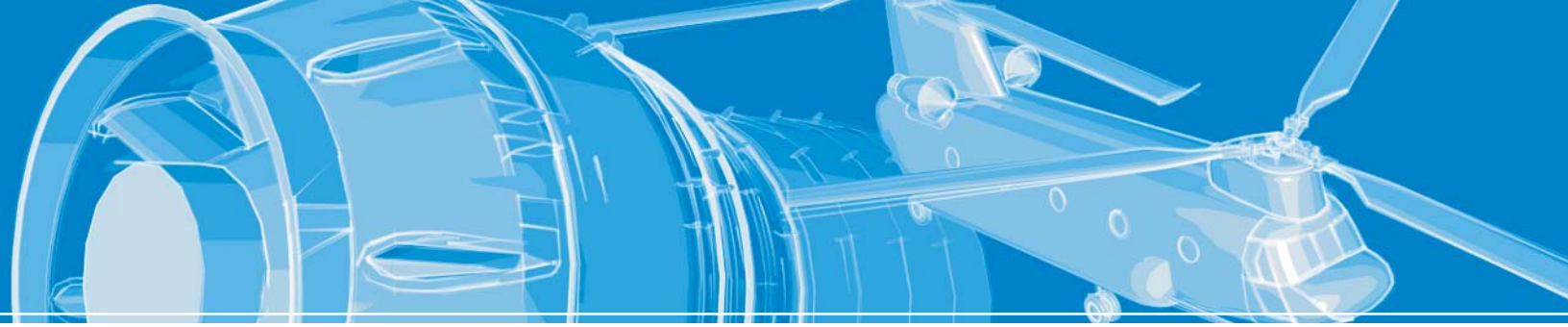

April 2005, Issue 12

Davis

# BOEING / HONEYWELL / DAVIS TEAM FOR THE CHINOOK

In response to the immediate threat, and also recognizing that the U.S. Army Chief of Staff's (CSA) number one priority for aviation is aircraft survivability equipment (ASE), DAVIS is pleased to announce that we have teamed with Honeywell and Boeing to develop an IR suppressor for the CH-47 Chinook helicopter.

## History

CH-47 Chinook, the heavy-lift helicopter of the U.S. Army, is manufactured by the Boeing Company and powered by Honeywell gas turbine engines. The mission of the CH-47 is to transport ground forces, supplies, ammunition, and other battle critical cargo in support of worldwide combat and contingency operations.

It is also used for medical evacuation, civil engineering projects, disaster relief operations, search and rescue, and Special Operations.

There have been over 700 airframes manufactured, since the first flight, which occurred over 43 years ago.

Its first combat was in Vietnam in 1965, and has been used in every U.S. action since that time, up to and including Afghanistan and Iraq.

## International Users

Due to the versatility and heavy lift capability the CH-47 has been adopted by several major international armed forces, including the U.K., Holland, Japan, Australia, Italy, Spain, Egypt, Korea and Greece.

## IR Signature

The two gas turbine engines are a major contributor to the very large IR signature exhibited by the helicopter. Until relatively recently, this large signature was not considered a significant problem, due to the type of missions normally flown.

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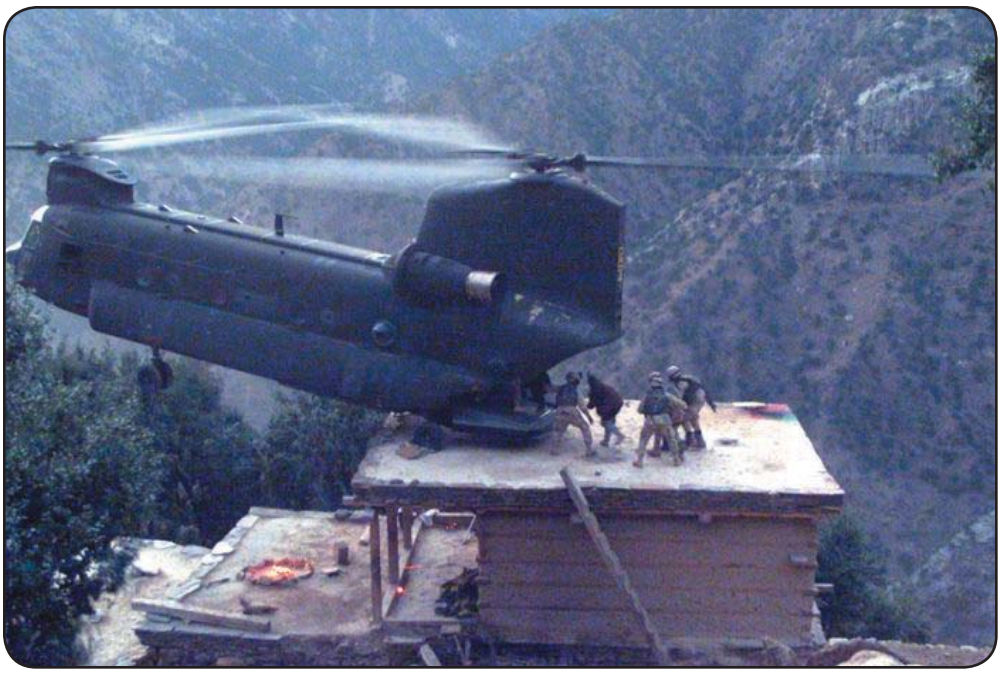


A U.S. Army CH-47D, lands on the roof of a house in Afghanistan to pick up suspects during Operation Mountain Resolve, approximately November 2003.

## PROFILE

In the past two years, DAVIS has continued to grow in the international marketplace. A significant part of that growth has been in the U.S., and to accommodate our customers there we have opened an office in Washington, D.C.

In addition, we have retained the services of a well known U.S. consulting firm, Peduzzi and Associates, who have an extensive background with DOD, and aviation in particular.

Our aircraft applications have expanded to the extent that we have devoted this Newsletter to those projects alone, and our naval programs are described separately.

At this point in time the demand for our technology is very high; first, aircraft survivability has taken a very high priority (number one according to the U.S. Army Chief of Staff), and second, signature suppression is the best first step when combining with IR countermeasures such as flares and jammers.

As can be seen from the articles and the suppressor inventory described here, in addition to the R&D initiatives described previously, DAVIS have positioned ourselves to meet this demand for aircraft survivability.

Rolly Davis, P.Eng.
President

## TEAMING FOR THE CHINOOK

*continued from page 1*

However, with the proliferation of more sophisticated IR seeking missiles, and the exposure of transport/utility aircraft to non-conventional forces, the large IR signature has become a concern. Recent targeting of the helicopters in the Middle East has brought a sense of urgency to the problem.

### Signature Reduction

As shown elsewhere in this Newsletter, DAVIS has been very active in the development of IR suppressors for several aircraft which have resulted in significant reductions in their signature and the accompanying reduction in susceptibility to IR seeking missiles.

### Partners

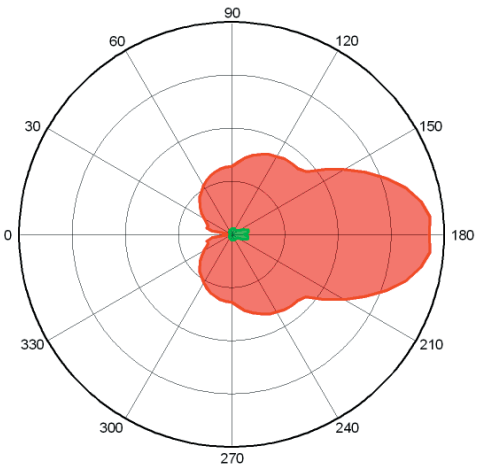
Since the IR suppressor interfaces with both the engine and airframe, DAVIS approached Honeywell and Boeing with the concept of adopting existing technology to this platform. Due to the desire of both companies to improve the signature, they responded with enthusiasm.

Honeywell is providing T-55 engine exhaust data over the range of operating conditions (power, altitude and load), and the Boeing Company is insuring that the mission capability is not compromised by the suppressor installation. In addition, Honeywell will perform the suppressor-engine testing, and Boeing will coordinate the suppressor airframe integration and flight tests.

### Suppressor Technology

DAVIS is developing a variation of the Centre-Body-Tailpipe (CBT) suppressor that has proven to be so effective on the UH-1H. Since the T-55 engine is so much larger than the Huey engine, the CBT must be increased in size, and adapted to the unique exit conditions of the bigger engine. These changes will not affect the performance of the suppressor which has been in operation since 2001.

The predicted reduction in signature, based on the measured performance of the original CBT suppressor, is shown below, on a relative basis.




IR Signature Plot

Due to the importance and urgency of this program, the team has proposed a very aggressive schedule which will result in testing of the first unit by November 2005.

# INFRARED GUIDE MISSILE COUNTERMEASURES (IRCM)

Infra-red (IR) guided missile countermeasures (IRCM) have been operational on military aircraft since 1968 when IR guided missiles were first deployed in a combat setting. Since that time, the technology has evolved but the basic countermeasure concepts remain the same: reduce aircraft IR signature through suppression; launch decoys; and jam the missile seeker.

All three technologies can be combined cost effectively on the same aircraft to provide the highest level of IR threat protection.

Unfortunately, decoys have several problems, including rejection by second and current generation seekers, complicated supply logistics, and limitations on deployment.

A combination of suppression and jamming has emerged as the most cost effective and robust IR countermeasure solution available today.

Jammers transmit a modulated IR signal towards the missile in order to confuse the missile seeker and cause the missile to veer off course. The performance of a jammer is dependent on the ratio between the strength of the jammer IR signal and the strength of the aircraft IR signal – the jammer-to-signal ratio, or J/S. A higher J/S results in improved jammer performance.

There are two types of jammers: omni-directional; and directed. A directed jammer must track the missile and precisely point a laser at its seeker head. Directed jammers are just coming on the market now but are expensive, unproven in combat, and can only defeat a single missile at a time. Omni-directional jammers, on the other hand, are inexpensive, proven in combat, and have been in use since the 1970s.

The reason that research is ongoing into directed jammers is that omni-directional jammers radiate power in all directions, requiring a small aircraft signature in order to provide protection against modern threats.

IR suppression solves this problem, bringing the aircraft signature down to a point where the J/S ratio of the omni-directional jammer can protect the aircraft. The result is an inexpensive, robust, and effective IR countermeasure solution.


## BRIEF NOTES

- In June 2005, Thomas Davis will present the paper “Effectiveness of IR Suppression and Active Countermeasures for Military Aircraft” at Forum 61 of the American Helicopter Society in Grapevine, Texas.
- In February 2005, we completed delivery of 14 shipsets of our IR suppressor for the MIL MI-17 helicopter.
- The first 8 of a total of 19 shipsets of the FCT IRS for the Bell 412 will be delivered to the Canadian Department of National Defence in April 2005; the balance will be delivered in June 2005.
- Deliveries of the Centre-Body-Tailpipe (CBT), that has been upgraded for the UH-1H with the T53-L-703 engine, will start in April 2005 and be completed in December 2005; total deliveries will number 78 shipsets.
- Our new IR Suppressor for the EADS (CASA) CN-235 will be engine tested in April 2005, as part of our development program.
- The first production unit of the DAVIS IR Suppressor for the AS-332 Super Puma will be delivered in May 2005.

## AIRCRAFT IR SIGNATURE REDUCTION

It has been shown that suppressing the IR signature of aircraft reduces the susceptibility to IR seeking missiles, and is cost effective. It has also been shown that combining different methods of self-protection, such as flares, jammers, and suppression, provides even greater effectiveness.

The increased risk to aircraft due to more sophisticated IR seeking missiles, and to the exposure of more aircraft to these threats in many parts of the world, has meant an increased demand for self-protection for a large variety of aircraft.

DAVIS has responded to this demand by utilizing our background and expertise to shorten the development cycle and produce very effective IR suppressors in less than one year.

As a result, we have a growing inventory of certified proven suppressors that can be retrofit to aircraft with little or no airframe modifications. These suppressors are designed as mission kits with installation time measured in hours.

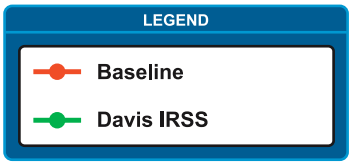
We now have very effective suppressors for the following helicopter platforms:

- Bell 212/412
- AB 139
- Bell 407
- Bell UH-1H/J/HP
- MIL Mi-17

In addition, as described on page one, we are currently developing a variation of the CBT suppressor for the CH-47 Chinook, teamed with Boeing and Honeywell.

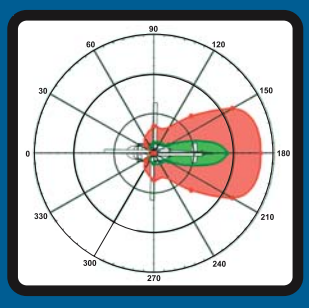
In concurrent development programs, we are designing new suppression systems for the EADS (CASA) CN-235 fixed wing transport aircraft, and the AS-332 Super Puma helicopter. These suppressors will be completed and flight tested later in 2005.

A summary of the technical performance parameters and the relative IR signature reduction for selected suppressors in our inventory is given below and on page 4.



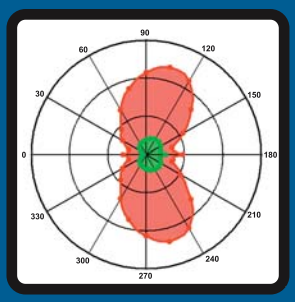

**Bell 212/412**

- **Engine power loss: 2% in Hover OGE**
- **Weight increase: 24 lbs. per aircraft**



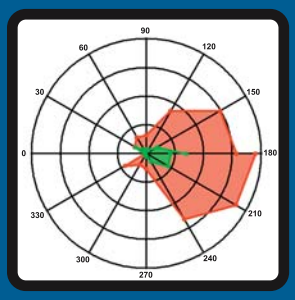
## AS 332

- Engine power loss: < 2% at MCP
- Weight increase: 190 lbs. per aircraft



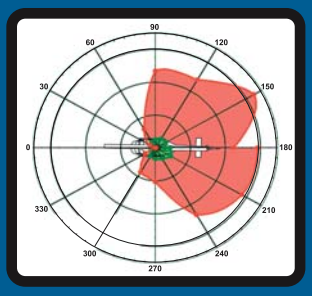

## Bell 407

- Engine power loss: < 1% in Hover OGE
- Weight increase: 26.5 lbs. per aircraft



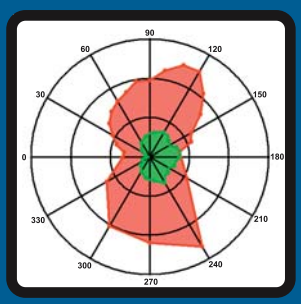

## Bell 205 (UH-1H)

- Engine power loss: < 3% at 940 SHP
- Weight increase: 30 lbs. per aircraft




## Mi-17

- Engine power loss: < 3% at MCP
- Weight increase: 240 lbs. per aircraft

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