N88-25689

AN OVERVIEW OF THE OMNITRACS - THE FIRST OPERATIONAL MOBILE KU-BAND SATELLITE COMMUNICATIONS

ALLEN SALMASI, President

OMNINET COMMUNICATIONS SERVICES
3416 South La Cienega Boulevard
Los Angeles, California 90016-4496
United States

ABSTRACT

The service features of the OmniTRACS system developed by Omninet Communications Services of Los Angeles, California, are described. This sytem is the first operational mobile Ku-band Satellite Communications System that provides two-way messaging and position determination and reporting services to mobile users on a nationwide basis. The system uses existing Ku-band satellites under a secondary international allocation for mobile satellite services.

INTRODUCTION

Omninet Corporation was formed in 1984 to provide a nationwide mobile communications service. Omninet has applied dramatic innovations to proven technologies creating a two-way messaging system for mobile and fixed applications.

The founder and president of Omninet, Allen Salmasi, has been actively involved for over a decade in developing and refining the initial NASA concept for mobile satellite systems. He conceived the OmniTRACS product which has enabled Omninet to develop a two-way mobile communications system employing in-orbit Ku-band satellites, with full operations commencing second quarter 1988.

The Federal Communications Commission (FCC) recently concluded there is an "outstanding need" for satellite-based position reporting and alphanumeric messaging. Because of such a demand for satellite-based mobile communications, the FCC over the past two years has given birth to two uniquely different services called the Mobile Satellite Service (MSS) and Radiodetermination Satellite Service (RDSS). Omninet is one of the two companies currently holding the RDSS license and the general authorization to proceed with the launch of its RDSS services, granted by the FCC in March, 1987.

Working with Qualcomm, Inc. of San Diego, Omninet is the first company to develop technology using existing Ku-band satellite capacity for mobile applications, eliminating the expense, risk and delays associated with satellite launches. Omninet and Qualcomm have been working closely to develop the OmniTRACS product for over two years. Omninet has contracted Qualcomm to design, implement and manufacture the OmniTRACS mobile and transportable VSAT's and the associated Network Management Facility exclusively for Omninet. Representatives from a variety of industries have expressed a need for improved communications with mobile fleets. Companies involved in public safety, transportation, public utilities and others have a need to send and receive information to vehicles enroute. As vehicles travel across the country into rural areas, they move out of range of

conventional land-based communication systems. Omninet's satellite communication system - OmniTRACS - eliminates the range problems inherent with land-based systems, creating a true nationwide network.

The OmniTRACS system began operational tests in January, 1988, in which an OmniTRACS mobile terminal was driven from Coast to Coast in constant communication with a Network Management Facility located in San Diego, California. Operation was very successful in all kinds of environments from wide open Western freeways to the concrete canyons of New York City.

Ku-band satellite communications are common-place in the commercial market and, in fact, the fixed VSAT (Very Small Aperture Terminals) network applications is one of the major growing markets for the Ku-band satellite communications. Telephony, television and private data networks are already extensive users of Ku-band satellites, plus Ku-band components are mass produced, making terminal costs relatively inexpensive. This provides for very reasonably priced communications and VSAT equipment. Other potential mobile satellite service providers must rely on tentative satellite launches years into the future at a cost of hundreds of millions of dollars or on securing frequency spectrum not yet sufficiently available for such use. Omninet is utilizing existing hardware and facilities, both on the ground and in space, with an innovative system design that takes advantage of novel signal processing techniques to deliver the mobile and transportable VSAT network services.

SYSTEM DESCRIPTION

OmniTRACS is a unique satellite-based communication system enabling users to manage mobile resources efficiently and economically.

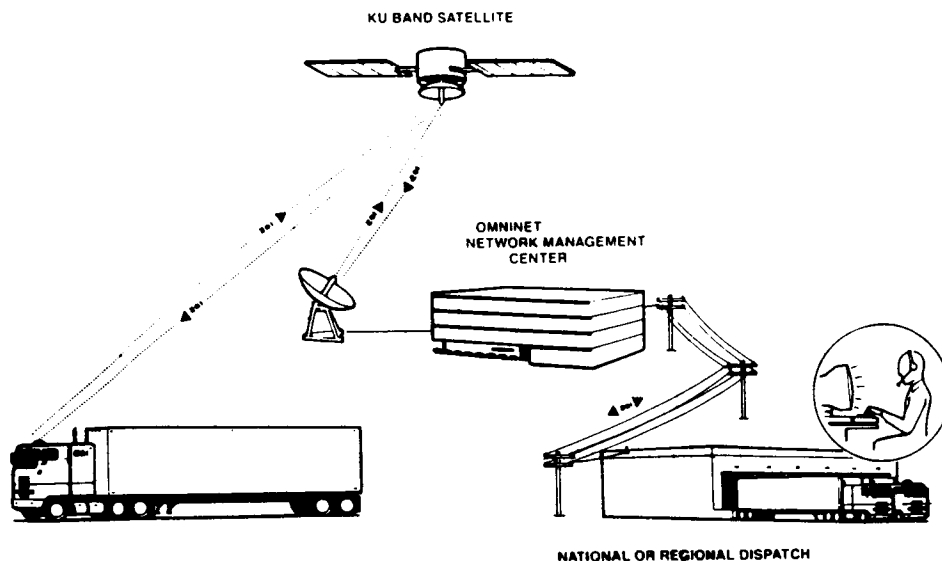

Fig. 1. OmniTRACS Service Network Concept

The OmniTRACS VSAT network has three major components:

1.   A Network Management Facility (NMF) which controls and monitors the OmniTRACS network. The NMF, located in Los Angeles, California with back-up facilities in San Diego, California, consists of a computer facility, message switching and processing equipment, and a satellite earth station to transmit and receive customer messages.

2.   Two Ku-band transponders aboard GTE Spacenet's GSTAR I satellite located at 103° west longitude.

3.   Two-way data-communication and position-reporting mobile and transportable OmniTRACS VSAT's.

The OmniTRACS mobile and transportable VSAT network features two-way data messaging, position reporting, fleet broadcasting, call accounting and message confirmation. The service provides users with an unprecedented range of features in a variety of cost-effective packages. A complete technical description of this system is presented in this conference in a paper by the technical staff of Qualcomm, Incorporated, "Technical Characteristics of the OmniTRACS - The First Operational Mobile Ku-band Satellite Communications System."

OmniTRACS features

Nationwide Covers the continental United States, including metropolitan and rural areas, so long as a direct line-of-sight to the satellite from the mobile antenna is available. No other commercial system is offering similar coverage in North America.

Existing satellites Uses fully protected Ku-band transponders on existing geostationary satellites which have been operational for many years. There is no risk of satellite hardware failure in-orbit and no dependence on future launches.

Two-way Allows dispatcher or driver to intiate or respond to preformatted or free-form messages. Emergency, group and fleet-wide messages are also available. Most importantly, it provides a positive acknowledgement of each message sent, ensuring the sender of a successful transmission.
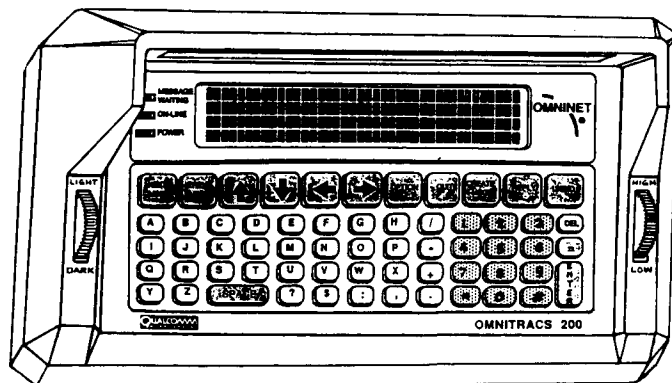

Fig. 2. The OmniTRACS Terminal Display Unit

Data Communication Dispatchers use computer terminals for message creation and response. Unlike traditional voice systems, messages are received by computer in a fraction of the time it takes for dictation of the same information, and can be stored for convenient viewing or later recall.

Demand for data communication systems has increased as the needs of mobile users have expanded and changed. The desire for greater speed and accuracy in mobile communications, the need to access information stored in computer databases, improvements desired in response time from the field, system security and privacy, and the need for preformatted and storable messages are some of the advantages that the OmniTRACS data communication system provides.

Position Reporting Satellite-aided Loran-C position information in available to the dispatcher after a message is sent to a mobile unit. It may also be provided on a scheduled basis or on demand.

By using the Ku-band satellite as a slave Loran-C station, the satellite-aided Loran-C provides highly accurate position information. This information is beneficial in vehicle management, such as ad-hoc dispatching, scheduling of shipments, vehicle arrival time management, accident location, recovery in the event of hijacking, and many other emergency and non-emergency situations.

Service Encompasses a range of equipment lease and purchase options, and a commitment to service at every level of customer involvement from training through customized system support.

OmniTRACS Outdoor Unit

OmniTRACS Display Unit
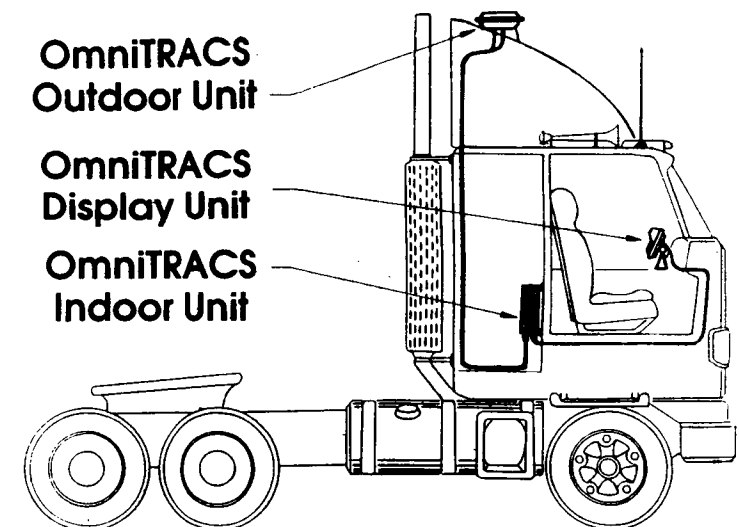
OmniTRACS Indoor Unit

Fig. 3. A Typical OmniTRACS Terminal Installation

Other features of the OmniTRACS service include:

Compact User-Friendly Terminals
End-to-End Turnkey Network Service
Network Monitoring and Diagnostics
Individually Addressable Terminals
Highly Reliable Data Delivery
Easy Maintenance

Federal Data Encryption Standard
Multiple Message Memory
Quick Installation
Minimal Power Requirements
Unattended Service

APPLICATIONS AND BENEFITS

There are numerous applications for the OmniTRACS mobile satellite communication system. Any organization or a company with a fleet of mobile vehicles will derive notable benefits from the system.

To date, twenty potential user markets have been identified. The market for Omninet's services includes trucking and other commercial transportation services; utilities and public sector users including public safety, emergency and Federal Government agencies; construction and resource-extraction companies; agriculture and forest resource companies; regional and charter bus lines; railroads and marine vessels; consumer and small business mobile users as well as stationary and transportable users desiring their own private low-volume data networks.

Omninet has executed contracts with eighteen transportation companies for over 25,000 units to be installed over a period of two years. Omninet's marketing and sales personnel are working with major transportation companies. Omninet projects that the companies it is working with have the potential for utilizing over 100,000 units. This represents roughly one percent of the total addressable market for satellite-based mobile communications.

Transportation

The transportation industry has an increasingly acute need for mobile communications on a nationwide basis. Companies involved in public transit, trucking, railroads, marine transport, and aviation require communication with and tracking of their mobile fleets. Trucking operations are subject to frequent changes in routing and scheduling. Trucks are more vulnerable than other types of transportation to mechanical failure, accidents, local traffic delays and adverse road conditions, increasing the need for mobile communications. The transportation industry currently has no communications and position reporting services on a nationwide basis. The OmniTRACS system provides a cost-effective answer to the needs of the transportation industry. Three key factors make the system cost effective: Use of the currently operational in-orbit Ku-band satellites, the mode of the communication (data) and the unlimited range of the system.

Because the OmniTRACS system uses data messages to communicate information, the cost per message is significantly less than voice transmissions. The time spent sending and receiving messages is decreased, thus saving money at both the driver and dispatch levels. In addition, the unlimited transmission range of the system allows for messages to be sent enroute, which eliminates unnecessary stops.

Of particular interest to the transportation industry is the ability of the OmniTRACS system to track vehicles, specifically those carrying hazardous materials, weapons or petroleum. The cargo's value, coupled with the risks involved, requires constant surveillance of the truck, train or aircraft. The OmniTRACS system provides position reporting of vehicles on demand or at predetermined intervals.

Vehicle Location

The sheer number of government and private industry vehicles traveling across the country make it difficult to monitor the location of each vehicle at a specific time. The OmniTRACS position reporting system allows a dispatcher to locate any vehicle at any time with the desired level of accuracy. This feature is beneficial for day-to-day monitoring of a fleet, as well as locating a vehicle that has been stolen or involved in an accident. Recovery of valuable merchandise and equipment is possible by using the OmniTRACS system.

Public Safety

Fire, police and emergency medical organizations using the OmniTRACS system improve their ability to respond and communicate during emergency situations. In emergency situations, when lives may be at stake, it is imperative that the communication system be reliable and accurate. The OmniTRACS data transmission system provides the reliability and accuracy demanded by the public safety industry. Users eliminate the risk of missing vital information by sending and receiving messages in data form. In addition, all messages can be stored for later recall.

The system is not meant to replace voice communications, but rather to enhance the current systems and provide accurate relay of information anywhere in the country. In the event of earthquake, flood or other major disaster, the OmniTRACS satellite system will remain operational, while land-based communication systems may become inoperable. The system could be the key to keeping information flowing from the location of the disaster.

Public Utilities

The need for communication with vehicles servicing public utilities such as water, power, and telephone is apparent in major metropolitan areas as well as small rural towns. The ability to convey information via satellite from field to base and vice versa allows for efficient servicing of the public even in the most remote areas of the country.

In addition to using the OmniTRACS system for mobile applications in the public utility sector, fixed applications are also appropriate. For example, by placing transportable VSAT terminals at strategic locations along a river or aqueduct, water flow information can be transmitted quickly and accurately, without the need for human interaction. The flexibility of the OmniTRACS system from mobile to transportable applications make it a valuable tool for public utility companies across the country.