

NARTE NEWS

Volume 24 WINTER 2007 Number 1





COVER The cover photo is of the Space Shuttle Discovery 7 seconds before liftoff on its 33rd mission. Discovery was launched at 8:47 p.m. on 9 December 2006. The photograph is used with permission courtesy of NASA.

contents

FEATURES

3 Headquarters Highlights

13 Administrative Page

ARTICLES

5 NARTE Links with History

8 Some Articles for Safety Engineers

9 Solar Flares Cause GPS Failures

8 EMC UK 2006

10 EMC 2007: Launch of the Global EMC University



Headquarters Highlights

WINTER 2007

by Brian F. Lawrence, Executive Director

Board of Directors Meeting

This year's second board of directors meeting was held at NARTE Headquarters on Saturday, October 7th. Three of our members were not able to be present, **Gary Gorr**, **Glen Watkins** and **John Christensen**. However, with all other directors being present, a quorum was established and business was able to be conducted.

Two names were put forward for consideration as new members of the board; **Russ Carstensen** our recently retired executive director, and **Mike Violette** the president of Washington Laboratories Ltd., a testing and engineering firm. Both were elected and we look forward to their active participation in the strategic guidance of NARTE in the future.

The board also endorsed a proposal to pursue a partnership agreement with the IEEE Communications Society. In September, the IEEE board of directors had approved a plan that will provide US \$200,000 to develop and assess the value of a new certification program for technical professionals in communications.

The Certificate of Communications Expertise was proposed by the IEEE Communications Society at the board's June meeting. The society plans to use the money to develop materials describing the communications areas candidates must master, as well as a set of questions for the certification exam.

The certification program could be used as a pilot for other IEEE societies that want to develop similar certifications for their technical fields of interest, according to IEEE President-Elect **Leah Jamieson**, chair of the IEEE's New Initiative Committee.

I had already discussed the advantages of a cooperative agreement between NARTE and the IEEE Communications Society with their executive director, **Jack Howell**. Jack was very receptive to this idea and had asked NARTE to prepare a draft Memorandum of Understanding to detail areas in which NARTE could assist them in developing and administering their new certification program.

IEEE Communications Society, Certificate of Communications Expertise

As reported above, the NARTE board of directors approved a plan to cooperate with the IEEE Communications Society in developing a new certification program. Subsequent discussions between myself and several members of the Communications Society working group have confirmed that the basis for the initial certification will be wireless cell phone communications engineering. Phase one of the program development has been the formation of a volunteer task force drawn from a diversity of backgrounds, including industry, research Institutes and academia. The task force, which includes a number of NARTE members, held their first meetings in early December and has started a road map to define the critical professional attributes of engineers working in this communications field. The NARTE draft Memorandum of Understanding has been sent to Jack Howell and I am now awaiting a response from the task force in order to cement a relationship.

IEEE EMC 2007 in Hawaii

To mark the 50th anniversary of the IEEE EMC Symposium in 2007, this EMC Society annual event is being held in Hawaii from July 8th to 14th. NARTE intends to support this event and as usual we will hold a NARTE certification examination for EMC and ESD engineers and technicians at the end of the conference programs.

EMC 2007 will also feature the Global EMC University, a series of tutorials conducted by world renowned experts. The NARTE workshop, which offers information and instruction to prospective examination candidates, will be a part of the first day's Global University event, "An Introduction to the Fundamentals of EMC" on Sunday, July 8th. The

Global University tutorials will continue until Thursday, July 12th and the NARTE Certification examinations will be held on Saturday, July 14th. Friday, July 13th will feature an island tour for all attendees. Alternatively, NARTE examination candidates can forgo the tour and spend the day revising for the task ahead.

NARTE hopes that this schedule will encourage all those attending the Global University to also take this opportunity of achieving certification of their engineering knowledge and skills.

A full listing of the EMC 2007 workshops and the Global University courses will be published in the near future on the event website, <http://www.emc2007.org>

NARTE Programs in Singapore

It looks like the EMC 2007 in Hawaii will necessitate a round the world airline ticket for me. So I have decided to make the most of this and stop off for visits in Singapore and Japan on the way, before continuing on to the NARTE office in Massachusetts and finally returning to London.

NARTE had attended the event "EMC Zurich in Singapore," at the end of February 2006. At this time 18 candidates took the NARTE Certification examination and interest was expressed by both Nan Yang Polytechnic and the regional headquarters of Rhode & Schwarz to organize a regular training and examination program for candidates to achieve NARTE certification in Singapore. Since that time there has been no further work done to organize this cooperative venture. I have contacted both of these parties within the last month and hope that we can reach an agreement that can be ratified by a visit at the end of June as I make my way to Hawaii.

From Singapore, I will travel to Japan to visit our partner, KEC. Here we have a very active and successful program that has certified over 600 candidates since 2000. This year another 144 engineers and technicians are scheduled to take the examination.

O'Brian Becomes NIST Boulder Laboratories Director

Thomas R. O'Brian, chief of the time and frequency division at the National Institute of Standards and Technology (NIST), has been appointed director of the NIST Boulder Laboratories in Colorado. O'Brian is the senior site manager with oversight of the facilities and technical infrastructure for the agency's 400 scientists, engineers, technicians and support staff.

The NIST Boulder Laboratories are engaged in research activities in measurement science, including time and frequency standards; electromagnetics, including superconductivity and electromagnetic fields; optoelectronics; chemical engineering; materials reliability; laser physics; quantum and optical physics; and computational methods. industry, other government agencies and universities.

O'Brian earned a bachelor's degree in chemistry from Washburn University in Topeka, Kansas, and a doctorate in experimental atomic physics from the University of Wisconsin in Madison. He joined NIST's Physics Laboratory in Gaithersburg, Maryland, in 1991.

Frankie Thrower Passes Away

It is with great regret that we report that on Tuesday, December 5, Frankie Thrower, wife of NARTE founder Ray Thrower passed away at age 69 after an illness. Frankie and Ray married in 1985. She was a homemaker and a devoted loving mother and grandmother. The funeral was held at

Aderhold Funeral Home located in West, Texas. Memorials may be made to a charity of your choice.



NARTE Links with History

By Brian Lawrence, Executive Director

Situated about 200 miles north of London and halfway between London and Edinburgh lies the historic city of York. With its ancient walled city centre dominated by the imposing York Minster, its turbulent past has for centuries been entwined with English history and the struggle for the crown.

The occupying Roman Ninth Legion marched on Yorkshire in the third century AD to extend the Empire's northern frontier. They built a new fort on a rocky spur above the River Ouse, which attracted traders and followers. Thus they established the settlement of Eboracum, from which the modern city of York has developed.

The first to govern the country from York were the Emperor Septimus Severus, who succumbed to the English weather and died of pneumonia in 211AD, to

be succeeded later by the Emperor Constantine who finally came to York in 306AD. Constantine's statue stands today outside the Minster.

When the Romans left Britain, the kingdom became fragmented and Eboracum became the capital of Northumbria, at which time it dropped its Roman name and became known as Eoferwic, "Place of the Wild Boar".

When King Edwin converted to Christianity in 625AD, he was baptized in a simple wooden structure built beside a local holy spring. This was the foundation of York Minster.

The Vikings invaded the land in the ninth century and captured the capital city of Eoferwic, changing its name to Jorvik. Much of the Viking influences remain today in the local language. Many of York's streets carry the Norse name of "gates". One of the must-do things for visitors to York is a tour of the renowned Jorvik Viking Centre in Coppergate.

A hundred years after the Viking invasions, Eadred, then King of Wessex, formed an allegiance with the deposed King of Northumbria and reclaimed Jorvik from the Viking ruler Eric Bloodaxe.

When King Edward the Confessor died in 1066, Harold Godwinson assumed the throne. The Norwegian ruler, also Harold, used this time to attempt to recapture York, but was driven back after losing almost his entire force. Later that same year the Duke William's army invaded from Normandy in the well documented "Battle of Hastings" at which Harold was defeated and died with an arrow in his eye. William, known thereafter as William the Conqueror, assumed the English throne in 1066 and immediately dispatched his nobles to govern the different regions of the land as his lieutenants.

However, the Yorkshire people remained loyal to their memory of King Harold and all William's nobles sent to govern York died mysteriously. This situation was resolved in no uncertain manner when William's forces sacked the city of York and in 1069 lay waste to all the land between York and Durham, leaving the people to starve. William built two castles to control the city, one of which, known as Clifford's Tower, remains in good condition today.





William relaxed his stranglehold on the region in 1079 and appointed the Norman Archbishop, Thomas of Bayeaux, to be Archbishop of York. Thomas built his great Cathedral in York over the period from 1080 to 1110. Remains of this early structure are still to be found in the undercroft of the present day Minster.

The present building was begun in 1220 when Archbishop Walter Gray decided to rebuild the Cathedral on a scale to exceed Canterbury. The Minster is a work in progress as repair and renovation has continued through the centuries, with the incorporation each time of more modern materials and designs. Today over a million people visit York Minster each year. It is still one of the largest and most magnificent testaments to faith in Europe.

The medieval walls that still surround the old city today were built from taxes levied by King Henry III, nephew of Richard the Lionheart. Henry was extravagant and demanded high taxes from his subjects. However, he left many examples of his charitable works and building programs, such as the York walls and the rebuilding of Westminster Abbey, that we can still enjoy today.

The Wars of the Roses were a series of [civil wars](#) fought in medieval England from [1455 to 1487](#) between the House of [Lancaster](#) and the House of [York](#), (not the 1989 Danny DeVito movie, starring Michael Douglas and Kathleen Turner). The name Wars of the Roses is based on the badges used by the two sides, the red rose for the Lancastrians and the white rose for the Yorkists.

Major causes of this conflict include the fact that both houses were direct descendants of king Edward III and that the ruling Lancastrian king, Henry VI, had surrounded himself with a group of unpopular nobles. There was considerable civil unrest among much of the population and there were many powerful lords with their own private armies willing to back whichever side seemed to have the upper hand. This unstable situation was made worse by the untimely episodes of mental illness on the part of Henry VI.

The city of York was determined to be on the winning side through these turbulent times and Edward IV hated them for their constantly changing allegiance. As a result the citizens had the habit of



Royal Timeline



closing the gates to the city whenever Edward came to visit.

Richard III may be the best known kings from the House of York. He was probably not the villain that he was depicted to be by William Shakespeare. In fact, Richard had very strong links with the city and adopted the white boar as his personal badge, honoring York's ancient city name. Richard was the last English king to die in battle at the hands of Henry Tudor, who by marriage to Elizabeth of York effectively ended the Wars of the Roses. But his good work of unification was undone when 50 years later, Henry VIII dissolved the monasteries and plundered St Mary's Abbey, a favorite of the citizens of York since the early 12th century.

In spite of the populist revolt against Henry VIII's actions, he visited the city with his wife Katherine Howard, staying at the King's Manor in the heart of the city. King's Manor has been renovated and extended through the centuries and some parts were built in the 16th century using recovered stones from St Mary's Abbey.

Today the King's Manor on Exhibition Square is part of the York University, which brings us neatly to the relationship recently established between York and NARTE.

As you may infer from this encapsulated history of York, it has not always been the most hospitable city to outsiders from the south, so it was with some trepidation that my wife and I boarded the train from London to York on September 22nd. But our fears were unfounded, we had a great time visiting the city's attractions and as luck would have it, we just happened to be there during the York Food Festival,

so there were wonderful samples to be had in the various city markets and festival centers.

The real purpose of our visit was to meet with Chris Marshman, managing director, and David Heaton, marketing manager, of York EMC Services, a commercial test and training organization, owned and operated by the York University Electronics Department. York EMC Services is a full service EMC test house, but they also run a series of excellent courses of Continuing Professional Development, CPDs, covering various subjects within the EMC field. Full information about this organization is available at www.yorkemc.co.uk.

It was clear that a partnership between York EMC Services and NARTE would be of major benefit to both parties. The attendees at the CPD classes would welcome an opportunity to demonstrate their expertise by obtaining an internationally recognized certification of their achievement and experience. NARTE can provide this very specific certification of excellence and our organization will benefit from an increased European membership.

The first step in building the relationship has now been completed. York University, York EMC Services is now the U.K.'s first NARTE authorized test center, able to offer and invigilate the NARTE certification examination in EMC and ESD. The NARTE question pool is being seeded with questions related to European commercial and military standards to enable York to hold the first examination sessions by the end of the first quarter of 2007. We can only hope that this relationship with NARTE will continue to grow, develop and prosper, just as the city of York has done.

York **EMC** Services Ltd

Some Technical Articles for Safety Engineers

by Dave Lohbeck
 Compliance Engineering Manager
 National Instruments
 Tel: 512-683-8474
ni.com/certification

Here are a few articles written by Mr. Lohbeck that may be of interest to safety engineers.

Safety isolation protects (EDN) >

<http://www.edn.com/contents/images/454635.pdf>

Safety certification for the T&M world (T&MW) >

<http://www.reed-electronics.com/tmworld/article/CA439351?pubdate=8%2F1%2F2004>

Safety Design and Certification - part 1 (EDN) >

<http://www.evaluationengineering.com/archive/articles/1103prodsafe.htm>

Safety Design and Certification - part 2 (EDN) >

<http://www.evaluationengineering.com/archive/articles/1203prodsafe.htm>

Intro to Safety Isolation and Certification (training video: 40 mins) >

<http://zone.ni.com/devzone/conceptd.nsf/webmain/EFA48CB646A6C93386256ED300527355>

EMC UK 2006

By Brian Lawrence, Executive Director

The U.K. had not hosted an international EMC conference and exhibition between 1997 and 2004. As there had been many changes in legislation, standards, and design techniques over that time, as well as a much broader involvement of government and industry, EMC UK 2004 was conceived and organized by Nutwood UK, under the direction of Alan Hutley, managing director.

EMC UK 2004 took place at the new exhibition center at Newbury Racecourse in October 2004, and was designed to attract an international audience keen to learn about new techniques and the implications of the broader legislation encompassing not only EMC but related topics such as the Low Voltage Directive,

functional safety, and telecommunications.

The following year EMC UK 2005, at the same Newbury venue, attracted 50 exhibitors and 36 technical papers divided into two streams and five modules.

On October 17-18, 2006, Nutwood UK presented their third EMC UK conference and exhibition, which turned out to be their most successful and enthusiastically supported event in this series. EMC UK 2006 featured 33 presentations spread over into 8 modules. There were 60 exhibitors and over 800 attendees for the two days.

The event was staged in association with the IET EMC Professional Networks and supported by EMCIA, EMCTLA and the IEEE GB and NI Chapter. The conference featured a keynote address from Andy Drozd, President of the IEEE EMC Society.

However, the most significant new feature for 2006 was the presence of NARTE as an exhibitor. Nutwood UK were kind enough to provide a full 3m x 3m booth



for NARTE at very late notice, and to feature a full page article and promotional advertisement from NARTE in the Show Guide edition of *The EMC Journal*.

NARTE experienced an active two days at the exhibition and received almost 40 requests for information about our EMC and ESD programs. Encouragingly, many of the requests were from company and department heads seeking to certify a number of their staff members.

The exhibition was also attended by York University and Kent University, with York able to promote their recently received NARTE Authorized Test Center status.

It is anticipated that this event will become a regular feature on the NARTE calendar and one at which we might run a certification examination in the future.



Solar Flares Cause GPS Failures, Cornell Researchers Warn

Cornell researchers have discovered that strong solar flares cause Global Positioning System (GPS) receivers to fail. Because solar flares are generally unpredictable, such failures could be devastating for “safety-of-life” GPS operations such as navigating passenger jets, stabilizing floating oil rigs and locating mobile phone distress calls.

“If you’re driving to the beach using your car’s navigation system, you’ll be OK. If you’re on a commercial airplane in zero visibility weather, maybe not,” says Paul Kintner Jr., professor of electrical and computer engineering at Cornell and head of Cornell’s GPS Laboratory.

Alessandro Cerruti, a graduate student working for Kintner, accidentally discovered the effect while operating a GPS receiver at Arecibo Observatory in Puerto Rico, one of six Cornell Scintillation Monitor (SCINTMON) receivers. Cerruti was investigating irregularities in the plasma of the Earth’s ionosphere – a phenomenon unrelated to solar flares – when the flare occurred, causing the receiver’s signal to drop significantly.

To be sure of the effect, Cerruti obtained data from other receivers operated by the Federal Aviation Administration (FAA) and the Brazilian Air Force. He found that all the receivers had suffered exactly the same degradation at the exact time of the flare regardless of the manufacturer. Furthermore, all receivers on the sunlit side of the Earth had been affected.

The flare consisted of two events about 40 minutes apart. The first lasted 70 seconds and caused a 40% signal drop. The second lasted 15 minutes and caused a 50% drop. But this flare was moderate and short-lived; in 2011 and 2012, during the next solar maximum, flares are expected to be 10 times as intense and last much longer, causing signal drops of over 90% for several hours.

“Soon the FAA will require that every plane have a GPS receiver transmitting its position to air traffic controllers on the ground,” warns Cerruti. “But suppose one day you are on an aircraft and a solar radio burst occurs. There’s an outage, and the GPS receiver cannot produce a location. It’s a nightmare situation. But now that we know the burst’s severity,

we might be able to mitigate the problem.”

The only solutions, suggests Kintner, are to equip receivers with weak signal-tracking algorithms or to increase the signal power from the satellites. Unfortunately, the former requires additional compromises to receiver design, and the latter requires a new satellite design that neither exists nor is planned.

“I think the best remedy is to be aware of the problem and operate GPS systems with the knowledge that they may fail during a solar flare,” says Kintner.

The team was initially confused as to why the flare had caused the signal loss. Then Kintner recalled that solar flares are accompanied by solar radio bursts. Because the bursts occur over the same frequency bands at which GPS satellites transmit, receivers can become confused, leading to a loss of signal.

Had the solar flare occurred at night in Puerto Rico or had Cerruti been operating SCINTMON only at night, he would not have made the discovery.

“We normally do observations only in the tropics and only at night because that’s where and when the most intense ionospheric irregularities occur,” says Kintner. However, since no one had done it before, Cerruti was looking at “mid-latitudes” (between the tropics and the poles), where weaker irregularities can occur both night and day. As a result, SCINTMON detected the solar flare.

Cerruti reported the findings on September 28 at the Institute of Navigation Meeting in Fort Worth, Texas, where he received the best student paper prize. The full results of the discovery will be published in a forthcoming issue of *Space Weather*. Other authors of the paper include D.E. Gary and L.J. Lanzerotti of the New Jersey Institute of Technology, E.R. de Paula of the Instituto Nacional de Pesquisas Espaciais and Cornell research associate Hien Vo.

EMC 2007: Launch of The Global EMC University

By Janet O’Neil, EMC 2007
Steering Committee Chair

At the 2007 IEEE International Symposium on Electromagnetic Compatibility (EMC 2007) in Honolulu, Hawaii, a new educational course will debut: The Global EMC University.

The goal of The Global EMC University is to provide in depth, applied, and practical material to those new to EMC. The course was designed to provide a solid foundation on important EMC topics to the practicing EMC engineer, presented by well-known EMC experts from universities or institutions around the world. These experts regularly gather at the annual IEEE EMC Symposium. For the first time, under the leadership of **Professors Clayton R. Paul** of Mercer University in Macon, Georgia and **Flavio Canavero** of the Polytechnic of Turin, Italy, these experts will share their knowledge following a structured agenda in a classroom type format.

The course curriculum includes:

- Professor Clayton Paul - Use of PSPICE in Solving EMC Problems
- Professor Flavio Canavero - Signal Spectra
- Professor Todd Hubing - Nonideal Behavior of Components
- Professor Mark A. Steffka - Conducted Emissions and Power Supply Filters
- Professor Andy Marvin - Antennas
- Professor Tom Jerse - Radiated Emissions
- Professor Christos Christopoulos – Shielding
- Professor Antonio Orlandi - Crosstalk
- Professor Kye Yak See - PCB Layout and System Configuration for EMC
- Dr. Al Ruehli - Transmission Lines and Signal Integrity

Nowhere else will one find these noted instructors in one place at one time for EMC education at this level!

Certificates of completion will be awarded and CEUs will be assigned; class size will be limited to ensure interaction with the speakers. Those that wish to attend should register early via the website www.emc2007.org. Registration opens January 5.

JOIN US FOR THE CONTINUED EDUCATION PROGRAM AT EMC 2007 July 8-13



EMC 2007
Honolulu, Hawaii



BYO Laptop

Register for EMC 2007 at www.emc2007.org
Make hotel reservations!
Don't Forget to register for Classes

- 9 MONDAY
Professor Clayton Paul - Use of PSPICE in Solving EMC Problems
Professor Flavio Capovilla - Signal Spectra
Professor Todd Hubing - Nonideal Behavior of Components
Prof Mark A. Steffka - Conducted Emissions & Power Supply Filters
- 10 TUESDAY
Professor Andy Morvin - Antennas
Professor Tom Jensen - Radiated Emissions
classes qualify for CEU's
- 11 WEDNESDAY
Professor Christos Christopoulos - Shielding
Dr. Albert Ruekli - Transmission Lines and Signal Integrity
- 12 THURSDAY
Professor Antonio Oxlandi - Crosstalk
Prof Kyo Yak Seo - PCB Layout & System Configuration for EMC
- 13 FRIDAY



No Classes!
EMC 50th Party
s(w) = w^3 c.



New for the EMC Symposium is the "Global EMC University"

Recognizing the need for low cost, high quality education on EMC, the Global University was developed to provide tutorials with Continuing Educational Unit credits. (CEU's) Nowhere else will one find these noted experts from all over the world in one place at one time for EMC Education at this level.

Registration Fee: \$250.00 before May 14 and receive a **FREE Global University Cap,**

Registration after May 14: **\$350.00**

Attendance is limited, sign up early
Registration to EMC 2007 is required
In addition to the GU Class Fee.



IEEE East meets West Through Education, Networking & Celebration



Students will be admitted on a first come, first served basis until the class is full. Note regular registration is required for the symposium in addition to a supplemental registration for The Global EMC University.

Students are encouraged to attend the annual "Fundamentals of EMC" full day tutorial on Sunday, July 8 held as part of the Symposium regular technical program. The Global University officially starts with a full day on Monday, July 9, followed by morning lectures over July 10-12. The afternoons are free so students may attend the excellent Symposium technical program or visit the exhibition held as part of EMC 2007.

For more information on The Global University, including topic outlines and speaker biographies, as well as on the 2007 IEEE International Symposium on EMC, please visit www.emc2007.org.

Editor's Note:

NARTE is delighted to support the Global University. We will run our Workshop in conjunction with the "Fundamentals of EMC" tutorial on Sunday, July 8. As a result, all GU students and other attendees can be prepared for the NARTE EMC Certification Examination, should they wish to complete this phase of NARTE Certification during EMC 2007. The NARTE Certification Examination consists of two four hour sessions, which will run consecutively on Saturday, July 14.

All Certification applicants are requested to register with NARTE as soon as possible. Registration instructions and forms are available from our web site www.narte.org or by calling the NARTE office at 800-89-NARTE. Last minute registration

for the examination may be possible during EMC 2007 by visiting the NARTE booth.

In order to encourage GU students to add NARTE Certification to their portfolio, we will offer a 50% discount for the second year of NARTE membership to all students who take the July 14 examination and subsequently achieve Certification. This is a great way to add an internationally recognized certification of engineering excellence to your cumulative knowledge base and information gained from the GU course materials.

NEW

INTERFERENCE TECHNOLOGY eGUIDE

This issue is now online.

Search it. Save it. Read it. Click it. Print it.



The new *Interference Technology eGuides* give you high quality information about EMC at the click of a mouse. Now our reference guides have become instantly searchable and available at any time on your desktop.

No special software required, no files to download—it is as easy as reading a web page. And you can save your own digital copy for future reference—free.

Simply go to www.interferencetechnology.com, and log in to the eGuide. You will need an up-to-date subscription.

Once inside, here are just a few things you can do:

- **Click the page corner to watch it turn.**
- **Click on a website or email address to find a live link.**
- **Search the entire publication for any subject or keyword.**
- **Click on a tab to go directly to your favorite section.**
- **Make your own personal notes on any article.**
- **Zoom in to read pages online, or print them out if you prefer.**
- **Bookmark your favorite pages.**

ITEM™ Publications
www.interferencetechnology.com
info@interferencetechnology.com

INTERFERENCE TECHNOLOGY eGUIDE

NARTE Administrative Page

OFFICERS, DIRECTORS, PRINCIPAL STAFF and KEY POINTS OF CONTACT

OFFICERS

H. Stephen Berger, NCE
PRESIDENT (2007)
Georgetown, Texas

Michael W. Hayden, NCE
VICE PRESIDENT (2007)
Dekalb, Illinois

Garry R. Gorr, NCE
2nd VICE PRESIDENT (2007)
Libertyville, Illinois
KD9OG

John Christensen, NCE
SECRETARY, TREASURER (2007)
Bethesda, Maryland

DIRECTORS

Lawrence Behr, NCE
DIRECTOR (2007)
Greenville, NC
K4JRZ

Russ Carstenson P.E., NCE
DIRECTOR (2007)
Olympia, WA

Dave Case, NCE
DIRECTOR (2007)
North Canton, Ohio
KB8GX1

Mike Violette P.E.
DIRECTOR (2007)
Arlington, VA

Glen Watkins
DIRECTOR (2007)
Austin, Texas

Kimball Williams, NCE
DIRECTOR (2007)
Southfield, Michigan
N8FNC

PRINCIPAL STAFF

Brian F. Lawrence
EXECUTIVE DIRECTOR
Stevenage, Hertfordshire, UK
Phone: +44 (0) 1438-880757
E-Mail: NARTEinEU@AOL.COM

Terri Marinucci
OPERATIONS DIRECTOR
Medway, Massachusetts

Tom Chesworth, PhD, P.E., NCE
NARTE NEWS EDITOR
Boalsburg, Pennsylvania
W3IA

KEY INFORMATION/ POINTS OF CONTACT

NARTE Headquarters:
NARTE Membership
Qualifications
Corporate and Personal
Certification Literature
NARTE and FCC Test
Locations
General Administration

WHERE: NARTE, Inc.
167 Village Street
Medway, MA 02053

WHEN: Hours 9-5 Eastern Time

WHO: Terri Marinucci
Brian Lawrence
PHONE: (508) 533-8333
800#: (800) 89-NARTE
FAX: (508) 533-3815
E-Mail: narte@narte.org

NARTE News
Articles, Publication, Letters to the
Editor and Advertising.

WHERE: 913 Tressler Street
Boalsburg, PA 16827

WHEN: 8-5 (Eastern Time)

WHO: Tom Chesworth
PHONE: (814) 466-6559
Fax: (814) 466-2777
E-Mail: nartenews@7ms.com

NARTE Net
E-Mail: narte@narte.org
Website: www.narte.org

Feel free to contact your officers and staff members by email at narte@narte.org

NARTE Officers



H. Stephen Berger
President (2007)



Michael W. Hayden
Vice President (2007)



Garry Gorr, Second
Vice President (2007)



John J. Christensen
Secretary (2006)

NARTE Directors



Lawrence V. Behr
(2007)



Russ Carstensen
(2007)



David A. Case
(2007)



Kimball Williams
(2007)