



**CONTENTS**

**GOVERNMENT RELATIONS** .....3  
**IEA**.....4  
**MEMBERSHIP** .....5  
**TECHNICAL GROUPS** .....5

**HUMAN FACTORS**.....5  
**JCEDM**.....6  
**HFES DIGITAL LIBRARY** .....6  
**FINANCIAL REPORT** .....7

## Improving Response to the Signs of Impending Heart Attacks

*By Pamela Savage-Knepshield, HFES Bulletin Features Editor, and Mary Carol Day*

Most heart attacks start slowly and are accompanied by discomfort, mild pain, an “odd sensation,” or even a “funny feeling.” Often, those affected are not sure what is wrong and wait too long before getting help. Eliminating uncertainty, conveying severity, and providing ample time to seek medical attention could save a cardiac patient’s life and prevent heart damage; however, the challenges of developing a device to address these goals raises several significant human factors/ergonomics issues. These include how to reliably and effectively alert patients of an impending heart attack and how to ensure they correctly perceive and interpret such an alert.

The following excerpts are from an interview with HFES Fellow Mary Carol Day, in which she describes the AngelMed Guardian® System and the HF/E support that it provides to ensure that its users know whether to call 9-1-1 or their physician when the system triggers an alert.

**What is the AngelMed Guardian® System?**

The AngelMed Guardian system, developed by Angel Medical Systems (<http://www.angel-med.com>), is an implantable cardiac-monitoring and -alerting system that is designed to warn cardiac patients of potentially life-threatening heart conditions. The Guardian system is currently in an initial feasibility study in the United States.

There are three major components of the Guardian system: the Implantable Medical Device (IMD), the External Device (EXD), and the Programmer.

The IMD is implanted under the skin below the left collarbone, similar to a pacemaker. It continuously monitors the heart’s electrical activity (that is, the electrocardiogram). If it detects a specific abnormality that indicates a possible heart attack, it vibrates in a particular sequential pattern to warn the patient to get immediate help. This alarm is called the Emergency alarm. In addition, the IMD vibrates using a different pattern, called the See Doctor alert, if the patient should see a doctor within the next couple of days to check on the IMD’s functioning.

The EXD is a pager-sized external alarm device that the patient is instructed to keep close by at all times. When the IMD alarms, it communicates with the EXD, and the EXD provides an auditory alarm (beeps) and a visual alarm (flashing red or yellow

light) that are redundant with the vibratory alarm provided by the IMD. Also, the patient uses the EXD to turn off the alarms.

The Programmer is a laptop used by medical staff to customize the parameters of the IMD for each patient and to retrieve and store data from the IMD.

**How did you become involved in work on the AngelMed Guardian system?**

As you may know, the Food and Drug Administration is now strongly encouraging – and often requiring – usability engineering for medical devices in order to decrease the fairly high rate of use errors and their negative impact on patient health. Early in the design of the Guardian system, AngelMed met with the FDA to discuss its primary features. The FDA encouraged AngelMed to get human factors expertise, which was considered especially important because the alarms had to be well designed to ensure that patients could identify and correctly respond to the alarms. AngelMed took the FDA’s advice seriously, and I was hired within a month as the eighth employee of the company. We now have 2 human factors professionals in a company of about 30 people.

**What challenges did you face providing HF/E support for the design of the AngelMed Guardian system?**

There were two unique challenges for me personally. First, I had not previously worked in the medical field and needed to rapidly understand the guidelines and expectations for human factors work in the medical device industry. I started from the FDA’s Web site on human factors (<http://www.fda.gov/cdrh/humanfactors>), which provided both FDA guidance documents and references to other standards. I was delighted to find that the processes recommended by the FDA and international standards were textbook descriptions of human factors involvement throughout a product’s lifecycle. But my initial excitement was followed by the sobering realization that there was no way I could do *all* of this.

The second challenge was starting a human factors program from scratch on a new product that used a new alarm modality – that is, sequential patterns of vibratory pulses. This challenge was both organizational and technical. Within the company, there were no existing human factors processes, and there had been no human factors input to initial product design. Also, there were no

## *Improving Response to the Signs of Impending Heart Attacks*

(continued from page 1)

organizational expectations about what I should do beyond design of the alarms, and there was a general concern that there would not be enough work for a full-time HF/E professional. Identifying and prioritizing the human factors work and then educating the organization and institutionalizing the processes were top priorities.

The technical challenge concerned the design of sequential vibratory alarm patterns. At the time, I could find very little research in this area.

### **What were the most challenging HF/E issues that you encountered during product design and development?**

#### **How were they resolved?**

Probably the most challenging human factors issue was the design of the two vibratory alarms – the Emergency alarm and the See Doctor alert. These alarms needed to be distinctly different from each other, have easily identifiable temporal patterns, be easily learned and remembered, and have perceptual properties that correspond to their meaning.

My first step, of course, was to conduct a literature search. Although I found research on basic vibration perception (for example, psychophysical studies of vibration thresholds), I found very little on the perception of sequential patterns of vibration and none on subcutaneous vibration perception. However, the auditory warnings literature identified auditory parameters that affected perceived urgency. It seemed reasonable that some of the same parameters would influence perceived urgency in the vibratory modality – for instance, speed, number, and density.

Based on the information from the literature search, I proposed several human factors studies to define the sequential patterns for the Emergency alarm and See Doctor alert. Feedback from the FDA told us about IEC 60601-1-8, an international standard on alarm systems for medical electrical equipment. This document provided specific information for the characteristics of high-priority, medium-priority, and low-priority *auditory* alarms. My goal then became modifying the temporal parameters for the high-priority (Emergency) and low-priority (See Doctor) alarms to make them appropriate for the vibratory modality.

In the meantime, I identified a consultant with expertise in vibration perception – Roger Cholewiak, formerly head of the Princeton Cutaneous Communication Lab – and he has provided expert advice and even equipment on a continuing basis.

### **Briefly walk us through the research methods that you used to ensure that the AngelMed Guardian's vibratory alarms were easy to distinguish.**

I conducted several experimental studies. The first of these was designed to identify the best temporal characteristics for the vibratory alarms and to ensure that the magnitude of the vibration was appropriate. In these studies, participants were presented with Emergency alarms and See Doctor alerts with different temporal characteristics (that is, different pulse durations and interpulse intervals) and with alarms of different strengths. Participants provided multiple ratings and judgments, such as strength ratings, strength preferences, urgency ratings, and temporal pattern preferences. In one of the studies, I also compared two different auditory alarm frequencies. It was exciting to find that similar characteristics affect perceived urgency for both vibratory and auditory alarms.

Data from these studies were used to define temporal characteristics for the two alarm types. I then conducted a learning and memory study, in which participants were trained on the alarms in the same way that a patient would be trained. Accuracy of alarm identification was then assessed about 10 minutes after training and then six weeks after training.

### **What do you feel was your most notable impact on the project?**

Clearly, the design of the vibratory alarm patterns was critical. However, equally important has been identifying, prioritizing, and addressing the most important of the numerous human factors issues for each of our three components (IMD, EXD, and Programmer) and continuously trying to keep the user's needs in focus in an organization in which novel technology is essential for the product's success.

### **Based on lessons learned, what advice would you give to the human factors/ergonomics community?**


The medical field is a great place to be! It provides challenging work that is inherently meaningful. Also, there is increasing recognition of the need for human factors expertise in the design of medical products and processes. The National Academy of Sciences' Institute of Medicine estimates that between 44,000 and 98,000 Americans die each year from preventable medical errors.

For a human factors specialist moving into the medical field, I'd offer the following advice:

- Obtain a solid background in human capabilities and limitations and in experimental and human factors methodologies.
- Learn about methodologies that are especially important in the medical fields, such as approaches to risk analysis.
- Refer to the relevant standards and guidelines.
- Identify and learn domain-specific knowledge that is required to do a good job.
- Consult experts on human factors topics for which you're not an expert. Human factors colleagues, as well as other psychology and engineering professionals, are a great resource.

*Mary Carol Day is director of User Interface Systems at Angel Medical Systems. Previously she was president of M. C. Day Consulting and a technical manager at AT&T Bell Laboratories. She is a Fellow of HFES and a voting member of the AAMI Human Factors Engineering Standards Committee.*





**Human Factors  
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# Bulletin

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# HFES Government Relations: What, Why, and How?

By William C. Howell, Chair, Government Relations Committee

At its fall 2005 meeting, the HFES Executive Council decided that the Society should beef up its involvement in government affairs to inform “national policy on matters in which HF/E has a contribution and/or interest.”

I was asked to form a standing committee to this end. I agreed, on the condition that the tasking be changed from *appointing a committee* to mounting an *in-depth analysis* of the government affairs activities in which it is desirable and feasible for HFES to engage. My reasoning was that the standing committee route had been pursued several times before with notable lack of success, largely because neither the functions nor the committee’s role had ever been clearly articulated.

I was not eager to reprise the ever-popular “appoint a committee and hope for the best” tune. My conditions were accepted, and in collaboration with a small, savvy advisory group that included HFES Executive Director Lynn Strother, the next year and a half were spent analyzing and formulating recommendations that were ultimately approved by Council. We did recommend a standing committee but, unlike its predecessors, one with limited and clearly defined responsibilities.

The new Government Relations Committee (GRC) was appointed – Jerry Krueger, Laurel Allender, David Kobus, Susan Meadows, Douglas Gillan, and the executive director *ex officio* – and has busied itself over the past year developing procedures while concurrently trying them out. Because gathering and coordinating information is central to any viable government relations effort, the GRC has focused a lot of attention on how best to do this.

The entire HFES membership is a potential source of information, so we felt it was time to fill you in and enlist your support and participation in this endeavor. The present article is thus an introduction to what we hope will be a continuing dialogue with Society members.

## Brief History

The fact that the U.S. federal government played a major role in the creation and evolution of human factors/ergonomics is common knowledge. The convergence of design and behavioral science disciplines under the exigency of war, sustained thereafter largely through direct and indirect support from the nation’s defense establishment, has morphed into a recognized field that contributes to and is funded by myriad public and private institutions.

The once rather simple relationship between government and the field (i.e., federal support of mostly defense R&D) has become increasingly complex – encompassing legislation, jurisprudence, industry standards, and government regulations – applied in virtually every setting in which human activity is involved (military systems, transportation, health care, manufacturing, city planning, communications, and countless others).

As a consequence, there are now many routes through which government policy can affect HF/E, and vice versa. Some, such as regulations governing workplace or aviation safety, are open and obvious. Others, such as neglect of HF/E considerations in appropriations bills or the setting of agency priorities, are often known only to a few “insiders” who are either directly affected or privy to the opaque processes by which public policy sausage is made.

Although from the beginning there have been individuals and isolated groups within the HF/E community who have been active in government affairs, their focus has typically been limited to issues directly affecting their immediate surroundings. Military contractors scrutinize defense appropriations bills, human factors specialists employed by the civilian agencies fight for their share of the agency’s budget, highway safety researchers push their agenda with congressional oversight committees or Department of Transportation agencies, and so on.

Representatives of the field have also become increasingly visible on government advisory bodies, and an entire committee of the prestigious National Research Council – the Committee on Human Factors – is dedicated to HF/E issues. But engagement by the field as a whole was never seriously considered until it surfaced within HFES as an issue – and initially a rather controversial one – several decades ago. The opposition weakened over time, and by the mid-1980s the majority view favored some sort of corporate advocacy effort, but opinions still differed on how big it should be and what form it should take.

The Society joined an advocacy consortium, the Federation of Behavioral, Psychological, and Cognitive Sciences (FBPCS), but withdrew shortly thereafter due to complaints that FBPCS didn’t adequately represent HFES interests. Later it rejoined, has been an active participant ever since, and over the years has worked with several consortia representing other HF/E interest areas.

Despite its growing involvement in government affairs, however, HFES has had difficulty finding an effective way to institutionalize its efforts. For one thing, the leaders (presidents and Executive Councils) who raised the issue typically lacked the necessary expertise in government affairs to make informed decisions, and for another, a lot was being accomplished quietly through informal means without the benefit of any such structure. Nevertheless, the feeling that the Society should “do more,” without any sense of what that might realistically entail, persisted and led to the abortive standing committee efforts noted earlier. By contrast, the present GRC was appointed only after the groundwork was laid through which its mission and role within the HFES decision structure could be clearly defined.

## New GRC’s Mission and Role

The GRC’s first task, therefore, was to review and classify government relations activities in which HFES has been or is currently engaged and to consider where authority for engaging and determining responsibility for executing them should reside. Its second task was to determine how the GRC could best fit into this picture.

Each of these tasks resulted in a formal document submitted to Council for endorsement that was subsequently adopted into the

*continued on next page*

HFES Operating Rules. Corporate government relations activities fall into four general categories: (a) interorganizational relationships, (b) information gathering, (c) reacting (which includes five subcategories), and (d) initiating action proactively. The GRC's role in these activities is primarily that of *supporting* and *advising* the authorized HFES decision makers (especially the president, Council, domain leaders, technical groups, and the executive director), not actually making or implementing corporate decisions.

Foremost among the GRC functions is the establishment and oversight of processes for gathering, evaluating, integrating, and disseminating information with which to advise decisions on what policy issues the Society should address and how to address them. In the past, issues came to the Society's attention mainly through its interorganizational relationships (e.g., requests from FBPCS to "sign on" to collective actions) or the chance interaction of a concerned member with some HFES official.

The intent of the GRC initiative is to replace happenstance with systematization in the identification and handling of such policy matters.

### Building the System

By virtue of representing the field's major interest areas, the HFES technical groups (TGs) constitute the obvious place to start in building a comprehensive intelligence network. Therefore, we are in the process of establishing a working relationship with all TGs through which to keep tabs on developments in their respective HF/E domains.

Through a designated point of contact in each TG, the GRC will compile and periodically update a file of all issues and topics with policy implications. Each entry will consist of a one-page description of the issue/topic, along with the TG's assessment of its urgency and any recommendations it wishes to offer for corporate handling. From this compendium, the GRC will select the most pressing and/or promising targets for action and forward its recommendations to the appropriate HFES decision agency (as now specified in the Operating Rules). Depending on the action involved, TGs also may be called upon to identify experts, prepare background information, or participate in other ways in executing a game plan.

In addition to enabling the Society to invest its limited resources wisely by engaging targets of highest priority, this compendium will permit more informed, timely responses to the unanticipated time-sensitive opportunities from external sources that have become fairly common in recent years.

After it's up and running, the TG network will also provide a convenient route through which individual members can bring their issues to the Society's attention. A TG's backing, of course, would typically strengthen one's case.

However, this in no way precludes direct input. We recognize that some issues may fall between the cracks in the TG network, and time constraints or other circumstances might also favor the direct route. Members are welcome to discuss any such issues with me (william.c.howell@asu.edu) or HFES Executive Director Lynn Strother (lynn@hfes.org).

### Where's the Beef?

To this point, government relations "issues" and "actions" have been discussed only in the abstract, and I realize that it is difficult to appreciate how HFES figures into the policy picture without concrete examples. Space limitations preclude doing justice to such illustrations here, so this will be the focus of a future article. As a preview, however, I'll close with two recent examples.

An HFES-sponsored briefing on human factors in driver safety was held in the U.S. House of Representatives in November 2007 and was reported by GRC member Jerry Krueger in the January 2008 issue of the *HFES Bulletin*.

In December 2007, a letter from the executive director to the Speaker of the Colorado State Senate, written in consultation with the GRC, provided HF/E contact and reference information for a hearing on voting machine decertification. The contacts were made, and as a consequence the legislature had the benefit of the human factors perspective in its deliberations.

The GRC is currently working within the Society structure toward compiling a set of position papers on "hot topics" such as these to inform policy in a variety of government venues.

*William C. (Bill) Howell is retired but holds adjunct faculty appointments at Arizona State University (Polytechnic Campus) and Rice University and serves on several national advisory boards.* ☒

## IEA

# Nominations Sought for IEA/Liberty Mutual Medal

*By William S. Marras, Chair, HFES IEA Representatives Committee*

The International Ergonomics Association (IEA) is accepting entries for the IEA/Liberty Mutual Medal. The award recognizes outstanding original research leading to the reduction of work-related injuries and/or the advancement of theory, understanding, and development of occupational safety research.

The medal has been restructured for 2008, replacing the previous IEA/Liberty Mutual Prize and IEA/Liberty Mutual Medal. The new medal will be awarded annually to the author of an original paper that meets criteria for innovation and impact. This is the most prestigious award of its kind in the field of occupational ergonomics and safety and carries a stipend of \$10,000. The winner's work will be presented at the IEA's Council meeting, to be held this summer in Reykjavík, Iceland.

The deadline for entries is *May 31, 2008*. Applicants will be notified of the results by mid-July. Announcement of the award winner will be made public on August 31, 2008.

Additional information on the IEA/Liberty Mutual Medal can be found at [http://www.iea.cc/browse.php?contID=libertymutual\\_prize](http://www.iea.cc/browse.php?contID=libertymutual_prize). For a list of frequently asked questions about the IEA/Liberty Mutual Medal, please visit <http://www.iea.cc/browse.php?contID=faq>. ☒

## Share the Benefits of HFES Membership

You know the value of your HFES membership, but do your friends and colleagues who have an interest in human factors/ergonomics? They too can benefit from the complimentary subscriptions to our regular publications and discounts on books, proceedings, standards, and annual meeting registration. In addition, all HFES members are entitled to the following:

- free access to the HFES Digital Library-Archive
- members-only access to the HFES Career Center for résumé posting and job searching (<http://www.hfes.org/web/CareerCenter/Career.aspx>)
- 20% off software, workload assessment tools, data analysis tools, and other products from the Human Systems Information Analysis Center (formerly CSERIAC)
- 15% off Taylor & Francis books and subscriptions to *Ergonomics*
- 15% off John Wiley & Sons books and other resources
- 15% off selected books from Academic Press
- discounts on car rentals from Alamo and Hertz

Let your colleagues know that they can apply online at <http://hfes.org>, and credit card transactions are secure.

Spread the word: HFES membership is an excellent value and an invaluable resource for anyone working or interested in the HF/E field! ☒

## TECHNICAL GROUPS

### Call for Nominations and Judges: User-Centered Design Award

By Dianne McMullin and Stan Caplan, PDTG Award Cochairs

The Product Design Technical Group (PDTG) welcomes your submissions for the 7th Annual User-Centered Product Design Award. The award will emphasize both product design and methods used to specify and achieve the design. Emphasis will be placed on innovative and user-centered approaches to human factors and industrial design.

Consideration is limited to products, software, or systems that are purchased for use in the home, in the workplace, or while mobile. They include consumer, commercial, and medical products but exclude military equipment or systems. The product or system being nominated must be operational and capable of being marketed with no more than minimal changes. Products already on the market for more than three years will not be considered.

Nominations may be submitted for your own work or that of others. At least one team member who contributed significantly to the project must be a member of HFES, but membership in the

PDTG is not required. Nominations should be submitted in electronic form by a human factors professional. Detailed submission requirements, including the submission format, are shown on the PDTG Web site, <http://pdtg.hfes.org>. More information concerning PDTG and previous User-Centered Product Design Award winners can also be found on the Web site.

The deadline for submitting nominations is *April 25, 2008*. Nominations should be submitted electronically to Dianne McMullin at [dianne.l.mcmullin@boeing.com](mailto:dianne.l.mcmullin@boeing.com).

The winning product/system will be recognized at the 2008 HFES Annual Meeting, and the awardees will be asked to present a talk on the product and methodology. Awardees will also be expected to submit a paper to *Ergonomics in Design* within two months of the meeting.

#### Call for Judges

An award selection committee consisting of a panel of judges drawn from the PDTG membership will evaluate the submissions. Judges may award multiple winners or a combination of winners and honorable mentions. Judging will be done by a predetermined, systematic process and will take place in June.

Please contact Stan Caplan at [scaplan@usabilityassociates.com](mailto:scaplan@usabilityassociates.com) for more information or to volunteer for the award selection committee. ☒

## HUMAN FACTORS

### Human Factors Editor Candidates Sought

The term of the current editor of *Human Factors* will expire at the end of 2008, and HFES is seeking candidates for the position.

The *Human Factors* editor's term is four years (2009–2012), with the possibility of two additional two-year terms. The incoming editor will be asked to work with the outgoing editor in the latter part of 2008, so on each end of the tenure there will be a few months of overlap to enable a smooth transition.

Desirable candidates should have prior experience working with authors of scientific research, including a demonstrated ability to communicate sometimes unwelcome news with consideration, tact, and diplomacy.

Administrative support for the manuscript review process is provided in the HFES central office in Santa Monica. The Society's publications staff also performs production editing of the journal. Questions about these functions may be directed to Communications Director Lois Smith (310/394-1811, [lois@hfes.org](mailto:lois@hfes.org)).

If you are interested in being considered for the *Human Factors* editorship, please log on to the journal page of the HFES Web site (<http://www.hfes.org/web/pubpages/hfeditorselection.html>), where you will find further instructions. Please forward a current CV, letter of interest, responses to the questions posted at the Web site, and two professional or personal recommendation letters to Lois Smith by *April 30, 2008*. The HFES Publications Committee will conduct telephone interviews with qualified candidates in May and make a recommendation to the Executive Council in September. ☒

## JCEDM Special Section

By Mica R. Endsley, Editor-in-Chief

We invite papers for a special section of the *Journal of Cognitive Engineering and Decision Making*, "Developing and Understanding Computational Models of Macrocognition."

A growing number of cognitive modelers and computer scientists are directing their efforts toward understanding and representing macrocognitive processes. Consequently, the literature across a wide variety of disciplines – human factors, cognitive psychology, human behavior representation, artificial intelligence (AI), operations research, and human-computer interaction, to name only a few – is now teeming with discussions of novel computational architectures.

Though many might see this as an interesting departure from the application of AI techniques to classic experimental paradigms in cognitive psychology, this turn also raises a host of interesting issues. For instance, research in macrocognition embraces phenomena and methods that might seem abstract or imprecise to those coming from a more traditional background in computational cognitive modeling. Conversely, to the macrocognitive researcher, computational cognitive models are likely to be seen as couched in too finely grained a scale – exactly at the "micro" level to which the macrocognitive researcher is reacting. There is no reason to assume that these micro and macro views are incommensurable, but a good deal of work needs to be done to show how they are best reconciled.

The goal of this special section of JCEDM is to begin this work by soliciting manuscripts from researchers in a range of disciplines who are developing computational representations of macrocognitive processes directly or are contributing to this body of work by development of theory, experimentation, or practice. To encourage the ongoing exchange of ideas across disciplines, our aim with this special section will not be to justify or reaffirm the importance of a macrocognitive perspective, nor will it be to establish priorities among various computational architectures. Rather, taking macrocognition as a starting point, we seek manuscripts that detail how various aspects of the theory have begun to find expression in computational architectures.

Suggested paper topics include the following:

- presentations of new and innovative architectures representing specific macrocognitive processes (e.g., recognitional decision making, actionable models of situation awareness, problem detection) and their application to real-world problems;
- discussion of the correspondence between conceptual and computational models and of the relationship between macro- and microcognitive models of cognition;
- methods for measuring and evaluating computational models of macrocognitive processes; and
- methods for validating both conceptual and computational models of macrocognition.

Prepare manuscripts according to the JCEDM guidelines, which follow the *Publication Manual of the American Psychological*

*Association* (5th ed.). Manuscripts should not exceed 25 pages in length and should be submitted electronically to cedm.journal@satechnologies.com, with the subject line, "Submission for Special Issue on Computational Models of Macrocognition."

The closing date for submissions is *June 27, 2008*. If you have any questions, please contact Special Section Coeditors Walter Warwick (wwarwick@alionscience.com), Laurel Allender (lallende@arl.army.mil), or John Yen (jyen@ist.psu.edu). ☒

### HFES DIGITAL LIBRARY

## Back Issues Sought

The HFES Communications Department is seeking a few missing issues and volumes for the Digital Library-Archive. If you have any of the following issues, please contact Communications Director Lois Smith at lois@hfes.org or call 310/394-1811. Thank you!

#### Human Factors

- Volume 24 (1982), Numbers 2 and 6
- Volume 25 (1983), Numbers 1, 2, and 3
- Volume 26 (1984), Number 5

#### HFES Annual Meeting Proceedings

- 1972, 1973, 1976–1981



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**150 West University Blvd.**  
**Melbourne, FL 32901-6975**

*Florida Institute of Technology is an equal opportunity employer committed to excellence through diversity.*

# 2006 Financial Report

The Human Factors and Ergonomics Society's 2006 audited financial report, received by Secretary-Treasurer Valerie J. Gawron in December 2007, was prepared by Castillo & Associates, an accountancy corporation. The firm audited the following statement of assets and liabilities – cash basis – of the Human Factors and Ergonomics Society (a nonprofit organization) at December 31, 2006, and the related statements of revenues and expenses – cash basis, and of changes in fund balance – cash basis for the 12 months then ended. These financial statements are the responsibility of the Human Factors and Ergonomics Society's management. The firm's responsibility is to express an opinion on these financial statements based on its audit.

In addition to the regular Society funds, the firm reviewed the A. Chapanis Award Funds. These funds had a balance of \$22,742 at January 1, 2006; at December 31, 2006 the balance was \$25,161.

The firm conducted its audit in accordance with generally accepted auditing standards. Those standards require that the firm plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. The firm believes that its audit provides a reasonable basis for its opinion.

As described in Note 1, these financial statements were prepared on the basis of cash receipts and disbursements, which is a comprehensive basis of accounting other than generally accepted accounting principles.

In the firm's opinion, the financial statements referred to above present fairly, in all material respects, the assets, liabilities, and fund balances of the Human Factors and Ergonomics Society as of December 31, 2006, and its revenue, expenses, and the changes in its fund balances for the twelve months then ended, in conformity with the basis of accounting described in Note 1.

**Statement of Assets and Liabilities – Cash Basis  
December 31, 2006**

Assets	
<b>Cash on deposit</b>	
Bank of America . . . . .	\$742,097
Total Cash on Deposit . . . . .	<u>\$742,097</u>
<b>Investments</b>	
Vanguard STAR Fund, at cost (Note 7) . . . . .	\$170,379
<b>Total assets</b> . . . . .	<b>\$912,476</b>

**Liabilities and Fund Balance**

Reserve for current payable (Note 3) . . . . .	\$ 12,000
Due to TG . . . . .	50,000
Payroll liabilities . . . . .	73
Total liabilities . . . . .	62,073
Fund balance . . . . .	850,403
<b>Total liabilities and fund balance</b> . . . . .	<b>\$912,476</b>

**Statement of Changes in Fund Balance – Cash Basis  
for the 12 Months Ended December 31, 2006**

Balance - January 1, 2006 . . . . .	\$671,159
Less: excess of expenses over revenues . . . . .	(179,244)
<b>Balance - December 31, 2006</b> . . . . .	<b>\$850,403</b>

**Statement of Revenues and Expenses – Cash Basis  
for the 12 Months Ended December 31, 2006**

Revenues	
Individual memberships . . . . .	\$ 674,496
Sustaining memberships . . . . .	6,000
Publications . . . . .	430,541
HFES Institute . . . . .	18,404
Annual Meeting . . . . .	337,234
Placement . . . . .	81,588
Net unrealized gains on investments . . . . .	7,371
Miscellaneous . . . . .	32,401
<b>Total revenues</b> . . . . .	<b>\$1,588,035</b>

Expenses	
<b>Publication Expenses:</b>	
<i>HFES Bulletin</i> . . . . .	\$ 38,705
<i>Human Factors</i> . . . . .	124,585
<i>Directory and Yearbook</i> . . . . .	42,616
<i>Ergonomics in Design</i> . . . . .	59,936
Books . . . . .	12,606
Proceedings . . . . .	809
Other publication expense . . . . .	17,667
<b>Total publication expense</b> . . . . .	<b>\$299,890</b>

<b>Member Services:</b>	
Mailings expenses . . . . .	\$ 19,331
Placement Service . . . . .	36,251
Committee and other (Note 4) . . . . .	140,643
Annual Meeting . . . . .	93,560
Member Services . . . . .	39,923
Computer, Web site, & related expenses . . . . .	37,633
Interorganizational . . . . .	26,394
<b>Total Member Services</b> . . . . .	<b>\$393,735</b>

<b>General and Administrative Expense:</b>	
Salaries and related costs . . . . .	\$566,925
Office expense . . . . .	140,586
Accounting and legal . . . . .	7,655
<b>Total General and Administrative Expense</b> . . . . .	<b>\$715,166</b>

**Total Expenses** . . . . . **\$1,408,791**

**Excess of revenues over expenses** . . . . . **\$179,244**

**Note 1 – Summary of Significant Accounting Policies**

This summary of significant accounting policies of Human Factors and Ergonomics Society, Inc. (the organization) is presented to assist in understanding the organization's financial statements. The financial statements and notes are representations of the organization who is responsible for their integrity and objectivity.

*Activity.* The organization is a nonprofit entity. The organization is an interdisciplinary organization of professional workers concerned with the role of humans in complex systems, the design of equipment and facilities for human use, and the development of environments for comfort and safety. The membership is composed of psychologists, engineers, physiologists, and other scientists from the United States and around the world.

Human Factors and Ergonomics Society, Inc. promotes research and the application of human factors in

the design, development, use, and evaluation of machines, systems, environments, and devices.

*Basis of accounting.* The organization's policy is to prepare its financial statements on the cash basis of accounting; consequently, certain revenues are recognized when received rather than when earned, and certain expenses and purchases of assets are recognized when cash is disbursed rather than when the obligation is incurred.

**Note 2 – Property and Equipment**

It is the organization's policy to expense all capital assets purchased throughout the year.

**Note 3 – Reserve for Current Payable**

This represents a segregation of surplus for bills due at December 31, 2006. This represents \$12,000 for miscellaneous payables.

**Note 4 – Committee and Other**

50th Anniversary . . . . .	\$16,573
IEA Representative . . . . .	4,705
Awards . . . . .	3,324
Media Relations . . . . .	1,307
Outreach Advisory . . . . .	42,496
Student Affairs . . . . .	4,874
Miscellaneous . . . . .	7,516
HFES Institute . . . . .	27,780
Executive Council . . . . .	<u>32,068</u>
	<b>\$140,643</b>

**Note 5 – Concentrations of Credit Risk**

The organization maintains its cash balances at several financial institutions located in Santa Monica, California. Accounts at each institution are insured by the Federal Deposit Insurance Corporation up to \$100,000. At December 31, 2006, there was an uninsured cash balance of \$642,097.

**Note 6 – Pension Plan**

The organization has a tax-deferred annuity plan using Teachers Insurance and Annuity Association-College Retirement Equities Fund (TIAA-CREF) Annuities that meet the requirements of section 403(b)(1) of the Internal Revenue Code.

Benefits are provided by individually insured contracts issued by TIAA-CREF to each participant. The guaranteed rate basis for premiums applied to TIAA Retirement Annuity contracts is in accordance with the terms of the participant's individual annuity contract.


The plan is a defined contribution plan, which covers all full-time employees with two years of service. The plan calls for contributions of 10% of compensation for participants for the first three years in the plan and 12.5% of compensation thereafter.

**Note 7 – Investments**

The organization has the following mutual fund with the Vanguard Group.

	Cost	Fair Market Value
9,136,539 shares of Vanguard STAR Fund	\$163,008	\$170,379

**Note 8 – Income Tax Status**

The organization is exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code. However, income from certain activities not directly related to the organization's tax-exempt purpose is subject to taxation as unrelated business income. For 2006, the organization had no tax on unrelated business income. In addition, the organization qualifies for the charitable contribution deduction under Section 170(b)(1)(A) and has been classified as an organization other than a private foundation under Section 509(a)(2). 

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- *Reviews of Human Factors and Ergonomics* (with current-year subscription)

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<i>Proceedings</i>	1993-2004	1980-2005	1972-2006
<i>Reviews of HF/E</i>	NA	NA	2006

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\*Members: Choose either the print or online version of the current year's issues of *Human Factors* and *Ergonomics in Design* at no charge as part of your member benefits package. The current year's issues of *Journal of Cognitive Engineering and Decision Making*, *Annual Meeting Proceedings*, and *Reviews of Human Factors and Ergonomics* may be purchased at special member rates.

## FLASH!

**2008 HFES Officer Elections** – Nomination ballots for HFES officers and Executive Council members will be mailed March 28. Completed ballots are due at the HFES Central Office on April 23.

**Midyear Meeting** – The Executive Council Midyear Meeting will take place April 25-27 at Loews Hotel, Philadelphia, PA.

**Update Your Membership Information** – You can update your member record by logging in at <http://hfes.org> or by notifying Member Services ([membership@hfes.org](mailto:membership@hfes.org), 310/394-1811, fax 310/394-2410).

Opinions expressed in BULLETIN articles are those of the authors and should not be considered as expressions of official policy by the Human Factors and Ergonomics Society.



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