It gives me great pleasure to announce my intention to establish, in Connecticut, production of my invention, "A VERY HIGH PERFORMANCE MULTI-ROTOR COMBUSTION ENGINE". Development and production of this engine is, I believe, in the national interest and has the potential of generating revenues in the billions of dollars both in the United States and overseas.

Testea Engine Systems and The University of Connecticut are seeking $400,000 to develop and produce a prototype. Please review the enclosed supporting documentation:

1. Budget Plan
2. The University of Connecticut Report
3. Review Panel Evaluation Report Form
4. Correspondence from Governor Weicker

I will call next week to set up and meeting to answer any questions you may have. Time is of the essence as funding must be acquired soon to satisfy the June 1, 1993 program start date. Your attention and consideration is sincerely appreciated.

Very truly yours,

George Testea, President

This document has been approved for public release and sale; its distribution is unlimited.
DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.
Testea Engine Systems Inc.

GEORGE TESTEA, President

April 6, 1993

Governor Lowell Weicker
167 Capitol Avenue
Hartford, CT 06016

Dear Governor Weicker:

I am writing you about my intentions to found a Connecticut based engine manufacturing company. I have been told that you are in the position to make incentives and funding available for this purpose.

The major benefit I can offer the State of Connecticut is the promise of the creation of new jobs. It is no secret that one of Connecticut's largest populations of unemployed workers is engineers and industrial manufacturers. A great number of these people would be vital resources in the success of this new company.

I wish to offer for your review some of the correspondence that I have received relating to the testing process of my engine. Among these are statistics and test results from the University of Connecticut department of Mechanical Engineering.

The production of my invention is in the national interest, and is capable of producing billions of dollars for both the United States and overseas and needs attention and consideration in this context.

Testea Engine Systems and the University of Connecticut are seeking $400,000 to develop and produce a prototype. Please see the budget plan and report from The University of Connecticut and report review panel evaluation form.

After you review the material I have enclosed, I would greatly appreciate it if you would provide me with an updated response. I am prepared to discuss any questions you may have and provide any additional information required. I will make myself available at your convenience, I hope I have made my position clear, and that you will expedite matters to assist in securing a mutually beneficial result.

I thank you in anticipation of your attention to my proposal.

Very truly yours,

George Testea, President
July 29, 1992

Mr. George Testea, President
Testea Engine Systems Inc.
77A Loomis Drive
West Hartford, Connecticut 06107

Dear Mr. Testea:

I would like to acknowledge and thank you for your recent letter concerning the rotary internal combustion engine you have redesigned.

I am sending your correspondence to Deputy Commissioner Robert Santy of the Department of Economic Development with my request that he arrange for Connecticut Innovations Incorporated to consider your requirements and whether any assistance can be appropriately provided at this stage.

Sincerely,

LOWELL P. WEICKER, JR.
Governor

LPW/jes

cc: Robert W. Santy, Deputy Commissioner
Department of Economic Development
August 27, 1992

Mr. George Testea, President
Testea Engine Systems Inc.
77A Loomis Drive
West Hartford, Connecticut 06107

I would like to acknowledge your letter of August 25 and enclosures, giving me the background of your invention, which you describe as a Rotary Internal Combustion Engine.

I understand that you have been in touch with Deputy Commissioner Robert Santy of the Department of Economic Development and his associate, David Driver of Connecticut Innovations Incorporated. They indeed are the persons responsible for determining the feasibility of providing any assistance.

Accordingly, I am referring your letter to Mr. Santy for his consideration and reply to you.

Sincerely,

LOWELL P. WEICKER JR.
Governor
Business Response Center
Referral for
Anthony Brescia
Priority: 2 - URGENT

Resolution Information
Call Status:  
- Open
- Call Back
- Closed

Date Referred: 08/28/92
Currently working with anyone on this issue? ☐ Yes ☐ No

If Yes, Who? Has been working with Tony
Best guess estimates for the last year for THIS LOCATION ONLY
Last yr's # empl.: Unknown
Last yr's $ sales: Unknown

Call Notes and Referral Notes
sent letter to govt. and he sent it to CII, they can't resolve the problem, has talked to Tony Brescia, looking for venture capital to continue design project, had asked for one mil. but changes to 300 or 400k if he has to. He is not having any luck in getting financing. Needs space for his company and the development and manufacturing of his project. He sent his business plan and everything to CII # is moving too slow. He has spent a lot of money on the project and needs help but can't seem to get any

Customer Information
Name: George Testea
Title:  
Company Name: Testea Engine Systems Corp
Address: 77A Loomis Drive
City, State ZIP: West Hartford, CT 06107
Phone #: 521-2132

Ship To Information
George Testea
Testea Engine Systems Corp
77A Loomis Drive
West Hartford, CT 06107

Call Information
Call Type: Financing
Response(s): Referral
Mail Is Sent:  
Caller Region: 2
Industry Type: Not Applicable

Referral History
Inquiry Taken: 08/27/92 09:19 AM by Sheila Leniart
Edited By: Sheila Leniart
Tracking ID: SL9208270002
Referral History:
08/27/92 09:29 43 AM - To Anthony Brescia by Sheila Leniart
08/28/92 12 32 18 PM - Closed by Sheila Leniart

Referral Created: 08/27/92 09:27 AM by Sheila Leniart
Referral Edit History:

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<th>Edit Date</th>
</tr>
</thead>
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<td>08/27/92 09:29 56 AM</td>
</tr>
<tr>
<td>0</td>
<td>Sheila Leniart</td>
<td>08/27/92 09:29 56 AM</td>
</tr>
</tbody>
</table>
March 19, 1993

Dr. Zbigniew M. Bzymek
University of Connecticut
Department of Mechanical Engineering
191 Auditorium Road
Storrs, CT 06269

Dear Dr. Bzymek:

Thank you for the submission of your project proposal 93G019, entitled "A Very High Performance Multi-rotor Combustion Engine Design and Modeling". While your project was not selected for funding under the Yankee Ingenuity Initiative grant programs, we appreciate your participation in this grant competition.

The competition this year was intense and many excellent proposals could not be funded simply because not enough money was available. One hundred twenty two proposals requesting over $11 million were submitted to the Yankee Ingenuity Initiative. Two out-of-state experts and a panel of scientists reviewed each proposal.

Enclosed is a list of the proposals recommended for funding this year as well as the reviews of your proposal.

I encourage you to apply to the Yankee Ingenuity Initiative in the future. If you have any questions or if there is any way I might help, please do not hesitate to call.

Sincerely,

Nancy C. Rion
Director
Yankee Ingenuity Initiative

NCR/rav
Enclosures
April 2, 1993

Mr. Robert N. Santy
and Mr. Anthony Brescia
Department of Economic Development
State of Connecticut
845 Brook Street
Rocky Hill, CT 06067-3405

Dear Sirs,

Responding to the request of Mr. George Testea, I am enclosing a copy of the proposal "A Very High Performance Multi-Rotor Internal Combustion Engine Design and Modeling" written for Connecticut Innovations, Inc.

The proposal was prepared by myself and Dr. Richard Garrett as a response to the referral of the Department of Economic Development to help Mr. Testea to establish research on his concept. In the Fall, 1992 competition, the Connecticut Innovations Inc. decided not to fund the proposal. Mr. Testea is asking me for further help in his development, however the University doesn't have resources to support the project. Mr. Testea told me that there could be some other ways of sponsoring the proposal. If you see such possibilities, please let me know.

Sincerely,

Zbigniew M. Bzymek
Associate Professor

cc: Mr. George Testea
Dr. Richard Garrett
Dr. Nejat Olgac
Dr. Baki Cetegen
Proposal No. : 93G019

Yankee Ingenuity Initiative
Charles Goodyear
Cooperative Research and Development Grants

Connecticut Innovations, Inc.
Department of Economic Development

Attachment I

PROPOSAL COVER PAGE
Name and Address of Submitting Institution (including branch, campus, school or division):
Institution: University of Connecticut, Department of Mechanical Engineering
Address: 191 Auditorium Road, Storrs, CT 06269

Name and Address of Co-sponsoring Business(es):
1. Teesta Engine Inc.
   774 Loomis Drive, West Hartford, CT 06107
2. 

Is the Co-sponsoring Business(es) a small business? X Yes No

High Technology Field: Computer Applications/ Energy Systems

Title of Proposed Project: "A Very High Performance Multi-rotor Internal Combustion Engine"

Design & Modeling
Amount Requested: $172,529- Proposed Duration: two years Desired Starting Date: June 1, 1993
Co-sponsor Matching Funds: (1) $186,000.- (2) $ 

Location of Project: University of Connecticut

PI Name: Zbigniew M. Brynek Telephone No.: (203) 456-2275

Items included in project (check where appropriate):

- Animal Welfare
- Endangered Species
- Human Subject
- Marine Mammal Protection
- National Environmental Policy Act
- Pollution Control
- Proprietary and Privileged Information
- Recombinant DNA Molecules

Principal Investigator:
Name: Zbigniew M. Brynek Signature:
Title: PhD, Associate Professor Date: November 27, 1992

Authorized Institutional Representative:
Name: Thomas Tiche Signature:
Title: Provost of the University of Connecticut Date: November 30, 1992

Authorized Co-sponsor(s) Representative(s):
1. Name: George Teesta Signature: 
   Title: President, Teesta Engine System Inc. Date: November 27, 1992
2. Name: Signature: 
   Title: Date: 
Title of Project: "Very High Performance Multi-rotor Internal Combustion Engine Design & Modeling"

High Technology Field: Computer Appl./Energy Systems Amount Requested: $168,748

Key Words to Describe Scientific Focus: Multi-rotor Eng., CAD, Modeling, Des. for Manufact.

Institution: University of Connecticut, Dept. of Mechanical Eng., Storrs, Connecticut, 06269

Principal Investigator(s): Z.M. Bzymek, R.F. Garrett, B. Cetegen, N. Olgac, G. Testa

Co-sponsoring Business(es) or Industry(ies): Testea Engine Systems Inc.

Technical Abstract (Limit to 200 words on this side of form):

Rapidly changing economic and market forces are causing Connecticut's manufacturing oriented firms to rely increasingly on technological innovation in order to maintain their competitive position. These firms are looking to engineering schools to help them respond to these changes. The primary task that exists, then, is a new spirit of cooperation between these firms and the University of Connecticut that would result in the formation of teams capable of developing, integrating and implementing new design and manufacturing concepts embracing up-to-date Computer-Aided Design and Computer-Aided Manufacturing technologies.

The objective of this proposal is a cooperative industry/university project between UConn's School of Engineering and Testea Engine Systems, Inc. of West Hartford, CT to research and develop a concept and design for a very high performance multi-rotor engine system of unprecedented power and economy. The high performance of the new engine is based on the utilization of a multi-rotor segment mounted on one shaft, improved combustion cylinder design and rotation under computer control. The economy will be realized through optimized fuel injection and minimizing the working rotors power.

The new system will be based on the concept proposed by Testea Engine Systems, Inc. It will be analyzed, designed and model-tested in the CAD and Expert System Laboratory at the University of Connecticut.

The proposed work will include three basic stages whose integration will make it unique. During the first stage, the concept will be studied in detail and a preliminary design will be developed. Secondly, a computer model will be created and analyzed. A simulation taking into consideration performance, safety and economy of the new engine will be generated. Thirdly, a detailed design of the system and a working model will be developed to provide the basis for prototype production. Successful completion of the three stages will place the Testea UConn team and the State of Connecticut at the leading edge of the internal combustion engine system design, research and production.
# TABLE OF CONTENTS

1. Cover page ................................................................. Page i
2. Project summary .......................................................... Page ii
3. Table of contents ....................................................... Page iii
4. Project description ...................................................... Page 1
5. Evidence of commitment ............................................. Page 4
6. Biographical information ............................................. Page 5
7. Budget explanation ..................................................... Page 13
8. Budget Statements ...................................................... Page 14
9. Current pending proposals ........................................... Page 17
10. Appendices ............................................................... Page 21

I. Pending Patent Information from the United States Dept. of Commerce Page 21
II. Letter from the Department of Treasury, State of Connecticut (Employer Identification Number) Page 22
III. CAD&CAM Laboratory Equipment List Page 23
IV. Acknowledgement letter from the Governor State of Connecticut Page 24
V. Statement of Matching Funds from Testea Engine Systems Inc Page 25
VI. Statement of Collaborative Intent from Testea Engine Systems Inc Page 26
Project Description

Introduction

The first rotary engine, the Wankel Engine, was invented by the German engineer Felix Wankel in the 1920's. Between 1936 and 1945 he worked on the engine in his laboratory in Lindau in West Germany. Wankel became director of his own research establishment at Lindau, investigating the fundamental problems and applications of the rotary engine. [1]

The Wankel engine is an internal combustion engine with trochoidal, rotatory piston eccentrically located in the cylinder. The working cycle of the Wankel engine is the same as in conventional engines. The first production unit was tested in 1957. Since then Mazda, a Japanese automobile company, produced and developed the Wankel engine, introducing it to the US market in 1971. During the next few years, poor fuel economy and a world oil crisis discouraged buyers, but the engine was constantly improved, and, by the end of the decade, the company's sports cars were being enthusiastically received in Europe and the United States.

Currently, the Mazda RX-7 is equipped with a 255-horsepower rotary engine with sequential twin turbochargers. It is one of the fastest sports cars in the world. 1991 Mazda cars powered with rotary engines won the 24 hour race at Le Mans. A second car produced by Mazda, the RX-792P GTP, is a race car powered by a 4-rotor engine similar to the one used in the winning Le Mans car in 1991 [2]. Though very successful in racing and sports cars, the engine is not applied in popular cars due to design and manufacturing problems.

Since the Wankel patent, several inventors patented rotary engines, but they were not superior to the Wankel engine so that, though patents were granted, the engines were seldom built. For example a rotary internal combustion engine was patented in June 1950 by the French inventor Casimir Andre Loubiere (US patent 2,511,441 [3]). On June 21, 1970 a rotary vane hydraulic motor was patented by Martti Korhonen (US patent 3,516,769 [4]). Neither engine reached a production phase.

Advantages of the Wankel engine include small overall size and mass, light weight, fewer moving parts, compactness, simple construction, low initial cost and fewer repairs. However, the Wankel Engine has several disadvantages. Serious overheating problems cause deformations of the rotor, deteriorate seals and make cooling a difficult task. The other problem is due to the elliptical two axis cylinder, which if even slightly misaligned, may cause serious vibrations.

Testea Patent Concept

The Testea System concept is a new invention patented recently. The patent includes the Turbo-Compressor and the Rotary Engine. The patent covers several group of countries: USA, Japan, European Community and others. The concept was recognized as unique and the patent is in the final stages. (Appendix 1)

The Testea System concept does not seem to have the disadvantages of the Wankel Engine. Friction is kept to a minimum, thus reducing the overheating problem. The circular rotating cylinder which holds the piston can be balanced perfectly, thereby eliminating vibrations.

The main differences and similarities of Wankel Engine and Testea System Concept are summarized below:

<table>
<thead>
<tr>
<th>Wankel Engine</th>
<th>Testea System Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Three explosions per rotation</td>
<td>- Three explosions per rotation</td>
</tr>
<tr>
<td>- Elliptic cylinder</td>
<td>- Round cylinder</td>
</tr>
<tr>
<td>- Turbo charge or no turbo charge</td>
<td>- Turbo compressor required</td>
</tr>
<tr>
<td>- The piston is moving inside of the elliptic cylinder</td>
<td>- The cylinder is moving together with rotor and the two meet at the tangential point which seems to be an example of the exception to the fundamental law of gearing.</td>
</tr>
<tr>
<td>- One spark plug per rotor</td>
<td>- One spark plug per rotor</td>
</tr>
</tbody>
</table>

In summary, Testea System consists of a stationary block in which the cylinder and the rotor are mounted together.
The rotor is mounted eccentrically in the cylinder. The eccentricity leaves space which becomes the combustion chamber. The cylinder rotates around an imaginary axis. The power is transmitted by the main shaft which also forms a type remove exhaust gases. In the simplest solution, the Turbo - Compressor is mounted on the back of the Rotor Engine (Fig. 2).

Proposed Project

Objectives

The objective of this project is to model, analyze, design and build a working model of the basic configuration of the Testea System according to the patented concept. The basic configuration will consist of the Engine and Turbo Compressor as shown in the photographs of the model (Fig. 1, Fig. 2). They will be located in one block, approximately 12" high, 12" wide and 9" deep (Fig. 2). The set of preliminary drawings was prepared on a CADKEY system, but due to the page limitation, it is not included here. The drawings are available on request.

Methodology of the Research

The concept of the Testea System is a turbo charged Internal Combustion (IC) engine for motor vehicles or other applications that employ a rotary design with a stator distributor obturator. Its purpose is to provide motorists with a highly reliable engine that operates more efficiently than standard IC engines while taking up less room in the vehicle engine compartment. The Testea System would consist primarily of a motor cylinder, rotor, and stator distributor obturator. The motor cylinder would serve as the housing for the rotor and stator distributor obturator. The rotor is the mechanical part of the engine analogous to the pistons in traditional engines and also functions as
part of the distributor. It includes three obturator slots, which serve as valves through which the admission and evacuation of gases takes place. Through its motion, the rotor would force these slots to open or close in front of the stator distributor obturator. Mounted on the rotor would be three rectangular-shaped palettes positioned 120 degrees from each other.

When the rotor rotates, the palettes stay in contact with the cylinder walls, moving rectilinearly due to the centrifugal force. They serve in separating the three compartments and in creating the engine cycle (admission, compression, explosion, and evacuation). This rotor is mounted eccentrically inside the cylinder, together with the stator obturator distributor.

The stator obturator distributor consists of two pipes which are concentrically placed and fastened to the three palettes. The pipe located on the exterior is actually a pipe segment. It serves as an obturator for the rotor's slot during the explosion. Simultaneously, it forms a canal for admission with the interior pipe. The interior pipe serves to evacuate the gases towards the exterior and from compartments through which admission and evacuation occurs. The compartments are closed off at the heads by two disks, one having a concentric hole that creates the compartment through which evacuation takes place. The stator has a fixed position and the rotor rotates on it concentrically. The evacuation channel can be thermally isolated. The admission and evacuation Turbo Compressor compartments could take on different forms that best serve the function of the motor. The turbo compressor would have approximately the same elements as the motor system and would be composed of a cylinder compressor, rotor, and stator obturator distributor. The turbo compressor is not necessary for the rotating motor and a traditional version can be used and incorporated into the design.

The appealing features of the Testea System are the increased power, a distribution set that does not move, and a smaller size, as compared to most of today's engines. Instead of relying on a system of springs and moving valves within an engine block for intake and exhaust, the distribution for the Testea System remains stationary. Not only could this increase the reliability of the engine due to fewer moving mechanical components, but it would reduce engine noise and lessen the vibration normally expected from an internal combustion engine. The increased number of explosions per rotation (3) enables the vehicle to obtain more power from the engine over a wide range of speeds. Since the engine is smaller and light-weight, it takes up less space in the engine compartment. This allows vehicle designers to create aerodynamic front ends with a reduced amount of hood room required. This advantage is useful in other applications as well.

Theory

The fundamental law of Gearing and Velocity Ratio may be described as follows [5]:

\[ rv = \frac{w_1}{w_2} = \frac{n_2}{n_1} = \frac{N_t1}{N_t2} = \frac{d_1}{d_2} \]

where

- \( rv \) = velocity, rad
- \( w \) = angular velocity, rad/sec
- \( n \) = angular velocity, rpm
- \( N \) = number of teeth
- \( d \) = pitch circle diameter, in

The Testea System seems to confute this theory. One of the goals of this research is to investigate it's behavior and describe exactly why it happens.

Project Milestones

The preliminary design will be done first. In this stage, we will check whether or not all the functions are satisfied.
As a next step, analysis of stress and deflection for static and dynamic loads, dynamic motion, vibration, heat transfer and materials will be done. In this stage, the computer model will be developed. After investigation of mechanical motion, stresses, deflections, vibrations, heat transfer and temperature distribution the design model will be developed using the experience of the UCONN CAD & CAM Laboratory. The Laboratory has designed three racing cars which, once built, successfully raced in significant competitions [6].

Finally the working model will be built and tested. The model should prove the feasibility of the Testea System concept. The final product of the project will be a complete design and the working model.

Special effort related to proper cooling of the engine will be required. Due to the combustion within the Testea System, an adequate cooling system would have to be incorporated into the design. If no cooling system were provided, some parts would melt from the heat of the burning fuel, and the rotor could expand so much it might seize (could not move within the main cylinder). The Testea System should be capable of withstanding these extreme conditions and remain dimensionally stable (with the use of the water jackets or some other cooling method) during normal operation.

Bibliography


Evidence of Commitment

a. The commitment of the University of Connecticut

Both the Center for Precision Manufacturing and the Department of Mechanical Engineering are fully committed to work on the project. The research time of four faculty members, worth more than $20,000 during the academic year and four months in summer, is clear evidence of the commitment.

b. Business

Testea Engine System Inc. is a new company founded in 1989 and registered in Connecticut on January 10, 1992 (Appendix II). It has three employees and their main goal is to develop the new engine according to the concept patented by George Testea. This project is the principal task for the company and the further existence of the company depends on its result.

c. Personnel

Personnel consists of four professors, the president of the company, technicians and administrative staff. The principal investigator Prof. Z. Bzymek will lead the team and will serve with his expertise in Inventive Design and Computer-Aided Design & Modeling, concurrent engineering and solid mechanics. Prof. Bzymek successfully lead three projects in car design. His group in mechanism design was awarded Second in a national ASME contest in 1988. Prof. R. Garrett will contribute his knowledge of computer techniques in engineering. Prof. N. Olgac will contribute
his knowledge in automatic control and Prof. Cetegen in heat transfer.

Mr. George Testea will constantly participate in the team work. He will add his practical knowledge of combustion engines and his manufacturing expertise. The university, company technicians and equipment will give the team full capability.

d. Facilities

The CAD&CAM Laboratory is fully equipped (Appendix III) to do all the theoretical and design work. The parts for the model prototype will be machined in the Mechanical Engineering Shop and in the Precision Manufacturing Center Shop. Some parts will be delivered by Testea Engine System Inc.

Biographical Information

General characteristics of the research team

Completing the research task described in this proposal in only two years demands a very efficient and intense effort. For this reason, the research team was designed in an optimum manner. When assembling the team, knowledge, experience and the ability to work cooperatively were all taken into consideration. The research team will consist of one senior and three middle level faculty members. The team has knowledge in Inventive Design, ICAD & CAM, Automatic Control, Mechanism Design and Heat Transfer. The following are the team members:

Z. M. Bzymek - Associate Professor of Mechanical Engineering and director of CAD&CAM and Expert Systems Laboratory. Publishes in national conference proceedings and Journal of Modeling & Simulation on CAD, Modeling and Simulation. His role on the team is to generate concepts for design and supervise the design and development of the system.

R. E. Garrett - Professor of Research. Has taught design and led graduate student teams in CAD at Purdue University and the University of Connecticut. He has over ten years industrial experience in CAD and expert systems. His role on the team will focus on programming of the CAD system.

N. Olgac - Associate Professor of Mechanical Engineering. An expert on Robotics, Mechanism Design and Control. He teaches courses and leads several MS and Ph.D. theses in the area of Robotics and Automatic Control. His role on the team is to study mechanical and control problems and supervise the design of the control system.

B. Cetegen - Assistant Professor of Mechanical Engineering. Has broad knowledge in Combustion Theory and Heat Transfer. He teaches courses, leads a research team and publishes in the area of combustion and heat transfer. His role in this project is to perform the research and design of the cooling system.

Member from Testea Engine System Inc.:

George Testea - President of Testea Engine Systems Inc. His experience includes, planning and designing various mechanical products for the automotive industry, including hydraulic and pneumatic systems, and plastic injection molds, development of the manufacturing tools and devices necessary for the development of these products, research and development of mechanical systems including power distribution and lubrication systems for the manufacturing industry. He is also proficient in conceptualization, designing, and developing automated manufacturing tools and machinery and also modification of existing equipment for greater efficiency.

Biography, Bibliography and Professional Summary of ZBIGNIEW M. BZYMEK, Associate Professor
Department of Mechanical Engineering. Revised 9/92

Birth date: 8/5/35 Birthplace: Warsaw, Poland Date of Appointment: 9/81

Education:

B.S. 1959 Technical University of Warsaw, Poland Civil Engineering (Bridge Construction and Design)
M.S. 1961 University of Michigan, Ann Arbor, Michigan, USA (Structural Engineering)
Ph.D. 1967 Technical University of Warsaw, Poland "The Analysis of Dynamic Deflections of Bridges Having the Deck Supported on Arches or Suspended Cables"

Experience:
1957-59 Teaching Assistant, Technical University of Warsaw, Poland
1961-63 Designer, Bridge, Road and Motor Traffic Technical Equipment Design and Consulting Office "Transproject", Warsaw
1961-66 Instructor, Technical University of Warsaw, Poland
1966-72 Assistant Professor, Technical University of Warsaw, Poland
1972-81 Associate Professor, Technical University of Warsaw, Poland
1974-81 Head Editor of Serial: "Research Reports on Automation of Structural Design", Technical University of Warsaw, Poland
1977-81 Editor in Charge of Department, Monthly "Highways" - Computer Aided Design and Bridge Construction and Design, Warsaw, Poland
1981- Associate Professor, University of Connecticut

Professional Societies: Association for Computing Machinery; International Association of Science and Technology for Development (IASTED); American Association of University Professors; American Society of Mechanical Engineers

Honors and Distinctions: Honor List Student (A-honor) in the class graduated in 1952 - Gen. Sowinski Lyceum of Warsaw, Poland

Scholarships: Honor List Scholarship in 1954-58 at the Technical University of Warsaw; United State National Student Association/Polish Student Association Graduate Exchange Scholarship, University of Michigan, Ann Arbor, Michigan (USA)


Award of the Secretary of the Polish Academy of Science for research in CAD of Engineering Structures, 1976.

Stefan Bryla Award of the Polish Society of Civil Engineers for advanced work in Computer Aided Design of Building Structures, 1977.

Several awards of Ministry of Higher Education in Poland for Teaching and Research Achievements in the years 1965-1979.

Member: Faculty Council of the Technical University of Warsaw (Civil Engineering) 1972-81; Advisory Council to the Mayor of the City of Warsaw (Transportation Section) 1972-81; Computer Science Committee of the Polish Academy of Science. 1976-81; Committee of Science of the Polish Association of Civil Engineers, 1968-81; Advisory Council to the Ministry of Building (Computer Application Section) 1972-1974; Pi Tau Sigma Honorary Membership since 1983; International CAD/CAM Program Committee of IASTED.

Recent Grants:

1982  Stanley Works Foundation. Topic: Development of CAD/CAM in Mechanical Engineering with Peter W. McFadden. Amount: $10,000.00
1983  University of Connecticut Research Foundation Topic: An experiment on Synthesis of Structures Amount: $2,600.00
1984  Harris Foundation Topics: Energy Recovery Systems and Synthesis of Structures. Two principal investigators: P. W. McFadden and Z. M. Bzymek Amount: $372,000.00 (Equipment Grant)
1985  Control Data Corporation, Hamilton Standard and other sources. Topic: Computer Aided Instruction in Engineering Sciences Co-investigator cooperating with five other researchers from the School of Engineering in the project headed by Dr. Michael Cutlip Amount: $1,200,000.00 (Equipment and graduate scholarships grant)
1989  Equipment grant. In a group of four professors, $80,000 in the Graduate School of the University of Connecticut.
1989  CADKEY grant, with Peter McFadden co-investigator; Amount $236,028.


Research Interests:  Engineering Design of Mechanical and Civil Systems, especially CAD/CAM; Optimization and Synthesis of Engineering Structures.

Publications:  A full publication list containing over 60 items including books, textbooks, journal articles, abstracts and conference papers is available on request.

Biography, Bibliography and Professional Summary of RICHARD E. GARRETT, Professor of Research Center for Grouting Research and Development

Education:  B.S. 1956 University of Delaware
            M.S. 1963 University of Florida
            Ph.D. 1967 Purdue University

Professional Positions:

1991 - present  Professor of Research (Part-time), University of Connecticut
1981 - 1989  Technical Consultant, MIT
1980 - 1990  Adjunct Professor, Purdue University
1978 - 1979  Director of Research, CIM Division, Control Data Corporation
1975 - 1978  Principal Consultant on CAD/CAM, Control Data Corporation
1972 - 1974  Chairman, Design Group, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana
1971 - 1975  Full Professor, Purdue University, West Lafayette, Indiana
1967 - 1971  Associate Professor, Purdue University, West Lafayette, Indiana
1964 - 1967  NASA Fellow, Ford Foundation Fellow, Purdue University
1959 - 1964  Assistant Professor, University of Florida, Gainesville, Florida
1956 - 1959  Test & Development Engineer, Hamilton Standard Division of
United Technologies, Windsor Locks, Connecticut

Consultant Work:
- Control Data Corporation, Minneapolis, Minnesota
- General Electric Corporation, Schenectady, New York
- Digital Equipment Company, Maynard, Massachusetts
- Ross Gear Division of TRW, Lafayette, Indiana
- Ecological Science Corporation, Houston, Texas
- Brenner Associates, Architects, Lafayette, Indiana

Citations:
- American Men of Science, 11th Edition

Society Memberships:
Professional:  ASME  ASEE  SES
Honorary:  Omicron Delta Kappa (leadership)
           Pi Tau Sigma (engineering)
           Sigma Xi (research)
           Scabbard & Blade (military)

Professional Activities (highlights):
- ASME Board of Research, 1983 - 1985
  - Technical Chairman, 1980 ASME Centennial on Computer Technology, San Francisco, CA
  - Member, ASME Computer Technology Committee, 1977 - 1981
  - NASA Workshop on Aircraft Surface Representation, NASA - AMES Research Center, 1978
  - Session Chair, ASME Winter Annual Meeting, Atlanta, 1977
  - Organizer of Man - Machine Interaction Group, 1st USA - JAPAN Joint Computer Conference
  - Co-Editor, Kinesiology Review, 1969 - 1972
  - Chairman, ASEE Engineering Design Committee, 1969 - 1970
  - Lecturer, Short Course on Modern Design Engineering, for Engineers of Ingersoll-Rand, 1969

Research:
Current research directed toward the goal of increasing the effective use of computing equipment in the
science and engineering areas in general, and in particular, mechanical design, manufacturing, optimization and
visualization (graphics). Recently directed the engineering research activities for Control Data Corporation at MIT,
Purdue, Stanford, Connecticut and an MIT spinoff project on engineering constraint management at the University of
Puerto Rico. Presently consulting for the engineering programs for the William C. Norris Institute - a non-profit
organization; involved in research in grinding at the University of Connecticut; and assisting with organizing an
industrial consortium at MIT.

Commuttes
**Engineering Advisory Committee, University of Connecticut, 1986 - 1991**
**Research Council, University of Connecticut, 1976 - 1979**
**Executive Committee, Research Council, University of Connecticut, 1977 - 1978**
**University Senator (Alternate), Purdue University, 1975**
**Mechanical Engineering Head Selection Committee, Purdue University 1974 - 1975**
**Chairman, Ad-Hoc Research Committee, Purdue University, 1974 - 1975**
**Graduate Committee, Purdue University, 1971 - 1975**

**Special Appointment:**
- Appointed by Secretary of the Air Force to study the U.S. Air Force's capabilities in Computer Graphics at their various research installations around the country, 1974

**Research Grants and Financial Support:**
- NASA - AMES Research Center 179,000 1973 - 1976
- NASA - AMES Research Center (joint Purdue Univ / Univ of Connecticut grant) 140,000 1977 - 1978
- NASA - AMES Research Center (joint Purdue Univ / Univ of Connecticut grant) 140,000 1979 - 1980
- Control Data Corporation (CIM Division grants to Purdue - approx.) 4,000,000 1980 - 1989
- Control Data Corporation (CIM Division grants to MIT - approx.) 2,500,000 1981 - 1989

**Recent Refered Publications:**
- "Research Needs in Mechanical Systems", K.N. Reid, R. Cohen, R.E. Garrett, H.H. Richardson, W.O. Winer, Select Panel on Research Goals and Priorities for the National Science Foundation, NSF

Nejat Olgac, Associate Professor, Department of Mechanical Engineering.

Date of birth: Aug. 28, 1950

Education:
- 1972: M.S. - Technical University of Istanbul, Turkey Mechanical Engineering
- 1972: B.S. - Technical University of Istanbul, Turkey Mechanical Engineering

Experience:
- 4/89-6/89: DAAD Study-Visit Scholar, Technical Univ. of Munich, W. Germany.
- 88-present: Associate Professor, Department of Mechanical Engineering, University of Connecticut, Storrs.
- 9/81-9/88: Assistant Professor, Department of Mechanical Engineering, University of Connecticut, Storrs.
- 1973-76: New York Institute of Technology, Adjunct Assistant Professor.

Recent Publications:

Recent Research grants and projects:
- “Design of Precision Electric Motor Drive Controllers”, a part of the precision manufacturing initiative (PMI), through the CT Dept. of Economic Development (1991-94), $225,000.
- “Experimental Study for the Sliding Mode Control on Robot Drives” An equipment grant from the State of Connecticut (1991), $30,000.
- A program on “Development of on-line vibration detection and feedback control of surface quality for metal cutting processes”, NSF, SME. UCONN Research Foundation (1983-86), total of $60,000.
Biography, Bibliography and Professional Summary of Baki M. Cetegen, Assistant Professor, Department of Mechanical Engineering, The University of Connecticut, Storrs.

**Education:**

**Professional Employment:**
- 9/1987 - Present Assistant Professor of Mechanical Engineering, University of Connecticut, Storrs, also Adjunct Assistant Professor of Chemical Engineering.

**Awards and Honors:**

**Publications:** Recent Refereed Articles


Recent Conference Proceedings and Meeting Presentations:


Biography, Bibliography and Professional Summary of GEORGE TESTEA, President, Testea Engine Systems; revised 11/92

Birth date August 19, 1934, Recea, Brasov, Romania

Education M.S. Polytechnic Institute - Brasov, Romania

Experience Mechanical Design Engineer at Automatica, Bucharest Romania, 1959-63
Mechanical Design Engineer at Institute for Research of Machine Construction Technology, Bucharest Romania, 1963-68
Manager, Cooperative Company, Bucharest Romania, 1968-83

Budget

a. Budget detail (see Attachment III, pages 17, 18, 19)
b. Budget Explanation

The project will last two years. In the first year, the main cost of $52,380 will consist mainly of personnel salaries and wages. A $2500.00 amount for travel is connected with gathering materials, participating in the related conferences and travel between Storrs and West Hartford where the company office is located. Materials and supplies, books, manuals etc. (cost $2500.00) are necessary for modeling of the system and other expenses connected with the project. Shop services are also needed for the model preparation.

In the second year, the structure of the expenses is similar, however, the wages of technicians and costs of the shop services are higher. This is connected with work on physical model.

Current and Pending Support (see Attachment IV, pp. 20, 21, 22, 23)

Collaborative Policies

University Collaborative Policy Statement is attached. This policy statement supersedes any other reference to collaborative policies.

Special Consideration

George Testea was directed to the University of Connecticut by the Department of Economics of the State of Connecticut after he received a letter from Governor Lowell P. Weicker Jr referring him to the Commissioner, Robert Santy (Appendix IV). The task which the project team is taking is to design, model and study the concept of the engine. This project is undertaken by the university in understanding of the Governor's program for helping small businesses. The concepts seem to be promising and if the company finds a serious investor, it can become very successful. The Testea System invention is an excellent opportunity for the Yankee Ingenuity Initiative.

Testea Engines Inc. agreed to sponsor this proposal by contributing $186,000 (Appendix V) and endorsing the statement of collaborative intent (Appendix VI).
**Proposal No.: 93GO19**

**Yankee Ingenuity Initiative**  
Charles Goodyear  
Cooperative Research and Development Grants  
Connecticut Innovations, Inc.  
Department of Economic Development

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**Attachment III**  
**SUMMARY PROPOSAL BUDGET**  
(REFER TO SECTION I FOR ALLOWABLE COSTS)

**First year: June 1, 1992 - May 31, 1994**

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>University of Conn., Dept. of Mechanical Engr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINCIPAL INVESTIGATOR</td>
<td>Zbigniew M. Bzymek</td>
</tr>
<tr>
<td>A. SENIOR PERSONNEL</td>
<td></td>
</tr>
<tr>
<td>1. Richard E. Garrett - Professor</td>
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</tr>
<tr>
<td>2. Zbigniew M. Bzymek - Associate Professor</td>
<td></td>
</tr>
<tr>
<td>3. Nejat Olgac - Associate Professor</td>
<td></td>
</tr>
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<td>4. Baki Cetegen - Assistant Professor</td>
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<tr>
<td>5. TOTAL SENIOR PERSONNEL (1-4)</td>
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<tr>
<td>B. OTHER PERSONNEL (SHOW NUMBER IN BRACKETS)</td>
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<tr>
<td>1. POST DOCTORAL ASSOCIATES</td>
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<tr>
<td>2. OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)</td>
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<td>3. GRADUATE STUDENTS</td>
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<td>4. UNDERGRADUATE STUDENTS</td>
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<td>6. OTHER - SPECIFY Specialist (1x12x2000)</td>
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<tr>
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<td>FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)</td>
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<tr>
<td>TOTAL SALARIES, WAGES &amp; FRINGE BENEFITS (A+B+C)</td>
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<td>D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH EXCEEDING $500)</td>
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<tr>
<td>E. TRAVEL: DOMESTIC (SPECIFY ON BUDGET EXPLANATION PAGE)</td>
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<tr>
<td>F. OTHER DIRECT COSTS</td>
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<tr>
<td>1. MATERIAL AND SUPPLIES: also - books, manuals</td>
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<td>3. COMPUTER (ADP) SERVICES</td>
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<tr>
<td>4. OTHER SHOP SERVICES</td>
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<td>5. TOTAL OTHER DIRECT COSTS</td>
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<tr>
<td>TOTAL DIRECT COSTS - SUBTOTAL</td>
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<tr>
<td>E. OTHER COSTS SPECIFY ON BUDGET EXPLANATION PAGE</td>
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<tr>
<td>TOTAL OTHER COSTS AND INGREDIENT COSTS - SUBTOTAL</td>
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</table>
**Proposal No. 93G019**

**Yankee Ingenuity Initiative**

**Charles Goodyear**

**Cooperative Research and Development Grants**

**Connecticut Innovations, Inc.**

**Department of Economic Development**

**Attachment III**

**SUMMARY PROPOSAL BUDGET**

(REFER TO SECTION I FOR ALLOWABLE COSTS)

*Second year: June 1, 1994- May 31, 1995*

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<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>University of Conn., Dept. of Mechanical Engr.</th>
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</thead>
<tbody>
<tr>
<td>PRINCIPAL INVESTIGATOR</td>
<td>Zbigniew M. Bzymek</td>
</tr>
<tr>
<td>A</td>
<td>SENIOR PERSONNEL: PI, Co-PIs, Faculty and Other Senior Associates (list each separately with title and organization, A-6: Show number in brackets)</td>
</tr>
<tr>
<td>1</td>
<td>Richard E. Garrett-Professor</td>
</tr>
<tr>
<td>2</td>
<td>Zbigniew M. Bzymek-Associate Professor</td>
</tr>
<tr>
<td>3</td>
<td>Nejat Olgac - Associate Professor</td>
</tr>
<tr>
<td>4</td>
<td>Baki Cetegen - Assistant Professor</td>
</tr>
<tr>
<td>5</td>
<td>TOTAL SENIOR PERSONNEL (1-4)</td>
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<tr>
<td>B</td>
<td>OTHER PERSONNEL (SHOW NUMBER IN BRACKETS)</td>
</tr>
<tr>
<td>1</td>
<td>POST DOCTORAL ASSOCIATES</td>
</tr>
<tr>
<td>2</td>
<td>OTHER PROFESSIONALS, TECHNICIAN, PROGRAMMER, ETC.</td>
</tr>
<tr>
<td>3</td>
<td>GRADUATE STUDENTS</td>
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<td>UNDERGRADUATE STUDENTS</td>
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<td>SECRETARIAL CLERICAL</td>
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<td>TOTAL SALARIES &amp; WAGES (A &amp; B)</td>
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<td>E</td>
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<td>F</td>
<td>OTHER DIRECT COSTS</td>
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<td>1</td>
<td>MATERIAL AND SUPPLIES books, manuals</td>
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<tr>
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<td>PUBLICATION COSTS/PAGE CHARGES</td>
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<td>3</td>
<td>COMPUTER (ADP), SERVICES</td>
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<td>4</td>
<td>OTHER maintenance</td>
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<td>TOTAL OTHER DIRECT COSTS</td>
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<p>| FOR DHF | 2,500 |
| SE ONLY | 2,000 |
| AWARD NO. | 1,753 |
| FUNDS REQUESTED FROM DHF | 5,792 |
| FUNDS CONTRIBUTED BY CO-SPONSORS | 1,500 |
| ----- | ---- | ---- |
| CAL | ACAD | SUM |
| 13,080 | 2 | 23,630 |
| 7,500 | 10,700 | 7,000 |
| 6,300 | 31,500 | 13,080 |
| 57,880 | 26,160 |
| 7,167 | 2,878 |
| 65,047 | 29,038 |
| 2,500 | 63,603 |
| 6,253 | 73,800 | 100,333 |
| 16,236 | 26,226 |
| 91,116 | 126,659 | 20 |</p>
<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>University of Conn., Dept. of Mechanical Engr.</th>
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**PRINCIPAL INVESTIGATOR**  Zbigniew M. Bzymek

**AWARD NO.**

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<th>FUNDS CONTRIBUTED BY CO-SPONSOR(S)</th>
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<td><strong>CAL</strong></td>
<td><strong>ACAD</strong></td>
<td><strong>SUMR</strong></td>
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</table>

<table>
<thead>
<tr>
<th>A</th>
<th>SENIOR PERSONNEL: PI, Co-PIs, Faculty and Other Senior Associates (list each separately with title and organization, show number in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Richard E. Garrett - Professor</td>
</tr>
<tr>
<td>2</td>
<td>Zbigniew M. Bzymek - Associate Professor</td>
</tr>
<tr>
<td>3</td>
<td>Nejat Olgaç - Associate Professor</td>
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<td>4</td>
<td>Baki Cetegen - Assistant Professor</td>
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<td>60,800.</td>
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<td>POST DOCTORAL ASSOCIATES</td>
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<td>OTHER PROFESSIONALS (TECHNICIANS, PROGRAMMER ETC.)</td>
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<tr>
<td>3</td>
<td>2 GRADUATE STUDENTS</td>
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<td>UNDERGRADUATE STUDENTS</td>
</tr>
<tr>
<td>5</td>
<td>1 SECRETARIAL CLERICAL</td>
</tr>
<tr>
<td>6</td>
<td>OTHER - SPECIFY</td>
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<td>TOTAL SALARIES &amp; WAGES (A &amp; B)</td>
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| D | PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH EXCEEDING $500) |

| E | TRAVEL: DOMESTIC (SPECIFY ON BUDGET EXPLANATION PAGE) |
|   | 5,000. |

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<td>PUBLICATION COSTS/PAGE CHARGES</td>
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<td>COMPUTER (ADPE) SERVICES</td>
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<td>TOTAL DIRECT COSTS (A THROUGH F)</td>
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<td>217,629.</td>
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<td>186,000.</td>
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**SUMMARY PROPOSAL BUDGET**

(FOR DHE USE ONLY)

**DURATION (MONTHS)**

PROPOSED GRANTED
### Attachment IV

**SUMMARY OF ALL CURRENT AND PENDING RESEARCH SUPPORT (FROM WHATEVER SOURCE)**

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of the proposal.

<table>
<thead>
<tr>
<th>Name of Investigator:</th>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>C</strong></th>
<th><strong>D</strong></th>
<th><strong>E</strong></th>
<th><strong>F</strong></th>
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<tr>
<td><strong>Richard E. Garrett</strong></td>
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<td>*1)</td>
<td>75,000</td>
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<td>B. Other pending</td>
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<td>this Project</td>
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<tr>
<td>2.</td>
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<td>*1) Computer-Aided Design and Graphics Hardware and Software Grant</td>
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<td><strong>IV. Other agencies</strong></td>
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</tbody>
</table>

---

1. Include Federal and Other State Agencies, and private resources
2. Entry in project title should be number coding (i.e., 1, 2, ...) and the full titles should be identified according to number on an attached sheet (i.e., 1. full title, 2. full title ...)
3. Non-academic researchers may report percentage of total research effort using the last column only.

USE ADDITIONAL SHEETS AS NECESSARY
Attachment IV

SUMMARY OF ALL CURRENT AND PENDING RESEARCH SUPPORT (FROM WHATEVER SOURCE)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of the proposal.

<table>
<thead>
<tr>
<th>Name of Investigator: Zbigniew M. Bzymek</th>
<th>A</th>
<th>B</th>
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1. Include Federal and Other State Agencies, and private resources
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USE ADDITIONAL SHEETS AS NECESSARY
## Attachment IV

### SUMMARY OF ALL CURRENT AND PENDING RESEARCH SUPPORT (FROM WHATEVER SOURCE)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of the proposal.

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<thead>
<tr>
<th>Name of Investigator:</th>
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### Definitions:

1. Include Federal and Other State Agencies, and private resources.
2. Entry to project title should be number coding (i.e., 1, 2, ...), and the full titles should be identified according to number on an attached sheet (i.e., 1. full title, 2. full title ...).
3. Non-academic researchers may report percentage of total research effort using the first column only.

**USE ADDITIONAL SHEETS AS NECESSARY**
# Attachment IV

**SUMMARY OF ALL CURRENT AND PENDING RESEARCH SUPPORT (FROM WHATEVER SOURCE)**

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of the proposal.

### Name of Investigator:

**Baki Cellegen**

<table>
<thead>
<tr>
<th>Name of Investigator: <strong>Baki Cellegen</strong></th>
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<td>A. This proposal</td>
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<td>10%</td>
<td>1 month</td>
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<td><strong>DED</strong></td>
<td>*6) 98,868</td>
<td>7/93 - 7/95</td>
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<td>1 month</td>
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<tr>
<td><strong>III. Prior Support for this Project</strong> If this project has previously been funded.</td>
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<tr>
<td>1.</td>
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<td>*1) &quot;Quantitative Comparison of Laser Induced Fluorescence and Molecular Spectroscopy in Combustion Systems&quot;</td>
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<td>2.</td>
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<td>*4) &quot;Development of High Performance Combustion Engine&quot;</td>
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<tr>
<td>3.</td>
<td> </td>
<td>*5) &quot;Experimental Study of Two-Phase Flow and Tumbling Heat Transfer on Spratly Fluted Pipes&quot;</td>
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<tr>
<td><strong>IV. Other agencies to which this proposal has been/ will be submitted.</strong></td>
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<td>2.</td>
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<td>*6) &quot;A Study of Mixing and Combustion in Pulsed - Combustion Furnaces&quot;</td>
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</tr>
</tbody>
</table>

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**USE ADDITIONAL SHEETS AS NECESSARY**
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<th>YEAR I MATCH</th>
<th>YEAR II MATCH</th>
<th>DED MATCH</th>
<th>TOTAL MATCH</th>
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<td>R.G.</td>
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<td>7,000</td>
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*subject to indirect costs*
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<td>7,167</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>FB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>59,761</td>
<td>5,877</td>
</tr>
<tr>
<td></td>
<td>65,047</td>
<td>7,167</td>
</tr>
</tbody>
</table>
NOTICE OF NEW EMPLOYER IDENTIFICATION NUMBER ASSIGNED

Thank you for your Form SS-4, Application for Employer Identification Number (EIN). The number assigned to you is shown above. It will be used to identify your business account, tax returns and documents, even if you don't have employees.

1. Keep a copy of the number in your permanent records.
2. Use your name and the number exactly as shown above on all Federal tax forms.
3. Use the number on all tax payments and tax-related correspondence or documents.

Using a variation of your name or number may result in delays or errors in posting payments to your account. It also could result in the assignment of more than one Employer Identification Number.

We have established the filing requirements and tax period shown above for your account based upon the information provided. If you need help to determine your required tax year, get Publication 538, Accounting Periods and Methods, which is available at IRS offices.

If you are required to make Federal tax deposits for employment taxes (Forms 941, 943, 940 or CT-1), excise taxes (Form 720), withholding tax (Form 1042), and or income taxes (Form 1120), an initial supply of Federal tax deposit coupon books will be sent to you. Please allow 5 to 6 weeks for delivery.

Thank you for your cooperation.
## APPENDIX III

**CAD & CAM LABORATORY EQUIPMENT LIST**

<table>
<thead>
<tr>
<th>Item</th>
<th>How Many</th>
<th>Unit Cost</th>
<th>Date of Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRIS SGI 2400</td>
<td>3</td>
<td>$20,000.-</td>
<td>1983</td>
</tr>
<tr>
<td>IRIS SGI 3100</td>
<td>1</td>
<td>$60,000.-</td>
<td>1986</td>
</tr>
<tr>
<td>Personal IRIS</td>
<td>2</td>
<td>12,000.-</td>
<td>1990</td>
</tr>
<tr>
<td>SGI 4081S server</td>
<td>1</td>
<td>20,000.-</td>
<td>1990</td>
</tr>
<tr>
<td>Select color printer</td>
<td>1</td>
<td>$6,000.-</td>
<td>1990</td>
</tr>
<tr>
<td>Matrix 6000 Form Copy</td>
<td>1</td>
<td>$12,000.-</td>
<td>1986</td>
</tr>
<tr>
<td>HP-800 Super Minicomput.</td>
<td>1</td>
<td>$374,067.-</td>
<td>1985 (grant)</td>
</tr>
<tr>
<td>Tektronix 4035</td>
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<td>$8,000.-</td>
<td>1986</td>
</tr>
<tr>
<td>IBM PC</td>
<td></td>
<td>$1,260.-</td>
<td>1984</td>
</tr>
<tr>
<td>Tektronix 4014 DVST</td>
<td>1</td>
<td>$14,000.-</td>
<td>1976</td>
</tr>
<tr>
<td>HP 7550A 8 Pen Plotter</td>
<td>1</td>
<td>$3,800.-</td>
<td>1985</td>
</tr>
<tr>
<td>Gerber Sc. Autograph Sys.</td>
<td>1</td>
<td>$120,000.-</td>
<td>1986 (grant)</td>
</tr>
<tr>
<td>IBM Proprinter</td>
<td>1</td>
<td>$300.-</td>
<td>1986</td>
</tr>
<tr>
<td>IBM PS II/50</td>
<td>2</td>
<td>$4,800.-</td>
<td>1988</td>
</tr>
<tr>
<td>HP 7574 6 Pen Plotter</td>
<td>3</td>
<td>$800.-</td>
<td>1989</td>
</tr>
<tr>
<td>HP Laser Jet II printer</td>
<td>1</td>
<td>$1,200.-</td>
<td>1989</td>
</tr>
<tr>
<td>IBM PC AT</td>
<td>1</td>
<td>$3,600.-</td>
<td>1986</td>
</tr>
<tr>
<td>Rolland CAMM - 3 Cutter</td>
<td>2</td>
<td>$16,000.-</td>
<td>1989</td>
</tr>
<tr>
<td>CAMM-1 (build in the lab)</td>
<td>1</td>
<td>$2,000.-</td>
<td>1986</td>
</tr>
<tr>
<td>CAMM-2 (build in the lab)</td>
<td>1</td>
<td>$1,500.- (still under construct.)</td>
<td></td>
</tr>
</tbody>
</table>
November 24, 1992

Dr. Thomas Tighe
Provost
University of Connecticut
Storrs, Connecticut

Joint Project for the Development
of a New Very High Performance Rotary Internal Combustion Engine

Dear Dr. Tighe,

On behalf of Testea Engine Systems Inc., I am pleased to confirm that we endorse the statement of collaborative intent as outlined on pages 9 and 10 of this document. Ownership of any programs developed would be held jointly by the University and Testea Engine Systems Inc.

Testea Engine Systems Inc. recognizes the importance of collaboration with education and research institutions and in particular with the University of Connecticut.

Yours Sincerely,

George Testea
President of Testea Engine Systems Inc.
November 24, 1992

Dr. Thomas Tighe  
Provost  
University of Connecticut  
Storrs, Connecticut

Joint Project for the Development  
of a New Very High Performance Rotary Internal Combustion Engine

Dear Dr. Tighe,

Testea Engine Systems Inc. agrees to co-sponsor the attached proposal in the event that it is sponsored by the Connecticut Department of Higher Education. Our in-kind contribution will be no less than $186,000.00 over a two year period. This will consist of consulting, materials and technical and shop assistance. We reserve the right to alter the proportions of each of these parts of our contribution.

Let me take this opportunity to compliment Dr. Bzymek on taking the initiative in developing this program and the associated sponsorship. Testea Engine Systems Inc. is a newly developed company which is promising a lot in the area of research and development of internal combustion engines. Thanks to the efforts of Dr. Bzymek, Dr. Cetegen, and Dr. Olgac a mutually beneficial relationship between the University and the company has been fostered. This will benefit not only the University and Testea Engines Inc., but also the State of Connecticut educationally, professionally and economically.

We look forward to a successful joint project.

Yours Sincerely,

George Testea  
President of Testea Engine Systems Inc.
THE UNIVERSITY OF CONNECTICUT
STATEMENT OF COLLABORATIVE POLICIES
November, 1992

The Cooperative High Technology Research and Development Grant Program was established to encourage research and development between Connecticut business and industry and institutions of higher education. The program will improve the transfer of basic research results to practical applications, allow industrial and academic scientists to improve their skills and remain current with research and development trends in their disciplines, provide additional resources to enhance and expand academic research opportunities, and stimulate economic development in the state.

PUBLICATIONS

Publications which may result from collaborative research under this program would, in general, be joint publications between The University of Connecticut and the co-sponsor. The co-sponsor would have the right to review the publication prior to submission. Prearranged and specified periods of minimum delay in publication may be agreed upon to ensure an opportunity to evaluate the patentability and to prepare and file an application.

It is imperative that faculty and students continue to maintain the freedom to disseminate the results of research. Therefore, no agreements can be made by the University to censor or restrict final disclosure of research findings.

PROPRIETARY INFORMATION

Any information designated in writing as proprietary and disclosed by either party to the other will be considered confidential and will not be released to any other party without the written consent of the disclosing party.

PATENTS POLICY

The University’s patent policy reflects its obligation to disseminate knowledge through publication as well as its obligation to serve the public interest by ensuring that inventions are developed to the point of maximum utilization and availability to the public.

COLLABORATIVE AGREEMENTS

The University of Connecticut will negotiate a research agreement with the co-sponsor after the project has been selected for an award. It is expected that the contract will reflect the intent of this statement of collaborative policy; mutually satisfactory and equitable provisions relating to inventions, patents and licenses; and, Department of Higher Education regulations and requirements. Finally, it will be negotiated to reflect the needs of each individual project.
Proposition # and Title (First 5 words): 93GO19  A Very High Prof...

REVIEW PANEL EVALUATION FORM

Please score the items using a scale of 1 (poor) to 5 (excellent). Some items have check-off responses. Use the comment sections to explain, clarify and support your ratings and responses. We ask that you not write your name on this form since we do make copies available to grant applicants upon request. Please use a pen or type your responses so that copies will be more legible.

1. The extent to which the project addresses the purposes of the program
   a. Encourages cooperative research and development between industry and higher education

   Comments: It certainly appears that the industry-academic link is strong here.

   Score 5

   b. Advances high technology research in Connecticut

   Comments: The project, if successful, would seem to open the door to innovative gynecologic design in Ct.

   Score 5

   c. Stimulates Economic development in Connecticut

   Comments: This would seem to be quite promising provided the system works.

   Score 5
2. Proposed project is appropriate and is adequately explained
   o objectives
   o relation to present state of knowledge in the field
   o general plan of work
   o description of experimental methods and procedures

   Comments: The technical review makes some excellent points in regard to the conduct of the research. Score 3.5

3. Evidence of Commitment
   a. Institutional commitment to the area and to this specific project
      Comments: I don't quite follow the statement on page 4 in regard to institutional commitment. Has release time been granted to the PIs?

      Score 4

   b. The role of the co-sponsor in the proposed project
      Comments: The company owns the engine presumably all of its specifications, so it is most likely that the company will actively participate. This, however, ought to be made much clearer.

      Score 4

   c. Competencies of proposed research staff
      o faculty investing sufficient time in project
      o level of involvement of faculty vs. graduate students

      Comments: The 3.5 is not a comment on the PIs per se, who are clearly all good researchers. I do wonder if the technical reviewers' comments might have a point (about having an engine person involved).

      Score (3.5)

   d. Adequacy of research facilities to support this project

   Comments: But this is not a drawback of any real severity in my mind. All 4 of the PIs together bring a great synergy to the project.

   Score 5
c. Involvement of small business

[ ] yes  [ ] no

Comments:


d. Evidence that the project will continue after grant period

[ ] yes  [x] no

Comments: 'I am not written, but I imagine that it would continue.'

6. Potential for project to generate additional funding or support

Comments: 'I am unsure of this.'  Score 4

7. The intrinsic merit of proposed project

Comments: 'I am not really liking this project & I think CT is the ideal place to get going on an idea like this. If this takes off, it could be the beginning of a significant industry in a state which is well prepared to supply a workforce for it.'  Score 5

[ ] yes  [x] no  [ ] possibly

Comments:
YANKEE INGENUITY INITIATIVE

CHARLES GOODYEAR COOPERATIVE RESEARCH & DEVELOPMENT GRANTS

TECHNICAL REVIEWER EVALUATION FORM

Proposal Number: 939019

Proposal Title: Very High Performance Multi-Rotor Internal Combustion Engine

Reviewer: 

Please complete each section below in ink or typed. Rank the proposal on each of the criteria with a score between (1) poor to (5) outstanding. Be conservative in scoring and use scores of five only in extraordinary circumstances. Continue comments on additional pages if necessary.

1. Scientific merit of proposal

   Score 4

   Comments:
   A simple engine with low fuel consumption has an excellent future in either large or small engines. Before this can really be determined it is very important that actual test experience be gained. Even a very simple version should be built and run early in the project.

2. Appropriateness and feasibility of proposed research methods

   Score 3

   Comments:
   See comment in 1.
   The program as planned depends heavily on analytical studies of various aspects of the engine. We feel if actual hardware is run until the final phase of the project, this is too late. In the first phase, a very simple but representative model should be built and run in both cold idle and heat gas tests to see how the system behaves. Much valuable data would become available to influence the design. I note that none of the research group cites actual experience in experimental development of
3. Relationship to the improvement of high technology instruction or research

Comments:

The program is required to begin simple but important tests of heat path, frictional values, leakage path, heat flows, and part tolerances required for performance. The program could provide an excellent experience in design methods and ways to gain insight into the actual mechanisms of gas flow, heat transfer, etc. This is the best way to teach design — a combination of analysis and relevant test data.

4. Potential for promoting high technology development

Comments:

A mixture of small engines and natural gas engines of various sizes as well as automobile could be influenced by the simplicity of this engine provided it shows by data, its potential and its ability to be rapidly developed further.

5. Qualifications of researchers

Comments:

The researchers are well qualified in their fields. However, as pointed out in 2 and 3 an experimentally oriented engineer needs to be added and test data obtained early on in the program so that the real design is based on both representative data of the key areas such as gas leakage and part expansion under hot and cold conditions and analytical design using the experimental data results to guide the design. A design program of this type has a much better chance of being successful that
OVERALL ASSESSMENT:

Does this proposal merit the Connecticut Innovations, Inc. funding?

Yes ☒ No _____ Possibly _____

Comments:

See comments

ADDITIONAL COMMENTS:

Please return by February 28 to: Nancy Rion, Director, Yankee Ingenuity Initiative, Connecticut Innovations, Inc., 845 Brook Street, Building #2, Rocky Hill, CT 06067
Phone: (203) 258-4305 FAX: (203) 563-4877
April 16, 1993

Mr. George Testea
77A Loomis Drive
West Hartford, Connecticut 06107

United States Patent Application for
ROTARY ENGINE SYSTEM - Our File: TES-1

Dear Mr. Testea:

Enclosed are copies of Notices of Allowability and of Allowance in connection with the captioned application. In view of this action, a United States patent will issue to you, containing all 14 claims originally filed (as amended), upon payment of the required issue fee ($585).

In addition to that amount, we normally obtain copies of the patent for the client, the minimum order being ten, at $3 each. There is also a charge of $150 for our services in finalization of the application.

Accordingly, upon receipt of your check in the amount of $1,495.37 (which includes the balance of $730.37 that is outstanding in your account), we will pay the necessary fees and bring the patent to issue. We normally wait to make payment until near the end of the allotted time (which expires on July 6, 1993 in this instance), since doing so will cause the patent to expire as far as possible into the future. However, if you prefer that the fee be paid sooner we will of course comply with your wishes.

Please contact us if you have questions in regard to the matter.

Very truly yours,

[Signature]

Enclosures
UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: Box ISSUE FEE
COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

IRA S. DORMAN
WATKINS CENTRE
935 MAIN STREET
MANCHESTER, CT 06040

NOTICE OF ALLOWANCE
AND ISSUE FEE DUE

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.
PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS
APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

1. Review the SMALL ENTITY Status shown above.
   If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:
   A. If the Status is changed, pay twice the amount of the
      FEE DUE shown above and notify the Patent and
      Trademark Office of the change in status, or
   B. If the Status is the same, pay the FEE DUE shown
      above.

2. Part B of this notice should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE.
   Even if the ISSUE FEE has already been paid by a charge to deposit account, Part B should be completed and returned.
   If you are charging the ISSUE FEE to your deposit account, Part C of this notice should also be completed and returned.
   All communications regarding this application must give series code (or filing date), serial number and batch number.
   Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Patents issuing on applications filed on or after Dec. 12, 1980 may require payment of
maintenance fees.
NOTICE OF ALLOWABILITY

PART I

1. The communication is responsive to the remarks submitted on 10/15/92. Amendments or cancellations of claims, or both, are considered under provisions of 37 C.F.R. § 1.116.

2. All the claims being allowable. PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Receipt is enclosed.

3. The drawings filed on 12/20/91 are acceptable.

4. Acknowledgment is made of the filing for priority under 35 U.S.C. 119. The benefit copy has been received. [ ] A patent application filed on 12/20/91 was filed on 12/20/91.

5. [ ] Note the attached Examiner's Amendment.

6. [ ] Note the attached Examiner's Interview Summary Record, PTO-413.

7. [ ] Note the attached Examiner's Statement of Reasons for Allowance.

8. [ ] Note the attached Notice of References Cited.

9. [ ] Note the attached Information Disclosure Statement, PTO-144.

PART II

A SHORTENED STATUTORY PERIOD FOR RESPONSE to this notification is set to expire three months from the "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extension of time may be obtained under the provisions of 37 C.F.R. § 1.136(a)

1. [ ] Note the attached Examiner's Amendment, Notice of Informal Application, PTO-144, which obviates that the oath or declaration is deficient; A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

2. [ ] Applicant must make the drawing changes indicated below in the manner set forth on the reverse side of this paper.

3. [ ] Drawing deficiencies are indicated on the Notice of Patent Drawings, PTO-94, attached hereto or in a paper No. 1249. CORRECTIONS ARE REQUIRED.

4. [ ] The proposed drawing correction is as follows: [ ] CORRECTIONS ARE REQUIRED.

5. [ ] Approving drawing correction has been approved by the Examiner. CORRECTIONS ARE REQUIRED.

6. [ ] Approving drawing has been reviewed by the Examiner. CORRECTIONS ARE REQUIRED.
NOTICE OF ALLOWABILITY

1. The application is in compliance with 37 CFR 1.121(b). No further action is required.

2. All the claims being allowed, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herein for previously mailed, a Notice Of Allowance And Issue Fee due. Due to an appropriate communication will be mailed in due course.

3. The allowed claims are:

4. The drawings filed on __/__/1999 are acceptable.

5. Acknowledgment is made of the claim for priority under 35 U.S.C. 119, the certified copy has [ ] been received, [ ] not been received. [ ] been filed for an earlier application No. [ ] filed on [ ]

6. [ ] Note the attached Examiner's Amendment.

7. [ ] Note the attached Examiner Interview Summary Record, PTO-413.

8. [ ] Note the attached Examiner's Statement of Reasons for Allowance.

9. [ ] Note the attached NOTICE OF REFERENCES, cited.

10. [ ] Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PARTY: [ ]

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application.

1. [ ] Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-149, which indicates that the oath or declaration is deficient; A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

2. [ ] APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.

   a. [ ] Drawing informalities are indicated on the NOTICE OF PATENT DRAWINGS, PTO-948, attached below or in Paper No.

   b. [ ] The proposed drawing correction filed on ( ) has been approved by the examiner. CORRECTION IS REQUIRED.

   c. An approved drawing correction is described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.

   d. [ ] Formal drawings are now REQUIRED.

Any response to this letter should include the following information from the NOTICE OF ALLOWANCE and ISSUE FEE DUE, ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE AND SERIAL NUMBER:

Reproduced from best available copy.

MICHAEL NENCZ
PRIMARY EXAMINER
ART. UNIT 343