

## INFRAMATION 2001 - CALL FOR PAPERS

**W**ith the resounding success of the inaugural InfraMation 2000 moving us forward, we are currently planning to make InfraMation 2001 even better! We will still be in Orlando, September 30 through October 3, 2001.

You have the opportunity to be an active part of InfraMation 2001 as an author and presenter! We encourage you to participate by sharing your experiences with fellow and future thermographers.

**ABSTRACT DUE DATE: APRIL 30, 2001**

Notification of acceptance will be made by

May 15, 2001

Abstracts must include:

1. Author listing (principal author first)
2. Abstract text (approximately 250 words)
3. Brief principal author biography

Abstract approval will be based on clarity, originality and technical merit of work.

SEND ABSTRACTS TO:

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[abstracts@inframation.org](mailto:abstracts@inframation.org) ♦

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## NASA USES IR TO DETECT HYDROGEN FIRES

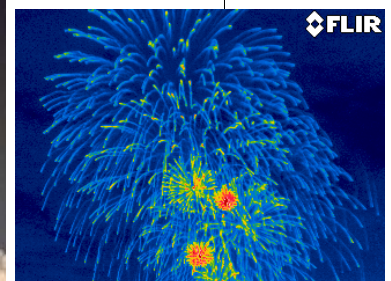
*By Mike Sweeney - Automation Group  
Product Engineer, Flir  
Systems - Boston*



**F**or two years the Automation group within FLIR Systems Boston, led by Jay Teich, Andy Neilson and Mike Sweeney, has been working closely with NASA to provide a way to detect Hydrogen fires on the launch pad for the Space Shuttle at Kennedy Space Center in Florida. The Space Shuttle uses Liquid Hydrogen as fuel for the main engines that power the space shuttle's lift off. This fuel needs to be loaded into the tank while the shuttle is sitting on the launch pad waiting to take off. Liquid Hydrogen is highly combustible and there is a possible danger of it igniting during the fueling process. Added to the danger of liq-



Endeavour lifts off on a pillar of flame Nov. 30, 2000. The IR cameras have to survive this explosive environment. (Photo courtesy NASA)



*Happy Holidays and  
Have a Great New Year  
from the Entire itc Staff*

*(Continued on page 2)*

## HYDROGEN FIRES (CONTD.)

(Continued from page 1)

One of the most interesting facts about hydrogen is the fact that when hydrogen burns, it is invisible to the naked eye: it does not emit radiation in the visible spectrum. However it does emit in the infrared and using a longwave, microbolometer, Thermovision 320 M camera, we are able to detect a hydrogen fire. Therefore NASA decided to purchase (14), 320 M cameras to be mounted in various positions on the launch pad to monitor the fueling and launch of the Shuttle.

Many interesting challenges came along with this contract. These cameras were to be mounted on the Launch Pad at ground zero and must survive the violent explosions that go along with a launch. Steve McKaughn of SED, designed vibration isolation frames that the cameras could be mounted in. The purpose of the frames was to dampen the shock and vibration that the systems would be subjected to. These frames and cameras were then installed and mounted into a blast-proof housing with an IR transmissive window, which makes it possible for the camera to survey the scene.

Much testing was done at FLIR and various outside agencies to simulate the harsh environment the cameras would be subjected to. This testing ranged from temperature and humidity testing to shock



Field testing the Hydrogen fire system.

and vibration testing to acoustic noise testing. Once the cameras successfully passed the NASA criteria they were shipped down to Kennedy Space Center where they went through the final acceptance testing on site at NASA.

For this testing I spent 2 weeks in Cape Canaveral working closely with NASA to ensure proper operation of the cameras and train the

NASA personnel on the use and functionality of the systems. During this testing, controlled Hydrogen fires were ignited and each camera was pointed at the fire to ensure proper detection of the flame. These cameras were tested with three different lens configurations at various distances from the flame to simulate the locations on the launch pad that they will be

mounted. NASA was pleased with the performance and accepted the units to be installed within the next year. These camera systems will soon be in operation to provide a safe and effective way to solve their problem of detecting a Hydrogen fire. Special thanks to the above mentioned along with Bob Rodgers, John Fricot, Tom Scanlon, Mike Soel, Bill Lanier and many others within the FLIR and its organizations for solving this problem and making the entire contract a success. ♦

## MEET THE STAFF - JIM HANEY

### Image Processing Applications Support Technician



Jim is currently pursuing a degree in Information Systems at the Univer-

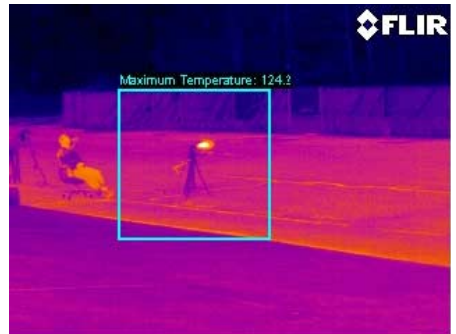
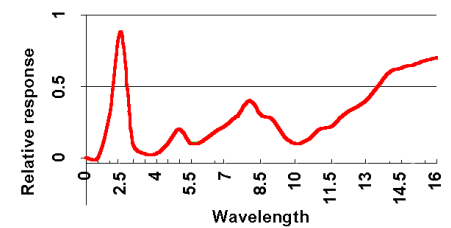
sity of Massachusetts. He has eleven years experience in production as a Technician: prototyping, testing, building and supporting Inframetrics and FLIR products. Currently he is responsible for supporting FLIR's commercial software products. ♦

## HOW ARE H<sub>2</sub> FIRES DETECTED?

Burning hydrogen emits in both the ultraviolet and infrared regions of the electromagnetic spectrum.

The chart below shows the regions of hydrogen flame emission in the infrared. Note the strong emission in the LW from 7 μm on up. These emission regions are due to the radiation from hot water vapor, the only chemical by product of hydrogen combustion in air. ♦

- Gary Orlove, Editor



## READER FEEDBACK - CAP ON A HOT TIN ROOF (NOVEMBER, 2000)

"In your story "Cap on the Hot Tin Roof", I would be really concerned about the repaired capacitor also. To see that much temperature rise would lead me to believe that the problem may actually be with the other capacitors on that phase. If one or more capacitor cans on that phase are open, then the voltage across the "hot" capacitor is excessive and may be causing the heating. Another possible cause could be a poor ground connection (If this is a grounded wye bank). It would be interesting to hear what a capacitor bank manufacturer (i.e. General Electric, ABB, Cooper Power Systems) would think about these thermograms." - Tony West

"Your right, this problem is not corrected yet! This individual capacitor unit needs to be replaced. The temperature rise of the entire can indicates that the connection on the inside of the unit is bad. As you know the can being hot is resultant heat and you would not know how hot the internal connection is. The internal connection is heating approximately five gallons of oil and is probably pretty hot." - Johnny Jordan

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**About the Infrared Training Center**

The Infrared Training Center offers training and certification in all aspects of infrared thermography use. Our world-class training facilities are located near Boston, Massachusetts, USA and Stockholm, Sweden and have the world's most extensive hands on laboratories for infrared applications. Please join us in exploring the fascinating world of infrared!

Your comments and suggestions about this newsletter are welcomed and encouraged. If you have an interesting application or case study to share, we encourage you to submit it for publication.

Please e-mail [Gary.Orlove@infraredtraining.com](mailto:Gary.Orlove@infraredtraining.com) or snail mail to the USA office

## "Hands On" Thermography Training, Certification, and Support

**We're on the Web!**  
**WWW.**  
**infraredtraining.com**

**ite INFRAMATION** Editor: Gary Orlove

Design: Gary Orlove

### Upcoming Classes - USA

Remember that we also teach customer site training courses at your convenience. Please contact us for more information.

#### 2000 Course Schedule

- December 11-15 -- Level 1 - Boston

#### 2001 Course Schedule

##### January

- 22-25 -- Level 1 - Phoenix
- 29-Feb 2 -- Level 1 - Boston

##### February

- 5-8 -- Level 1 - Los Angeles
- 12-15 -- Level 2 - Los Angeles
- 26-March 1 -- Level 1 - New Orleans

##### March

- 5-8 -- Level 1 - Edmonton, Alberta, Canada.
- 6-8 -- R & D - Boston
- 12-16 -- Level 2 - Boston
- 19-22 -- Level 1 - Nashville
- 27-29 -- Refresher 2.5 day - Boston

##### April

- 2-5 -- Level 1 - Detroit
- 23-27 -- Level 1 - Boston
- 30- May 3 -- Level 1 - San Antonio

### Upcoming Classes - Sweden

#### 2000 Course Schedule

- December 11-15 (W50) -- Level 1 CM

### 2001 Course Schedule

#### January

- 29-Feb 2 (W5) -- Level 1

#### February

- 12-16, Swedish (W7) -- Level 1
- 19-23 (W8) -- Level 2 - South Africa

#### March

- 1-2 (W9) -- Advanced Software
- 5-9 (W10) -- Level 1
- 19-22 (W12) -- Level 1 - Italy
- 26-29 (W13) -- Level 1 - Singapore

#### April

- 2-6 (W 14) -- Level 1
- 2-6 (W 14) -- Level 2 - Malaysia

### Upcoming Classes - Germany

#### 2000 Course Schedule

- December 11-16 (W50) -- Level 1

#### 2001 Course Schedule

##### January

- 15-20 (W3) -- Level 1

##### February

- 5-10 (W6) -- Level 1
- 13-16 (W7) -- Application Seminar
- 20-22 (W8) -- Level 2 R&D

##### March

- 12-17 (W11) -- Level 1

##### April

- 2-7 (W14) -- Level 1
- 24-27 (W17) -- Application Seminar



## DON'T BE LEFT IN THE DARK.

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