The staff of The CADD/GIS Technology Center would like to congratulate Dr. N. Radhakrishnan on his new position as Director, Corporate Information and Computing Directorate, U.S. Army Research Laboratory (ARL). As Director of the Information Technology Laboratory from its beginning in 1986 until June 1999, Dr. Radhakrishnan was instrumental in transforming a 12-member Computing Center into a nationally recognized multi-disciplinary laboratory, renowned for its supercomputing capabilities and CADD/GIS expertise. He has long served the CADD/GIS community as a member of the Executive Working Group, providing leadership and direction. We thank him for his guidance and his loyalty, and we will continue to be inspired by the challenges he presented to us.

## A/E/C CADD Standard Release 1.8

Release 1.7 of the A/E/C CADD Standards is now available on the Web. The CD-ROM of Release 1.8 will be available in late September. The MicroStation Workspace will be included with the CD-ROM Release 1.8. To request a copy of the CD, contact Toby Wilson at (601) 634-3604 or [wilsonj@wes.army.mil](mailto:wilsonj@wes.army.mil).

## Welcome

A "Welcome on-Board" is extended to Mr. David Johnson, Architect, formerly from the Augusta Technical Institute, and Mr. Drew Anderson, Electrical Engineer, formerly from U.S. Army stationed in Germany. David and Drew are new staff members with The CADD/GIS Technology Center.

# Spatial Data Standards (SDS) Toolbox

by Nancy Towne, The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment

The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment has developed a 32-bit Spatial Data Standards (SDS) Toolbox application to assist users in:

- Finding information in the SDS (Browser).
- Customizing a SDS feature set (Filter Maker).
- Building a SDS compliant database (Generator).
- Examining a SDS database (Diagnostics).
- Modifying a SDS database (Upgrading).

The SDS Toolbox can be downloaded free of charge from <http://tsc.wes.army.mil/products> under Spatial Data Standards.

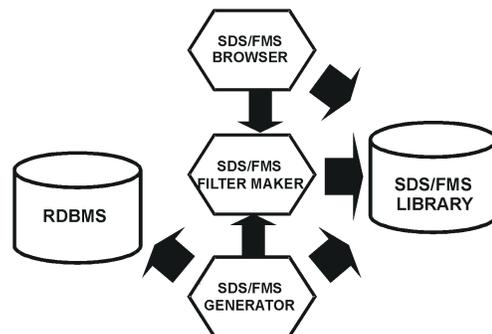
The SDS Browser 32 is the 32-bit browsing software designed specifically for Windows 95/98 and Windows NT. In addition to providing increased speed associated with the improved operating system, the Browser has been completely redesigned to increase the usefulness of finding information in an ever-expanding standard.

The Filter Maker allows individual users to build custom filters, which define a specific subset of the SDS/Facility Management Standards (FMS), tailored to individual needs. Within the SDS/FMS, a filter is coded at all levels, including Entity Set, Entity Class, Entity Type, Table, Domain, and Join. There are two critical constraints on the construction of the filter:

- If a given table is included in a filter, then all attributes in that table are included in the filter.
- If a given domain is included in a filter, then all values in that domain are included in the filter.

One of the more important characteristics of the Filter Maker software is that it examines the selected features and includes all nongraphic-related tables such that the constructed database will contain all of the tables necessary for consistent operations of the database. As an example, it will examine the entity type and, if required, include any metadata, media, coordinate, or other tables that link to the feature. In this way, it is not necessary for the user to determine which tables must be included, but rather only to select the desired entity types.

The Generator 32 creates SQL Scripts to build SDS-compliant databases based on the user-configured release of the SDS. The SQL code that is generated is compatible with ANSI, Oracle, SQL Server, and Informix Relational Database systems. The Generator also builds Tables and Attributes and populates Domains and Values. The Generator 32



offers several options in the generation of SQL code to build and populate SDS Domain Tables (both List and Range). In addition to the capability to generate for all domains, the user may select one or more single domains into a generation set, which is then generated in accordance with the designated parameters. Of special interest is the “Prior Generation” option, which builds a list of Domains to generate based on an examination of a Tables and Attributes generation file that was previously produced in the Generator. This option is useful in creating a subset of the complete domains, which has been specifically tailored to the user’s data set. One of the more useful options of the SDS Generator is Upgrades. This option generates SQL Scripts (or configures ACCESS Databases) based on the changes occurring in the SDS from Release to Release. This capability assists in the maintenance of user databases and facilitates the compliance of these databases with the SDS.

The Diagnostic tool calculates record counts of the current database to determine which tables are populated with data and which tables are currently empty. As a part of this process, it determines which of the database tables are SDS and which tables are non-SDS tables. It also checks the usage of all domain values and attributes that have been deleted. The Diagnostic checker calculates Compliance Statistics, which determine the degree to which the configuration of the database complies with the configuration of the current release of the SDS.

The Upgrading tool compares the user’s data set against the “selected” version of the SDS. This option allows users to capture all the updates that will need to be made in their current data set to become compliant with the “selected” release of the SDS.

For additional information, contact Nancy Towne at (601) 634-3181 or [townen@wes.army.mil](mailto:townen@wes.army.mil).

# Natural and Cultural Resources Forum

by Laurel Gorman, The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment



Welcome to the Natural and Cultural Resources Forum, a new column dedicated to geographical information systems (GIS) issues and information for natural and cultural resources management. Because of Federal compliance regulations and laws, natural and cultural resources play a vital role in supporting the mission of military installations, Civil Works projects, and other related Federal agencies. Our column will highlight these key activities championed by the Natural and Cultural Resources Field Working Group (FWG) and provide a forum to discuss natural and cultural resource issues with GIS. Regular news items will include Standards activities, FWG projects and accomplishments, and GIS advancements for resource management. This issue's column highlights ongoing Center and FWG initiatives on cultural resources.



**Standards Watch...**The cultural resources FWG members are tackling the reorganization and expansion for the Cultural Entity Sets in the Spatial Data Standards (SDS). Restructuring of the cultural geospatial features and their attributes will follow the legal reporting requirements to Federal and State agencies and general site survey forms. If you would like to contribute to this effort, please contact Tad Britt at [TadBritt@mvk02.usace.army.mil](mailto:TadBritt@mvk02.usace.army.mil) or Laurel Gorman at [gormanl@wes.army.mil](mailto:gormanl@wes.army.mil). Related sets of the TSSDS under review this FY include: Flora, Fauna, and Range and Training.



**FWG Meetings...**Current Chair, Mr. Arte Rahn (Army, Fort Stewart), led a successful FWG meeting that was part of the annual Joint-Field Technical Advisory Group (FTAG)/FWG/Executive Working Group (EWG) meeting held May 17-19 in Las Vegas, NV. Arte welcomed four new members: Dr. Chris Hamilton, Archeologist (Fort Benning); Mr. Ron Johnson, Preservation Architect (NAVFAC, Southern Division); Mr. Kevin Porteck, Forester (HQ Air Force Center for Environmental Excellence); and Dr. Paul Green, Cultural Resources Manager (HQ Air Combat Command). A summary of the Natural and Cultural Resources FWG projects, long- and short-term goals, ranking of FY00 proposed projects, was presented by Arte and Tad to the full assembly of EWG and FTAG members. Additional contributions to the meeting were made by Kevin, who is pursuing Federal agency partnerships with the FWG, and by Chris and Ron who recommended linking natural and cultural resources compliance with Facility

Management initiatives. Congratulations to Arte Rahn on the Center Award for "Outstanding Leadership to GIS."

Following the FWG briefings, Laurel gave an overview of the completed report *Soil Erosion Guide for Military Lands: Analysis of Erosion Models for Natural and Cultural Resources Applications*. The EWG/FTAG members gave positive feedback on the quality and practical evaluation of available soil erosion models. The sponsor members encouraged the Natural and Cultural Resources FWG to disseminate completed reports throughout DoD and other Federal agencies. The most recent meeting, hosted by Mr. Ken Bristol from Eglin Air Force Base, was held 3-5 August 1999 at the Natural Resources Branch. The meeting topics included the FY99 and FY00 FWG projects, Eglin GIS case examples, and a detailed review of the Cultural-Related Entity Sets.

**FWG Projects...**The final FY98 report, *Soil Erosion Model Guide*, is now available on the Center's Web site under the "Products" Link. The FWG is already planning the FY00 project focusing on "Digital Topological Photogrammetric Recording Standards." By establishing digital photogrammetric recordation standards, cultural and natural resources managers can meet compliance requirements in an efficient and cost-effective manner. Visit the Natural and Cultural Resources FWG at <http://tsc.wes.army.mil/contacts/groups/>, for the latest project information.



**FGDC News...**Dr. Paul Green is also participating on a new Federal Geographic Data Committee (FGDC) subgroup, the Cultural Resources Working Group, which is part of the Subcommittee on Cultural and Demographic Data. The mission of the Cultural Resources Work Group is to develop, update, and review recommendations for the collection and maintenance of spatial cultural resource data, as well as metadata for cultural resource data. Their effort will be tracked and announced as reports and findings are available.



**Web Sitings...**Here are some related links to this column's topics:

- State Historic Preservation Offices - <http://www.mindspring.com/~wheaton/statelinks.html>
- The National Heritage Network - <http://www.heritage.tnc.org/>

- Revised Section 106 Regulations: Major Changes - <http://www.achp.gov/106changes.html>
- SDS - Draft Cultural Standards - <http://fwgcom.wes.army.mil/projects/standard/tssds/Projects/cultural/cultural90/cultur90.htm>
- SDS - Draft Flora and Fauna Standards - <http://fwgcom.wes.army.mil/projects/standard/tssds/Projects/florafaua/flfa90/flfa90.htm>

- FGDC Cultural Resources Work Group - <http://www2.cr.nps.gov/gis/fgdc/CRWG.htm>

**Field User's Input** - On behalf of the Natural and Cultural Resources FWG, I invite you to contribute articles or comments to: Laurel Gorman at [gormanl@wes.army.mil](mailto:gormanl@wes.army.mil) or (601) 634-4484.

## Highlights of Joint Meeting of EWG/FTAG/FWG

by Amy Sullivan, The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment, and Lee Byrne, Information Technology Laboratory

The new name for The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment was one of the open issues discussed at the joint meeting of the Executive Working Group (EWG), Field Technical Advisory Group (FTAG), and Field Working Group (FWG) held 17-21 May 1999 in Las Vegas, NV. Other items considered were FWG memberships, "Strawman" Development Criteria for the FY00 Work Plan, FTAG Chair and Vice Chairmanship, and the possibility of combining the FTAG/EWG. During the meeting, attendees received the 3rd Quarter Project Status Report and an update on the FY2000 Symposium planning. The FWGs conducted their bi-annual meeting and ranked their top 10 projects for FY00, with presentations to the EWG on 19 May.

During the meeting, Mr. Harold Smith, Chief of The CADD/GIS Technology Center, presented a Center overview, the Third Quarter Project Status Report, a briefing on the National CADD Standards, and an update on the next generation of the CAD2 Procurement contract for Information Technology, hardware, and services. In other presentations, Mr. Randy Lierly briefed the group on the FY00 Work Plan Schedule, and Mr. Deke Smith presented the Business and Marketing Plan 2000. Mr. Bobby Bean briefed the group on Facility Management, concentrating on three core areas: Asset Management, Land Management, and Civil Works. It was agreed to focus on inventory data needed for operational requirements but to first satisfy the legal reporting requirements for assets.

Awards were presented to Messrs. Arte Rahn, Sam Bass, Jay Hart, Terry Thiesen, and Ron Santos for their outstanding leadership and dedication to CADD and GIS. Dr. N. Radhakrishnan, former Director of the Information Technology Laboratory, presented Mr. Deke Smith with the "Partners in Progress" award. Harold and Randy also welcomed numerous new members.

In other actions, the FTAG/EWG agreed that the FY00 Project Category Funding target distribution percentages would be as follows: Core Mission - 35%; Mission Related - 40%; and Mission Support - 25%.

Consideration was given to combining the FTAG and EWG to avoid duplication of briefings. Although the FTAG and EWG work closely together, they have separate roles, with the FTAG working with the field groups and the EWG acting as staff for the ESG. The groups decided to streamline their roles and reduce their number of meetings to two per fiscal year, with additional meetings conducted via video teleconferencing.

Other issues covered included reorganization of the Center's Web site, possible name change of Tri-Service Spatial Data Standards to Facilities Spatial Data Standards, subsequently changed to The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment, and the FWG's lists of their top 10 recommended projects.

For additional information, contact Amy Sullivan at [sulliva@wes.army.mil](mailto:sulliva@wes.army.mil).

Latest Products Available on the Center's Web Site		
Product	URL	POC and E-Mail Address
Center Calendar - Staff Schedule and Events	<a href="http://tsc.wes.army.mil/calendar/calendar.asp">http://tsc.wes.army.mil/calendar/calendar.asp</a>	Chris Crocker <i>crockec2@wes.army.mil</i>
Center Video	<a href="http://tsc.wes.army.mil/news/">http://tsc.wes.army.mil/news/</a>	Denise Martin <i>martind1@wes.army.mil</i>
SDS/TSFMS Release 1.80	<a href="http://tsc.wes.army.mil/products/tssds-tsfmts/">http://tsc.wes.army.mil/products/tssds-tsfmts/</a>	Bobby Carpenter <i>carpenb@wes.army.mil</i>
A/E/C CADD Standards, Rel. 1.7	<a href="http://tsc.wes.army.mil/products/standards/aec/intro.asp">http://tsc.wes.army.mil/products/standards/aec/intro.asp</a>	Toby Wilson <i>wilsonj@wes.army.mil</i>
CADD Details, Rel. 2.0	<a href="http://tsc.wes.army.mil/products/cadd_details/">http://tsc.wes.army.mil/products/cadd_details/</a>	Stephen Spangler <i>spangls@wes.army.mil</i>
CADD/GIS Bulletin	<a href="http://tsc.wes.army.mil/news/bulletins/default.asp">http://tsc.wes.army.mil/news/bulletins/default.asp</a>	Laurel Gorman <i>gormanl@wes.army.mil</i>
SEMMS, Rel. 1.2.02	<a href="http://tsc.wes.army.mil/products/semms/semms.asp">http://tsc.wes.army.mil/products/semms/semms.asp</a>	Dr. Danuskodi <i>danushv@wes.army.mil</i>
EBS	<a href="http://tsn.wes.army.mil">http://tsn.wes.army.mil</a>	Elias Arredondo <i>arredoe@wes.army.mil</i>

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