INTRODUCTION

President Clinton has called technology "the engine of economic growth." It is a key element in attaining one of the major goals enunciated by the President: reinvigorating American competitiveness in the global marketplace.

Technological innovation is today the principal currency of international competition. The rewards for bringing superior new products and processes to the marketplace are a robust economy for the successful nation and an elevated standard of living for its people.

The great storehouse of technology NASA has built in 37 years of pursuing aeronautical and space goals represents a singularly important asset for the United States. That technology is not perishable; it can be used over and over, and it can be adapted to uses different and often remote from the original application.

This bank of knowledge is, in fact, being well utilized. Hundreds of companies have taken advantage of this national resource to develop more than a thousand new products and processes for the world market. They gain a competitive edge in the marketplace because they employ advanced technology already developed.

These secondary applications of aerospace technology - "spinoUs" - span so broad a range of public needs and conveniences it is almost impossible to find an area of everyday life they have not improved. Collectively they represent a substantial dividend on the national investment in aerospace research.

Recognizing the great potential of the technology bank, Congress charged NASA with stimulating the widest possible use of this valuable resource in the national interest. NASA's instrument of that purpose is the Technology Transfer Program, which seeks to broaden and accelerate the spinoff process. Its intent is to spur expanded national benefit, in terms of new products and new jobs, by facilitating the commercial application of the technology; it encourages greater use of the storehouse of knowledge by providing a channel linking the technology and those who might be able to put it to advantageous use. In July 1994, NASA implemented an Agenda for Change - a new way of doing business in partnership with the private sector. This Agenda marks the beginning of a new focus to further improve our contributions to America's economic security through the pursuit of aeronautics and space missions.

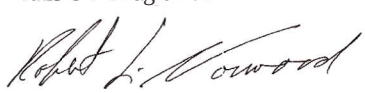
This publication is an implement of the Technology Transfer Program intended to heighten awareness among potential users of the technology available for transfer and the economic and social benefits that might be realized by applications of NASA technology to U.S. commercial interests.

Spinoff 1995 is organized in three sections:

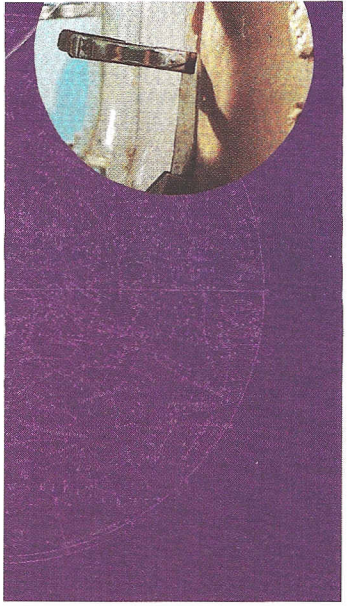
Section 1, outlines NASA's mainline effort, the major programs that generate new technology and therefore replenish and expand the bank of technical knowledge available for application.

Section 2, the focal point of this volume, contains a representative sampling of spinoff products and processes that resulted from applications of technology originally developed to meet NASA aerospace goals.

Section 3, describes the various mechanisms NASA employs to stimulate technology transfer and lists, in an appendix, contact sources for further information about the Technology Transfer Program.



Dr. Robert L. Norwood
Director, Commercial Development and Technology Transfer Division
National Aeronautics and Space Administration



STRESS PREDICTION SYSTEM

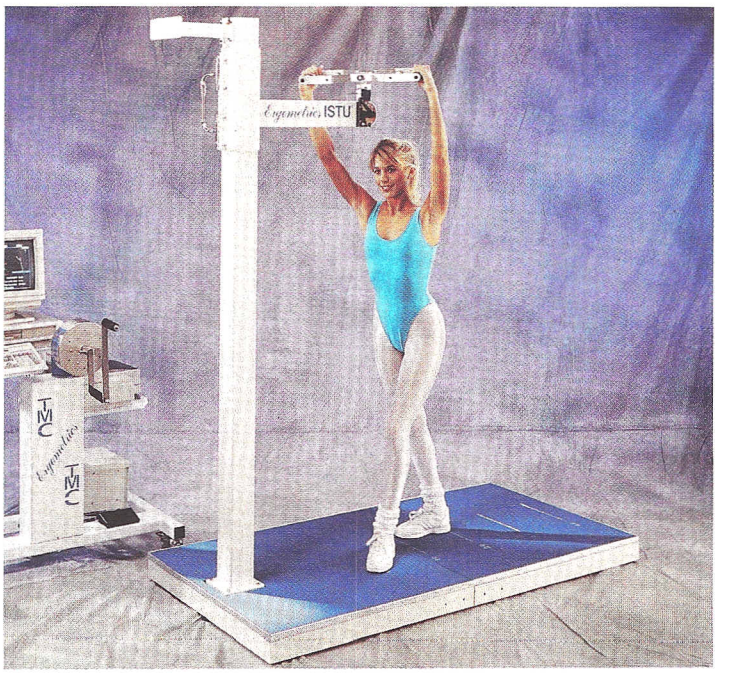
In the early 1970s, NASA contracted with the University of Michigan's Center for Ergonomics for development of a computerized biomechanical model capable of predicting stresses on various parts of the human body. Planning for possible advanced lunar missions and space station extravehicular activity, NASA wanted to know how astronauts' bodies would react under various gravitational pulls and space suit weights.

The Center for Ergonomics successfully developed an algorithm, or mathematical formula, for determining what type of stress and what degree of load a body could stand, taking into consideration the body's height, weight and posture. That technology has been commercialized with the ISTUTM(Isometric Strength Testing Unit) Functional Capacity Evaluation system **(right),** manufactured by Ergometrics, Inc., Ann Arbor, Michigan.

The hand grips the subject is pressing measure the lift/pUSh/pull furce being applied. The horizontal bar slides upward and downward from overhead level to foot level; varying the bar level and the body position enables testing the lift capacity of a subject.. Tasks such as lifting a heavy box from floor level, or lifting a weight overhead, or pulling/pushing a cart can be simulated. A computer printout provides the subject's test score and the exertion expended, and identifies the muscle group (knee, hip, ankle, etc.) that limits the subject's performance on a particular task..

Biomechanical strength modeling compares the physical stresses generated in the body with the resultant force capabilities of industrial workers; it translates job stresses into term;, of human ability to handle them, and is therefore an effective tool of personnel evaluation, personnel selection and job redesign.

The isometric strength test is useful in disability evaluation; for example, it shows how much an injured worker is capable of lifting, an aid to disability rating, return-to-work targeting or detection of malingering. It is also useful for preemployment examinations, identifying candidates capable of meeting predetermined physical requirements; this helps reduce the number of future injuries and therefore reduces workers' compensation claims. The system also has utility in redesigning unsafe jobs and in rehabilitation programs; strength measurement at the start of a therapy program and at intervals thereafter allows the therapist to determine if there has been actual improvement.



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