



# Halting interference

Rarely do we consider how a satellite system is installed. However, correct installation is a crucial part of any satellite system.

**Satellite operators all over the world are faced** with a daily problem that costs them millions of pounds a year – it is that of satellite radio interference. It refers to all unwanted forms of radio signals that infringe on and affect their own signals. These unwanted signals are emitted most commonly from satellite newsgathering (SNG) trucks, from VSAT networks, from satellite Internet services and also from faulty ground equipment. The problem often arises from technicians who do not install the ground segment properly and, as a result causes signal interference. So what is being done about this?

The demand for low-cost satellite services has been booming and therefore more installers than ever have been required to meet this demand. Interference is often put down to human error through bad installation of the ground equipment. Several groups have recognised the need for a higher standard of installer expertise and have taken action by making available courses that certify those who take them as able to deploy state-of-the-art satellite systems to the highest standard.

## SUIRG

SUIRG is an international assembly of parties with representation from both the private and public sector organised to combat the increasing and costly problem of satellite RF interference. Members disseminate information and actively pursue programmes to reduce radio frequency interference incidents. SUIRG was formed over ten years ago as an informal group working to reduce radio interference but has since been recognised as a trade association.

The Group's membership is comprised of satellite operators, users, uplinkers, service providers, equipment vendors and other organisations with a stake in combating radio frequency interference. SUIRG is currently collecting interference incident data from satellite operators on its web site to clearly define the specific areas that need focus to reduce the number of incidents.

SUIRG's objective is to stop interference before it starts, pursuing a number of remedies, among them: signal identification, which involves working with uplink equipment vendors to modify their equipment to provide a unique ID for cross-reference in a database when interference occurs; uplink training, procedures and certification; improved detection and identification tools, and continuous sharing of information and solutions among the SUIRG membership.

SUIRG defines the causes of satellite radio interference as:

- Reductions in orbital spacing of satellites;
- Reduced antennae size, wider beams and higher power;
- Poor equipment manufacturing & unmet performance specifications;
- Decrease in knowledgeable staff & lack of training;
- Poor installations, lack of routine station maintenance;
- Lack of industry standards and guidelines, and
- Unauthorised use of satellite space segments.

And the remedies as:

- Identifying and prioritising the causes of radio frequency interference,
- Acting as a central repository of RFI information and resources

- Coordinating industry-wide interference management efforts;
- Providing a neutral and broad interface for manufacturers and vendors;
- Serving as a single coordinating point on interference reduction issues;
- Establishing the first global geo-synchronous satellite empirical database on interference statistics;
- Working with other user groups to develop an industry recognized training and certification programme;
- Providing a registry of uplinkers for global and regional users to locate specific uplink services and capabilities;
- Working with satellite equipment vendors to establish an interference source locator identification capability on uplink carriers.

SUIRG has also monitored 1,624 interference causes and discovered the following causes of interference as:

• Human error	16.1%
• Adjacent satellite	14.7%
• Terrestrial Services	0.9%
• Deliberate	0.8%
• Cross polarisation	6.8%
• Equipment malfunction	33.9%
• Unknown	26.8%

## GVF

In 2002, responding to membership requests to address the increasing problem of interference due to improper VSAT installations, the GVF initiated a Certified VSAT Installer programme, comprised of a three-course sequence of classroom sessions. Classes are given periodically in the US, South America, Africa and Asia, and the Certified VSAT Installer database now lists over 200 installers worldwide. Up until now, most VSAT installer training programmes have focused on how to bolt-up the components and mount parts to a roof or wall, providing instructions on how to make certain indicators illuminate and/or achieve minimum levels on meters or displays. But unintended consequences of basic 'bolt up' training have become liabilities and cost burdens for the VSAT industry. Without a good understanding of the fundamentals of the satellite link, it is easy for installers to accidentally cause interference and difficult for them to troubleshoot problems. The GVF VSAT Installation and Maintenance Training Course is an intensive programme created to serve as the global industry standard for installers of bi-directional satellite earth stations. It was established by a consensus of expert volunteers serving in the GVF Education & Training Working Group (E&TWG).

## Three steps to success

The Course is offered in three levels of increasing complexity and culminates with a hands-on skills test. The first two levels are offered online and consist of animated and interactive HTML or Flash movies presented in a self-paced screen prompt style. This type of presentation encourages the student to explore diagrams using mouse rollovers, turn knobs, adjust antennas and tune test equipment.

The Level 1 course introduces the technology of VSAT communications; it also serves as a solid introductory training course for all staff and professionals in the satellite industry. The fundamentals of spacecraft operation, orbits, and coverage are explained followed by an overview of the ground equipment hardware and alternative methods for sharing space segment cost. The students are exposed to:

- Spacecraft Signal Path Building Blocks and Flight Control



Systems;

- Satellite Bandwidth and Capacity;
- Spacecraft Orbits;
- RF Spectrum Assignments allocated for Commercial Satcom;
- Channel Latency;
- Regional Coverage Footprints;
- Analogue/Digital TV, IP, Voice, Media Satellite Services;
- Advantages of SATCOM;
- Disadvantages of SATCOM;
- Earth Station Varieties;
- Satellite Transmission Access Techniques; and
- Digital Video Broadcasting.

The Level 2 course thoroughly covers the fundamentals that all VSAT field technicians should know, including cross-pol and accurate dish pointing to enable them to achieve high quality, interference free installations. Items covered include:

- Decibels (dB);
- Carrier to Noise Ratio and Digital Eb/No Ratio;
- Digital Signal Primer for BPSK, QPSK, 8PSK, 16QAM;
- Antenna Primer;
- Polarisation and Frequency Reuse;
- VSAT Hardware Variations;
- Forward Error Connection (FEC) Coding and Channel Bit Error Rate (BER);
- Rain Fading and Link Budgets;
- Site Survey Basic, Use of Compass;
- Virtual Antenna Pointing Exercises;
- IP Networking; and
- Trouble Shooting.

Finally, students progress to Level 3 training which is given on-site or online. At present, two varieties of Level 3 training are offered.

**Level 3S: Advanced/SCPC VSAT installation.** This course is currently offered in a classroom setting only. Students who complete this course, as well as the Level 1 and 2 courses, are awarded a GVF Advanced VSAT Installer Certification and may be posted in the GVF's Global VSAT Installer Database.

**Level 3i: GVF-iDirect Remoter Terminal Installation.** This course is offered on-line in an interactive, animated environment. Students who complete this course, as well as the Level 1 and 2 courses and the Hands On Skills Test, are awarded a GVF iDirect Remote Terminal Installer Certification and may be posted in the GVF's Global VSAT Installer Database. Over 100 students have now completed this course, including iDirect's own technical support staff.

### A growing concern

Over the past 18 months, over 800 students either independently or from organisations all over the world, have taken the GVF's online, interactive VSAT fundamentals courses. In the same period, over 140 students have progressed to the Level 3 training course and have received GVF certification. Many have noted that the online training is more effective than instructor-led training.

The result of this intense manner of training installers is that service providers are reporting a significantly reduced number of installation errors and site re-visits. A new training centre has now been opened in Bangkok, Thailand in addition to another established centre in Senegal and training is underway or scheduled for the US, Middle East, Europe and Africa. A two-for-one discount is available for those students in developing countries. Future goals for the expansion of GVF training include new online courses for managers, engineers and general staff development on fundamentals of satellite communications and also courses on speciality stabilised antenna platforms.

As raised earlier, a major contributor to satellite RFI is satellite newsgathering. Developments in the satellite newsgathering indus-

try over the last 20 years have been significant and have changed the way we think about and consume the news. However, one of the most prevalent problems facing the industry at present is that of interference. Radio Frequency Interference (RFI) has beleaguered the satellite newsgathering industry and is often down to operator error. The effect of interference on the satellite industry is significant and causes severe economic harm. SUIRG (the Satellite Users Interference Reduction Group) is dedicated to 'stopping interference before it begins' and is a membership-funded organisation comprised of representatives from private industry and the public sector. SUIRG works to share and disseminate information and remedies, to define equipment standards and proficiency training and also pursues programmes to reduce or mitigate satellite interference.

SUIRG have recently endorsed the very first Satellite Newsgathering training course being offered by Slingpath. The Basic SNG Operations and Practical SNG Operations courses were developed to provide a solution to the global phenomenon of satellite interference. Interference can result from poor operator skills and training. The Basic SNG Operations course offers a thorough introduction to the theoretical knowledge to use satellites.

Basic SNG Operations is an online course covering the correct procedures to access a satellite. The course is presented in seven modules and include topics such as the origins of satellite newsgathering, how to uplink, and safety hazards.

The course contains multimedia features such as interactions, animations, graphics, charts, and audio. Throughout the course are quizzes that reinforce your learning and self-check activities that test your knowledge and prepare you for the assessment.

The benefits:

- Professional training in transmission to eliminate satellite interference caused by operator error;
- Increased confidence in rigging up, transmitting, and de-rigging SNG equipment;
- Greater effectiveness in the use of satellite bandwidth and capacity; and
- Increased credibility within the SNG industry.

After successfully completing the Basic SNG Operations course, the student is awarded a Record of Competency in Basic SNG Operations. Full certification is gained by also taking the companion course Practical SNG Operations. After successfully completing both courses, the student will be awarded a Certificate in SNG Operations. This demonstrates to any satellite operator or employer that the certificate holder has been trained and examined to an industry standard. It is hoped that this type of pro-active attitude will not only prevent signal interference from occurring but will also heighten awareness and produce a new generation of skilled technicians who will be familiar with the equipment and what must be done in order to avoid interference in future.

### Taking control

The likelihood of satellite interference being eradicated completely is highly unlikely but heightened awareness of the issue will mean that companies can ensure that their staff are properly trained and aware of the requirements they must meet to reduce interference. An understanding of the workings of a satellite system from the very basic level is just as important as highly technical knowledge. Education is the key to the mitigation of RFI and ultimately saving companies a large amount of money and time. If the issue is constantly kept at the top of satellite group agendas and companies invest in the courses on a large scale, things can (and have already started to) change. A database, such as the one provided by GVF, means that installers may be selected on their capabilities and will be ultimately reliable, regardless of the equipment involved. This really is an essential part of the satellite business. Like a jigsaw, each piece has to fit together and the installer's accuracy is crucial. ■