

Working Group for the LFSP Study

1. Outline of the Problem

The following note is intended to describe the beginning of an NRAO engineering group to work on the LFSP. Three ways of carrying out the study within the NRAO have been considered.

- a) Set up an engineering group on the NRAO staff to monitor and conduct the study
- b) Contract the whole study to a competent outside contractor
- c) Use a part-time NRAO engineering group

From many points of view (a) would be ideal. However, at the start of the study it has proved impracticable to interest good engineers in joining the NRAO staff for what may be only a study and not a funded project. Nevertheless, as the study continues and the project becomes more real the group in (a) must come into existence.

Course (b) has been rejected for various reasons, among which are that it would make it difficult to provide the essential interplay between the study and the scientists. The study is also not funded sufficiently well yet to support a large contractual effort.

Course (c) is possible and is being adopted as a first step. The plan which is to be followed is now outlined.

2. A Part-Time Engineering Group

The following group of engineers has been formed to work with JWF on all engineering aspects of the study:

Edgar R. Faelten, Consulting Engineer, Buffalo, New York
 Otto R. Heine, Engineer, Playa del Rey, California
 Richard L. Jennings, Assistant Professor, School of Engineering,
 University of Virginia, Charlottesville, Virginia
 John A. Hungerbuhler, Head of Engineering, NRAO

Brief resumes of the group members are at Appendix A. Each member of this group will fulfill two functions.

- a) To carry out specific tasks in the LFSP study, in the design, analysis or evaluation of concepts and ideas which arise during the study. Each member of the group has his own supporting staff, associates, or graduate students who will work under him to do the various tasks.

- b) To meet together with JWF at regular intervals, about once every four weeks, to review the progress of work already done and to plan new work. These meetings will be used also to:
 - i) Provide a place where interested astronomers or engineers may come from time to time to learn of progress or to suggest changes or improvements to the study
 - ii) Help decide what further work, outside the working group, is needed; to advise NRAO where such work might be done

3. Administrative and Finance

The external members of the group will each have a contract with NRAO which covers their general services to the group and allows them to perform specific designs, analysis or evaluation work. The specific tasks will be assigned from time to time by NRAO as a task order under the contract to the group member doing the work.

Meetings of the group would be mainly at Charlottesville, but would also be held in Buffalo/Boston (Faelten moves to a location near Boston in the fall), Green Bank, or on the West Coast. The general contract will cover the travel and other costs of such meetings.

J. W. Findlay
NRAO
April 19, 1965

Resume, Edgar R. Faelten

Born: November 21, 1915

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| Education: | Whitman, Massachusetts High School | 4 years |
| | Huntington School, Boston, Mass. | 1 year |
| | Northeastern University, Boston, Mass. | 1 year |
| | Massachusetts Institute of Technology, Cambridge, Mass. | 3 years |

Experience:

1938-45 Eight years, Federal Shipbuilding & Dry Dock Co., Asst. to Hull Superintendent last 4 years; large commercial and naval construction

1945-46 Sawmill owner and building contractor, 1 year

1946-47 Structural engineer, Donnelly Elect. & Mfg. Co., Boston, Mass.

1947-50 Designer, Bethlehem Steel Corp., Lackawanna, N.Y., 4 years. Many heavy structural steel and reinforced concrete problems, foundations, hydraulics, blast furnace and open hearth modifications, also rolling mill and finishing mill design.

1950-51 Chief draftsman, Central Steel Constr. Corp., Buffalo, N.Y., 2 years, a small shop averaging about 500 tons per month (buildings, bridges, etc.)

1952-54 Lake Erie Machinery Corp., Buffalo, N.Y., Rolling Mill Division, 3 years, squad boss in charge of design of heavy machinery for steel and aluminum rolling mills, examples, break-down mills, senzimer mills, slitting lines -complete-, stretchers, levelers, complete steel and alum shearing lines including flying shears.

1955- Present Consulting engineer in private practice, Buffalo, N.Y., now in 11th year of business. Staff, maximum 30 men, 10 at present, 5 of whom have been with me over 8 years. Nearly 100% of my practice has been with the following clients:

Cornell Aeronautical Lab.
Remington Rand
Colorado Fuel and Iron Corp.
Bethlehem Steel Corp.
City of Buffalo, N.Y.
County of Erie, N.Y.
County of Cattaraugus, N.Y.
U.S. Army Corps of Engineers, N.Y. District
National Radio Astronomy Observatory
Naval Research Laboratory

The above have been furnished designs for wind tunnel expansion, various steel mill structural, mechanical and electrical projects, mill and factory buildings, several office buildings, an entire fiscal year expansion program at a military base, fallout shelter survey for 4 counties, numerous highways and bridges, and the following large antenna design projects:

- a) Completed conceptual structural design of R.D. Hall for NRAO 300-ft transit telescope into complete design package, including foundations and machinery (built and operating)
- b) Complete design study and estimate for fully steerable 300-ft alt-az for NRAO
- c) Complete design study and estimate for a second 300-ft transit radio telescope for NRAO
- d) Complete design package for fully steerable 150-ft alt-az antenna (elevation motion from 0-90° altitude) for NRL (under construction). I am also furnishing construction phase engineering services for this project.
- e) Complete design package, specs ready for bidding, 300-ft alt-az, full sky coverage, for NRL
- f) Design study for S. von Hoerner, 500-ft cable surfaced alt-az
- g) "In-house" design and estimates for 400-ft and 500-ft transit instruments, also for 100-ft equatorial mount

I am a registered professional engineer in the States of New York, Connecticut, West Virginia, Pennsylvania, and Massachusetts.

My business structure is now being divided into 3 entities, as follows:

- a) A consulting engineering firm under the name of Faelten and Fretz, Consulting Engineers, doing business at 602 Grover Cleveland Highway, Buffalo 26, New York. This group will perform all antenna design problems in the immediate future.
- b) Old Colony Technical Service, Inc., a group doing sub-professional work (drawings, specifications, etc.) at 47 Main Street, Plymouth, Massachusetts. This office opens on April 5, 1965.
- c) Edgar R. Faelten, Consulting Engineer, Inc., at Indian Trail, Cummaquid, Massachusetts. This group will start building up about (hopefully, if my house is completed by then) September 1, 1965. Office will eventually be in Hyannis, Massachusetts and the work will be transferred there from Buffalo.

Resume, Otto R. Heine

Born: August 11, 1931
Nationality: American (Naturalized)

Education:

1937-51 Various High Schools - Graduated 1951
1951-55 School of Engineering, Hamburg, Germany
Graduated 1955, Mechanical Engineering

Experience:

1947-51 Apprentice at "Heidenreich Und Harbeck" in Hamburg, a Division of V.D.F. Company, which is one of the largest manufacturers of machine tools and precision gearing in Western Germany. I became a Journeyman Machinist in 1951.

1955-56 Application Engineer at the "Deutsche Worthington Gesellschaft" in Hamburg, a division of Worthington Corporation. Duties included sales promotion, application and service of company products, such as large centrifugal pumps, water or steam turbines, refinery waste gas engines, etc.

1956-58 Project Engineer with the "Manitowoc Engineering Corporation," Manitowoc, Wisconsin. Assignments were of a special nature and included the introduction of digital computer analyses to the development of crane booms, gear trains, crane bodies, etc. In particular, development of 200-ft crane boom, 125 ton truck crane, 6 cu. yard barge mounted excavator and ship unloading devices.

1958-61 Project Engineer with the "Flocrete Manufacturing Company" and with the "Kemper Construction Company," both located in Los Angeles and operated by the same owner. Developed mining equipment and material handling machinery for copper and other ore mines, machinery for construction of hydro-electric plants, diversion tunnels, railroad tunnels and pneumatic concrete placing equipment for above. Developments included complete responsibility for design, construction and initial operation of equipment.

1961- Present Chief Engineer with the Astro Structures Division of Lear Siegler, Inc. This company is at present dissolving their operation and was until now engaged in the design and development of special machinery, such as stretch form machines, presses, spin forge machines, ground handling equipment, satellite tracking antennas, etc. During the course of this employment I was engaged in numerous projects, ranging from aircraft lifting jacks to complex satellite tracking antenna mount and drive systems.

Summary

During the course of my professional career I have had the opportunity to apply the knowledge gained during my practical and theoretical engineering training to a numerous variety of machinery, such as tracer controlled engine lathes, bevel gear cutters, woodworking machinery, centrifugal pumps, turbines, diesel engines, cranes, shovels, drag lines, hoists, conveyors, excavators, pneumatic concrete pumps, travelling Jumbos, jacks, tunnel shields, ground handling equipment, satellite tracking antennas and optical or radio telescopes.

As a result of this experience I have become thoroughly familiar with the development of machinery or systems with original concept through final installation and with engineering management techniques coupled with sound knowledge of budget, financing, scheduling, organizing, and planning for engineering operations.

Resume, Richard L. Jennings

Personal: 31 years of age (place of birth Newark, N.J.)
Married, father of two children

Education:

1956 B.S. in Mathematics, Ohio University
1957 B.S. in Civil Engineering, Ohio University
1958 M.S. in Civil Engineering, University of Illinois
1964 Ph.D. in Civil Engineering, University of Illinois

Teaching Experience:

1955 Laboratory Assistant, Ohio University
1956-58 Research Assistant, University of Illinois
1958-61 Research Associate, University of Illinois
1962-64 Instructor, University of Illinois
1964- Assistant Professor, University of Virginia
Present
1965- Coordinator of 1st year Curriculum, School of Engineering
Present University of Virginia

Industrial Experience:

1956 Structural Designer and Construction Superintendent, American Telephone and Telegraph Co.
1964 Visiting Post-doctoral Fellow, National Aeronautics and Space Administration
(Summer)

1959-64 Consultant in Earthquake Engineering and the Effects of Nuclear Weapons on Protective Construction, N. M. Newmark Associates

Principal Publications of Last Five Years:

"Elastic Response of Multi-Story Shear Beam Type Structures Subjected to Strong Ground Motion," Proceedings of 2nd World Conference on Earthquake Engineering, Vol. II, p. 699, Tokyo, Japan, 1960

"Analysis of Arches and Domes," Kirtland Air Force Base, Special Weapons Center, Contract AFSWC-TR-60-16, Vol. I (1958), Vol. VIII (1960)

"Studies of Response of Arches and Domes under Dynamic Loads," Kirtland Air Force Base, Special Weapons Center, Contract AFSWC-TR-61-90, 1961

"A General Theory for Ring-Stiffened Shells of Revolution," Proceedings of National Aeronautics and Space Administration - American Society for Engineering Education Summer Program, Langley Research Center, Hampton, Virginia, 1964

"The Elastic Response of Spherical Shells to Blast Waves," Ph.D. dissertation, University of Illinois, 1964

Honors; Scientific and Professional Societies:

Participant, Conference for Young Engineering Teachers, Pennsylvania State University, 1962

Holder of NASA-ASCE Postdoctoral Fellowship, Langley Research Center, 1964

Member, American Society of Civil Engineers

Member, Society for Industrial and Applied Mathematics

Member, The Society of Sigma Xi, Scientific Research Honorary

Member, Tau Beta Pi, Engineering Scholastic Honorary

Resume, John A. Hungerbuhler

Born: July 13, 1929

Education: Lyceum High School Graduate
Vocational Apprenticeship 3 1/2 years
University of Switzerland, B.S.M.E. and E.E.

Associations: Member, W. Va. Professional Engineers Society

Experience:

- 1951-53 International Contracting Co., Engineer, Mechanical-Electrical. Design, layout and installation of power and propulsion machinery and auxiliary equipment -- installations as assistant project engineer in upper Egypt, South America and Far East.
- 1953-56 Saudi Arabian Royal Government, Director Public Works. Planning, design and contractual responsibility for the modifications, additions and expansions of power generating plants, electrical distribution networks, pipelines, pumping stations, water distribution systems, sewage disposal plants, air conditioning, and their construction and operation -- design and construction of hospitals, palaces, roads, airports and public buildings -- organizing and direction of 1400 men work force.
- 1958-60 Baker Process Co., Field Consulting Engineer. Design, development, construction, and installation of custom made automated bakery and conveyor systems -- customer relations responsibility and complete project control.
- 1960-63 General Cable Corp., Project Engineer-Manager. Design and construction of new manufacturing plants and facilities. Design, development, fabrication, installation and testing of new automated manufacturing equipment -- contract selection and awarding responsibility and full managerial control of all phases of various projects.
- 1963- Present National Radio Astronomy Observatory, Head, Engineering Division. Design and fabrication of radio telescopes, components and auxiliary equipment, control buildings, electrical power and distribution network, roadwork design and construction, designer air conditioning systems, and associated supporting facilities.