

THEME
LEVEL I
LEVEL II
Level III

Revolutionize Aviation
Vehicle Systems
Propulsion and Power Level II Program
Smart Efficient Components

OBJECTIVE

The objective of the Smart Efficient Component (SEC) Project is to develop and demonstrate novel multidisciplinary technologies that enhance operability and maximize performance of engine components throughout the propulsion system operating range.

KEY DELIVERABLES

1	Report assessing the use of Micro Blowing Technique on centrifugal compressor performance	6/03
2	Conceptual design of advanced fuel injector design concept incorporating MEMS technology	10/04
3	Smart Efficient Components (SEC) Technology Transfer Workshop	6/05

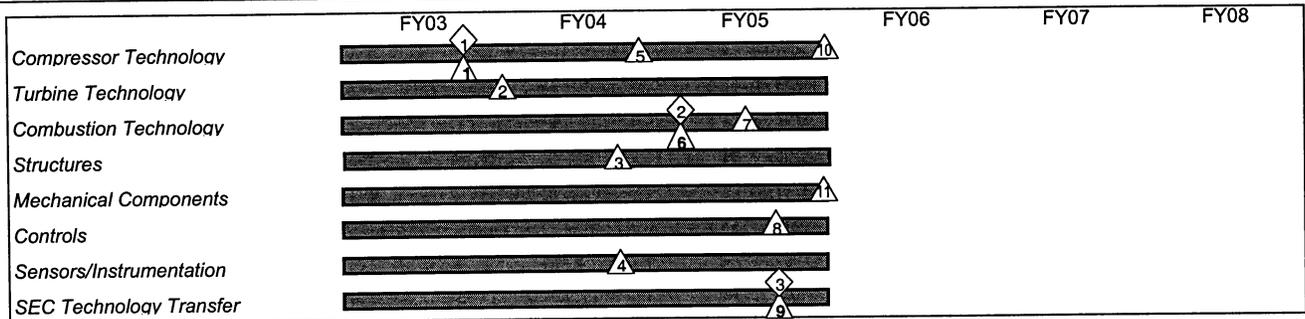
IMPACT

The SEC project will combine novel flow control concepts, smart sensors and controls to allow fluid-dynamic and structural "morphing" or changing a components behavioral characteristics. Computational tools and associated modeling techniques are developed to provide guidance and insight in the development process, and reduce development time, cost, and risk barriers. The Project will apply this approach to seals and bearings, rotordynamics, airfoil and flow separation, combustors and aeroelasticity in turbomachinery.

TECHNICAL APPROACH

(a) Compressor Technologies: advanced flow control techniques that enhance the performance and operability of compression systems; investigate the aeroelastic behavior of turbomachinery wrt flutter suppression alternatives. (b) Turbine Technologies: develop CFD tools and models for turbine aerothermodynamics; active and passive separation flow control for LPT airfoils and transition ducting. (c) Combustion Technologies: development of ultra-low emission Lean Direct Injection (LDI) injectors incorporating MEMS technology; develop and validate the National Combustor Code (NCC). (d) Structural Dynamics: high fidelity three-dimensional computer simulation for flutter and forced response prediction; blade vibration damping mechanisms; develop high-temperature, high-load magnetic bearings for aerospace applications. (e) Mechanical Components: develop non-contacting hydrodynamic seals and acoustic seals. (f) Controls: development of advanced control methods for active combustion instability suppression and integrated control. (g) Sensors/Instrumentation: the development and demonstration of passive acoustic tomography.

SCHEDULE



MILESTONES

1	L2 - Assess impact of MBT on compressor operating range extension and efficiency	6/03
2	L3 - Turbine vane heat-transfer coefficient and film effectiveness maps	9/03
3	L3 - Assess conical magnetic bearing operation at high temperature/high speed	6/04
4	L3 - Assess acoustic tomography signature data correlation to combustor burner pattern factor	6/04
5	L3 - Validation of experimental data and MSU TURBO simulation of compressor blade unsteady aerodynamics	8/04
6	L2 - Develop advanced fuel injector design concept incorporating MEMS technology	10/04
7	L3 - Release National Combustor Code (NCC) RANS Version 2.0	3/05
8	L3 - Assess active control of combustion instability emissions in a low emissions combustor	6/05
9	L2 - SEC Technology Transfer Workshop	6/05
10	L3 - Complete flow control concept assessment in compressor test facility	9/05
11	L3 - Complete prototype acoustic seal testing	9/05

MANAGEMENT

The SEC Project is a Level III project at the NASA Glenn Research Center. Level I Manager is Richard Wlezien at HQ. Level II Manager is Dr. Gary Seng at the NASA Glenn Research Center. Level III Manager is Robert Corrigan at the NASA Glenn Research Center. This project is in full compliance with NPG7120.5B.

RESOURCES

	FY03	FY04	FY05	FY06	FY07	FY08
Funding (M\$)	5.788	6.060	5.400			
Workforce (WY)	64.5	70.7	57.3			

KEY FACILITIES

	FY03	FY04	FY05	FY06	FY07	FY08
ERB - Component Test Cells						

AGREEMENTS

Partner	Agreement Title	Number
Pratt & Whitney/UTRC	Turbine Engine Systems Technology; Combustion Instability Control Program	NAS3-98005
University of Nevada - Reno	Acoustic Tomography for Jet Engines/Turbines: Proof of Concept	NCC3-750
Fluoroscience, Inc	CMC Temperature Sensor Development Activity	in work
Pratt & Whitney	XTE 67 Turbine Blade Damping Study	in work

ACQUISITION STRATEGY

Due to the broad nature of the Smart Efficient Components Project, a variety of acquisition instruments will be employed. Free and open competitive procurements will be used to the maximum extent possible. Among the approaches to procurement, the most likely include NASA Research Announcements (NRA), NASA Cooperative Agreement Notices (CAN), the RASER Task Order Contracts, and Requests for Proposals (RFP). These vehicles will result in grants, cooperative agreements, and contracts. For on-site contractors, performance-based contracts are the preferred instrument.

RISK MANAGEMENT

Risk	Mitigation Strategy
If adequate funds are not available, major project milestones will be jeopardized	1. Communicate needs and impacts to the Program Manager (PM). 2. De-scope Project Tasks to eliminate and/or delay all tasks that do not support a Level II milestone.
If appropriate research and management personnel are not available, then project milestones will be jeopardized.	1. Continue communications with 5000 and 7000 performing organizations. 2. Participate with Program Office in Workforce planning to ensure commitment. 3. De-scope Tasks and/or slip schedules.
If appropriate research facilities are not available for conducting planned tests due to schedule conflict or facility hardware failures, then project milestones will be jeopardized.	1. Coordinate all facility requirements with the ERB Facility Manager. 2. Monitor facility status.

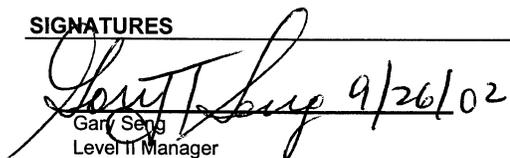
TECHNOLOGY TRANSFER

An objective of the SEC Project is to ensure rapid and effective dissemination of the technology to the U.S. industry. Technology transfer mechanisms depend on the maturity of the technology. A variety of technology transfer mechanisms will be employed. The most important mechanisms are direct involvement by the customers in the formulation of the project described in this plan, direct contract of R&D and cooperative agreements with industry and other government agencies. The SEC Project funds R&D contracts, memoranda of agreement (MOA's) and grants that ensure direct transfer of technology to the U.S. industry, increasing the likelihood of transfer into customer products. Technology exchange also occurs among the participants through special technical working group meetings. Presentations at technical conferences sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and other similar professional societies will be limited to discussion of non-competitively sensitive information. Other methods of technology transfer include publication of NASA technical reports, communications between NASA, industry and other government agencies through MOA's, and technical demonstrations at NASA and user facilities.

EDUCATION OUTREACH

The Project provides support to the educational outreach activities of the Level II Office.

SIGNATURES

 9/26/02
 Gary Seng
 Level II Manager

 9/26/02
 Robert Corrigan
 Level III Manager