Davis NEWSLETTER

January 2000, Issue 9

FILM COOLED TAILPIPE FOR KOSOVO AND BOSNIA

In June, 1999, Canadian Forces' CH-146 Griffons (Bell 412CF) began flying missions into Kosovo in support of the multi-national peacekeeping force KFOR. The high threat posed by the proliferation of shoulder-fired IR seeking missiles in this region led to the requirement for infrared signature suppression on the Griffons. The Film Cooled Tailpipe (FCT) IRSS, developed by DAVIS for the Bell 212/412 aircraft, was installed on the helicopters as part of their self-protection suite.

Due to the tight schedule imposed on Canadian Forces personnel, little notice was given for the fabrication of the FCTs. DAVIS was awarded the contract in December, 1998 and delivered the first hardware for a fitment test at Bell Helicopter, Mirabel, on June 1, 1999. In total, 13 shipsets were delivered under this contract by October, 1999. The heavy flight schedule of the Kosovo helicopter detachment gave the devices a demanding run-in. As of November, 1999 the lead IRSS devices had logged approximately 200 flight hours.

The FCT concept was developed originally under several R and D contracts with Canadian DND to be a mission kit installation, with no modifications to the airframe and no

continued on page 2

Canadian Forces CH-146 Griffons in Kosovo

FOCUS

As we embark on the year 2000, DAVIS marks its 25th Anniversary, and it is appropriate to reflect on the past, but more interestingly, on the future.

During our first 25 years, the company has evolved from a diversified consultancy, serving a primarily Canadian market, to a specialized defence contractor serving the international market. We have found a market niche in the stealth field, and our products are the most technologically advanced available.

Today, we are recognized as world leaders in the fields of Infrared and Electromagnetic signatures, and signature management will continue to be an area of high priority.

Our future growth will be in the international marketplace, and our challenge will be to bring improved technology to that larger market efficiently and effectively. The explosion of the Internet provides an opportunity to achieve this.

It is an exciting time for DAVIS, and we look forward to the upcoming developments.

Rolly Davis, P.Eng.
President

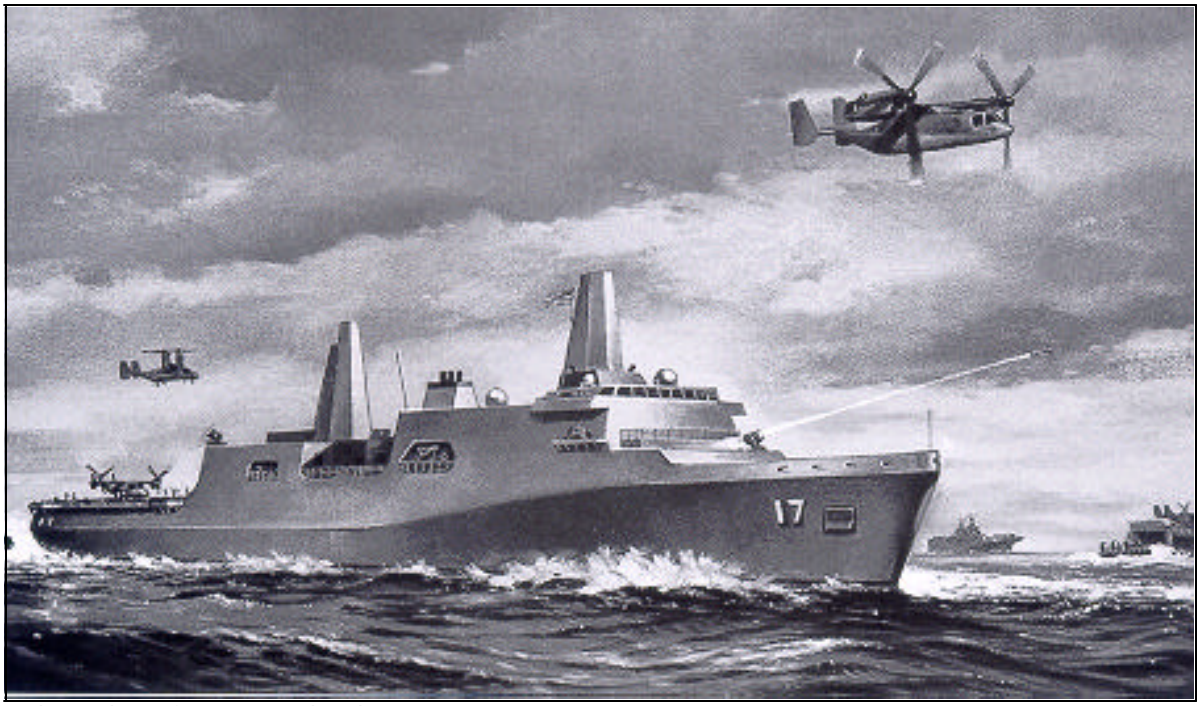
STEALTH EQUIPMENT FOR THE USN SAN ANTONIO CLASS

Davis Engineering has recently been awarded contracts by Avondale Shipyards for the supply of stealth equipment for the new San Antonio class amphibious landing platform dock.

The lead vessel, designated the LPD-17, will benefit from reduced signatures in both the Infrared (IR) and Electromagnetic (EM) spectrums. Reduced signatures will decrease the susceptibility of the ship to IR seeking missiles and Extra Low Frequency (ELF) mines.

The underwater ELF signature will be virtually eliminated by the DAVIS Active Shaft Grounding system, which will also provide reduced corrosion due to cathodic protection system currents.

The infrared signature will be reduced by the fitting of DAVIS IR suppressors to the propulsion and electric generator engine exhaust systems.



Artist's View of San Antonio Class LPD

FCT for Kosovo and Bosnia
continued from page 1

special mounting hardware required. It provides visible hot metal and exhaust plume cooling over all view angles except directly down the tailpipe. Power loss on the engine is roughly 2%, and the particle separator performance is not affected by this installation. This was demonstrated in a dramatic fashion by a bird ingestion that occurred without damage to either the suppressor or engine components. DAVIS has optimized the design to maximize maintainability, and met the commercial requirements of FAR 29 wherever possible.


Doug VanDam

EMPLOYEE PROFILE

DOUG VANDAM, MANAGER OF MECHANICAL ENGINEERING

Doug joined DAVIS as a junior engineer in 1986, shortly after graduating from Queen's University in Applied Science (Mechanical).

Doug steadily increased his responsibilities at DAVIS until he assumed his current position in 1997. Since that time he has contributed to significant growth in his area as well as the company. He is also increasingly responsible for overall corporate management.

Originally from Kenora in Northern Ontario, Doug loves the outdoor life, and tries to get away on fishing trips whenever time and his young family (Ann and three kids, Nick, Kevin and Caroline) permit.

PC - SHIPIR / NTCS NOW AVAILABLE

DAVIS is pleased to announce that we are now able to offer a fully compatible PC-version of SHIPIR/NTCS.

The same models are used in both versions, so the only difference lies in the particular implementation of OSF/Motif and 3D-OpenGL on both platforms. Since these libraries are closely tied to hardware capabilities, there are some noticeable differences in precision and speed when rendering and analysing NTCS images using PC-NTCS.

The reductions in accuracy are due to limitations in the current PC graphics hardware (only 8-bit colour maps are supported whereas 12-bit colour maps are supported on most low-level SGI's).

The reduction in speed is largely due to the lack of "direct rendering" in X-servers on the PC when operated in colour index mode (a software limitation we hope will be eliminated eventually).

Both the SGI and the PC versions use the same underlying models and data, and thus the PC version is an interesting and inexpensive option to demonstrate and test the IR simulation capabilities of SHIPIR/NTCS.

The PC version can be effectively used as a second seat of NTCS, for example inputting the target model geometry, setting up the scenario analysis, and pre-processing the targets and backgrounds prior to their use on the SGI. In fact, newer and faster PC's can out perform the SGI on raw floating-point math.

A number of current NTCS users already have a PC version of NTCS.

BRIEF UPDATES

- Rolly Davis will present a paper titled "Lowering Warship Signatures (IR and EMF)" at the Pursuit of Stealth Conference in London, England on February 21-22, 2000.
- David Vaitekunas will be giving a training course for SHIPIR/NTCS to Centre Technique des Systèmes Navales (CTSN) in Toulon, France during the week of February 7, 2000.
- DAVIS recently completed wind tunnel and configuration scale model tests for new IR suppressor concepts for the C-130 Hercules aircraft. R & D will continue in 2000.
- The first shipset of IR suppressors for the Spanish F-100 was delivered to Bazan in December 1999. The second to fourth shipsets are scheduled for November 2000 - 2002.
- Rolly Davis presented a paper on IR technology to the MEKO User Workshop sponsored by the German Frigate Consortium in Lisbon in October 1999.

CEPYC WAVE GENERATOR COMMISSIONED

In September of 1999, DAVIS completed the commissioning of a large wave generator for the Centro de Estudios de Puertos y Costas (CEPYC), a division of the Spanish government located in Madrid.

DAVIS was awarded the contract for the construction of the wave generator for this new flume which measures 90 m x 3.6 m x 6 m. The mean water depth is variable from from 2.2 m to 4.4 m plus a tidal level change of ± 0.25 m. The flume also has current generation capability. The 6-m high, flapper-type wave board has a mass of 6,000 kg and swings through ±14 degrees. It can make regular and irregular waves with heights up to 1.5 m.

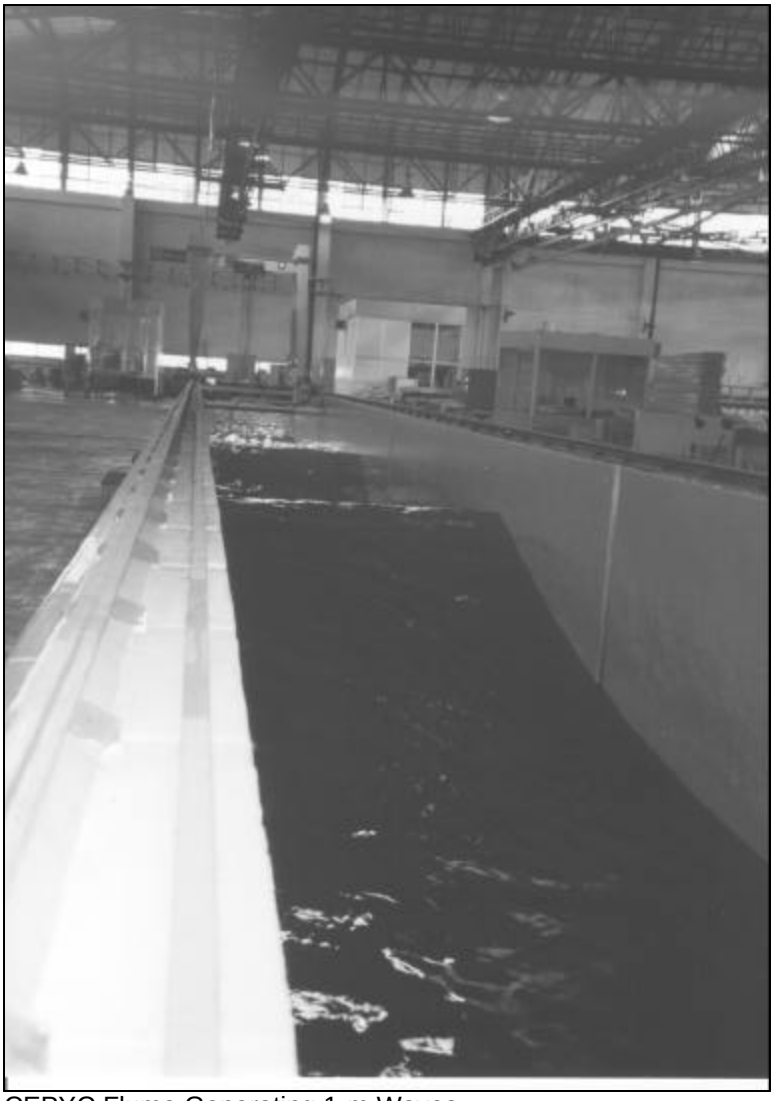
DAVIS incorporated some novel features in this particular wave generator. The wave generator is of the dry-back, hydraulically driven design. The main actuator, which has a bore diameter of 17 cm, can develop 200 kN of force to drive the wave board. The wave generator has a high pressure nitrogen balancing system to compensate the hydrostatic force of the mean water level so that the main hydraulic actuator applies symmetric forces on both extension and retraction. Two 15 cm diameter hydraulic jacks on either side of the main actuator transmit this force to the wave board.

The bottom and side sliding seals are pressurized by air to maintain a tight seal to maintain leakage at 20 L per minute. Water behind the board is collected in a sump and pumped under the board back into the bottom of the flume.

The Canadian Hydraulics Centre supplied the GEDAP software including Active Wave Absorption (AWA) and automatic wave height correction for tidal variations, both in real time. AWA removes any wave components reflected back to the wave generator from either the model under test or the opposite end of the flume.

Installation staff were Steve Reinisch, Andre Lacroix, and Ian Jeffrey of DAVIS, Dan Pelletier of CHC, and Will Campbell of AE Hydraulics.

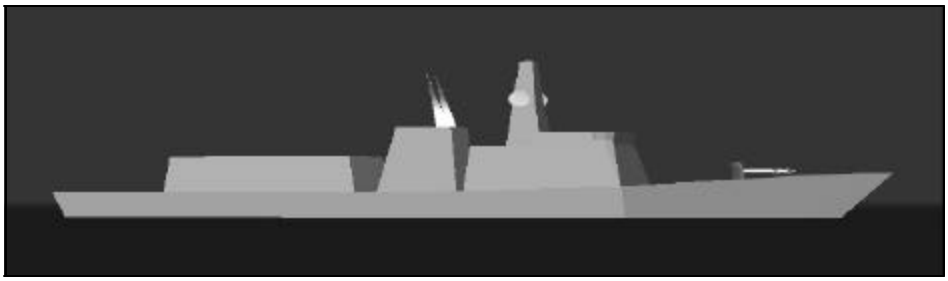
This is the second wave generator supplied to CEPYC. In 1993 DAVIS commissioned a 72-segment wave generator for coastal studies at the same facility.



CEPYC Flume Generating 1-m Waves

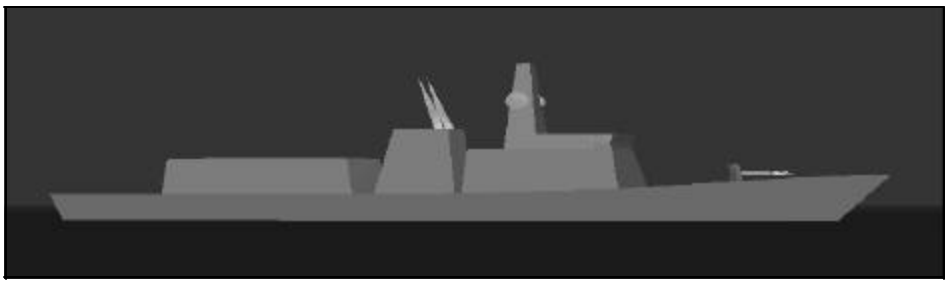
TECHNOLOGICAL ADVANCEMENTS

Advances in IR guided seeker technology are making it very difficult for a warship to avoid lock. Consequently, the IR Signature Management of both today's modern and future warships has dramatically increased in scope and complexity. DAVIS continues to remain the world leader in this field by making technological advancements which equal or exceed that of the threat.



No Suppression

The engine exhaust continues to be the largest "hot spot" on a ship and therefore this area has received the most attention. DAVIS is currently developing advanced high performance IR suppressors which provide resultant plume temperatures below 150°C. These systems are being developed for both vertical and horizontal exhaust arrangements.



Modern Exhaust Supression and Simple Active Hull Cooling System

They feature options such as sea water injection and variable geometry which not only provide exceptional performance, but also impose no losses on the engine when the ship is operating in non-threat situations.

Sun heated ship surfaces present a large IR signature in both the 3-5 and the 8-12 micron wave band. DAVIS has developed an active hull cooling system which acts to blend the ship into its background, ultimately rendering the ship invisible to an IR seeker.

Advanced Suppression Systems Controlled by OSM

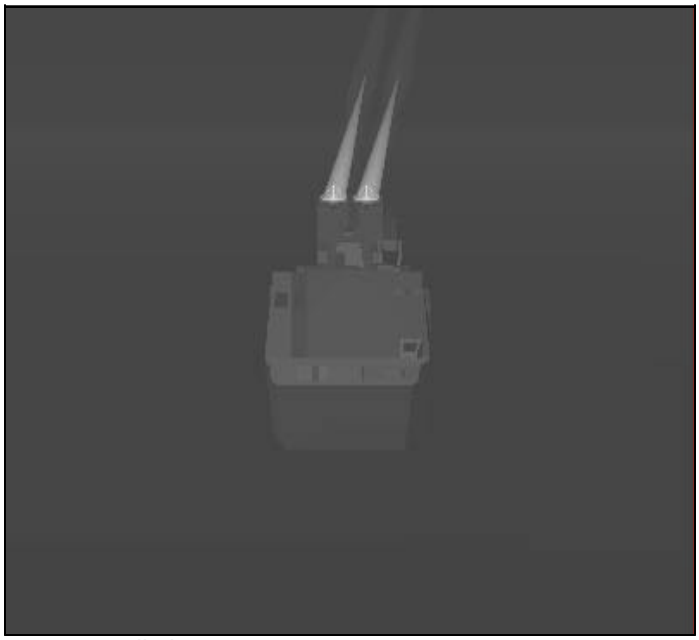
This system incorporates a series of water spray nozzles optimally located on the ship to water film cool the heated surfaces. The nozzles are configured in zones and each zone is controlled to reduce the potential for over cooling.

Many improvements have been made to the DAVIS Naval Threat and Countermeasures Simulator (SHIPIR/NTCS) (see pages three and six).

Development has continued on the Onboard Signature Manager (OSM), which provides a real time feedback of a ship's actual signature as well as a means of controlling the IRSS options discussed above, to ensure both a minimal and variable signature as operational conditions dictate.

The advancements made in each of these areas will ensure that DAVIS remains at the forefront of technology in the IR Signature Management field. The accompanying figure shows NTCS generated images of a ship with varying levels of IRSS treatment.

IR Trial Measurement



NTCS Prediction

NTCS / SHIPIR NTCS UPDATE

The naval ship infrared target, threat and countermeasure simulator (SHIPIR/NTCS) has now gained worldwide acceptance as a standard tool for predicting maritime infrared target and background signatures. Developed by DAVIS in the early 1990's for the Canadian Department of National Defence, in conjunction with the Defence Research Establishment Valcartier (DREV), it has now been officially adopted by the U.S. Naval Research Laboratory (NRL) for use in the DDG-51 Flight IIA (Live Fire Test and Evaluation) and DD-21 (21st Century Destroyer) programs.

There are now a total of 26 site licenses worldwide, with 10 in the participating nations of NATO TG.06 (Task Group on Maritime Infrared Target and Background Signatures, Measurement and Characterization), 9 in other various government organizations, and 7 licenses in commercial naval warship design offices. We anticipate the user community to grow as the demand for infrared stealth technology increases, and the science to predict its IR signature matures.

With recent improvements to the background and target models, we have seen a large number of full-ship comparisons being made between SHIPIR and various IR trial measurements. Such countries as Canada, USA, Netherlands, Germany, and Italy have taken a lead role in the validation of SHIPIR/NTCS. It is estimated that over 8 existing ships have been modeled and validated using IR trial data.

One benefit of these studies is the standardization of methods and procedures used to both measure and simulate the infrared signature of naval vessels. We expect these results to impact on the future specification and qualification of IR stealth technologies.

As SHIPIR/NTCS is accredited for use in new ship programs, and the models of existing ships are validated, we expect the next phase of development to focus on the IR threat and the countermeasures used to defend against them. With the launch of smart decoys, such as the NULKA and Multicloud decoy systems by Sippican Inc., we expect SHIPIR/NTCS to become an integral part of any new EW tactical development program.

For further information please contact:
W.R. Davis Engineering Limited, 1260 Old Innes Road, Ottawa, Ontario, Canada, K1B 3V3
Tel: (613) 748-5500, Fax: (613) 748-3972, E-mail Address: marketing@davis-eng.on.ca