

# Davis

## NEWSLETTER

September 2002, Issue 11

### KDX-III ADVANCED IR DESIGN

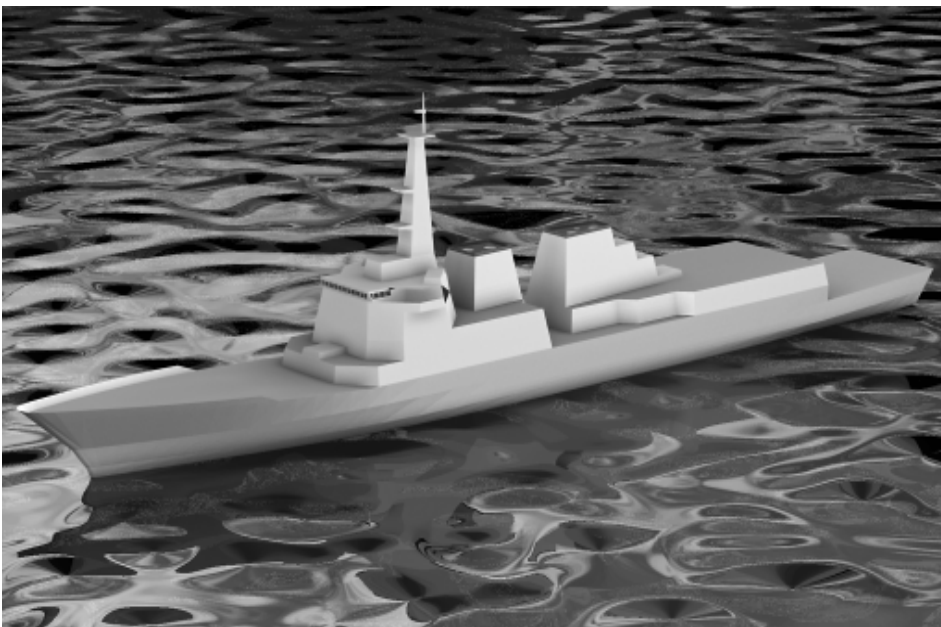
The ROK Navy's new Aegis class destroyer, the KDX-III, will be the first ship to apply DAVIS' Advanced IR Signature Management methodology. The method makes use of a high definition computer model of the ship (ShipIR, see page 6) that is updated throughout the entire design, construction, and sea trial process.

The model allows for predictions of the ship's IR signature and detection range under any desired operational or environmental condition, and provides the capability to assess the impacts of design changes before they are made. This methodology hinges on the availability of a hi-fidelity IR signature simulation software, in this case DAVIS' commercial software NTCS.

Hyundai Heavy Industries (HHI) has contracted DAVIS to manage the IR Signature of the KDX-III. The preliminary design of the ship will be complete sometime in Fall 2002, at which point the general arrangement of the ship will have been frozen, including the selection of IR signature targets.

The signature target selection process is based on the use of NTCS to establish the Best and Worst Possible Signature (BPS/WPS) the ship can have over its entire operating range. The application of IR signature suppression (IRSS) allows the ship to have a signature target anywhere between the BPS and WPS. By

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The New Korean AEGIS Class Destroyer - KDX-III

### Focus

We have continued to expand in the international marketplace, and we now have active customers in more than twenty countries.

We believe that to stay at the front of our field we must constantly improve our technology and to this end we have initiated a comprehensive R&D program at Queen's University (see article on page 2). We expect this four year program will provide both short and long term benefits.

One of the factors in focusing our IRSS R&D effort is the diversity of the applications we are encountering on aircraft and helicopters. These applications usually push our technology to the limits, and we are finding there is an increased demand due to a greater threat.

Along the same line, we are also developing a second version of the ASG system, to better meet smaller applications for the same technology (see article on page 3).

We are positive that our emphasis on R&D will show an early benefit to our customers, and hasten the adoption of our technology.

Rolly Davis, P.Eng.  
President

## DAVIS TEAMS UP WITH QUEEN'S UNIVERSITY, NSERC AND DND

Davis Engineering has entered into a four year research agreement with the Department of Mechanical Engineering at Queen's University, DND and NSERC to study the performance of various kinds of specialized exhaust components for gas turbines.

The overall objective of the program is to keep DAVIS at the leading edge

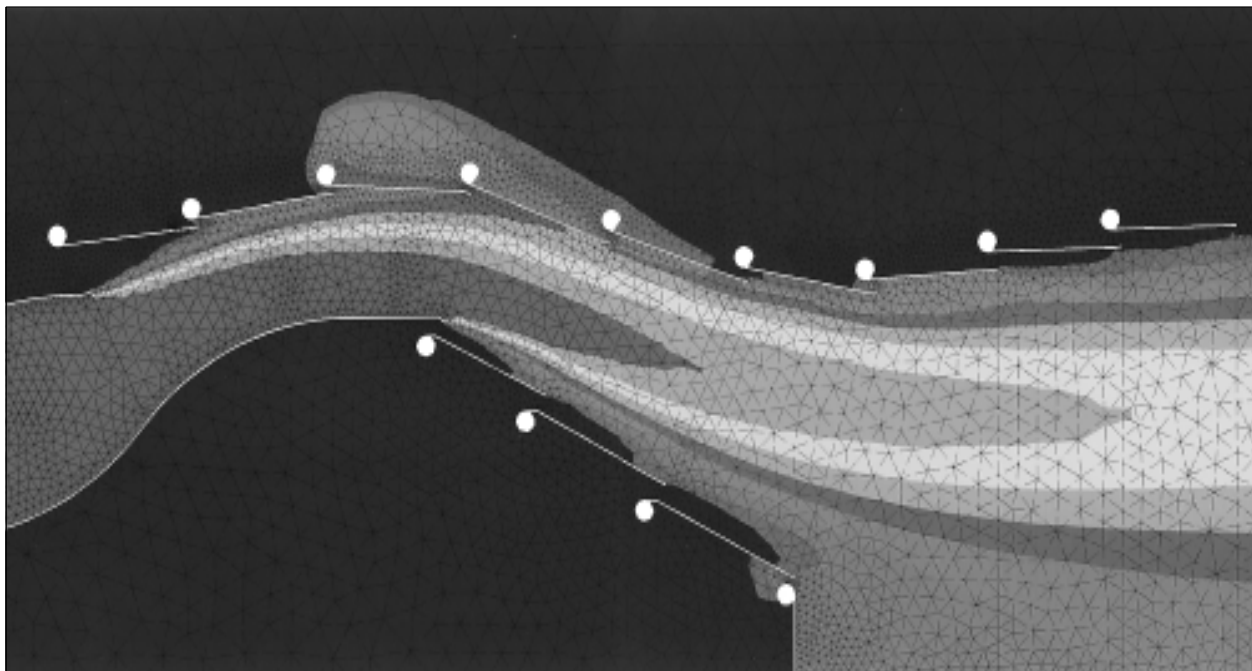
of infrared suppression device development and related technologies. This will be done by making sure that DAVIS engineers have the best information available in this technology area. The research will provide valuable fundamental design and performance data to DAVIS engineers to help in the design and manufacture of specialized exhaust components for gas

turbines, including ejectors, mixing nozzles, film and effusion cooled ducts, heat exchangers and passive mixing devices.

The detailed objectives of the research program are to:

- i) develop a better understanding of gas turbine exhaust component operating environments

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CFD Analysis of Flow Around a Centre-Body

### KDX-III Advanced IR Design

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balancing the treatment of internal IR sources (engine exhausts, deck equipment) with the treatment of the external signature (skin), an efficient IR design is ensured. The use of this

advanced method for IR signature management has allowed HHI and the ROK Navy to clearly understand their ship's IR signature, and what is achievable using today's IRSS

technology. As a result, the KDX-III will be designed with an IR signature far superior to ships of its class, including its U.S. contemporary the Arleigh Burke class destroyer (DDG).

## THOMAS DAVIS

We are pleased to announce that Thomas E. Davis has accepted the position of Vice President, Marketing at DAVIS.

Tom graduated from Queen's University in Engineering Physics in 1989, and then joined DAVIS as a control system engineer for two years before returning to Queen's to complete a MSc in Electrical Engineering in 1993. He then joined Newbridge Networks and started his career in the system



Thomas Davis

design of networking equipment. Managerial roles were in the fields of performance analysis, and then in architecture, first in switching and routing systems and most recently in application specific integrated circuits.

With responsibility for marketing at DAVIS, Tom will provide a focus for many of the functions which have previously been carried out by senior management of the company.

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## ACTIVE SHAFT GROUNDING UPDATE

### Arleigh-Burke Class (USN)

In January of this year DAVIS was awarded contracts for the advance procurement of six ship sets of ASG for the Arleigh-Burke class US navy frigates DDG-102 through 107. Three ship sets will go to each of Bath Iron Works and Northrop Grumman Ship Systems to be installed in ships being built over the next several years.

### USN Retrofit Program

The ASG system has been specified for the USS Ticonderoga (CG-47) Cruiser Conversion Program and the USS Arleigh Burke (DDG-51) Retrofit.

### FFG Class (RAN)

In April DAVIS was awarded a follow on contract from ADI Limited

in Australia for ASG spare components. ADI is the defense contractor supplying the Australian navy FFG frigate upgrade program. Last October DAVIS delivered six ship sets of ASG to Australia for this program.

### New ASG Development

In an ongoing effort to improve its product line and in order to meet market demands for a more economical, lower current ASG unit, DAVIS has embarked on a design program for a new, reduced current ASG unit.

This new unit has performance specifications similar to the 200 Amp version but with a reduced output current capability of 50 Amps.

This unit is designed to meet the requirements of ships with lower

current demand. Due to its lower current capability this new unit is physically smaller and lighter than the existing unit. It operates from 120 VAC single phase instead of three phase and draws 400 watts maximum.

As a result of these changes, the 50 Amp unit will be more economical. Like the 200 Amp version, it will be tested to various military shock, vibration, EMC, and environmental standards.

DAVIS will continue to manufacture and support the current 200 Amp Active Shaft Grounding unit for larger ships with higher current demand, for those clients who want the additional military qualifications, and for those with a substantial investment in 200 Amp logistics.

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## DAVIS Teams with Queen's University, NSERC and DND

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- ii) develop a better understanding of the internal and external aerothermodynamics of specialized exhaust components
- iii) develop improved analysis and design methodologies.

MSc and PhD research projects will be defined to study these various issues. Since the work will be done by graduate students, a secondary objective of the program is to provide advanced training to engineers to support Canadian industry.

Meeting the above objectives will mean that DAVIS can design and manufacture devices that are more compact, with fewer parts, with lower weight, with improved efficiencies and lower losses. Improved design

and development methods will mean DAVIS can bring new products to the market faster. This all adds up to keeping DAVIS at the top of its field.

DAVIS, NSERC and DND will contribute equally a total of almost \$1 million over four years. This money will be used to support one full time research engineer and a number of MSc and PhD graduate students.

The work will be supervised by Professor A. M. Birk of Queen's Department of Mechanical Engineering. Prof. Birk was employed by DAVIS from 1983 to 1986 when he joined the Mechanical Engineering Department at Queen's. While at DAVIS he was the lead engineer on IR suppression technology development for early programs such as TRUMP, CPF, SA'AR 5,

CFLH and NTCS. He has had a very close relationship with DAVIS since joining Queen's and has been involved with most of DAVIS' IR suppression work.

The program is off to a good start since its official start-up in January 2002. A full time research engineer has been hired and six graduate students have been recruited. A new cold flow wind tunnel has been constructed and a new hot gas wind tunnel is under construction at DAVIS for installation at Queen's.

The students will be actively taking courses starting in September and rig testing should begin around the same time. Students should be ready to present initial research results in the spring of 2003.



The First KDX-II, "Choongmoogong Yi Soon Shin" is Christened at Daewoo Shipyard

# Davis

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Carol Anderson

## EMPLOYEE PROFILE CAROL ANDERSON, HEAD OF ADMINISTRATION

Carol joined DAVIS in 1985, and has augmented her skills every year, so that she is now responsible for all facets of our administration, as well as filling the role of Executive Assistant to the President.

In 1985, she met her future husband Max, an engineer at

DAVIS, and they have become avid rock climbers and windsurfers, sailing at Cape Hatteras in the winter, and the Hood River gorge in July.

Their daughter Tara graduated from Algonquin College with Honors in 2002 and also made the Dean's List.

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## BRIEF UPDATES

- There were three ShipIR courses given at the DAVIS Facility this year.
  - April 2002: Korea/KRISO
  - May 2002: Companies from South Africa, USA and Sweden
  - June 2002: Government representatives from Australia, Germany and USA.
- Rolly Davis presented a paper titled "Developing an IR Signature Specification for Military Platforms Using Modern Simulation Techniques" by Jim Thompson (DAVIS) at the annual SMI "Pursuit of Stealth" Conference in London on March 11, 2002.
- South Korea KDX-II Frigate: The first of class of the 4,200 ton destroyer was christened on May 22, 2002 (see picture on page 4). DAVIS has delivered three shipsets of IRSS equipment for KDX-II.
- DCN International: On July 26-27, 2002, DAVIS International successfully completed contract negotiations with DCNI for IRSS equipment for a new frigate being built for export.
- Royal Norwegian Air Force AB 412 Helicopters: Final delivery of eight shipsets of the FCT IR suppressor was made in July 2002. These suppressors were operational in Kosovo. We anticipate another contract later this year for an additional fourteen shipsets.
- DAVIS has recently won a competitive bid with Northrop Grumman (Ingalls) to perform Computerized Fluid Dynamic (CFD) studies on the new LHD-8; this requirement arose out of the installation of the GE LM2500+ in that ship.
- Astute Program (July 2002): DAVIS will supply our ASG technology for the new Astute Submarine Program for the Royal Navy.
- Rolly Davis presented a paper titled "IR Signature Suppression Exhaust Gas Cooling by Water Injection" by Bruce Hiscoke (DAVIS) at the MECON 2002 in Hamburg on September 3, 2002.
- Royal Navy Type-45 Frigate: DAVIS has been selected by BAE Systems to supply equipment for the first six ships of the Type-45 Program. This program is expected to reach twelve ships when completed.

## SHIPIR/NTCS UPDATE

DAVIS is pleased to announce that a new version of ShipIR/NTCS (v3.0), the NATO-standard in naval ship infrared target, threat and countermeasure simulator, is now available. This new version significantly increases the rendering speed and accuracy on the PC platform by adding new functionality to emulate color-index mode in RGB mode (using 1-D texture mapping). This has eliminated the previous 8-bit limitation in accuracy of the Windows NT version.

The new version has been tested in combination with a graphics card from NVIDIA Corporation (GeForce4 Ti4400) with 128 Mb of graphics memory, to demonstrate an equivalent 12-bit accuracy to the SGI. The added ability to use both hardware acceleration and direct rendering in RGB mode (under Windows NT) has resulted in model-processing and rendering speeds that now either match or exceed the SGI. This represents a significant cost savings in the hardware required to run the model – from about \$30,000 US for an SGI Octane2 to about \$3,000 US for a high-end PC.

As a consequence, our standard pricing has been changed to reflect a single price for all versions of the code (contact [ntcs@davis-eng.com](mailto:ntcs@davis-eng.com) for more information). The release of ShipIR/NTCS (v3.0) also includes a new Linux version, which can further reduce the platform cost since both the operating system and X-Server software are free-of-charge.

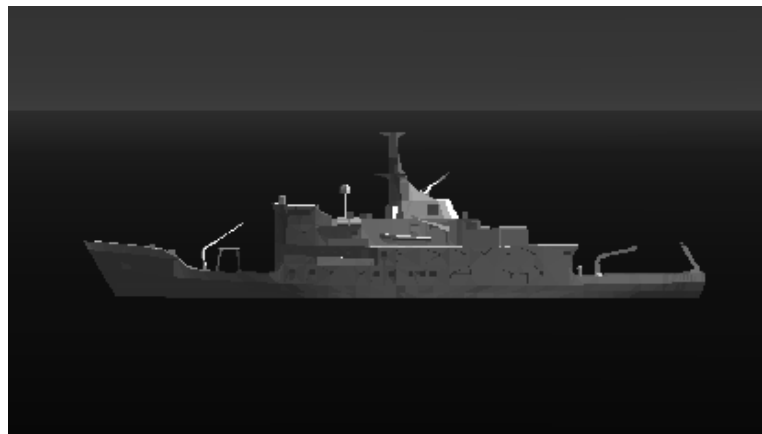
As mentioned in our previous Newsletter, a NATO-sponsored Ship Infrared Model Validation Experiment (SIMVEX) was held last year in Halifax, Canada to generate a

high-quality radiometric database of ship signatures for an unclassified ship. An acoustic research vessel from the Canadian Navy (CNAV Quest) was selected as the candidate for this IR ship trial. A ShipIR model was constructed jointly by the US Naval Research Laboratory (US-NRL) and DAVIS for use in collaborative efforts by each NATO country to further validate the ShipIR code against their IR measurements.

Preliminary results were presented at the NATO TG.16 meeting held last April at TNO-FEL in The Hague (see side graphs). The data set is proving useful to both the accreditation process and the further development of the code by helping to identify areas that can still benefit from further research. Some of these areas include wind convection, cloud modeling, and background clutter prediction.



Measured Mid-Wave IR Image of Quest



NTCS Predicted Mid-Wave IR Image of Quest

For further information please contact:

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