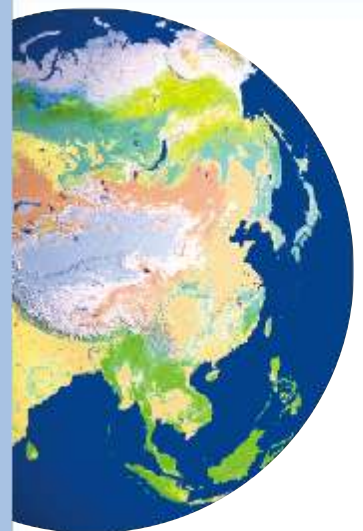




**PILOT PROJECT ABSTRACT**  
Satellite Communications (SATCOM)  
PG Course (Phase-I)



## Design of digital modem

Mr. Kim Byong Ho  
P&T Ministry, Central district  
Pyongyang, DPR Korea

*Supervisor*  
Mr. M. Jeyamani  
MD  
SAC, Ahmedabad, India

The scope of the project is to design 2 MBPS QPSK Modem with forward error correction. As part of the design of Modem, detailed study of the functioning of the various parts of the Modem will be undertaken. Modem design and development is planned to be carried out using VLSI - DSP technology and the performance of the Modem will be evaluated for fulfillment of the requirements. 2 MBPS Digital Modem will have applications in intermediate Data rate (IDR) Systems widely used in medium and small capacity satellite communications systems.

## Design and development of GPS receiver subsystem

Mr. Kim Ryong Chol  
The Institute of Remote Sensing & Geoinformatics  
State Academy of Sciences  
Pyongyang, DPR Korea

*Supervisor*  
Mr. P.M.C. Lal  
DCTD  
SAC, Ahmedabad, India

General purpose expensive GPS receivers which can measure both position and velocity are being used in DPR Korea for measuring ground truth and ground control points for formation of Digital Terrain Model (DTM), Geometric rectification and classification of satellite imagery. Hence there is need for application specific, low cost, accurate GPS receivers for use in remote sensing. The scope of the project is to design and develop GPS receiver subsystems by using MMIC, C-MOS VLSI and DSP technologies.

## Protocol design of CDMA based mobile satellite network for voice and data

Mr. Rajesh Kumar Uppal  
Baseband Division, Satcom Group  
DEAL, Dehradun, India

*Supervisor*  
Mr. V.S. Yadav  
ESSE&ID  
SAC, Ahmedabad, India

**A**s part of the project the design of Network Signaling System for CDMA based mobile satellite system has been taken up. The multiple access schemes are chosen to be CDMA because of the requirement of message security and anti jam capabilities. Demand Assignment is also desirable to serve a large number of users with the limited available network resources.

The network signaling system design will consist of:

- Design of the network access protocol for inbound and outbound links for mobile-to-mobile, mobile to PSTN sub-carrier & PSTN subscriber to mobile and also to design the formats of signaling messages.
- Performance analysis of the network signaling in terms of maximum number of mobiles in the network and the average delay incurred by the mobiles in accessing the service.

## The study of a satellite based network for store and forward data collection

Mr. Edwin Winarano  
Lapan Rancabungur  
Bogor, Indonesia

*Supervisor*  
Dr. K.S. Dasgupta  
CTG  
SAC, Ahmedabad, India

**T**he use of a satellite link to store and forward data collection system will provide many benefits that a satellite based system can offer, e.g. large coverage area, distance independence, reliability etc. This approach helps in efficient allocation of a satellite communication channel to a population of geographically distributed terminals. As part of the project different multiple access techniques, suitable for data collection system requirements, will be studied. The scope of the project includes study of the performances of different multiple access techniques in terms of channel utilization, throughput and delay characteristics.

## A study on earth station reliability

Mr. Mostafa Torabian  
SDG Earth Station  
Assadabad Hamedan, Iran

*Supervisor*  
Mr. P. Dhar  
RQA  
SAC, Ahmedabad, India

**S**ystems comprising of electrical, mechanical, electromechanical and electronic parts designed to perform specific functions consist of a large number of parts and each part is liable to failure. In satellite communications, a reliable operation of Earth Station is essential for providing desirable service. The reliability of earth station can be improved by using high reliability components and adopting other reliability techniques like derating and redundancy at part level or unit level. The scope of the project is to classify earth stations, identify critical components in transmit and receive chains and generate various configurations by adding redundancy at unit level for improving the reliability. An overall availability goal of 99.99% is aimed for INTELSAT Earth Stations. Human reliability which is an important factor in operations and maintenance of Earth Station is also to be studied. A subsystem of the Earth Station will be taken up as an example for studying the reliability concepts.

## Feasibility study and performance analysis of a satellite based computer network for ministry of agriculture of Iran

Mr. Naser Shaibani Asl  
Ministry of agriculture of Iran  
Tehran, Iran

*Supervisor*  
Dr. K.S. Dasgupta  
CTG  
SAC, Ahmedabad, India

**A**gricultural information dissemination (AID) is of great significance for Islamic Republic of Iran as a producer, importer and exporter of agricultural products. Agricultural Statistics Information Department (ASID) has already established different hardware environment and software schemes for AID. Taking this background into account, this project has been proposed. The scope of the project is as follows:

- To consider user requirements and provide an appropriate design to overcome the limitations of the existing infrastructure in terms of data bandwidth, turn around time and future requirements.
- To study the possibility of using a VSAT network to make two way data connectivity between agricultural organizations located in different cities and interconnecting to the existing network.
- To identify data interface ports requirement, protocol conversion, access method, transmit & receive antenna, power and network configuration.
- To analyze and evaluate the quality of inbound and outbound links.

## Development of computer based training on satellite communications

Mr. Imanaliev Uzak Murzabekovich  
Physics Department  
Bishkek, Kyrgyzstan

*Supervisor*  
Mrs. Dipti Rustogi  
SATCOM Applications Area  
SAC, Ahmedabad, India

**C**omputer based training on Satellite Communications is aimed at making the study of different topics on Satellite Communications interactive and interesting. As part of the project, development of computer based training on topics like satellite orbits, link budget, earth station sub systems, modulation, coding etc. will be taken up. In addition to texts and graphics, the computer technology will assist in working out and solving problems on each topic. Provisions will also be made for updating the material and make personal notes at the end of each topic without disturbing the main text. Evaluation of the understanding of the subject will be done at the end of each topic.

## Study of satellite based radio and TV broadcasting system for Nepal

Mr. Deepak Mani Dhital  
Nepal Television  
Kathmandu, Nepal

*Supervisor*  
Dr. C. Lal  
CTG  
SAC, Ahmedabad, India

**D**ue to mountains and difficult terrain of the Kingdom of Nepal, linking different transmitting stations to the Central Studio for the purpose of broadcasting is extremely difficult and costly through terrestrial links. Nepal television (NTV) has plan for satellite based broadcasting system for expansion of its coverage in near future. The scope of the project is to study the satellite based broadcasting system and assist in evolving a system suitable for Nepal.

## Study of Ku- band VSAT network for Nepal

Mr. Dinesh Dev Pant  
Earth Station Expansion,  
Project Implementation Department,  
Nepal Telecommunications Corporation  
Kathmandu, Nepal

*Supervisor*  
Dr. R. Ramani  
NSD  
SAC, Ahmedabad, India

**I**n the hilly terrain of Nepal providing Telecommunications facilities to all parts of the country using terrestrial links is very difficult. Nepal Telecommunications Corporation

(NTC) responsible for providing communications facilities to the country envisages the use of Satellite technology to provide communications facilities to remote places where access by terrestrial means is very difficult. The scope of the project includes assessment of service requirements and designing the network in terms of the topology, bandwidth and access method. Selection of the appropriate technology to be used along with broad specifications of subsystems of the VSAT network and costing of the overall system will be carried out as part of the project. Since Ku band is very susceptible to rain attenuation the study will also include rain attenuation calculations for the link availability.

## The study of rain attenuation on earth-space downlink operating at 12 GHz in Korea

Mr. Min Kyung Hyun  
DACOM Corporation  
Seoul, Republic of Korea

*Supervisor*  
Dr. Raghbir Singh  
AFG  
SAC, Ahmedabad, India

DACOM Corporation, one of the common carriers in Korea is planning to provide Direct Broadcast Service through linearly polarized 12 GHz Satellite downlink by 1999. However, the actual attenuation data due to precipitation, which is a major factor in degradation of Satellite Communication link at 12 GHz is not available for Korea. Hence, it is proposed to carry out the study of rain attenuation on satellite link at 12 GHz in Korea. The scope of the project is to collect direct rain attenuation data by using satellite beacon signal for one year, analyse the data and compare the result with that of the existing prediction model.

## Voice coding and decoding system design and software development

Mr. Lassana Weeratunge  
Arthur C Clarke Centre for Modern Technologies  
Moratuwa, Sri Lanka

*Supervisor*  
Mr. R.N. Mutagi  
BPD  
SAC, Ahmedabad, India

**I**n Telecommunications, Voice Coding and Decoding have major roles. Low bit rate coding and decoding provide Low Rate Voice Coding (LRVC) allowing usage of small terminal and more capacity in a given frequency band. LRVC is implemented in real time with digital signal processing techniques. The scope of the Project is to study low bit rate codecs and design ADPCM transcoder of single channel PCM recommended by CCITT Rec. G 721. As part of the project, Study and Design of Digital Telecommunication functions such as PCM stream synchronization and PCM to ADPCM conversion for trunk transmission will be taken up.

## Study and simulation of video and data compression techniques for satellite based multimedia applications

Mr. Muthuthanthrige Saman Hemantha Cooray  
Arthur C Clarke Centre for Modern Technologies  
Moratuwa, Sri Lanka

*Supervisor*  
Dr. K.S. Dasgupta  
CTG  
SAC, Ahmedabad, India

**M**ultimedia applications are currently being used extensively through satellites. Hence the need arises to compress video and data using fast and efficient algorithms. Video conferencing, distance learning, telemedicine, video phone and real time broadcast transmissions are some of the applications which demand fast and efficient algorithms. The scope of the project is to study/review and simulate various compression techniques, motion estimation and correction and to arrive at a suitable algorithm which is cost effective and efficient. The study will also cover transport layer which is an important element of MPEG-2 for satellite based multimedia applications.

## Design and analysis of 3 m dia earth station antenna-CAD approach

Mr. Botir Shucurillaevich Usmunov  
Uzbek State Space Agency "Ezbekkoilot"  
Uzbekistan

*Supervisor*  
Dr. D.S. Purohit  
AMD  
SAC, Ahmedabad, India

**W**ith the advent of powerful digital computers it is possible to handle earth station antenna design and analysis through Computer Aided Design (CAD) approach. The scope of the project is to use Mechanical Computer Aided Engineering (MCAE) domain for conceptualizing analyzing and designing a 3 m. dia. Earth Station Antenna. The approach synthesis involves conceptualising reflector and mount geometry, development of geometric model on CAD package (Autocad) ported on a Pentium platform and Finite Element Modeling (FEM) with pre/post processing through Finite Element Software NISA ported on SUN CLASSIC+ Work Station. The geometry will be checked for specific design specifications like RMS (Root Mean Square) surface error and pointing error for the operational wind. The stresses in the members of the mount and the skin stresses in the reflector will be checked as per the permissible stresses specified by the standard design codes for the survival wind speed cases.

## Development of meteorological data processing software

Ms. Sahena Begam  
Bangladesh Space Research and  
Remote Sensing Organisation (SPARRSO)  
Dhaka, Bangladesh

*Supervisor*  
Dr. K.S. Dasgupta  
CTG/SAPA  
SAC, Ahmedabad, India

**D**irect Broadcast Service is provided by meteorological satellites that transmit satellite sensor data and products in real time and near real time. In the next few years there will be change of transmission mode from analog to digital. The satellite data direct broadcast service will migrate from analog Automatic Picture Transmission (APT) and weather facsimile (WEFAX) broadcast standard to digital equivalent, now known as Low rate Information Transmission (LRIT) and low Rate Picture Transmission (LRPT) respectively. The transmission implies that at the user's side there will be replacement of software to handle these data. Scope of the project is to understand the proposed digital data transmission system and develop the necessary software.

## Study and design of DAMA system for satellite communications

Mr. Mamlukar Rahman  
CTO, Bangladesh Telegraph and  
Telephone Board Ramna  
Dhaka, Bangladesh

*Supervisor*  
Mr. M.K. Sharma  
MMAD/CTG  
SAC, Ahmedabad, India

**E**fficient modulation and multiple access techniques can improve the traffic carrying capacity of a satellite transponder. Another way is to assign traffic to channels so that each channel can carry more traffic. Demand Assigned Multiple Access (DAMA) Technique takes advantage of both the approaches to optimize the channel capacity and its utilization. Providing rural telecommunication is a challenge to the developing countries because of low revenue generated by thin route traffic and high cost of providing the service. This challenge is met by maximizing the channel capacity to the extent possible depending upon the actual traffic pattern. The scope of work for this project is to study DAMA Techniques suitable for rural communications and develop the relevant software.



## Study of antenna tracking system for LEO satellites

Mr. M Nur Hossain Shariffe  
Bangladesh Space Research and  
Remote Sensing Organisation (SPARRO)  
Dhaka, Bangladesh

*Supervisor*  
Mr. S.S. Valdiya  
ESEID/ESFG  
SAC, Ahmedabad, India

LEO satellites orbit around the Earth at the altitude of 500-2000 km. These satellites are in view from any point on earth's surface for a limited period of time and sweep a path across the observer's sky in a period of time determined by the orbital parameters of the spacecraft. Without a proper Tracking system, the ground station would lose contact with the satellite link. Different types of tracking system like Manual/Program tracking, Monopulse, Sequential Amplitude Sensing, Electronic Beam Switching etc. are used depending upon the specific requirements. Study of different Tracking Systems and the design of a tracking system will be undertaken as part of the project.

## Study and system design of HEO based communication system

Mr. Paek Chang Ho  
Kwangmyong Dong, Unjong District  
Pyongyang City, DPR Korea

*Supervisor*  
Mr. K. Bandyopadhyay  
SAEG  
SAC, Ahmedabad, India

**F**or countries situated on higher latitudes, Geo synchronous satellites are not found suitable due to low elevation angle of the earth station antenna, causing multipath, high elliptical orbit (HEO) satellites are better suited for these countries. Korea being a country on higher latitude, HEO satellite system is preferred for domestic needs. As part of the project work, HEO based satellite communication systems will be studied in order to evaluate the feasibility of a communication system for Korea. Preliminary design of the total system including satellite and ground system will also be undertaken.

## Study of data compression techniques for remote sensing imageries

Mr. Ri Tong Il  
Unjong District  
Pyongyang City, DPR Korea

*Supervisor*  
Dr. K.S. Dasgupta  
CTG/SAPA  
SAC, Ahmedabad, India

**R**ecent advances in remote sensing techniques with high spectral and spatial resolution have increased the volume of data from such sensors considerably. Data compression technique is used to overcome the problem of handling large data. As part of the project, different data compression techniques will be studied and development of a data compression technique with high compression ratio and high speed will be undertaken.

## Study of mobile satellite communication system

Mr. Parimal Majithiya  
Space Application Centre Jodhpur Tekra  
Ahmedabad, India

*Supervisor*  
Mr. A.K. Sisodia  
PSED/PSIG/MISA  
SAC, Ahmedabad, India

**M**obile communication is one of the important applications of satellite communications by which communication can be provided to anyone at any time globally. There are number of satellite based mobile communications systems presently operational and quite a few are planned for operations in the near future. The scope of the work for the project is to study the configuration of different operational and planned mobile satellite systems, international standards being evolved and present a satellite payload configuration suitable for meeting the requirements of different users.

## Study of satellite systems for military applications

Mr. Ajay Malik  
Defence Electronics Applications Laboratory  
Dehradun, India

*Supervisor*  
Mr. K. Bandyopadhyay  
SAEG  
SAC, Ahmedabad, India

**C**ommunications is one of the important logistic supports any military system needs in times of peace or conflict. Satellite communications is attractive to military system because of the flexibility and ease of operations from difficult terrain. As part of the project, a detailed study will be conducted on present and future military satellite communication systems. Areas of significant technological thrust for minimizing the gap between commercial and military needs will be addressed. A Satellite Communications system configuration for military applications will also be proposed.

## Study and simulation of multi-carrier demodulator for on board processing communication payload

Mr. Himanshu Shah  
OPD/CTG/SAPA, Space Application Centre  
Ahmedabad, India

*Supervisors*  
Dr. K.S. Dasgupta  
CTG/SAPA  
Mr. V. Ramakrishna  
OPD/CTG/SAPA  
SAC, Ahmedabad, India

**I**n an on-board processing communication payload, multi-carrier demodulator performs simultaneous demodulation of a number of SCPC carriers. Different digital signal processing techniques are used for this purpose. As part of the project, apart from the study

of different techniques used for multi-carrier demodulation, the demodulator will be undertaken by simulation of the algorithm using MATLAB.

## PC based network for distance education

Mr. Bolotbek Dusheyev  
Kyrgyz State National University  
Bishkek, Kyrgyzstan

*Supervisor*  
Dr. K.S. Dasgupta  
CTG/SAPA  
SAC, Ahmedabad, India

**S**atellite Communication is an effective tool for implementing Distance Education in developing countries with poor communication infrastructure. PC based Distance Education system is easier and economical to implement and operate compared to Television based system. The scope of the project includes study of different Satellite based distance Education Systems and a configuration for implementing a Distance Education System using VSATs and personal Computers will also be proposed.

## Study and design of digital TV broadcasting system for Mongolia

Ms. Vandanmagsar Bolorchimeg  
NARAN Earth Station of  
Mongolian Telecom Company  
Mongolia

*Supervisor*  
Dr. C Lal  
CTG/SAPA  
SAC, Ahmedabad, India

**S**TV Broadcasting by satellite is technically convenient and cost effective for mountainous country like Mongolia. Digital Broadcasting of TV gives added advantages of better picture quality and accommodating a large number of TV channels in a transponder. A number of interesting value-added services can also be provided through the digital TV network. As part of the project, different digital broadcasting system by satellite is being addressed and a suitable network for transmission and reception of digital TV system for Mongolia will be designed. Television based system. The scope of the project includes study of different Satellite based distance Education Systems and a configuration for implementing a Distance Education System using VSATs and personal Computers will also be proposed.

## Study of internet broadcasting by cable radio network

Mr. Guliraanz Dugarchuluun  
School of Telecommunications &  
Information Engineering,  
Mongolian Technical University  
Ulaanbaatar, Mongolia

*Supervisors*  
Mr. K. Bandyopadhyay  
SAEG

Mr. A.R. Charania  
NSD/SAEG  
SAC, Ahmedabad, India

**I**nternet is a very powerful network of information. Accessing Internet via cable network is gaining popularity where such networks are available. Cable Radio Network is well distributed to a very large population at cheaper cost all over Mongolia. By taking advantage of the existing radio cable network, Internet service can be provided to a large number of people. Scope of work for the project includes Study of Internet data distribution by different means and design of a network using radio cable network for Mongolia.

## Development of software for satellite antenna foot print

Ms. Jigjidsuren Javzansuren  
School of Telecommunications  
and Information Engineering,  
Mongolian Technical University  
Ulaanbaatar, Mongolia

*Supervisor*  
Dr. D.N. Holla  
ATPG/MISA  
SAC, Ahmedabad, India

**F**or better distribution of satellite power over the coverage area, contoured antenna beams are desired to minimize the radiation on unwanted area. Beam shaping of antenna increases the antenna gain and efficiency while reducing radiation interferences to other service areas. Three dimensional satellite antenna radiation patterns when projected over the coverage area gives the antenna footprint, the process of generating the desired antenna foot prints include-determination of optimum antenna design parameters for a given coverage requirements, calculation of contoured beam pattern based on antenna parameters and finally plotting the projection of contoured antenna beam pattern on earth. As part of the project, computer programs of complex mathematical formulations for generating antenna foot prints will be generated using Visual C++.

## Development of CBT on satellite communications

Ms. Erkhembaatar Narantuya  
School of Telecommunications &  
Information Engineering, Mongolian Technical University  
Ulaanbaatar, Mongolia

*Supervisor*  
Mr. D.A. Dhond  
AES/ESFG/SAPA  
SAC, Ahmedabad, India

Use of audio, visuals and animations for teaching is the most effective way of teaching. Computer based teaching (CBT) integrates all these media and it is convenient to navigate to the desired topic. CBTs are also ideal for self-learning at the learner's own pace. A course on Satellite communications needs vast teaching material with sophisticated teaching aids for effectively teaching the students. As part of the project work computer based teaching material on Satellite Communications will be generated using Visual Basic.

## Study and design of digital satellite news gathering system

Mr. Sudarshan Krishna Malla  
Nepal Television  
Kathmandu, Nepal

*Supervisor*  
Mr. A.S. Durai  
AES/ESFG  
SAC, Ahmedabad, India

Broadcasting important news with visuals from locations, live or recorded is a challenge to any TV news agency. A satellite News Gathering (SNG) System is a transportable/portable TV transmission system which transmits news worthy visuals with commentary or live programs from remote locations via satellite to the main Broadcasting for SNG applications helps in making the equipment smaller and lightweight. As part of the project work, different parameters of Digital SNG Systems will be studied and a systems level design of Digital Satellite News Gathering system will be undertaken.

## Study of internet service using VSAT

Mr. Dhruva Ram Munankarmi  
National Computer Centre  
Kathmandu, Nepal

*Supervisors*  
Mr. K. Bandyopadhyay  
SAEG  
Mr. A.R. Charania  
NSD/SAEG  
SAC, Ahmedabad, India

Communications using VSAT is popular, convenient, cost effective and technically suitable for mountainous terrain of Nepal. For providing Internet access from remote locations VSATs are essential. Exploiting capabilities of VSAT technology for providing Internet service is the objective of the project work. As part of the project, use of receive only and two-way VSAT systems for Internet applications will be studied and the systems level design of a network will be undertaken.

## Design of a satellite based emergency communications system

Mr. Lok Raj Paneru  
Sagarmatha Satellite Earth Station,  
International System Manager's Office  
Kathmandu, Nepal

*Supervisor*  
Mr. V.S. Yadav  
ESEID/ESFG/SAPA  
SAC, Ahmedabad, India

**S**atellite communications is ideally suited for providing quick communications under emergency situations. Nepal being a mountainous country, natural calamities like earth quake and landslides are common requiring emergency communication system for organizing relief operations. As part of the project, study of different LEO and GEO satellite systems capable of providing mobile and fixed services for emergency will be undertaken as per the requirements of the country. Out of the systems studied an optimum emergency communications system will be designed.

## Study of Ku band VSAT network for meteorological data dissemination

Mr. Danilo F Cambay  
DOST/PAGASA (Weather Bureau)  
Quezon City, Philippines

*Supervisors*  
Mr. M. Jeyamani  
MD/CTG/SAPA  
  
Mr. S.V. Mehta  
NSD/SAEG  
SAC, Ahmedabad, India

**F**or the purpose of weather forecasting, meteorological data from remote locations need to be collected at a central location. It is also required that the weather forecast is disseminated quickly and efficiently. Satellite communication plays an important role in both meteorological data collection and dissemination. The scope of the work for the project is to study Ku band VSAT network for real time exchange of alpha-numeric data, imageries, and environment related information between Main Communications Centre and all Regional Forecasting Centres. The study of broadcasting system for meteorological data dissemination of observations and processed data to low cost satellite-receiving stations will be also undertaken. This will allow quick dissemination of a large amount of information including alerts to all concerned.

## Study of satellite based meteorological data collection system

Mr. Nuwan Kumarasinghe  
Department of Meteorology  
Colombo, Sri Lanka

*Supervisor*  
Prof. M. Jeyamani  
MD/CTG/SAPA  
SAC, Ahmedabad, India

**T**imely collection of data from remote meteorological data collection platforms is important for weather forecasting. Unique features of Satellite Communications provide a very efficient way of meteorological data collection from remote locations to a central location. The objectives of the project work is to study the present communication system of the Department of Meteorology of Sri Lanka and propose a hub based VSAT network for meteorological data collection with all regional stations as nodes.

## Study of Ku-band VSAT network of satellite communication for DPR Korea

Mr. Ri Chol  
International Satellite  
Communication Earth Station of P&T Ministry  
DPR Korea

*Supervisor*  
Mr. K. Bandyopadhyay  
SAEG,  
SAC, Ahmedabad, India

The current trend in domestic satellite communication is toward the Ku-band VSAT network. Development of Ku-Band VSAT network is becoming important in satellite communication system. The scope of the work for the project is to study VSAT technology and different multiple access techniques. The propagation effect in Ku-band, and the reason for selection of Ku- band would be studied while designing VSAT network for DPR Korea.

## Study of satellite based meteorological data reception system

Mr. Ro Myong Bok  
Academy of Sciences  
Pyong Yang, DPR Korea

*Supervisor*  
Mr. A.S. Durai  
AES/SGST/SITAA,  
SAC, Ahmedabad, India

World Meteorology Organization (WMO) is directly providing the real time data to various users. This data is utilized for social and economic development which is brought about through environment studies. The objective of this project is to study present meteorological data reception system from meteorological satellite for DPR Korea.

## SSPA using hybrid power modules

Mr. Ramesh J Doshi  
SPAD/TRG/MISA  
SAC, Ahmedabad, India

*Supervisor*  
Mr. R.V. Singh  
SPAD/TRG/MISA  
SAC, Ahmedabad, India

The SSPAs are used in transmit chain of earth station and satellite. The SSPA has become a competitor of Traveling Wave Tube Amplifier (TWTA). As in case of SSPA, the power requirement is low. Due to better linearity, low voltage requirement and compactness, SSPA is becoming more popular for On Board applications. The aim of the project is to design compact C-Band 20 Watt Solid State Power Amplifier Using Hybrid Power modules.



## Design of Ka-band electronic beam squint tracking system

Ms. Rupal R Yagnik  
SPAD/TRG/MISA  
SAC, Ahmedabad, India

*Supervisor*  
Mr. S.S. Valdiya  
SEID/SGSTG/SITAA  
SAC, Ahmedabad, India

**M**odern satellites have spot beams at Ka-band for communication applications. The spot beams are required to focus on a small defined area on earth and must not be disturbed. To meet this requirement an antenna pointing mechanism is required to be used in satellites. Use of spot beams in satellite for communication purpose will demand accurate pointing of satellite and hence the requirements of an on board tracking system. The electronic beam squint (EBS) technique has been selected for on board Ka-band tracking system because of its high accuracy, simplicity and low cost design. As a part of project, apart from study of different techniques used for tracking system, design of EBS tracking system will be undertaken. The optimization and verification of the design of EBS controller will be undertaken by simulation of algorithm & generating antenna beam switching pattern using 'C' language computer program.

## Study and selection of suitable encryption scheme for satellite based data communication

Mr. Deval Chitranjan Mehta  
ACTD/ADCTG/SITAA  
SAC, Ahmedabad, India

*Supervisor*  
Mr. V.S. Palsule  
ACDT/ADCTG/SITAA  
SAC, Ahmedabad, India

**S**ecure communication for prevention of unauthorized interception of sensitive information is a legitimate need, not only of military and government, but also of the business sector. If a non interceptable means for data storage and transmission were available, then all messages and data including data in storage units would obviously be secured. One such possible system is a cryptographic cipher system, which can conceal the contents of every message by transforming (enciphering) it before transmission or storage. The project titled "Study and selection of suitable encryption scheme for Satellite based Data Communication" will explain and compare various encryption schemes and will suggest suitable scheme for satellite based data communication system.

## Satellite based meteorological data collection system for land and sea

Mr. Chusnul Tri Judianto  
Jl. Cagak Satelit Rancabungur,  
Kemang Bogor  
Jawa Barat, Indonesia

*Supervisor*  
Mr. M. Jeyamani  
SATD/SGSTG/SITAA  
SAC, Ahmedabad, India

**I**ndonesia (The land of islands) has difficulty in collection of environmental/ weather data due to wide spread topology. Also the terrain has hills and forests. Weather data is acquired using NOAA and GMS/MTSAT. Some times remote areas remain without data acquisition. This project is focused on to study the Data Collection System through Indonesian satellite by using DCP and data re transmitting system. The data collection system under study will have collection of environment data from remote areas using DCP, transmitting it to the satellite in UHF band, re-transmitting DCP data to primary ground station for processing in L band and finally dissemination to users.

## Communication payload for low earth orbit satellite system

Mr. Minto Suwarjo  
LAPAN  
Bogor, Indonesia

*Supervisor*  
Mr. S.M. Srivastava  
FCD/TRG/MISA  
SAC, Ahmedabad, India

**L**ow Earth Orbit (LEO) satellite network for communication is alternate to Geosynchronous Satellite network. The disadvantages of GEO like large propagation delay, higher G/T for receive terminal etc. could be overcome by using LEO Network. The LEO based satellite Networks have been planned by ICO, Teledesic, Orbocm etc. The scope of this project is to study the communication Payload for Low Earth Orbit satellite systems and applications, as a prelude for establishment of Low Earth Orbit based satellite system for data communication for Indonesia.

## Web based interactive training programme for satellite communications

Ms. Oyun Battumur  
Mongolia Telecom Training Center  
Ulaanbaatar, Mongolia

*Supervisor*  
Dr. K.S. Dasgupta  
ADCTG/SITAA  
SAC, Ahmedabad, India

**S**atellite Communications can be studied through various Media. Internet media is the one of the most appropriate to reach the people. As a part of project, a detailed study of HTML, Macromedia Flash, Java applets will be done. The study will have following components.

- Publish all materials in HTML format with appropriate links
- Include Macromedia Flash animation objects to help visualization
- Intend to include Self Evaluation Tests
- Provide Glossary of Terms encountered in Satellite Communications
- Provide List of important links to online references
- Provide List of interesting Books and Articles on Satellite Communication

## Study and simulation of satellite-based multimedia distance education system

Mr. Ram Krishna Maharjan  
Institute of Engineering, Tribhuvan University  
Kathmandu, Nepal

*Supervisor*  
Dr. K.S. Dasgupta  
ADCTG/SITAA  
SAC, Ahmedabad, India

**S**atellite Based Multimedia distance education system provides a real time, easy to access and cost effective ideal solution to the mountainous country like Nepal. The project is aimed in finding out the cost effective, efficient and easy to access communication methodology for point to multi-point and multi-point to point for distance education. The project also aims in finding out different options for data transmission from teaching end to classrooms and vice versa.

## Design of optimum remote area communication system for Nepal

Mr. Amar Nath Jha  
Nepal Telecom Corporation  
Butwal, Nepal

*Supervisor*  
Mr. M.K. Sharma  
DCTD/SGSTG/SITAA  
SAC, Ahmedabad, India

**R**ural Nepal situated in Himalayan region has many hurdles in developing communication systems. Repeaters have to be located in high altitude areas making access difficult in general and impossible during winter and rainy season. Such repeaters, may not be cost effective in rural areas as traffic is low. Satellite based communications system happens to be only solution for remote areas in Nepal. The aim of the project is to study different communication systems and select the optimum for remote areas of Nepal. Effective use of VSAT-WLL techniques will also be explored.

## Design of transportable SATCOM terminal for TV broadcasting

Mr. Bishnu Ram Neupane  
Nepal Television  
Kathmandu, Nepal

*Supervisor*  
Mr. S.S. Valdiya  
SEID/SGSTG/SITAA  
SAC, Ahmedabad, India

**T**elevision is widely acknowledged as a powerful medium for mass communication. Television broadcasting has spread its influence among people of all countries. In order to have live coverage of events, Transportable Satellite Communication Terminal is essential. Such terminal can be transported to the place of event in a short span. The aim of the project is to have detailed study and system design of Transportable Satellite Communication Terminal for TV Broadcasting in Nepal with special emphasis on Digital Satellite News Gathering Terminal.

## Feasibility study on secure ship-borne composite satellite communication system

Mr. Pattiyage Deepthi Kumudu Nandana Peiris  
Naval Headquarters  
Colombo, Sri Lanka

*Supervisor*  
Mr. V.S. Palsule  
ACDT/ADCTG/SITAA  
SAC, Ahmedabad, India

**H**F communication has been widely used in ship borne communication system to provide long distance, ship to shore communication links. It has been observed that HF communication does not provide a reliable link. VHF and UHF communication that depends on LOS also does not provide high reliable links. Satellite communication provides a simple and reliable solution. However Commercial Satellite Communication System like INMARSAT may not be able to provide effective solution to Sri Lankan Navy due to reasons of cost, data security, network reconfigurability etc. The objective of this project is to develop a set of standards that will enable integration of multiple services such as voice, data, Fax and SMS etc. through a common satellite based communication interface. The proposed system will consider CDMA as the multiple access scheme link and data security being of the primary concerns. The project will focus on the designing of physical data-link and network layer of the OSI model that will ensure inter operability with existing services based on PSTN and HF/VHF/UHF links in the Sri Lankan Navy.

## Design of shaped Cassegrain antenna for satellite earth station

Mr. Pavel Radikovich Safin  
Department of Special State Programmes  
Uzbek State Space Agency "Uzbekcosmos"  
Tashkent, Uzbekistan

*Supervisor*  
Dr. Arun Kumar  
AFG/MISA  
SAC, Ahmedabad, India

**U**zbekistan is developing an enhanced nationwide communication system using satellite. In the development program, it is envisaged to develop earth station technology and antenna system indigenously. The project aims in design of Shaped Cassegrain Antenna for Earth Station in which design problems will be analysed. Study of latest antenna production technology, optimization of antenna fabrication in line with existing technology will be taken up.

## Satellite based VSAT business network for Vietnam

Mr. Nguyen Manh Thang  
C5b P501, Lang ha  
Hanoi, Vietnam

*Supervisor*  
Mr. Shyamal Mehta  
ADCTG/SITAA  
SAC, Ahmedabad, India

Vietnam has planned to launch its own satellite. It will have its business network through VSATs linking home, business centers etc with the capabilities of providing voice, data, and fax. It is planned to link corporations, communities and government agencies using VSAT based business networks. The scope of the project is to study the present communication using satellite in Vietnam, expansion of telecommunication infrastructure in Vietnam. VSAT access techniques and services and design proposal for VSAT network in Vietnam will also be covered.

## Study and design of meteorological data reception system for Bangladesh

Md. Abdul Mannan  
SWC, Bangladesh Meteorological Department (BMD)  
Dhaka, Bangladesh

*Supervisor*  
Mr. P.K. Jain  
SEID/SGSTG  
SAC, Ahmedabad, India

**B**angladesh is affected by various natural calamities every year. Its economy depends on mitigation and management of natural disasters. But, mitigation of natural disaster fully depends on timely and accurate weather forecasting. For, forecasting a meteorologist needs real and near-real time data of surrounding countries surface observations, upper air sounding data, cloud images, sea surface temperatures, observations, upper air sounding data, observations from the Ocean surface of Bay of Bengal & Indian Ocean, Upper air moisture content, vertical profile of temperature and upper air wind profile. Therefore, availability of data is critical factor. The quality of forecast depends on availability of meteorological data. Therefore it is essential to establish a Satellite Communication Earth Station that will be able to provide realtime and near realtime data. Bangladesh also experiences difficulty in collection of meteorological data from remote areas, coastal islands and the basin of the Bay of Bengal. Meteorological data can be acquired using Metsat (INSAT) as well as the NOAA satellites. Considering the above facts it is proposed to study and design a Meteorological Data Reception System for Bangladesh.

## Study and design for satellite based disaster warning dissemination system for Bangladesh

Md. Shameem Hassan Bhuiyan  
Rangpur Meteorological Observatory (BMD)  
Bangladesh

*Supervisor*  
Mr. Kalyan Bandyopadhyay  
SAG  
SAC, Ahmedabad, India

**W**ith the technological revolution, Cyclone forecast is now possible to predict more accurately. But accurate forecasting is of no benefit unless the information can be spread to the people at risk in a timely manner. The ability of cyclones to quickly change its direction and or intensity makes it particular important to disseminate and update forecast more quickly. On the other hand, to give an accurate cyclone forecast, real time meteorological data is also very important. The choice of communication channels for disaster warning dissemination varies from one place to the other depending on the communication infrastructure, technology level, local landscape, and disaster awareness, socio-economic and cultural practice of the vulnerable people. This meant that when selecting telecommunications systems in Bangladesh security against natural disasters becomes a critical issue. Only space technology can provide full coverage immediately over the country and in a cost-effective manner. The purpose of this project is to study and develop a reliable and cost effective disaster warning dissemination and meteorological data collection system for Bangladesh.

## Applications of propagation model to design geostationary satellite links operating in Ka band over Indian rain zones

Mr. Damodar Mahipati Magdum  
Shivaji University  
Maharashtra, India

*Supervisor*  
E.P. Balasubramaniam  
PSED/SPSG/SPSA  
SAC, Ahmedabad, India

**D**ue to congestion of the radio electric spectrum satellite communication systems are evolving towards higher frequency bands. An increasing number of new services are being promoted for Ka band (20-30 GHz), involving very small aperture terminals (VSAT). In the Ka-band, propagation impairments strongly limit the quality and availability of satellite communications. The design and planning of future Ka-band services require accurate estimate of the impact of propagation degradations (gaseous absorption, rain and cloud attenuation, scintillation and impairment dynamics) on system performance. Attenuation due to rain is an important propagation effect, which must be considered in the design of satellite systems. The attenuation by rain depends on the temperature, size distribution, terminal velocity and shape of the raindrops. The rain attenuation can be measured quite accurately by means of satellite beacon signals and radiometers. The prediction of rain induced attenuation starting from the cumulative distribution of rainfall intensity has been the subject of a major effort carried out by many researchers. Several methods have been developed and tested against data to relate the site climatic parameters to the signal attenuation statistics. As a part of the pilot project, a study of different propagation models was carried out. In the final project, application of suitable propagation model to design geostationary satellite links in Indian rain zones (20-30 GHz-Ka band) will be explored.

## Study and design of satellite based communication system for ship borne application using INSAT

Lt. K Narendra Bhat  
Assistant Electrical Officer  
Indian Navy, India

*Supervisor*  
Mr. S.S. Valdiya  
SEID/SGSTG/SITAA  
SAC, Ahmedabad, India

**T**he satellite today offers innumerable advantage for rapid and secure global communication, monitoring of the sea and air environment, for locating and targeting adversary naval and air forces etc. The project "Study and Design of satellite based communication system for ship borne application using INSAT" aims at studying the various possibilities of using the indigenous National satellite network for defence communications. Considering the pros and cons of an international satellite (which are rapidly getting commercialized these days) and the need for a secure and reliable communication onboard



a warship, the indigenous satellites definitely always has an upper hand and can play a vital role in future defence communication scenario. The project in stages would involve the study of the fundamentals of mobile satellite communication and the Indian national satellites. The deficiencies with respect to its usage onboard ship have been clearly brought out in the pilot project. The one year project deals with the design requirements of a ship borne terminal and the feasibility study of using existing and future indigenous satellites for Naval communications.

## Design of satellite based communication backbone for Indian navy and its integration into existing infrastructure

Cdr. Yudhvir Sawhney  
Naval Signals  
Indian Navy, India

*Supervisor*  
A.S. Durai  
AES  
SAC, Ahmedabad, India

Processed satellite images of area of interest can help pinpoint enemy forces, weather details can help optimize use of electronics etc. Therefore, the need is for a high capacity secure data communications, data exchange in real-time. The use of satellite communications for military purposes was started by the US in the 1960s and during the 70s, most advanced naval forces, the world over, switched over to satellite based global communications. The goal of these systems has since been to provide communications between, and to supply information to, military units in situations where terrestrial means of communication are impossible, unreliable, or unavailable. The future lies in satellite based solutions for navy's comprehensive communication requirements, where there are no restrictions or limitations in communicating. The pilot project was aimed at defining the satellite communication requirement of the Indian Navy, both in the short term and the long term, and examining immediate solutions possible. The main project would go into details of future requirements and examining possible options. Taking these into account, a comprehensive design will be done of the satellite communications backbone and plan formulated for integrating it into the naval communications infrastructure.

## Data receiving station for LAPAN TUBSAT micro satellite

Mr. Suhata  
LAPAN  
Indonesia

*Supervisor*  
Mr. V. Ramakrishna  
OSPAD/ADCTG/SITAA  
SAC, Ahmedabad, India

**I**n satellite communications ground stations plays a very important role. They transmit and receive the signals from the satellite. TUBSAT is a micro satellite, which is capable of taking pictures of the earth and transmits the same from a low earth orbit. Technical university of Berlin (TUB), Germany, will develop the satellite. While, LAPAN will develop the necessary Ground Station required for receiving the signals. For achieving full competency in space technology this project will be implement in 2 (two) steps. The scope of this project is to study various subsystems, which are required to receive TUBSAT data and designing a Ground Station for LAPAN-TUBSAT.

## Digital repeater for microsat LAPAN TUBSAT low earth orbit

Mr. Zulfar Rasijidin  
LAPAN  
Jakarta Timur, Indonesia

*Supervisor*  
Mr. A.K. Sisodia  
APDD/SPTA  
SAC, Ahmedabad, India

**I**ndonesia has proposed to develop a micro satellite (microsat) technology and applications for food sustenance because Indonesia is basically an agricultural country. Micro satellite is built by utilizing simple technology. Cost of microsat is lesser than a big satellite and microsat can be made in lesser time than a big satellite. By this development Indonesia will hopefully achieve the competency in satellite technology. Microsat is small in mass (50 kg) small size (32x32x32cm) and small DC power 30 W. This satellite observes vegetation in Indonesia land, vegetable (leaves) reflect the sun radiation to the satellite, and pick up by the sensor and process in digital form and sends it back to the Earth station and produces a image of vegetable and than it is analyzed. As a part of the Pilot Project initially the system studies have been carried out and in the one-year project it is proposes to design the digital repeater for Microsat.

## Study and design of portable communication systems for disaster relief in Iran

Mr. Hassan Rezazadeh  
Telecommunication Company of Iran  
Tehran, Iran

*Supervisor*  
Mr. M. Jeyamani  
SATD/SGSTG/SITAA  
SAC, Ahmedabad, India

**D**isasters like Bam earthquake on the 26<sup>th</sup> December 2003 which created enormous communication problems for emergency response organizations and relief workers, calls for a effective communication means. In spite of the best efforts of the rescue parties, the failure of communication systems can seriously jeopardize the overall success of emergency response measure. The emergency response community must make a more concentrated and coordinated effort to ensure the effective application of technology during emergencies. Knowledge of what telecommunication systems exist, and how these can contribute to the effective management of an emergency, must increase. Satellite communication provides one component of the needs supporting humanitarian efforts during a disaster relief. A combination of suitable portable communication systems should be a mix of portable E/S, Mobile Switching Center, portable Wireless Local Loop, trunked land mobile radio, GMPCS, IMT-2000 etc. In this project one transportable VSAT equipped with complete Mobile Switching center for voice and data traffic and another transportable VSAT with telemedicine equipment and a facility of providing video conferencing have been proposed.

## Code division multiple access based on mobile satellite services for Mongolia

Ms. Ariunsan Denee  
Naran Earth Station  
Ulaanbaatar, Mongolia

*Supervisor*  
Mr. Vilas Palsule  
ACDTD/ADCTG  
SAC, Ahmedabad, India

**M**ongolia is a land-locked country situated between Russian in the north and China in all other directions. The aim of this project is to provide and cover by small terminals all those rural areas of Mongolia which are without any communication access. The best choice of multiple access schemes depends on the characteristics of the traffic to be transmitted in the networks, regularity, duration of calls, required data rates, as well as propagation characteristics in mobile satellite communication systems. CDMA will stand out as a strong candidate to choose multiple access schemes in mobile and personal satellite communications. There is a possibility that in the future, telemedicine and tele-education services shall also be introduced in these rural areas. Use of LEO and MEO for satellite communications will also be explored.

## Design of high speed backbone network for Ulaanbaatar city

Mr. Chuluunbataar Jamgan  
Training Center of Mongolia Telecom Company  
Ulaanbaatar, Mongolia

*Supervisor*  
Dr. K.S. Dasgupta  
ADCTG/SITAA  
SAC, Ahmedabad, India

**I**t plays vital role in the development of a nation. In Mongolia about 70% area is occupied by the hills and high lands. Expansion of communication network by terrestrial means is a difficult task. The capital city of Ulaanbaatar is also a hilly area. The main communication network of this city is not capable to meet the needs of one million. Therefore an effective network which will be able to meet the requirements of communication is needed. Only a High Speed Backbone network for Ulaanbaatar can meet the requirements. So it is very essential to upgrade the present backbone network of Ulaanbaatar city which will play a vital role for the development of Mongolia. The project "Design of high speed backbone network for Ulaanbaatar city" aims at studying the various possibilities of using the high-speed backbone network for Ulaanbaatar city.

## Satellite based internet access for remote area of Mongolia

Oyun-Erdene Tseyen-Oidov  
Naran Earth Station  
Mongolia

*Supervisor*  
Mr. N Vasantha Kumar  
ADCTG  
SAC, Ahmedabad, India

**O**ne of the most exciting recent developments in communications and information transfer is the Internet. The main problems with Internet today are, terrestrial networks are not able to provide adequate bandwidth uniformly and the traffic distribution is not uniform worldwide. A new generation of Internet access built around geo-synchronous satellites can provide immediate relief. They can improve service to bandwidth-starved regions in a cost effective manner. However, the interoperation between a satellite system and the existing terrestrial Internet infrastructure poses new challenges. Mongolia has a population density of about 0.6 persons per square km. Around 40 percent of population lives in urban area. 50 percent of the population are aged below 20 years and 47% of these live in the rural area. Government is planning to provide Information Technology to everyone by 2010. Therefore, satellite based Internet access is considered as the best solution. The scope of the pilot project is to study the various Satellite based Internet networks and their system architecture that exist currently. In the final project, typical requirements of the rural and other areas of our country will be studied and based on the requirements an optimal solution will be worked out.

## Study of satellite based radio broadcasting system for Nepal

Mr. Ashok Banskota  
Radio Broadcasting Service (Radio Nepal)  
Nepal

*Supervisor*  
Mr. M. Jeyamani  
SATD/SITAA  
SAC, Ahmedabad, India

Nepal is a mountainous region where Radio Broadcasting and distribution of its programs all over the country through terrestrial means is very difficult and expensive. Satellite is the only means of communication, which can reach any part of Nepal and distribute the radio program produced in any part of the country. Radio broadcasting has proved to be a very effective medium for disseminating information, educating people and entertaining the masses. Radio Nepal has started to distribute its programs produced in central studio via satellite from 2000. The program channel (10 KHz bandwidth) is in mono. The local FM radios are airing their programs in high quality FM stereo mode. Therefore, being a National broadcasting organization, Radio Nepal should also broadcast in FM Stereo mode. This report will be based on digitally controlled VSAT equipment made for satellite program delivery system. It will have 20 KHz FM Stereo bandwidth to be delivered by leased transponder for rebroadcast in various parts of the Kingdom. It will carry in detail a study of Satellite based Radio Broadcasting system in Nepal and will also suggest appropriate cost-effective equipment which will ultimately provide quality signals.

## Study of satellite based telemedicine system for Nepal

Kishor Kumar Bhat  
Nepal Telecommunications Corporation  
Nepal

*Supervisor*  
Mr. A.K. Sanghal  
COSSAG, DECU ISRO  
SAC, Ahmedabad, India

Nepal is a mountainous country where most of the people are living in rural areas where medical facilities are very poor or non-existent, situation is further worsened due to lack of other infrastructure such as roads and telecommunications. Telemedicine is one of the emerging and communication technology (ICT). Satellite based telemedicine is particularly very effective and reliable for providing health care services to rural areas where medical and other infrastructures are poorly developed. Satellite communication system is more suitable for Nepal because of difficult geographical conditions. Rugged mountainous terrain makes it difficult and expensive to built terrestrial transmissions systems. An attempt has been made to explore the application of information technologies for the delivery of medical services, namely telemedicine. The scope of the project includes study of satellite communication systems and configurations and propose a telemedicine network for Nepal.

## Study and design of multi-channel radio broadcast using satellite communication for radio Nepal

Mr. Krishna Chandra Paudel  
Radio Nepal  
Kathmandu, Nepal

*Supervisor*  
Mr. M.K. Sharma  
DCTD/SITAA  
SAC, Ahmedabad, India

**T**oday, we are in the verge of a revolution in radio broadcasting since digital radio Broadcasting is just around the corner. This new Digital Broadcasting Service will ultimately replace the current AM and FM radio services that have filled the airwaves since the 1920,s for AM and the 60's for FM. But, this will not replace in short time, a lot of work has to take place in terms of technology development especially in the consumer receivers. Thus this project has aimed to establish multi-channel radio broadcast network for terrestrial broadcast from regional stations in local language and in study of direct satellite broadcasting and the consumer receiver's availability.

## Preliminary design of antenna for NOAA AVHRR data reception station and implementation plan for NOAA earth station in Uzbekistan

Mr. Yunir V Gataullin  
Tashkent Research Institute of Space Engineering  
Tashkent, Uzbekistan

*Supervisor*  
Mr. K.K. Sood  
SCAD  
SAC, Ahmedabad, India

**T**he data from the NOAA polar orbiting environmental satellites offers immense applications various sectors such as meteorology, agriculture and ecology, especially in the developing countries. The project will be realized in two parts. The first part is the pilot project. In the framework of the pilot project he has studied and discussed the NOAA satellites and their advanced Very High Resolution Radiometer, link calculations. Subsequently, he has discussed the basic antenna parameters, and proposed a helical antenna array as one of the cost effective design for the NOAA AVHRR data reception station which, is most important for a developing country. Second part which is the final project, will be the logical continuation and completion of the pilot project. In this part he will emphasize mostly on the antenna preliminary design part using CAD and CAM systems and on the developing of the NOAA HRPT reception earth Station.