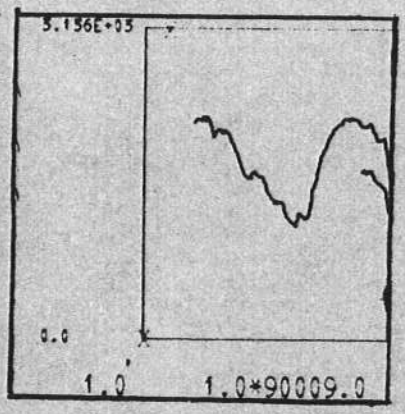
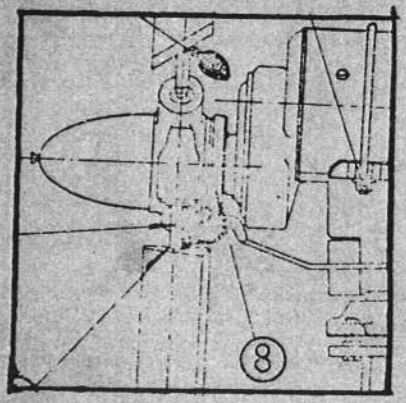
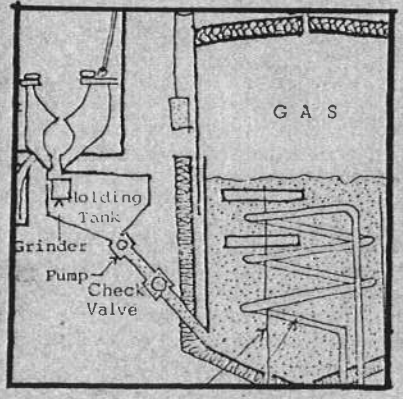
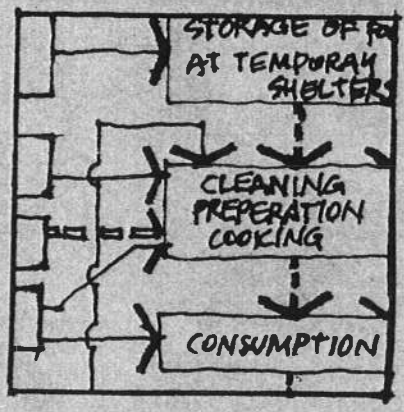
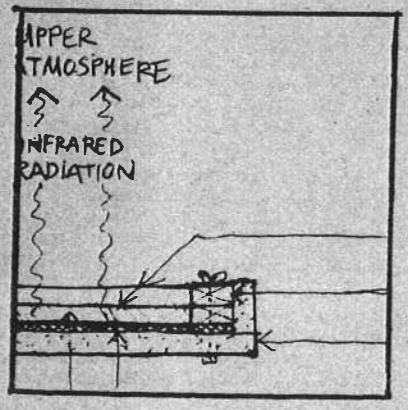
ENERGY PROJECT

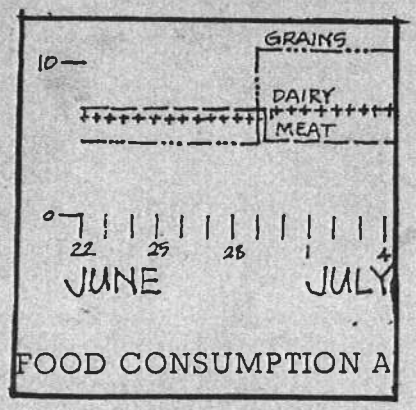












RUNNING CREEK FIELD STATION

ENERGY PROJECT

Coordinator: Frank C. Miller

WRIGHT-INGRAHAM INSTITUTE

1228 Terrace Road

Colorado Springs, Colorado

FEBRUARY 15, 1976

FOCUS

The Energy Project at Running Creek Field Station focuses on research programs which measure and monitor available solar energy, wind energy, and energy by-products from waste. The Energy Project was partially funded with a grant from the General Service Foundation, St. Paul, Minnesota. Data from the project will be summarized and used to construct operational energy use models which relate available on-site energy sources to consumption patterns. This information will be used to establish design parameters for the 255,000 sq.ft. Technics Laboratory.

At this time working units at the Field Station include: A 1000 watt Quirks Wind Generator which produces electrical energy from wind and provides a source of power to operate weather equipment and field demonstration projects; 24 hour strip chart recorders for recording temperature, humidity, wind speed, wind direction, precipitation, solar radiation, soil and rock temperature. Strip chart data is digitized and stored on magnetic tape at the National Center of Atmospheric Research in Boulder, Colorado. Data summary and analysis is being completed by utilization of computer programs designed to calculate means, standard deviations, maximums, minimums, etc. Institute staff under the direction of professional consultants operate instruments which collect weather data. A bio-digester has been designed to process human wastes and to produce methane gas, water, and fertilizer as useable by-products. This unit will service approximately 18 persons. Construction of the bio-digester is planned for the Spring of 1976. In addition, experiments are being conducted with the purpose of studying the surface cooling effects caused by upward infrared radiation from the earth's surface to the upper atmosphere at night. Possible on-site uses of this effect include cooling and refrigeration.

Related projects include: summary and analysis of flows of food and materials imported to and wastes exported from the Field Station; fire danger substation reporting to the U.S. Forest Service; and, field testing of various building materials.

CONTENTS

1.0 Weather Monitoring Station
- 1.1 Purpose
- 1.2 Objectives
- 1.3 Description of the System

2.0 Weather Data Storage and Retrieval
- 2.1 Purpose
- 2.2 Objectives
- 2.3 Description of Procedures

3.0 Weather Data Utilization
- 3.1 Purpose
- 3.2 Objectives
- 3.3 Description of Procedures
  - 3.3.1 Manual Data Summaries
  - 3.3.2 Computer Data Summaries
  - 3.3.3 Future Multi-Varient Research

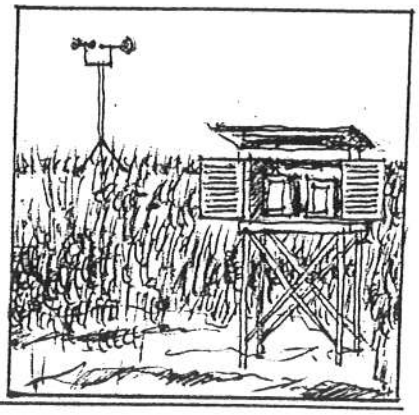
4.0 Energy Monitoring
- 4.1 Purpose
- 4.2 Objectives
- 4.3 Monitoring Programs
  - 4.3.1 Renewable On-Site Energy Resources
  - 4.3.2 Energy Production/Consumption Models of RCFS

5.0 Working Experiments
- 5.1 Purpose
- 5.2 Ojectives
- 5.3 Experiments
  - 5.3.1 Wind Power Generating Facility
  - 5.3.2 Bio-Digester Research Project
  - 5.3.3 Solar Shower
  - 5.3.4 Night Sky Radiation
  - 5.3.5 Field Test/Demonstration Solar Collectors

6.0 Related Projects
- 6.1 Purpose
- 6.2 Objectives
- 6.3 Projects
  - 6.3.1 Food and Waste Monitoring
  - 6.3.2 Fire Danger Weather Station
  - 6.3.3 Field Testing of Building Materials

7.0 Energy Programs

8.0 Proposals and Grants



1.0 Weather Monitoring Station

1.1 Purpose

To measure and monitor weather conditions at Running Creek Field Station

To provide a comprehensive data base of abiotic driving variables

1.2 Objectives

To measure and record temperature, humidity, wind speed, wind direction, precipitation, and solar radiation (abiotic driving variables

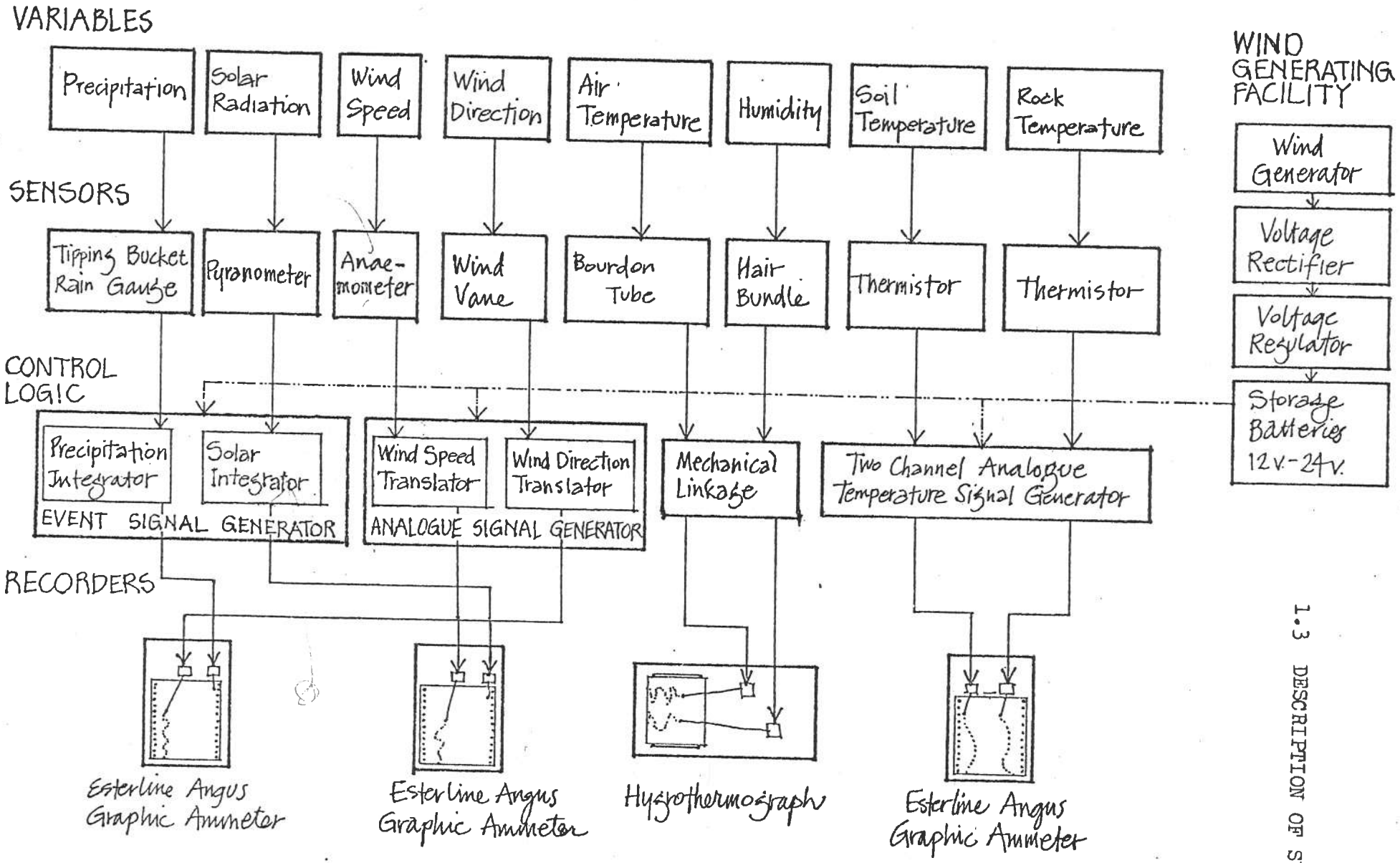
To maintain complete documentation on the operational and maintainance procedures followed

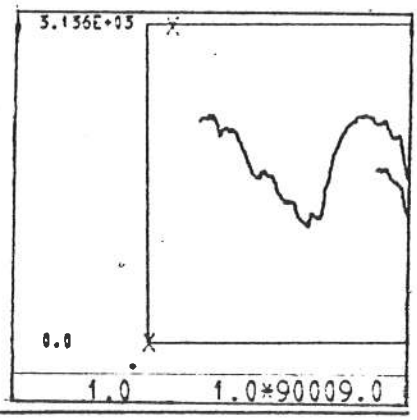
To develop a data collection program which is consistant with the educational and research directions of the Institute

To develop a data collection program which will produce high time resolution and time accuracy baseline data records

To assemble a data collection instrumentation system which can be powered by on-site energy sources, i.e., the 1000 watt wind generator

To utilize measuring and recording instruments which can be read on-site to facilitate a clearer understanding of the relationships between the theory and practice of the data collection procedure and the reality of weather


VARIABLES
Precipitation
Solar Radiation
Wind Speed
Wind Direction
Air Temperature
Humidity
Soil Temperature
Rock Temperature
WIND GENERATING FACILITY
Wind Generator
Voltage Rectifier
Voltage Regulator
Storage Batteries 12 v. - 24 v.
SENSORS
Tipping Bucket Rain Gauge
Pyranometer
Anae-mometer
Wind Vane
Bourdon Tube
Hair Bundle
Thermistor
Thermistor
CONTROL LOGIC
Precipitation Integrator
Solar Integrator
EVENT SIGNAL GENERATOR
Wind Speed Translator
Wind Direction Translator
ANALOGUE SIGNAL GENERATOR
Mechanical Linkage
Two Channel Analogue Temperature Signal Generator
RECORDERS
Esterline Angus Graphic Ammeter
Esterline Angus Graphic Ammeter
Hygrothermograph
Esterline Angus Graphic Ammeter



2.0 DATA STORAGE AND RETRIEVAL SYSTEM

2.1 PURPOSE

To provide a system of storage and access for weather data collected at Running Creek Field Ststion which will interface with the educational and research programs of the Institute.

2.2 Objectives

To establish a working file of weather data consisting of hourly averages of temperature, relative humidity, wind speed, wind direction, precipitation, and solar radiation stored in month time blocks on magnetic

To develop data retrieval procedures which will facilitate generation of data summaries bounded by specified dates and times (i.e., daily, weekly, monthly)

To develop a system which will be compatable with the existing Field Inventory Project being conducted at Running Creek Field Station

To tie the data storage and retrieval system into local, regional and national weather reporting networks (i.e., National Weather Service, National Climatic Center)

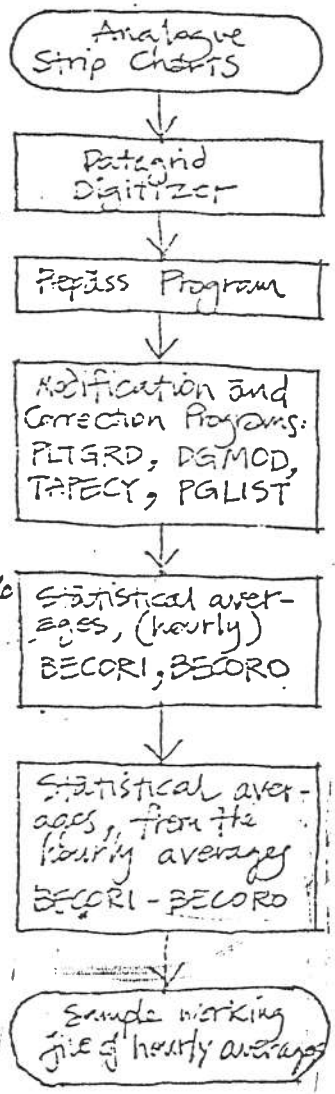
To develop a system which will be compatable with the various projected studies directed towards a better understanding of the relationships between the natural and human-made systems

STAGE 1

PROTOTYPE DATA STORAGE AND SUMMARY PROCEDURE

A small amount of data (i.e., one month) will be processed through the entire storage and summary procedure including the following steps:

Daily



Strip charts generated at Running Creek Field Station.

Convert analogue data into digital data for 1 month data.

Process Datagrid output into Fortran ready data.

Corrections, editing, copying of Prepass output.

Sample working file generated consisting of hourly averages of all variables.

Sample summary generated from the file of hourly averages.

Sample working file retained.

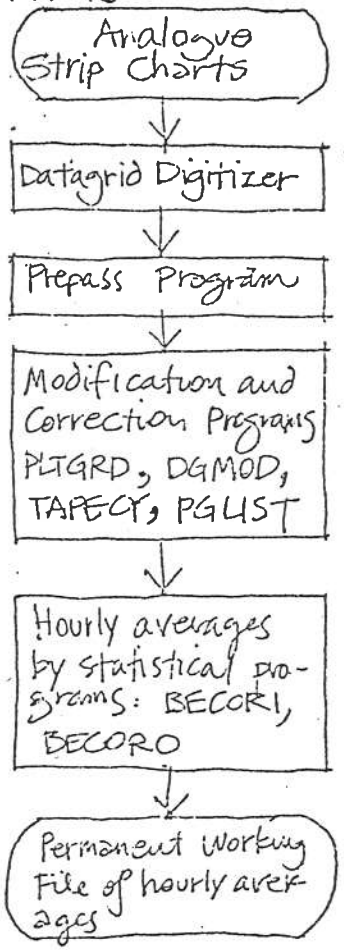
CRU: 150 TIME FRAME: 15 PERSON-DAYS

STAGE 2

PROCESS ALL STRIP CHARTS INTO WORKING FILE

All strip charts will be digitized and processed into hourly averages for a permanent working file:

15 MAY 76



All strip charts generated at Running Creek Field Station since Sept. 1974

Digitize all strip charts by batches.

Process the Datagrid output batches into Fortran-ready data.

Corrections, Editing, Copying of Prepass Output.

Hourly averages of batched data generated.

Hourly averages stored on a master tape, working copies made.

CRU: 250 TIME FRAME: 30 PERSON DAYS

STAGE 3

GENERATION OF STATISTICAL DATA SUMMARIES

15 JUNE 76

The hourly averages file is used to derive summaries.

NCAR subroutines utilized to generate daily, weekly, monthly, yearly summaries.

Summaries stored on tape, plus printed out.

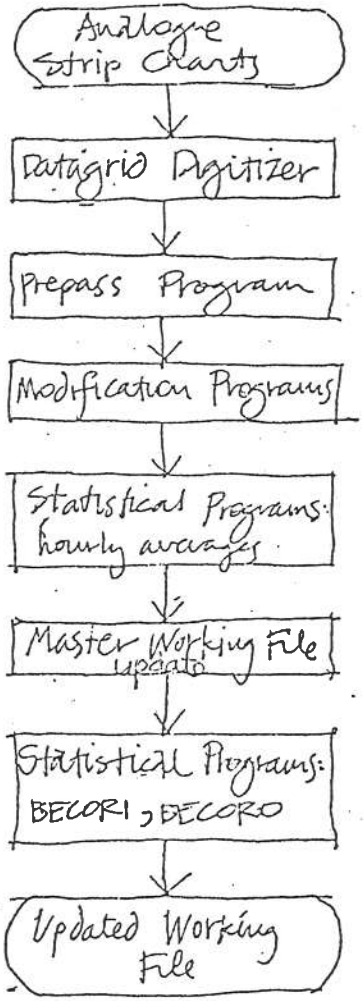
CRU: 150 TIME FRAME: 5 PERSON-DAYS

STAGE 4

MONTHLY UPDATING OF WORKING FILE

Every month, the new strip charts are brought to NCAR, digitized, stored and summarized.

1 JULY 76



Monthly ~~recording~~ accumulation of strip charts brought to NCAR.

Charts digitized

Data made Fortran-ready

Data cleaned up

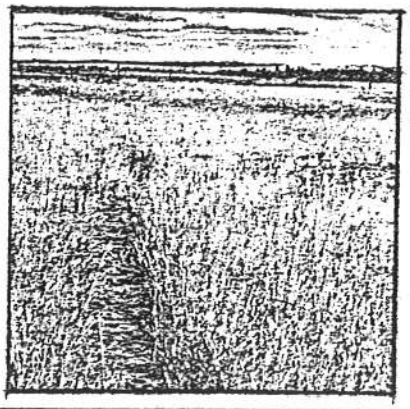
New hourly averages generated

Master Working File updated

Updated summaries generated.

Updated File stored.

CRU: 25/month TIME FRAME: 1 PERSON-DAY/MONTH



3.0 Weather Data Utilization

3.1 Purpose

To effectively utilize the weather and energy data bank that has been established for studies related to the natural and human-made systems at Running Creek Field Station.

3.2 Objectives

To develop programs which contribute to a clearer understanding of the relationships between the micro/meso-climatic conditions and the human-built systems at the Field Station

To develop programs which contribute to a clearer understandings of the relationship between the micro/meso-climatic conditions and the natural systems at the Field Station

To develop a data utilization program which is consistant with the educational and research programs of the Institute

3.3 Manual Data Summaries

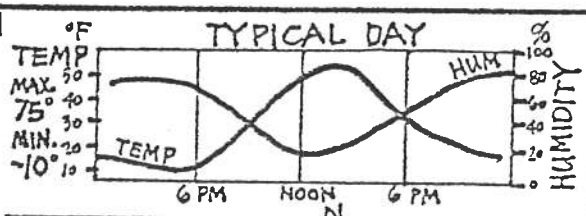
Prior to the completion of the Weather Data Storage and Retrieval System, some preliminary data summaries have been generated from sample data taken from both the continuous strip charts and the Fire Danger Weather Station readings.

The information displayed on the following page was derived from both of these sources.

RUNNING CREEK FIELD STATION

WEATHER INFORMATION

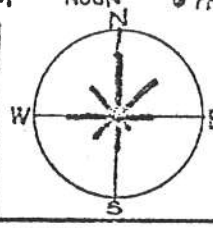
MARCH APRIL MAY



WIND SPEED

MAX : 55 MPH

AVE : 11-13 MPH



WIND DIRECTION

SOLAR INSOLATION ON LEVEL SURFACE

AVE. DAY = 500 LANGLEYS

3 MONTH TOTAL ~45,000 LANGLEYS

PRECIPITATION

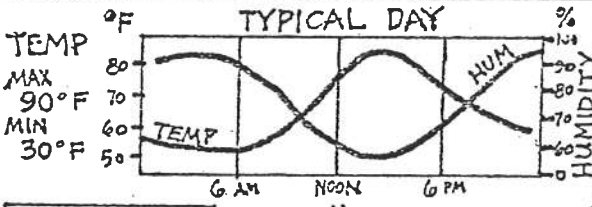
AVERAGE 3 MONTH TOTAL:

3 INCHES

STORM ACTIVITY

Wet, heavy snow storms, sporatic, approach mainly from NW-N-NE. Up to 8" snowfall per storm. Danger of white-outs.

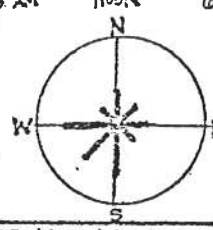
JUNE JULY AUG



WIND SPEED

MAX : 55 MPH

AVE : 9-11 MPH



WIND DIRECTION

SOLAR INSOLATION ON A LEVEL SURFACE

AVE. DAY = 450 LANGLEYS

3 MONTH TOTAL = 40,000 LANGLEYS

PRECIPITATION

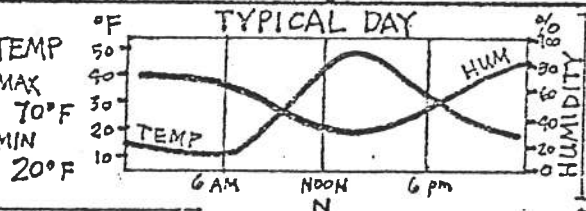
AVERAGE 3 MONTH TOTAL:

7 INCHES

STORM ACTIVITY

Thunderstorms-approx. 30 to 50 per summer, duration 1-3 hours, occuring between 12pm and 4pm, few at night. 0.1" to 1.0" rain per storm; storms approach from the southwest. 1 to 3 2-day rainstorms per summer.

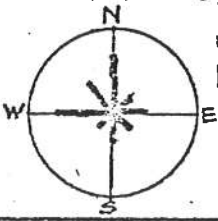
SEPT OCT NOV



WIND SPEED

MAX : 75 MPH

AVE : 8-10 MPH



WIND DIRECTION

SOLAR INSOLATION

AVE. DAY = 450 LANGLEYS

3 MONTH TOTAL ≈40,000 LANGLEYS

PRECIPITATION

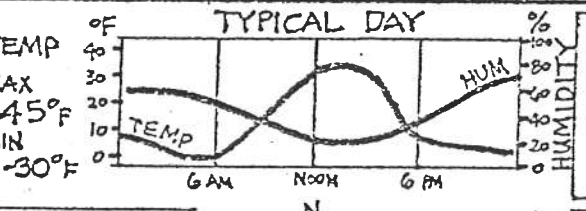
AVERAGE 3 MONTH TOTAL:

2 INCHES

STORM ACTIVITY

Few, scattered snow-storms, some rain. Sporatic heavy winds.

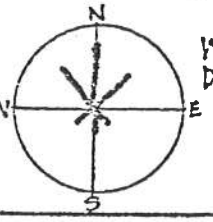
DEC JAN FEB



WIND SPEED

MAX : 60 MPH

AVE : 7-10 MPH



WIND DIRECTION

SOLAR INSOLATION

AVE. DAY = 350 LANGLEYS

3 MONTH TOTAL ≈32,000 LANGLEYS

PRECIPITATION

AVERAGE 3 MONTH TOTAL:

4 INCHES

STORM ACTIVITY

Winterstorms; very severe, 4-8 per winter. Approach from N-NW, duration about 3 days, snow-fall 4" to 12" each.

ANNUAL SNOWFALL:

45-55"

EM. JAN 1976

Convenient Conversions

LENGTH

1	feet =	30.5	centimeters =	0.305	meters = 0.000305 kilometers
2		61.0		0.610	0.000610
3		91.4		0.914	0.000914
4		122		1.22	0.00122
5		152		1.52	0.00152
6		183		1.83	0.00183
7		213		2.13	0.00213
8		244		2.44	0.00244
9		274		2.74	0.00274
10		305		3.05	0.00305
20		610		6.10	0.00610
50		1520		15.2	0.0152
100		3050		30.5	0.0305
200		6100		61.0	0.0610
400		12,200		122	0.122
600		18,300		183	0.183

WEIGHT

1	pounds =	454	grams
2		908	
3		1360	
4		1820	
5		2270	
6		2720	
7		3180	
8		3640	
9		4080	
10		4540	
20		9080	
50		22,700	
100		45,400	
200		90,800	
500		227,000	
1000		454,000	

TEMPERATURE

0	°F =	-17.8	°C
5		-15.0	
10		-12.2	
15		- 9.44	
20		- 6.67	
25		- 3.89	
30		- 1.11	
35		1.67	
40		4.44	
45		7.22	
50		10.0	
55		12.8	
60		15.6	
65		18.3	
70		21.1	
75		23.9	
80		26.7	
85		29.4	
90		32.2	
95		35.0	
100		37.8	

ENERGY

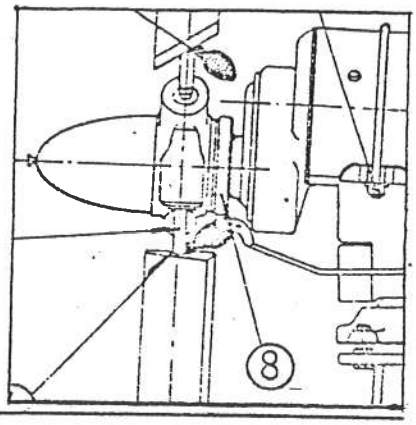
1 btu	=252	calories
1 kwh	=3448	btu
1 kwh	=8598.5	calories
1 watt	=3.413	btu/hr
1 watt	=.01433	kg-cal/min

1 foot	=0.3048	meter
1 inch	=2.540	centimeters
1 mile	=1.6093	kilometers
1 meter	=3.2808	feet
1 light year	=5.9 x 10^{12}	miles

1 acre foot	=325,900	gallons
1 cubic foot	=7.48	gallons
1 meter/second	=2.237	mph
1 ounce	=28.35	grams
1 kilogram	=2.2046	pounds
1 acre	=43,560	square feet
1 acre	=4050	square meters
1 square mile	=640	acres
1 hectare	=~~.4047~~ 2.471	acres

$$°C = \frac{5}{9}(°F-32)$$

$$°F = (\frac{9}{5}°C) + 32$$



4.0 Energy Monitoring

4.1 Purpose

To study the provision, flow, and consumption of energy within the human-built infrastructure at Running Creek Field Station, with emphasis on development of the Technics Laboratory .

4.2 Objectives

To measure and monitor renewable sources of energy available on-site including solar energy, wind energy, and energy by-products from waste

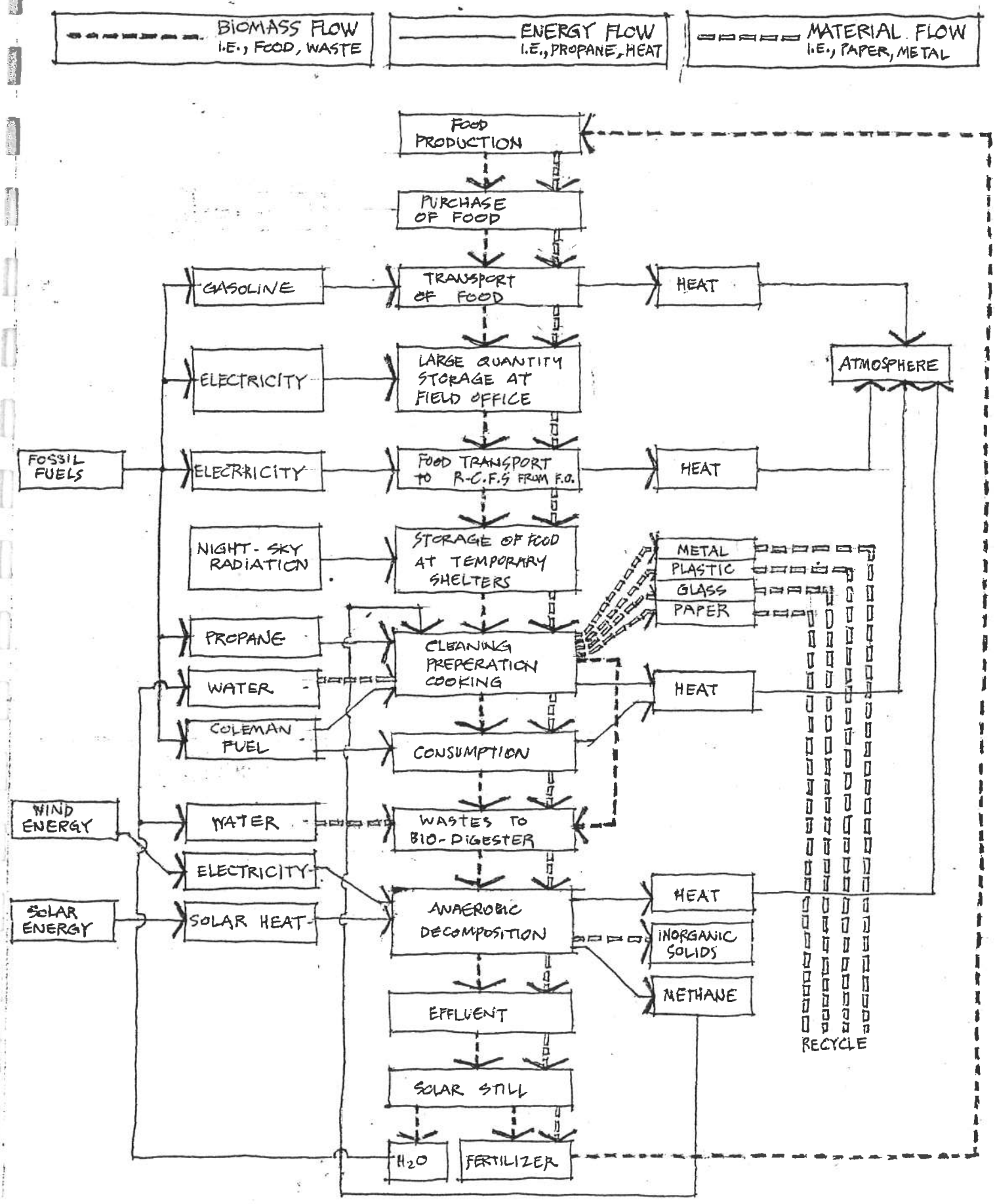
To measure and monitor both renewable energy sources utilized at Running Creek Field Station

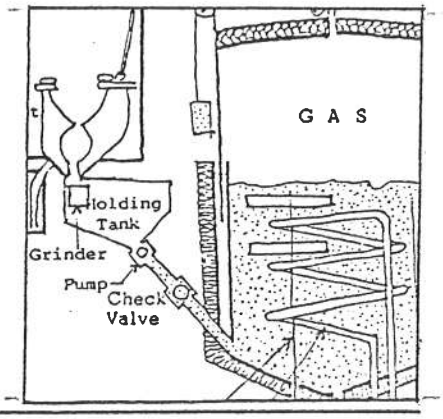
To construct operational energy use models which relate energy sources to consumption patterns

To utilize the energy measurements and models in establishing design parameters for the 255,000 sq. ft. Technics Laboratory structure

To interface the programs of the Energy Project with the other educational and research programs

BIOMASS, ENERGY AND MATERIAL FLOW MODEL : RUNNING CREEK FIELD STATION





5.0 Working Experiments

5.1 Purpose

To conduct in-field experiments at Running Creek Field Station which demonstrate the utilization of renewable on-site energy sources and contribute to the development of the integrated energy system for the Technics Laboratory structure

5.2 Objectives

To select experiments which are directed towards the study of renewable energy resources at the Field Station

To design the operational and maintainance procedures such that they interface directly with the educational and research programs at the Field Station

To explore aspects of energy systems for the purpose of developing future prototype components for application to the Energy Project

5.3 Experiments

5.3.1 Wind Power Generating Facility

Objectives

To utilize a Quirk's 1000 watt wind generator to generate electricity for use at the Field Station

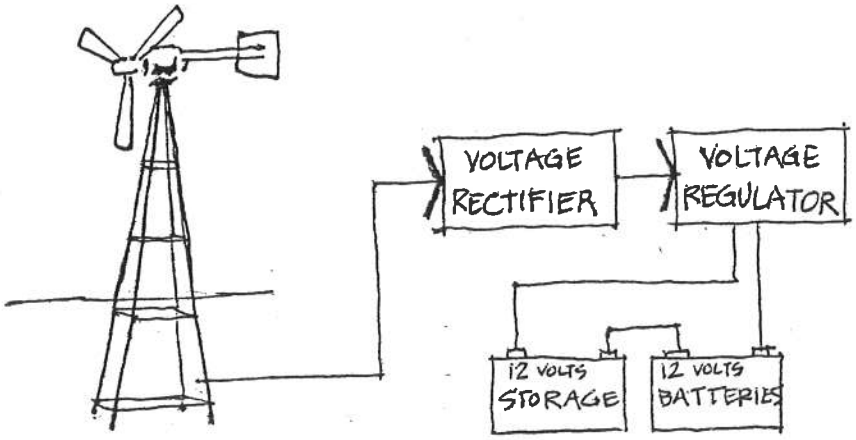
To store the electricity in storage batteries

To monitor electrical output in relation to wind speed

To provide a source of power to operate in-field instruments related to the Energy Project

To measure and monitor electrical use at the Field Station

Description of System



Power supplied by the Wind Generating Facility has made possible the operation of several projects at Running Creek Field Station. One of these is the Boundary Layer Profile Balloon Experiment, the purpose of which is to determine the vertical temperature profile over the Field Station. The experiment was conducted by students in the Field Workshops 1975 program under the direction of Dr. Val Veirs, in-field faculty member.

The system consists of a small transmitter attached to a tethered weather balloon and a ground based receiver. The transmitter sends a frequency proportional to the air temperature down to the receiver, and the frequency is read off an attached metering unit. The entire system is then powered by the wind generator. Figure 1.0 shows a schematic representation of the hardware.

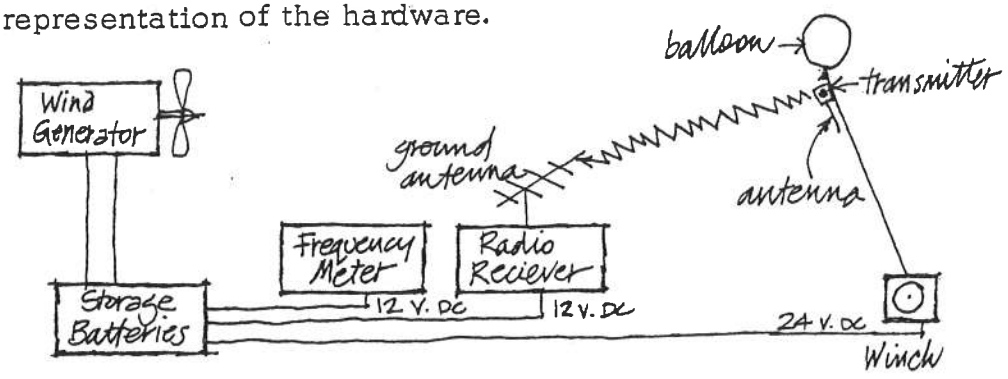


Figure 1.0

Results of the experiment are shown in Figure 2.0. The decrease in temperature with height is apparent, and roughly corresponds to standard values of a 10° C decrease in temperature per one kilometer height increase. The data points are time corrected.

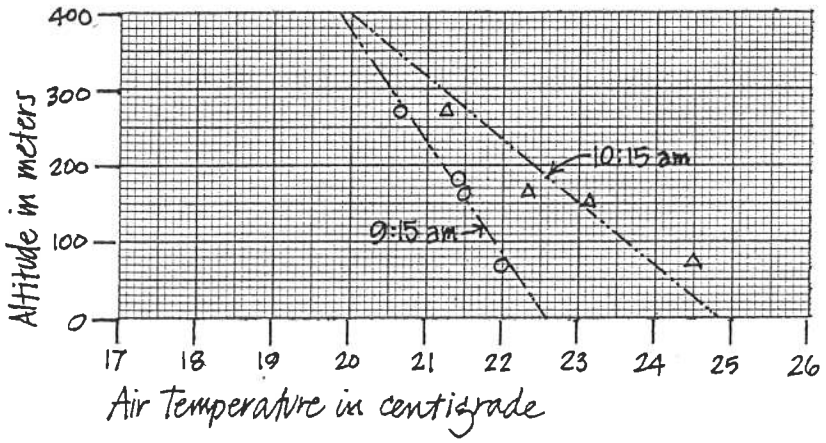


Figure 2.0

5.3.2 Bio-Digester Research Project

Objectives

To produce methane gas from human sewage

To measure the quantity of gas produced

To measure the quantity of sludge produced

To investigate the use of anaerobic waste digestion systems for remote sites with little water or external power hook ups

To utilize solar energy for the digester heating requirements

To utilize solar energy for the distillation of waste water

To experiment with the reuse of water in the bio-digestion system

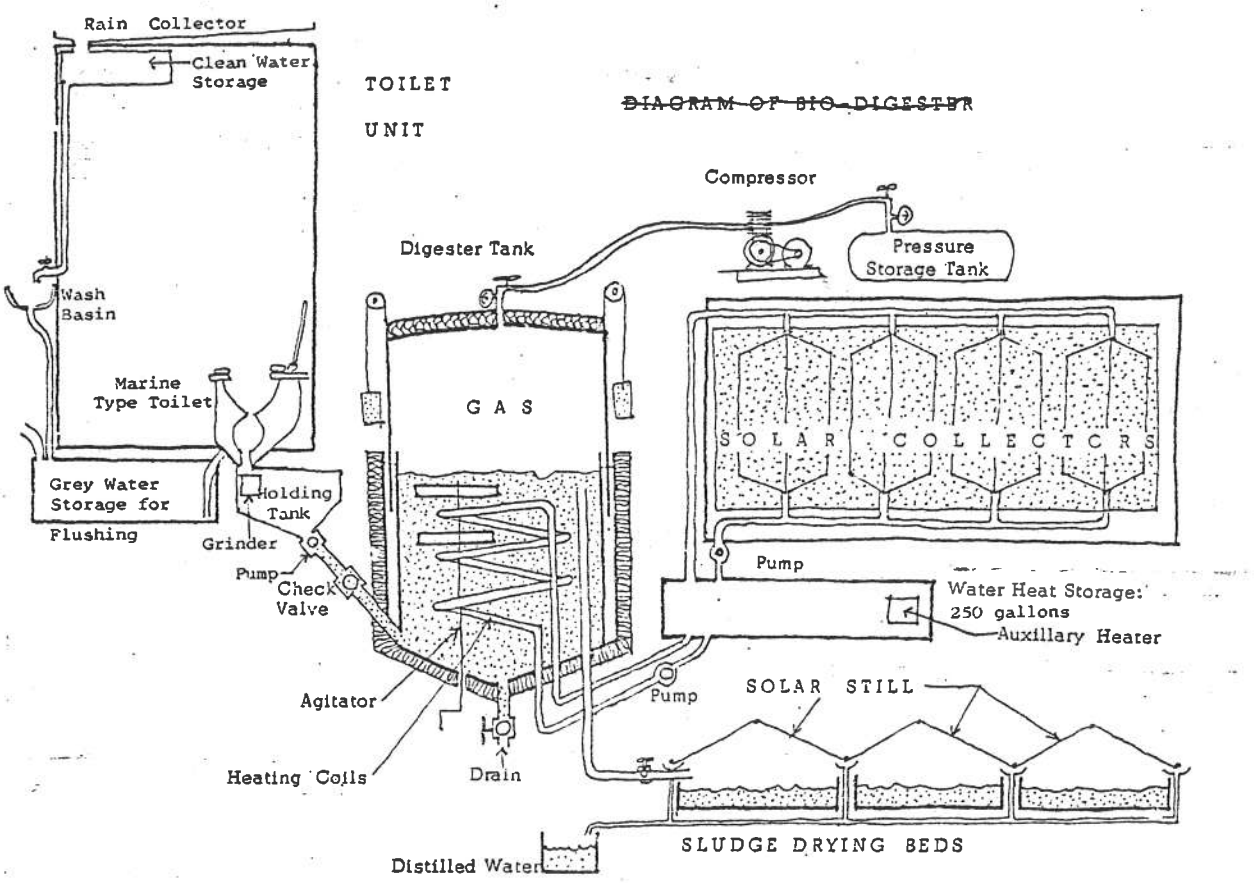
To integrate the bio-digester system with existing facilities at Running Creek Field Station, i.e., wind generator, monitoring equipment, existing sani-john

To develop an operating procedure which maximizes the control of inputs for the study of the digestion process

To monitor the pH level, temperatures throughout the system, nitrogen to carbon ratio and optimum digesting time

To complete comprehensive documentation of working drawings, specifications, equipment, construction and preliminary testing

Diagram of the Bio-Digester



5.3.4 Night Sky Radiation

Objectives

To study the upward infrared radiation from the earth's surface to the upper atmosphere which occurs during the night time hours

To verify rates of upward heat flow per unit aera of surface at the ground

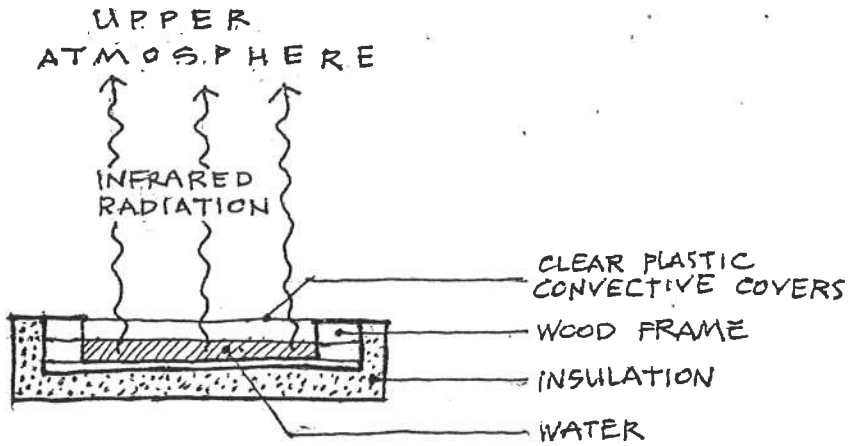
To investigate the potential uses of this cooling effect with regard to application to the temporary structures currently on-site and to the design of the Technics Laboratory structure (i.e., cooling, refridgeration)

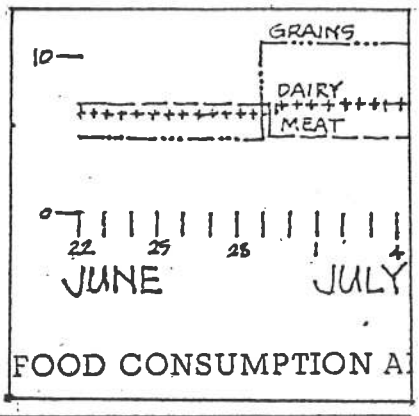
To construct test units for feasibility accessment of the heat radiator configuration, materials,etc.

Principal of Operation

Utilizing the fact that heat will flow from a hotter source to a cooler source (entropy), it is possible to radiate heat in the form of infrared radiation from a heat source on the ground up to the cold upper atmosphere and into space. Water is used as a heat source, and in the container diagrammed below, the water can

be cooled down to freezing temperatures even though the ambient air temperature never drops below 5 or 10 C (40 or 50 F). The rate of cooling also depends on several other factors including humidity, wind speed, cloud cover, and particulate in the atmosphere. The container is insulated against local conductive or convective heat gains (i.e., wind, ground surface)





6.0 Related Projects

6.1 Purpose

To develop a broader base of input for the Energy Project through the introduction of projects directly related to the primary focus of the Project

6.2 Objectives

To develop measuring and monitoring projects which focus on energy related aspects of the Summer Workshops as areas for study

To study the biomass and material flows as integral to the energy flows in the human-made systems at Running Creek Field Station

To involve students in the Summer Workshops in the measuring and monitoring procedures of the projects

To develop projects which are consistant with the educational and research directions of the Institute

6.3.1 Food and Waste Monitoring

Purpose

To monitor the cost and consumption of all imported food the quantities of exported wastes during the Summer Workshops at Running Creek Field Station

Objectives

To monitor food consumption according to the following catagories; meat, grains, fruit and vegetables, meats, and misc.

To monitor the cost of all food consumed at the Field Station

To monitor the gross weight of all foods and packaging

To monitor the net weight of the food consumed

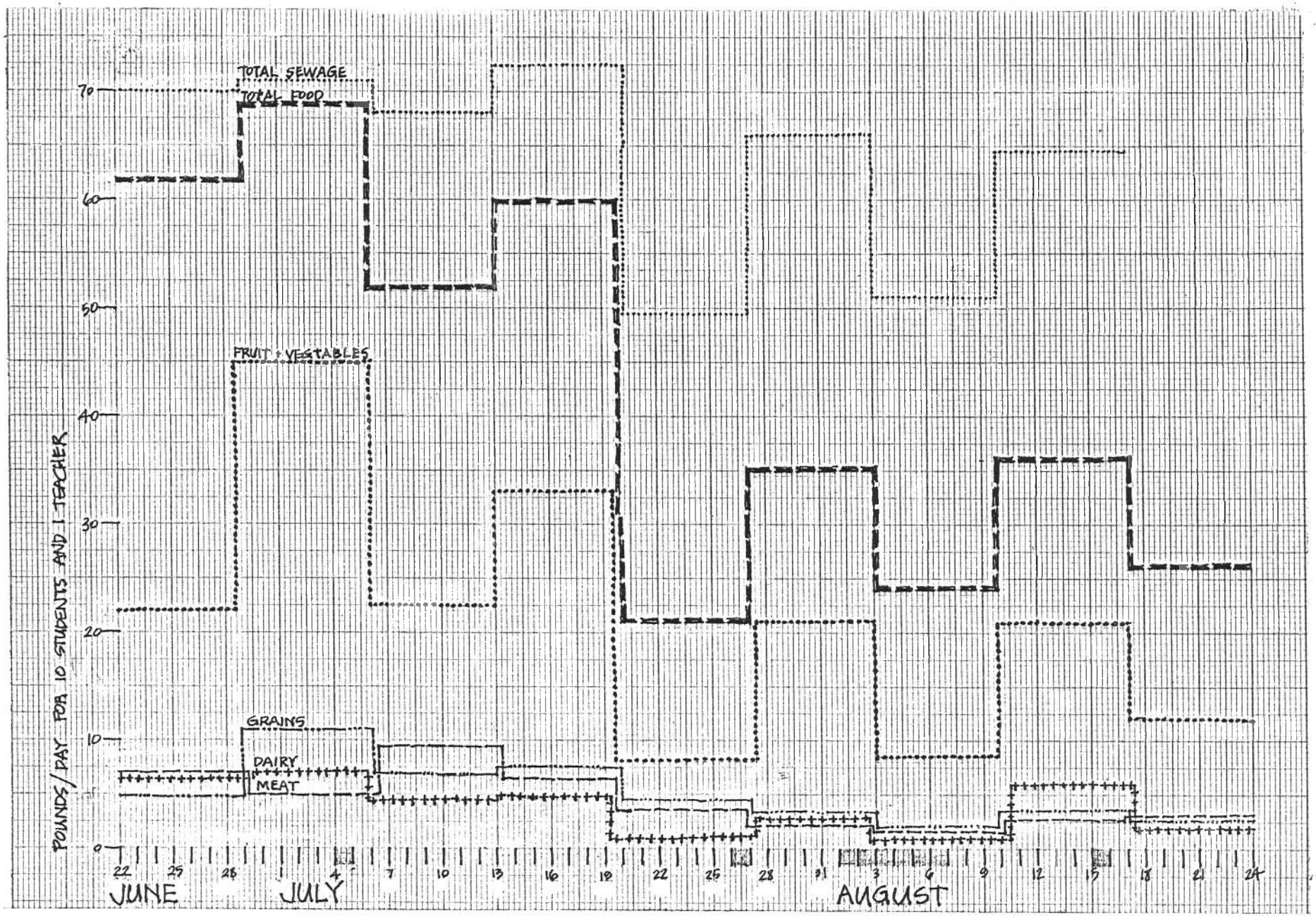
To monitor the quantity of water consumed

To monitor the quantity of wastes exported from the site

To develop efficent procedures and recording forms for the monitoring programs

To study the relationships between food consumption, waste production and water consumption during the summer, plus the equivilent energy conversions

To tie this information in with the educational and research programs at Running Creek Field Station



FOOD CONSUMPTION AND WASTE PRODUCTION : Running Creek Field Station Summer, 1975

6.3.2 Fire Danger Weather Substation

Purpose

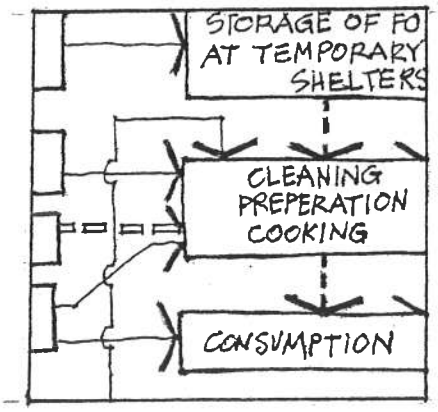
To maintain and operate a Fire Danger Weather Station and report the computed daily fire danger readings to the Colorado State Forest Service

Objectives

To take readings at 6 am, 1 pm, and 6 pm daily on the following variables: dry bulb temperature, wet bulb temperature, wind direction, wind speed, maximum temperature, minimum temperature, and precipitation

To maintain a well operating weather station

To have students take the readings and calculate the fire danger information



7.0 Energy Programs

Program for students to participate in the Energy Project* at Running Creek Field Station, Elbert County, Colorado

The Energy Program is a cooperative educational program whereby students enrolled in universities and colleges in the State of Colorado may pursue independent study in energy, or energy-related fields, at Running Creek Field Station. This program is supplementary to the student's curriculum at his or her university or college.

Programs

I. Meteorology Program

The Institute has maintained a weather monitoring station at Running Creek Field Station over a three year period. Data is collected on twenty-four hour strip chart recorders for temperature, humidity, wind speed, wind direction, precipitation, solar radiation, and rock and soil temperatures. Strip charts are digitized and stored on magnetic tape at the National Center for Atmospheric Research facility (NCAR) in Boulder. Computer programs are in the design process for data utilization. Calculations include standard deviation, means, maximums, minimums, etc. Summarized data is particularly relevant to the development of design parameters for the Technics Laboratory[1] and correlation of weather monitoring information with in-field research and testing at Running Creek Field Station.

Students are included in the project as assistants to the project director, computer personnel, and staff. Assistants' responsibilities include maintenance of the weather monitoring equipment, collection and digitizing of data at NCAR, and correlation of data for specific field projects. Students are directed in this program by professional staff working on the project. Seminars on meteorology, geology, hydrology, and the implications of climate on food production, energy requirements, field biological studies, and so forth accompany the program on a scheduled basis. The program gives the student the opportunity to gain training in computer science, field weather monitoring and data collection techniques, and an introduction to the study of climate and how it affects natural and human-made systems.

II. Bio-Digester Research Project

A Bio-Digester Research Project is planned for design and construction in the Spring of 1976. The unit will be for research and testing purposes to further the investigation and data available on waste utilization. With an eighteen person control group, the unit will process human waste, and produce methane, distilled water, and fertilizer as by-products.

Students are included as assistants in either the design and construction phase of the project or in the monitoring program. Students can expect to be directly involved in actual construction work, model building, and organization of a formal monitoring procedure. Special seminars accompany activities including the investigation of data collection techniques, principles of waste engineering, microbiology, environmental planning, and the current technology of waste disposal and utilization. Students will be directed in the program by professional consultants and staff working on the project.

III. Energy and Structure

An energy and structure program has been designed to combine all monitoring and research programs related to energy under a single study. Solar energy, wind energy, waste monitoring, and other working experiments are being studied as foundation material for eventual application to structure and design. Experiments include a 1000 Watt Quirks Wind Generator, demonstration solar collection units, night sky radiation monitoring equipment, and a demonstration bio-digester unit at Running Creek Field Station. Collected data are utilized to construct energy flow models which relate on-site renewable resources and imported non-renewable resources to the patterns of energy consumption at the Field Station.

Students will be included as assistants on the project. Responsibilities include working with the monitoring equipment on all projects, correlation of data, maintenance of experimental units, construction of models and calculations related to energy flow, and assistance with the Technics Laboratory development program. Seminars accompany the activities in areas of particular relevance to the program. Students are directed by the Energy Project Coordinator, Institute professional staff, and consultants.

Applications

Students may apply for any of the above programs through regular Institute channels, i.e. submission of academic program, relevance of Energy Program to background and future academic plans, and general information. Correspondence should be addressed to:

Energy Project Coordinator
Wright-Ingraham Institute
1228 Terrace Road
Colorado Springs, Colorado 80904
(303) 633-7011

Program schedules are developed on an individual basis with the student, his or her university advisor, the Institute's Planning Board, and the Energy Project Coordinator.

A Program Schedule may be designed to include one or more of the above programs, provided that sufficient time is available to fulfill program commitments. With the exception of the Bio-Digester Project, which requires full time work for approximately one month or a monitoring schedule during the summer months only, a possible schedule of four hours per week on project work during the academic year (9 months) is anticipated. Such a schedule would include a diversity of work at various locations.

Fees

A fee of $500.00 is charged for participation in each program. This fee is subject to review given special circumstances. A limited number of scholarships may be available for participation.

Credit

The Wright-Ingraham Institute does not grant credit. However, to facilitate credit granting, the Institute issues a transcript to the student upon completion of program indicating hour equivalency.

The Energy Program is designed as a cooperative program with Colorado institutions of higher education and credit is arranged accordingly.

Evaluation

All project work is evaluated in conjunction with the student, the student's university advisor, the Board of Advisory Consultants, and the Institute's Planning Board.

Evaluation procedures are individual to the student's schedule and will include comment and review from the Planning Board, compilation of field notes, documentation of procedure, and special project work.

Wright-Ingraham Institute
1228 Terrace Road
Colorado Springs, Colorado 80

RESULTS OF ENERGY SURVEY

on renewable energy sources

ROCKY MOUNTAIN FRONT RANGE REGION

As of 5 April 1974

✓ present (✓) future

Places Contacted	SUN				WIND				WASTE							
	Research	Application	Monitoring	Working Collector	Research	Application	Monitoring	Working Generator	Research	Application	Monitoring	Wkg. Methane Digestor	Energy Education	Product Design	Product Sales
ABR Partnership Denver, CO	✓	(✓)		(✓)											
Steve Baer, Zomeworks, Inc. Albuquerque, NM	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓
William Baker, Architect Colo. Spgs., CO	✓	✓	✓	✓											
Bridges & Paxton, Engineers Albuquerque, NM	✓	✓	✓												
Colorado Energy Info. Center Denver, CO													✓		
Colorado Energy Research Inst. School of Mines, Golden, CO													✓		
Colorado Springs, City of Sewage Treatment Plant									(✓)	✓	✓	(✓)	✓		
Colorado State University Ft. Collins, CO	–	–		–	–	–			–	–			–		
Dr. George Löf Dept. of Chem. Engineering	✓	✓		✓					✓	✓			✓		
Dr. J.E. Cermak Dept. of Civil Engineering					✓	(✓)									
University of Colorado at Denver Environmental Action of Colorado	✓	✓		✓	✓	✓		✓				(✓)	✓	✓	
Adolph Coors Company Denver, CO									✓	✓	✓				
Richard Crowther, Architect Denver, CO	✓	✓	(✓)	✓	✓	✓			(✓)	(✓)	(✓)		✓	✓	✓
Denver, City of Waste Water Control Division											✓	✓			
Robert L Haynes, Engineer Boulder, CO				(✓)	✓	(✓)	(✓)	(✓)							
Hewlett-Packard Corp. Colo. Spgs., CO		(✓)		(✓)											
Kaman Science Corp. Colo. Spgs., CO	✓	(✓)		✓	✓	(✓)	✓		✓	(✓)			✓	✓	✓
Littleton, City of Public Works Dept.									✓	(✓)	✓	(✓)			
Monfort of Colorado Greeley, CO									✓			(✓)			
National Oceanic & Atmos. Admin. Colorado Offices	–	–	–	–			–								
U.S. Weather Service Aurora, CO			✓				✓								
Environmental Res. Lab. Boulder, CO	✓	(✓)	✓	(✓)			✓								
Phoenix Corp. Colo. Spgs., CO		✓		✓											
Dr. Jerry Plunkett, Mats. Consults., Inc. Denver, CO	✓	✓	✓	✓		✓	✓						✓	✓	✓
Robert Reines Tijeras, NM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	(✓)	✓	✓	
Benjamin T. Rogers, Consult. Engineer Emudo, NM	✓	✓	✓	✓	(✓)										
Rocky Mt. Forest & Range Ex. Sta. USDA, Ft. Collins, CO									✓						
Security, City of Waste Water Treatment Plant											✓	✓			
Sun Mountain Design Santa Fe, NM	✓	✓	✓	✓		✓		✓	✓	✓			✓	✓	✓
Peter Van Dresser El Rito, NM				✓				✓							
Daniel Weitzel, Elect. Engineer Boulder, CO	✓	(✓)		(✓)	✓	(✓)	(✓)	(✓)	✓	(✓)		(✓)			
Wright-Ingraham Institute Colo. Spgs., CO	(✓)	(✓)	✓	(✓)	(✓)	(✓)	✓	(✓)	(✓)	(✓)	✓	(✓)	✓		

See reverse side for complete names and addresses

8.0 Proposals and Grants

ENERGY PROJECT, funded by General Services Foundation, 15 March 1974, grant period 31 March 1974 to 31 March 1975.

BIO-DIGESTER RESEARCH PROJECT, funding being sought, grant period for Phase I, 1 May 1976 to 1 November 1976

NCAR APPLICATION FOR COMPUTER RESOURCES, granted by NCAR 17 December 1975, 750 Computer Resource Units; Grant period 20 December to 1 May 1977, NCAR project number 3603001, scientist number 5667.

Rec'd 29 Mar

General Service Foundation
First National Bank Building
St. Paul, Minnesota 55101

March 26, 1974

Mrs. Elizabeth Wright Ingraham, Director
Wright-Ingraham Institute
1228 Terrace Road
Colorado Springs, Colorado 80904

Dear Mrs. Ingraham:

Thank you for your letter of March 18, 1974, and in response to your request have authorized The First National Bank of Chicago to send you a check for $10,000. for your Energy Project, as set forth in your letter of March 18. Enclosed is a copy of our letter to the First National Bank of Chicago.

Your proposal to send in reports on the project on August 30, 1974 and March 30, 1975 is agreeable with us. With regard to your inquiry about publicizing the grant, the Foundation has no wish for publicity, and your normal procedure for handling grants, as set forth in your letter, meets with our approval.

Thank you for your invitation to visit your field station. If I should be in the area, I should be most interested.

With all best wishes,

Very truly yours,

John M. Musser

John M. Musser, President

Department of Atmospheric Science

Colorado State University
Fort Collins, Colorado
80523

December 3, 1975

Mr. Frank C. Miller
Wright-Ingraham Institute
Running Creek Field Station
Elbert, Colorado 80106

Dear Mr. Miller:

Our discussion on November 20, 1975 was interesting and informative. I was pleased to hear about your program for collection of meteorological data. Colorado has never had enough observing sites due to the large effects of topography. Your data will be a valuable addition to normal sources. The location of your field station is an especially interesting one due to the large variation in precipitation in the area.

I would like for you to keep me informed of your activity and look forward to the possibility of including your data in our data base for Colorado.

Sincerely,

Thomas McKee
State Climatologist

TM/kc

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
P. O. Box 3000 • Boulder, Colorado 80303
Telephone: (303) 494-5151 • TWX: 910-940-3245 • Telex: 45 694

17 December 1975

Mr. Frank Miller
Wright-Ingraham Institute
1228 Terrace Road
Colorado Springs, CO 80904

Dear Mr. Miller:

Your request to use the NCAR Computing Facility has been approved with a grant for 750 Computer Resource Units to be expended by May 1, 1977. Your project number is 36031000, and your scientist number is 5667.

Enclosed is a self-addressed postcard to use in requesting copies of our most current computer manuals. The manuals available are described in Chapter 12 of the "NCAR User's Guide" which is being sent to you under separate cover. Enclosed for your information are copies of the reviewers' comments.

When you publish your research on "Weather Data Storage and Acquisition System for Running Creek Field Station," we would appreciate your acknowledging NCAR's assistance in this project using the form suggested in the User's Guide. We would also appreciate receiving a copy of the resulting publications.

The Computing Facility maintains a University Liaison and Information Services Office to assist users with programming problems. If you plan to use a terminal for Remote Job Entry, you should make a request to this Office for the site code and a password to be assigned to your project. Some of the services available are described in the User's Guide we are sending you. Since our reviewer felt that consultation might be valuable, we do urge you to talk with Jeanne Adams, University Liaison Manager. If necessary, she may then assign a Computing Facility Staff member to you for consultation.

Beverley Chavez, at extension 521, will be glad to help you in making hotel reservations and to acquaint you with Computing Facility procedures.

If I can be of any further assistance to you, please let me know.

Yours sincerely,

E. Cicely Ridley

E. Cicely Ridley
Computing Facility

ECR:bc
Enclosures

The National Center for Atmospheric Research is Operated by the University Corporation for Atmospheric Research under sponsorship of the National Science Foundation.

REVIEW FORM

APPLICANT: Frank Miller of Wright-Ingraham Institute

PROJECT TITLE: Weather Data Storage and Acquisition System for Running Creek Field Station

COMMENTS: This project qualifies as atmospheric science in the sense that its immediate objective is to acquire, process, and store meteorological information. The observations are being made in an area which is of particular interest. They are being processed in an economical way, and they are being stored in a manner which will make them easy to recover for future use. The most immediate uses are outlined in the description of the problem in Mr. Miller's application. In my opinion, however, the real value of the work is indirect and will not be realized for a few years.

The Wright-Ingraham Institute is attacking some of the most pertinent and pressing problems of our day. It is inspiring young students to search for realistic ways to live in harmony with their environment. It is doing this by giving young upper division and starting graduate students an opportunity to study and attempt to solve real problems in developing and using solar and wind power, in recycling waste products without polluting, and in developing good relationships in a community in which their activities are decidedly different from most other human endeavor. After spending a time helping to build a campus for the Institute which incorporates his own ideas and efforts on self-sufficiency and environmental compatibility, each student is expected to return to the university of his choice and pursue his own interests. My contacts with a few of those students leads me to believe that the experience they are getting at the Institute is inspiring them to believe they can make a real contribution to the problems of today and tomorrow. It also gives them a much better understanding of what they need to study in graduate school to enable them to pursue their interests.

Thus the greatest value in this program is educational. I'm confident that in a few years participants in the Institute program will make outstanding contributions to environmental science.

RECOMMENDATION: I heartily recommend that this program be approved. It could be made more efficient if an NCAR scientist or skilled programmer could be induced to take a personal interest in it.